

OM 842A

OPERATOR'S MANUAL

INTERSHAKE II
DTM-2 SERIES

SEPTEMBER 1977

ATLANTIC RESEARCH CORPORATION

TELEPRODUCT®

ALEXANDRIA, VIRGINIA 22314

OM 842A

OPERATOR'S MANUAL

INTERSHAKE II
DTM-2 SERIES

Applies to units having serial numbers in the "E" and "F" series.

SEPTEMBER 1977

Manufactured by:

ATLANTIC RESEARCH CORPORATION
Teleproducts Division
5390 Cherokee Avenue
Alexandria, Virginia 22314

FOREWORD

With the Intershake II, Atlantic Research introduces *System Performance Evaluation*, . . . a new concept in test systems!

The Intershake II is designed to be used full-time in data communications systems, to monitor and evaluate overall performance. In many instances, greater system economy and efficiency can be achieved by measuring overhead, downtime, long delays, extra pad characters, error rates, and identifying areas of operation which may require improvement.

As an aid in system troubleshooting, the Intershake II will prove to be invaluable in isolating and identifying malfunctions immediately. Start-up and troubleshooting delays are kept to a minimum.

The software-controlled Intershake II has the power to simulate protocol, send message blocks, make CRC calculations, measure timing, and exercise interface controls by programming from a library of over 180 instructions and subroutines which relate to actual operation of a data communications system.

This Operator's Manual has been developed not only to serve as a comprehensive guide in using the Intershake II, but also to serve as a self-teaching aid in developing operator proficiency. An outline, "How to Use This Manual" is included to show the operator *when, where, and why* specific types of testing are used.

HOW TO USE THIS MANUAL

PURPOSE AND USE OF MANUAL

This Operator's Manual has been developed not only to serve as a guide in operating the INTERSHAKE II, but to be used as a self-teaching aid for quickly developing proficiency in the use of the INTERSHAKE II.

Since the INTERSHAKE II is designed principally for use in troubleshooting and evaluating the performance of data communications systems, it is recommended that the user be familiar with the principles of data communications, and also be familiar with the specific system or systems in use.

In addition to outlining specific operating instructions, this manual also provides explanations of "how" and "why" the INTERSHAKE II is used in a variety of testing applications. Specific operating instructions are supplemented by fully illustrated step-by-step operational exercises to facilitate a rapid understanding of the INTERSHAKE II, regardless of previous training or experience.

The Appendix of this manual includes code charts, code conversion tables and other reference material for the convenience of the operator.

The following paragraphs cover each chapter of the manual, and offer suggestions on how the information may be used to be of maximum value to the operator.

CHAPTER I – INTRODUCTION

The Introduction of the manual covers the overall capability and use of the INTERSHAKE II in general terms. Review of this chapter will give the operator a general knowledge of the variety of applications in which the INTERSHAKE II can be used. Illustrations are provided to show how the INTERSHAKE II is integrated into a system for testing and monitoring.

CHAPTER II – CONTROLS AND INDICATORS

This chapter of the manual shows how the controls and indicators of INTERSHAKE II are divided into functional groups of "Control Zones." Each control zone is associated with a major function of the equipment. Each control and indicator within a zone is then listed in a table which explains its detailed use and significance.

Review of this chapter will give the operator an in-depth understanding of INTERSHAKE II major operational functions, and how the controls may be used to establish a variety of testing configurations.

CHAPTER III – PROGRAM FUNCTIONS (INSTRUCTION SET)

This chapter provides a complete listing of the 91 basic program functions which can be used with the INTERSHAKE II to perform numerous automatic testing operations. Each testing function is explained in detail, with full instructions for entering it into an overall test program. Application notes are included in some cases to assist the operator in selecting the most effective and useful functions for any specific test program.

Review of this chapter, and frequent reference to the tests which can be performed automatically through the use of the Program Functions will enable the operator to use the INTERSHAKE II effectively and increase its testing versatility.

CHAPTER IV – OPERATING INSTRUCTIONS

This chapter provides both general and detailed operating instructions in the form of step-by-step procedures which may be applied to any type of testing configuration. The instructions are supplemented by illustrations which show each control and indicator which must be used or observed during a test.

In addition to detailed operating instructions, this chapter contains a variety of testing exercises which can be performed "off-line" if desired, to provide hands-on experience in setting up the INTERSHAKE II for testing and monitoring operations. In several instances, the practice exercises require the operator to choose operating parameters of a system, and then configure the INTERSHAKE II to operate within the selected parameters. Performance of these test exercises, and frequent reference to the step-by-step operating instructions will aid significantly in developing and increasing proficiency in operating the INTERSHAKE II.

APPENDICES

The Appendices contain reference materials which will aid the operator in setting up the various test functions and parameters required for data communications system testing. Code charts are provided for translating binary or hexadecimal notation to any operating code. References are provided for translations between decimal, hexadecimal, binary, BCD and octal number systems. A short form of the Program Functions (Chapter III) is included to serve as a quick reference. Typical test routines and programs are included in Appendix E to aid the operator in developing specialized tests, or test programs which are unique within a specific environment.

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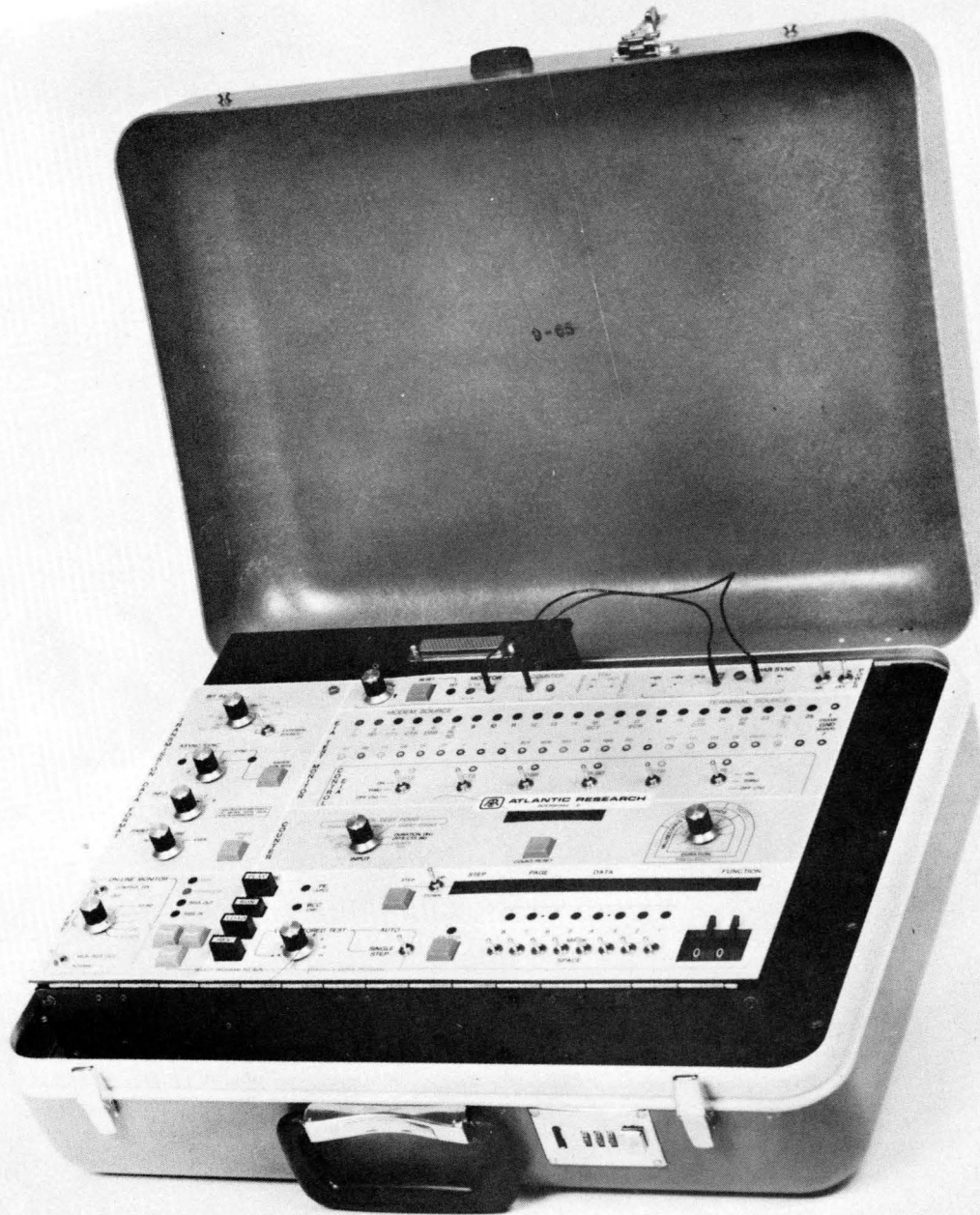


Figure 1-1. INTERSHAKE II

CHAPTER I

GENERAL INFORMATION

1.1 INTRODUCTION

The information in this Operator's Manual covers the basic operation, operating instructions, and self-teaching exercises for the INTERSHAKE II (DTM-2). The INTERSHAKE II is shown in Figure 1-1.

1.2 PURPOSE AND USE OF THE INTERSHAKE II

The INTERSHAKE II represents the latest technology in the field of data communications system testing and evaluation. The INTERSHAKE II is designed to operate with *any* data communications code or line discipline, at data rates of up to 256,000 bits per second.

The INTERSHAKE II can be used for testing full-duplex or half-duplex data communications systems; it can calculate the Block Check Character for transmitted and received data for bisync, SDLC and other protocols.

1.2.1 Testing Capability

The INTERSHAKE II provides up to 15 program cells which can be selected and executed instantly. Other test routines may be structured and programmed manually, from a library of over 180 instructions, including *branch* and *jump* (decision) instructions, and *loop* (repeat) instructions to provide software-like test programming. The program versatility permits the operator to combine tests easily to provide testing formats which correspond directly to system operation, thereby providing the capability of developing protocol tests which range from basic to those which perform a wide variety of comprehensive diagnostics.

Test programming for such operations as recording or trapping character sequences, recording the status of RS-232 (V.24) leads, transmitting data blocks, etc. are routine operations which can be implemented quickly.

In addition to the high data rate capability already mentioned, INTERSHAKE II can perform tests using internally-provided clock for binary synchronous links using non-clocked modems, or external clock in the asynchronous mode for digital networks such as Data Route. An auxiliary parallel interface is provided for auto dialers, data acquisition printers, CRT displays, bulk storage cassettes and keyboards.

Display of a full-duplex data stream is provided by INTERSHAKE II with its CRT Option No. 18. With INTERSHAKE II, CRT display of data is possible for all language codes in either CLEAR TEXT, HEXADECIMAL or OCTAL. By combining the DTM Option 18 series of CRT's with INTERSHAKE II, the operator can monitor and/or test data and display any Transmitted or Received information. All data being monitored can be displayed, or with a few simple program instructions, only data of interest is displayed. Thus, the operator can observe all data traffic from a particular terminal, or protocol. Typical type of tests include: error counts, test polling responses for proper character sequences, or response (turn-around) time measurements.

A simplified functional block diagram of INTERSHAKE II is shown in Figure 1-2.

1.2.2 INTERSHAKE II Memory Organization

The INTERSHAKE II contains four discrete memory capabilities as follows:

STORED TEST MEMORY (PROM)

This memory exists in the form of preprogrammed firmware. The memory may be programmed at the factory, and is used as a permanent file of reference tests.

PROGRAM MEMORY (RAM)

This memory exists in the form of battery powered CMOS RAM. The memory can be "written over," and will remain intact while the INTERSHAKE II is deenergized for up to 1 month.

RESULTS MEMORY (RAM)

This memory is used to record the results of a test. The memory is "written over" by subsequent test results, and is volatile (erased when INTERSHAKE II is deenergized).

The arrangement, capacity and relationship of these memories are shown in Figure 1-3.

MESSAGE PROM

Eight fixed messages are available to be called by the program. This capability eliminates operator entry errors and standardizes the message texts.

Operating Mode/Memory Relationships

Load Mode – The AUTO SINGLE STEP MANUALLY ENTER PROGRAM switch in Zone 8 is used to select the source of data to be written into the Program Memory. In the AUTO position, the stored test PROM cell is selected using the rotary selector switch positions A through H. The selected program is automatically written into Program Memory Cell A when the ENTER push button is depressed once.

When the toggle switch is set to the MANUALLY ENTER PROGRAM position, a test program is entered by using the FUNCTION thumblever switch and the eight two-position MARK-SPACE bit switches in Zone 8 to originate the functions and data required for the test. The RAM cell to be programmed is selected by the selector switch (A through H). Since cell A is *always* used as an interim location when programs are loaded from PROM, the use of cell A should be reserved for that use when programs are entered manually.

Run Mode – Tests are always RUN from the nonvolatile RAM program memory cells A through H, as selected by the rotary selector switch in Control Zone 8. (See Figure 2-1.)

Program cell "A" is *always* selected to *run* a program from the Stored Program test PROM. Cells B through H contain programs which have been stored manually. Cell A serves as an interim storage, where PROM programs may be edited (as desired) before *running* the test program.

1.2.3 Memory Description

Stored Test Memory (PROM) – The Stored Test PROM firmware cells contain up to two pages (0 and 1) of 64 steps each for a total of 128 steps per cell. The cells are permanently programmed for specific applications.

The desired program sequence is selected from positions A through H of the rotary selector switch in Zone 8, and is loaded into Program Memory cell A automatically when the toggle switch is set to AUTO and the ENTER push button is depressed. Once entered into cell A, the program can be run in the same manner as any other program in a Program Memory.

Program Memory (RAM) – The Program Memory cells, like the Stored Test firmware PROM cells, exist for the purpose of application of a test program sequence. Also, like the firmware PROM cells, they can be used to hold (store) a program for future application. However, unlike the PROM cells, the nonvolatile RAM cells can be readily programmed, and reprogrammed, or edited at any time manually from the front panel.

This *manual* programming is accomplished by setting the rotary selector switch (Zone 8) to the cell to be programmed (A through H), setting the toggle switch (Zone 8) to the MANUALLY ENTER PROGRAM position, setting the desired functions and data by using the FUNCTION switch and eight MARK-SPACE switches, and depressing the ENTER push button. This process is repeated until the cell is filled, or the program is completed. The entered program (or programs) will remain in the cell until it is written over by another program. The memory will remain intact indefinitely while the unit is energized, and for periods of up to one month when the INTERSHAKE II is deenergized.

Results Memory (RAM) – A program that requires answers (or results) from a system component will record results in the Results Memory. This memory starts with Step 00 Page 0 and ends with Step 63 Page F which equals 16 pages of 64 characters each for a total of 1,024 characters. The results can be reviewed by pressing the PLAY push button (Zone 4) and using the UP-DOWN toggle switch to step through the memory.

Alternate Capacity Configuration

The Stored Test (PROM) and Program (RAM) memories have alternate configurations which are shown in Figure 1-3. By setting an internal DIP switch, the memories can be set to provide:

8 Cells of 128 steps each: 2 Pages, 64 Steps per Page
OR
4 Cells of 256 steps each: 4 Pages, 64 Steps per Page

Chapter II (Controls and Indicators) provides detailed instructions for setting either the primary or alternate configurations.

1.3 INTERSHAKE APPLICATIONS

1.3.1 General Testing

The INTERSHAKE II makes available in a single instrument the power to simulate the data communications facility for all test routines in protocol, message block, CRC calculations, timing and interface controls. Applications, in addition to those in a communications center are: (1) development of equipment and software, (2) factory tests of system components under system conditions, (3) system installation, (4) technical control, (5) performance degradation analysis, (6) nuisance problem diagnostics and (7) "tuning" for maximum performance (detailed timing measurements). Several typical applications of the INTERSHAKE II are shown in Figures 1-4 through 1-7.

1.3.2 Full Duplex Loop-Back Testing

The Receive Delay feature of the INTERSHAKE II permits comprehensive testing of a full-duplex data channel.

In this application, the full duplex data channel is looped-back at the terminal modem as shown in Figure 1-8. The Receive Delay function of the INTERSHAKE II is then used to examine its own transmissions, after the transmissions have been sent through the full duplex system and delayed up to 4,096 bits.

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With a delay of 4,096 bits incorporated, the INTERSHAKE II can transmit a data block of up to 512 eight-bit characters, including STX, ETC and CRC. After the block has been transmitted through the full duplex system, it is examined as it clocked from the delay registers. CRC checks are made by comparing the initial block CRC to the CRC which has been calculated from the received block.

The front panel COUNTER is used to display the number of errors detected, and the number of blocks tested.

1.3.3 RS-232 Interface Signal Flow

The internal connections of the DTM-2 between the MODEM and the TERMINAL connectors are shown in Figure 1-9. The DTM-2 is Fail safe as an ON Line monitor. In Power OFF and in TEST MONITOR (with control EIA Switch to OFF) all signals are METALLIC through from the MODEM to the TERMINAL connectors. This figure also shows the location of the lights and test points in the circuit.

1.3.4 Loop Interface

The DTM-2 can easily be interfaced with a 60 mA keying circuit by using the two tip-sleeve jacks located on the rear apron of the control panel. The jacks will accommodate PL-225 type plugs, with the polarity of the tip NEGATIVE and the sleeve POSITIVE.

Although the DTM-2 is set internally to interface with 60 mA keying circuits, adjustments can be made to accommodate 20 mA circuits.

CAUTION

When the loop interface jacks are used, the TX-RX leads on the RS-232 Interface *must not be used* since interaction will occur.

1.3.5 Controls

All controls and indicators for operating the DTM-2 are located on the front panel. For convenience, the Panel artwork divides the Panel into simple ZONES to assist the operator. Figure 1-10a shows the Zone layout and connector access locations.

Certain internal controls and options are located behind the front panel. Figure 1-10b shows the location of these important features.

1.4 INTRODUCTION TO THE DTM-2 AS A COMPUTER

1.4.1 General

INTERSHAKE II (DTM-2) is a user programmable stored program special purpose computer oriented to the needs of Data Communication testing. Harvard architecture is used to simplify the program entry and to enable testing at data communication rates up to 256 kB/s.

1.4.2 Instruction Set

The INTERSHAKE II provides over 91 "basic instruction" or "op-codes" which are called FUNCTIONS. 24 of these FUNCTIONS may be expanded through use of an associated data byte. The instruction set is specifically tailored for data communication protocol programs.

Many of the *single* FUNCTIONS represent nontrivial *subroutines* in most microprocessors and minicomputers available today. Major groupings of the Instruction Set are listed with the *primary* related function shown in brackets.

- SEND data characters/messages [50 and 60 series Functions]
- TRAP specific data characters (sequences) [10 and 20 series Functions]
- RECORD data (by time, location, or relative displacement) [30 series Functions]
- CONTROL of RS-232 leads [70 series Functions]
- SENSING of RS-232 status [70 series Functions]
- 11 basic JUMP/BRANCHES (plus expansion) [40 series Functions]
- 5 VECTORED INTERRUPTS (5 priority destinations are preassigned) [97 series Functions]
- CONTROL of Panel switches [90, 91, 92, 93 series Functions]
- FLAGS Internal Program Status Word (8 Bits-direct bit test) [47 series Functions]
- TIME delay and measurement [80 series Functions]
- MARKERS (Halt, restart, return from interrupt, no-op, etc.) [90 series Functions and others]

1.4.3 Word Length

The INTERSHAKE II bus is 16 bits wide (organized as 2 bytes of 8 bits each).

The Word is broken into a DATA byte and a FUNCTION byte. The Function Byte is restricted to BCD values from 00-99.

The DATA byte is used in several ways depending upon the appended FUNCTION:

- Data character
- RS-232 (V.24) leads (preassigned and patchable)
- Binary Program Cell address (00-FF)

- BCD Values (00-99)
- Special Codes (FUNCTIONS 91, 92, 93)
- Dual HEX digits where the high (X) and low (Y) order digits represent function expansion.

1.4.4 Execution Speed

All Functions not dependent on data communication timing execute in 3 μ sec, thereby yielding a usable instruction execution rate of approximately 330 KIPS (thousand instructions per second).

1.4.5 Memory

Four electrically separate memories are contained within the Intershake II to guarantee protection of the Program Memory.

- STORED TEST (PROM) – Source of Programs to be called into Program Memory
- PROGRAM MEMORY (RAM) – Dedicated to executing the program.
- RESULTS MEMORY (RAM) – “File” for recording test progress and results and data.

Available to the Program as a source of data to be transmitted.

- MESSAGE (PROM) – Available to be called by the Program as a source of a canned block of Data.

This architecture also permits partial results to be obtained from a test that has not “completed.” The dedicated Program Memory *eliminates* the usual COMPILE/ASSEMBLE operation.

1.4.6 Program Memory Map

RUN-START always executes the instruction at address 0 first (Step 00, Page 0). The Vectored Interrupts are preassigned to the top 5 addresses with the highest priority at Step 63 of the last Page.

The Program Memory Cell is fixed at 128 or 256 steps. One function is executed in one step. Since the architecture employs “parallel” execution, a single Function/Step is equivalent to 5-12 bytes of memory in a conventional microprocessor (μ P).

The combined stored test cells and Program Memory cells yield an available resident program FILE of 15 cells of 128 steps each. Using the above ratio, this approximates a conventional μ P memory of 10K to 24K bytes. DTM-2 is thus seen to be a significantly more efficient approach.

1.4.7 Input/Output

The DTM-2 has been designed as an extremely flexible test tool through the use of a variety of access ports using standard DB-25 connectors for RS-232 and a 104-pin AUX connector for ancillary equipment connection.

- Serial data; Sync, Async, SDLC, (RS-232 (V.24) and TTL)
- Parallel data; 8 bit in, out (TTL)
- Parallel control, 8 bit in, out (TTL)
- Separate Port for remote programming and operation of DTM-2 by a host computer system.

1.4.8 Addressing

The DTM-2 uses DIRECT addressing. Since the maximum cell size is 256, the 8 bit data byte will define the address to which the program counter will jump.

An Unconditioned jump requires one step and executes in 3 μ sec.

A Branch requires two steps: the first to preset the address and the second to define the condition to be tested. Execution time is 6 μ sec.

1.4.9 Interrupts

Five Vectored Priority Interrupts are provided. One of the five may be selected to sense one of seven conditions thereby providing a menu of eleven interrupts. The top five steps are reserved for the destination addresses. Interrupts may be individually enabled and disabled. A RETURN to interrupted STEP function is also available. One interrupt can be serviced by four instructions and "return" in 15 μ sec. Nesting or servicing more than one Interrupt is to be avoided.

1.5 FACTORY SETTINGS

The INTERSHAKE II is shipped from the factory with settings as follows:

- a. Memory cell size: 8 X 128
- b. Internal Oscillator (as ordered)
 - (1) Customer specified crystal
 - (2) 1200 baud (if no crystal is ordered)
- c. 2 SYN characters
- d. Internal Clock Recovery OFF

1.6 AUXILIARY I/O

1.6.1 Auxiliary I/O Signals

A separate manual is available (SI-842) which describes the characteristics of the auxiliary I/O signals and the 104 pin Mating Connector. Mating connector is described below:

Auxiliary Connector: AMP No. 204532-2, 204532-3, 204532-3¹ = ARC PN 35442
MIL-M24308/4-16, MIL-M24308/4-22

Hood for
Auxiliary Connector: ARC PN 35441

Crimp Tool: Inserter: 22520/2-09 – Male Pin
22520/2-06 – Female Pin

Tool: AFM8 Crimp Tool, M2250/2-01
Daniels Manufacturing Co.
Bloomfield Hills, Michigan

An Auxiliary Connector with 50-pin cable is available as option 19-2.

¹Includes pin insertion/removal tool.

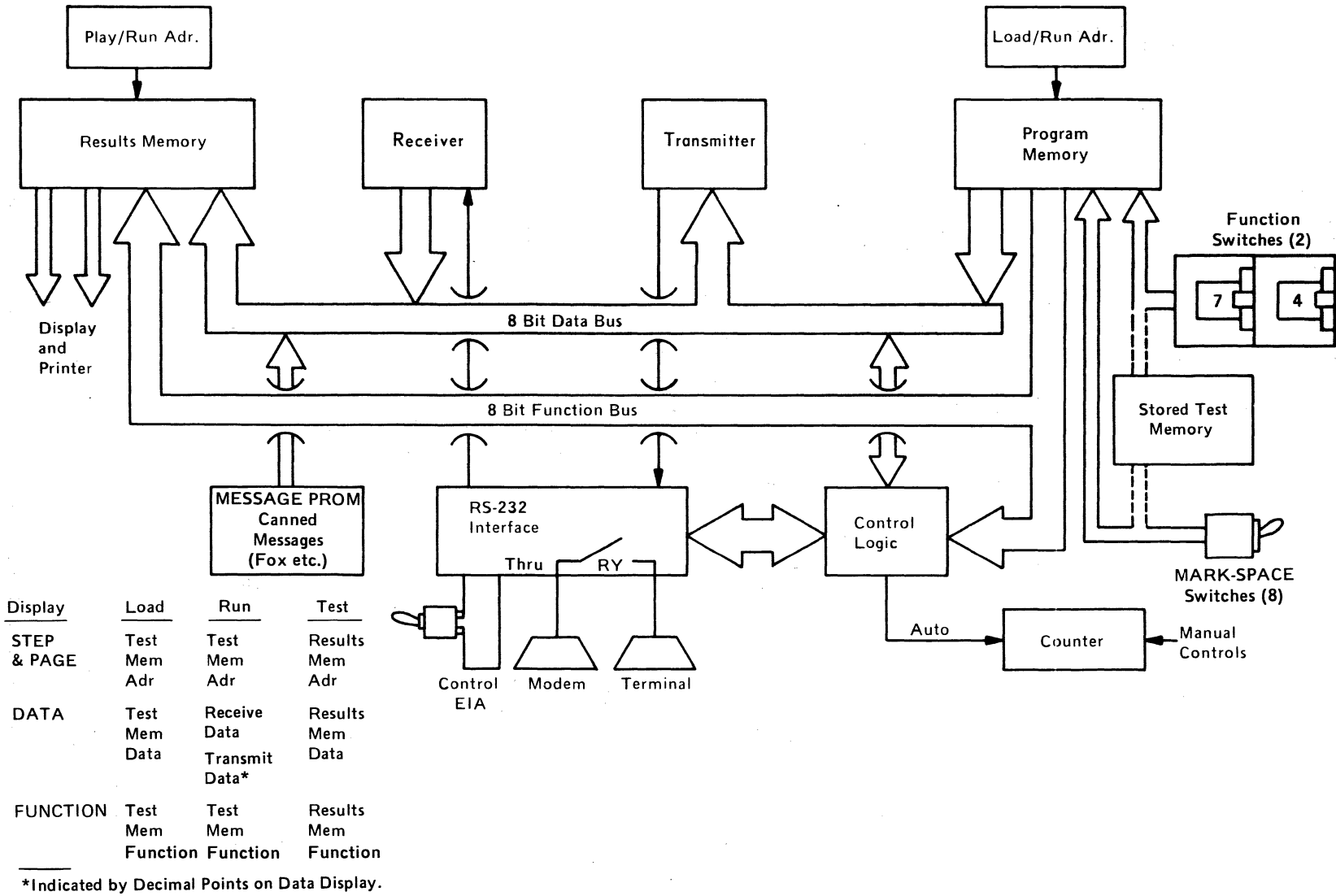


Figure 1-2. DTM Functional Block Diagram.

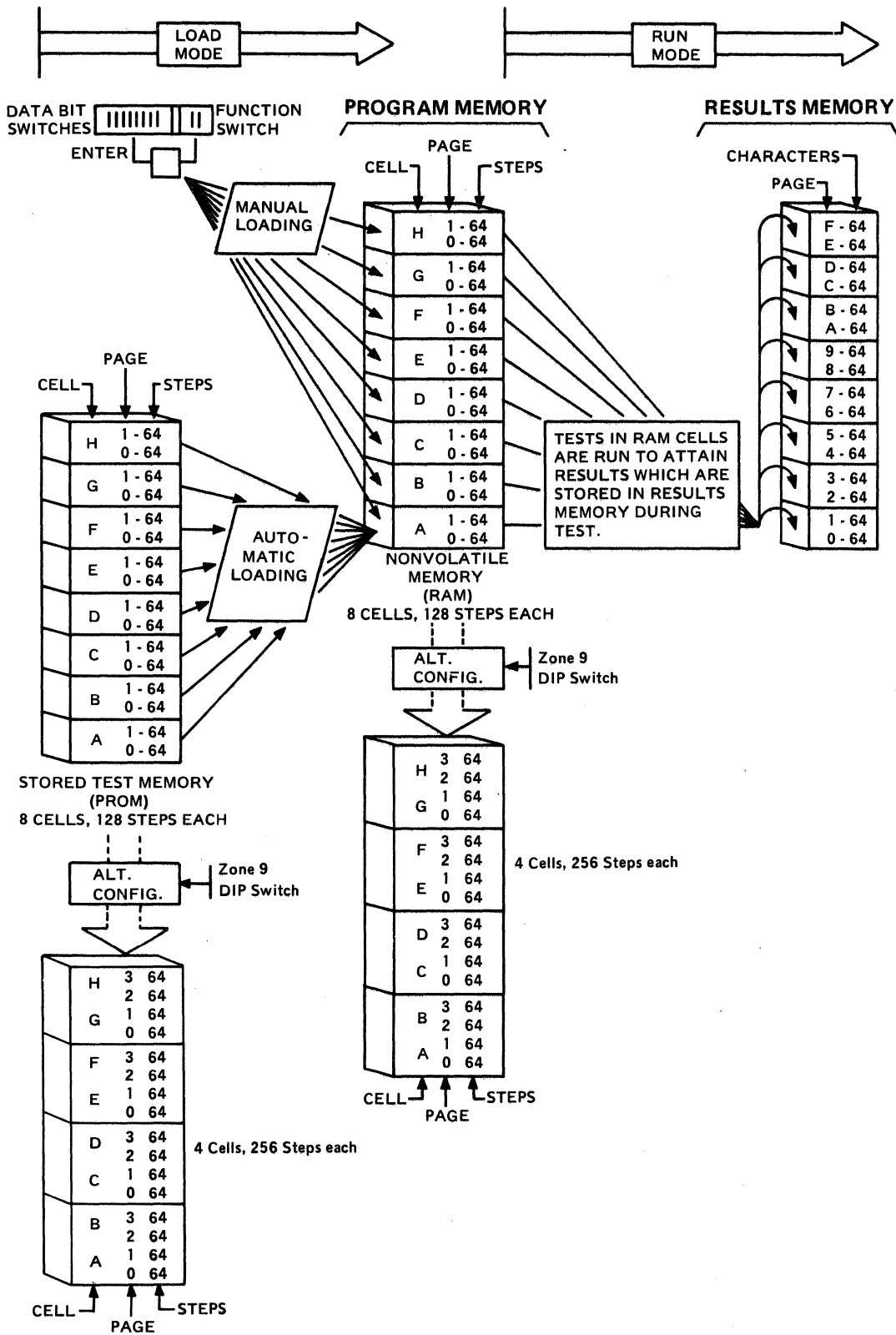
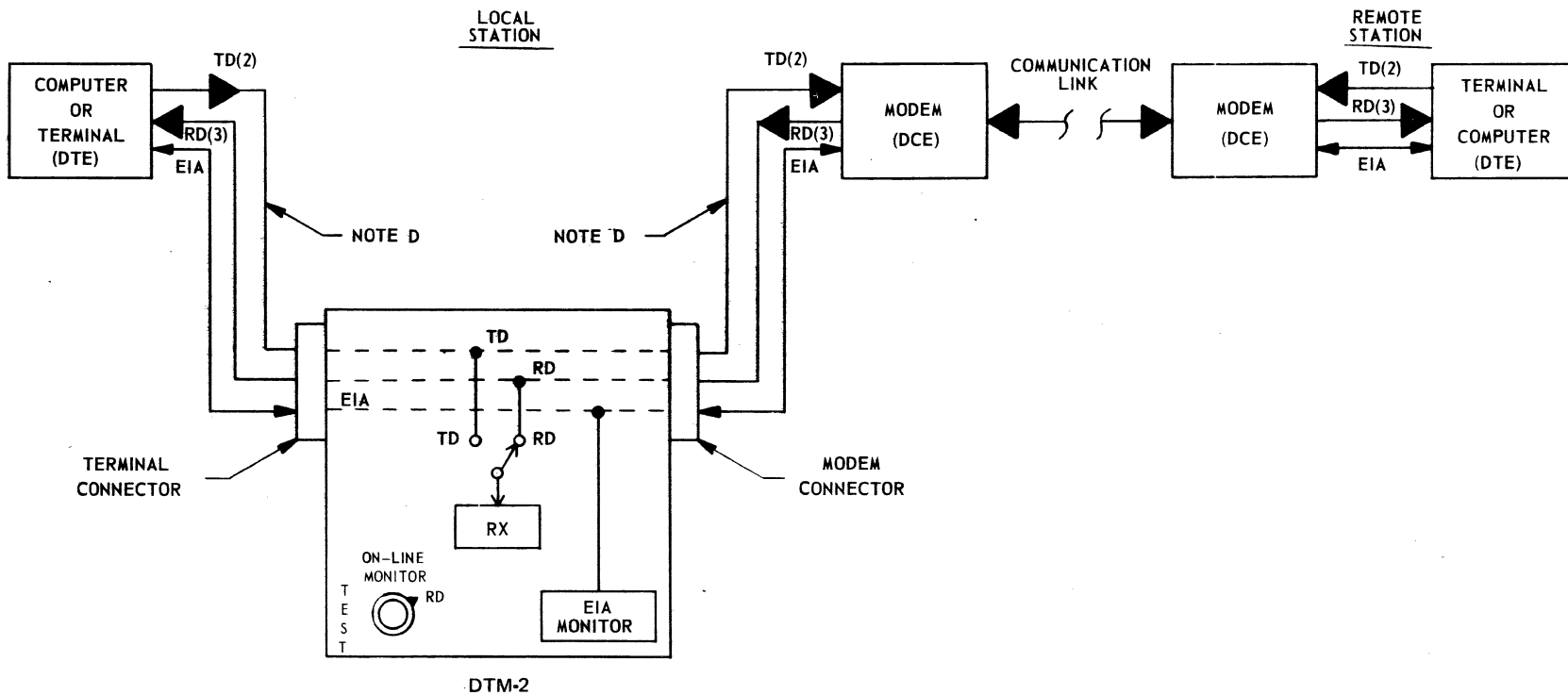


Figure 1-3. INTERSHAKE II Memory Organization and Capacity.



NOTES: TEST SELECTOR SWITCH:

- A. SET TO TD/RD - RX MONITORS ACTIVE LINE.
- B. SET TO TD - RX MONITORS TD LINE (PIN 2).
- C. SET TO RD (SHOWN) - RX MONITOR RD LINE (PIN 3).
- D. 10 FT. EIA CABLE PROVIDED WITH DTM.
- E. CONTROL EIA TOGGLE (TEST ZONE) OFF FOR METALLIC RS-232 THRU.
- F. CONTROL EIA TOGGLE ON FOR MANUAL INTERVENTION IN RS-232 PATH (S).

Figure 1-4. On-Line Monitor Test Configuration.

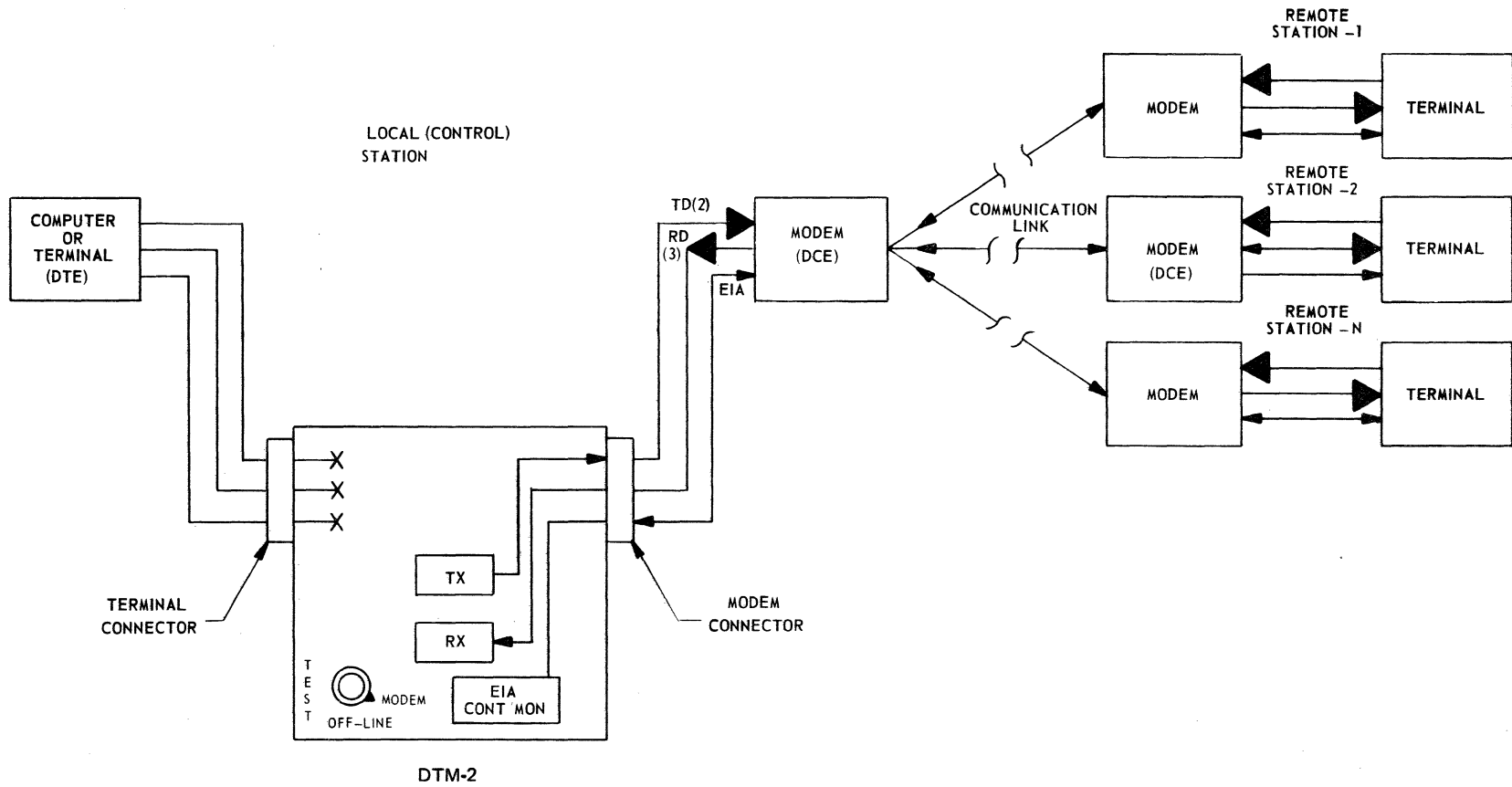


Figure 1-5. Off-Line Test Configuration, Exercise Remote Terminal(s)/Modem(s).

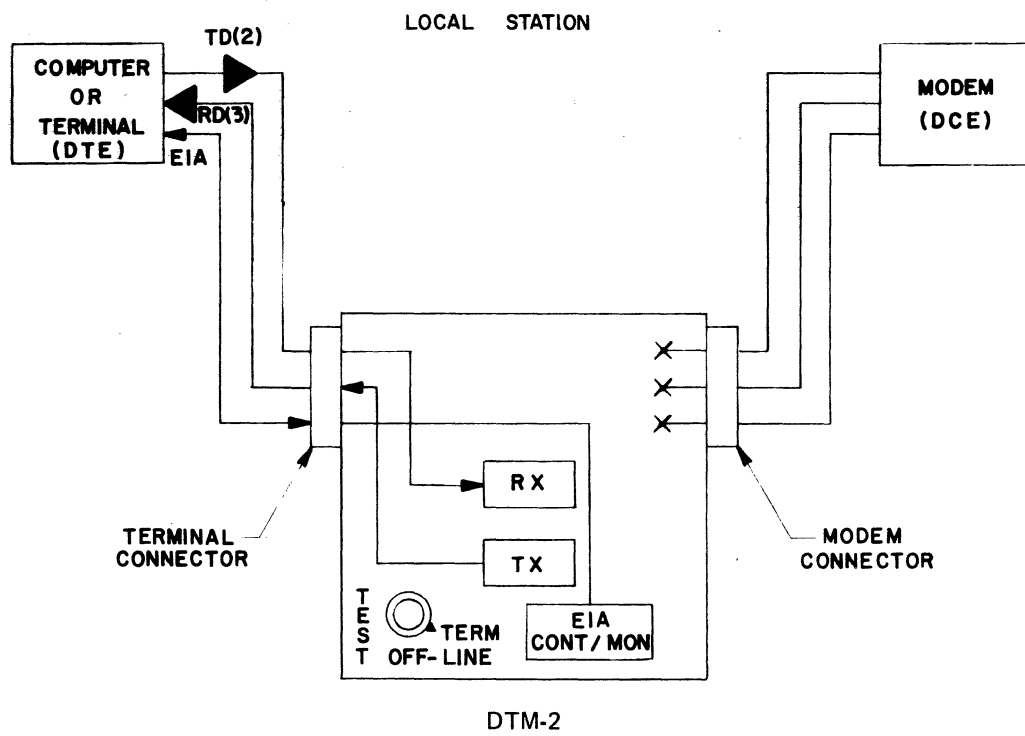


Figure 1-6. Off-Line Test, Exercise Local Terminal.

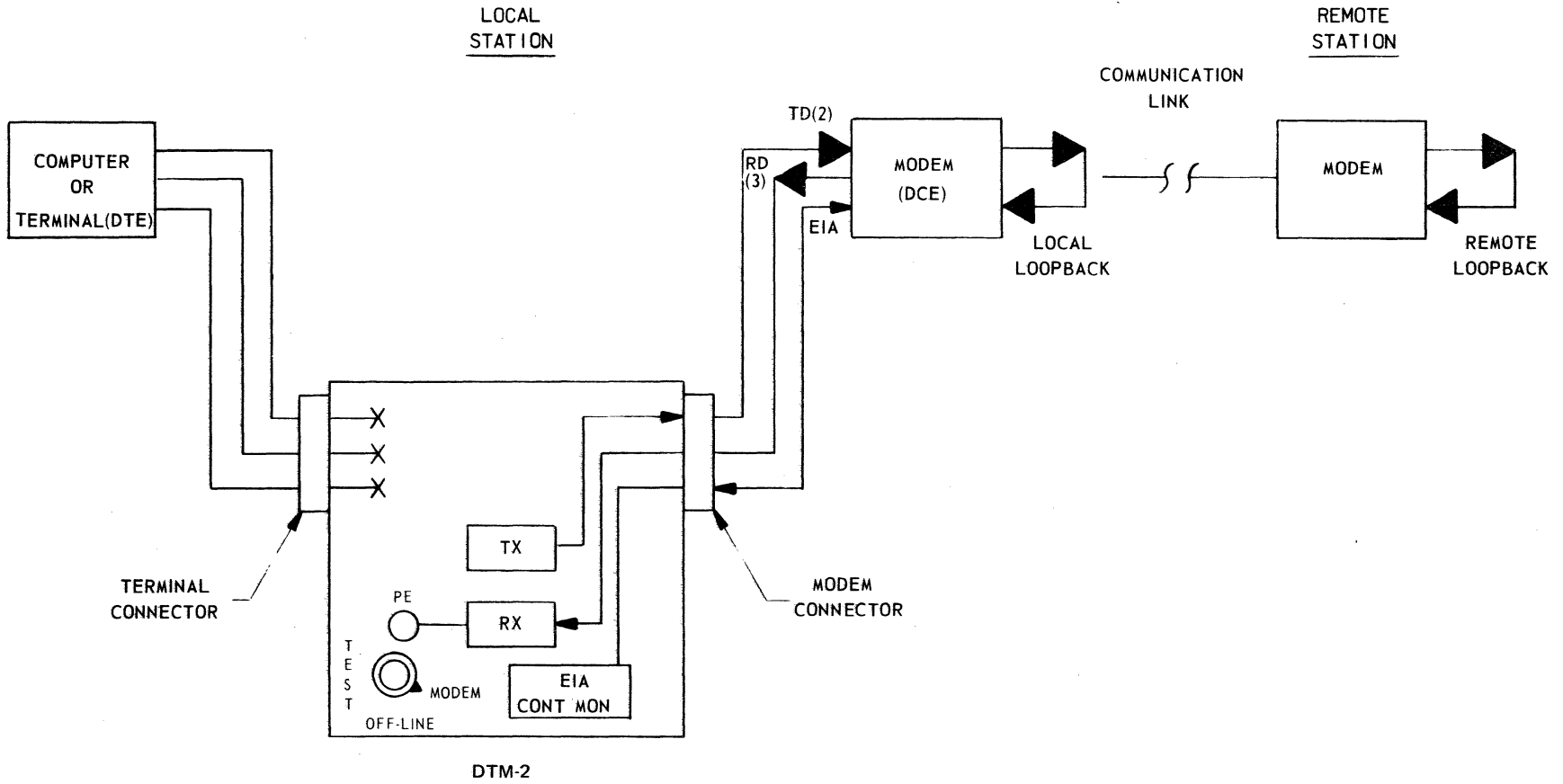
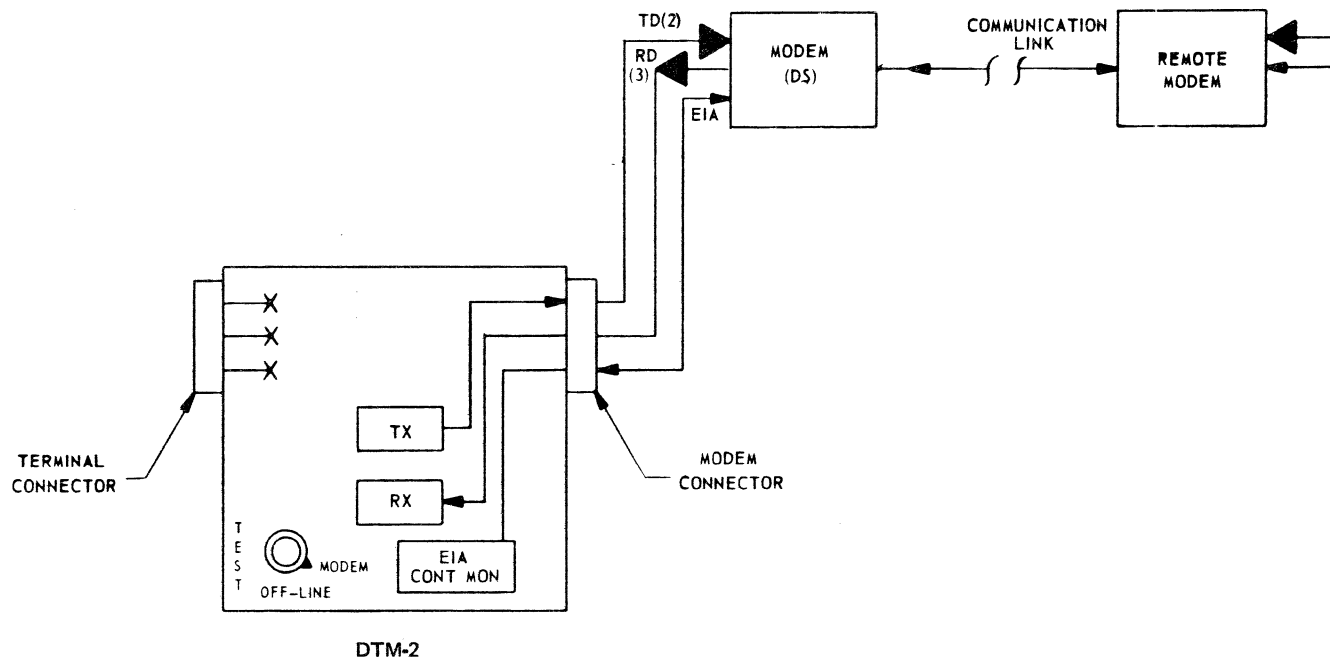


Figure 1-7. Off-Line Test, Local or Remote Loop Back.



**Figure 1-8. Off-Line Test Configuration, Exercise Remote/Modem.
Full Duplex Loop Back Test.**

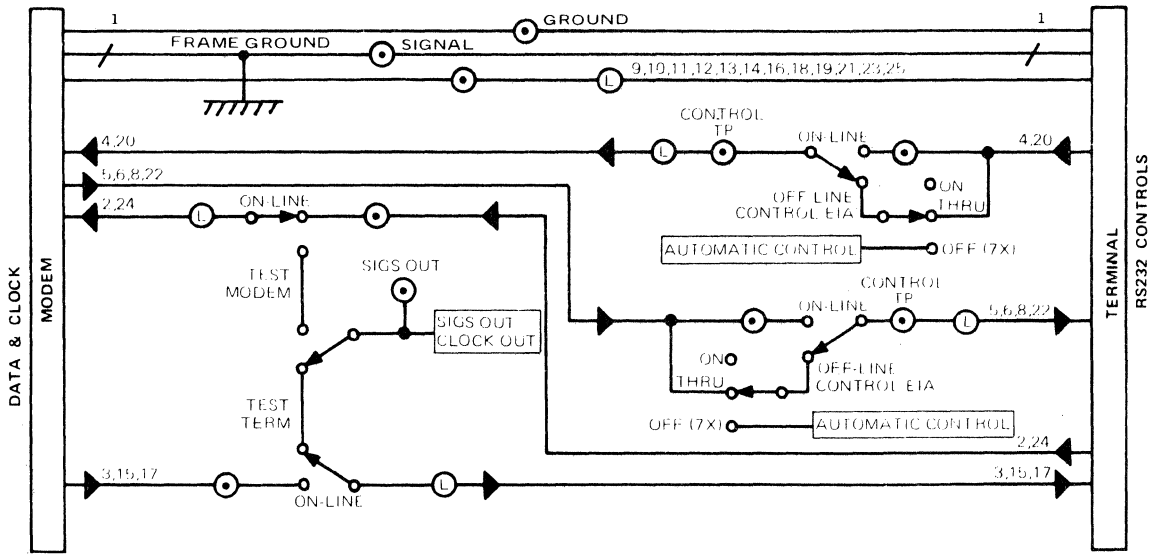
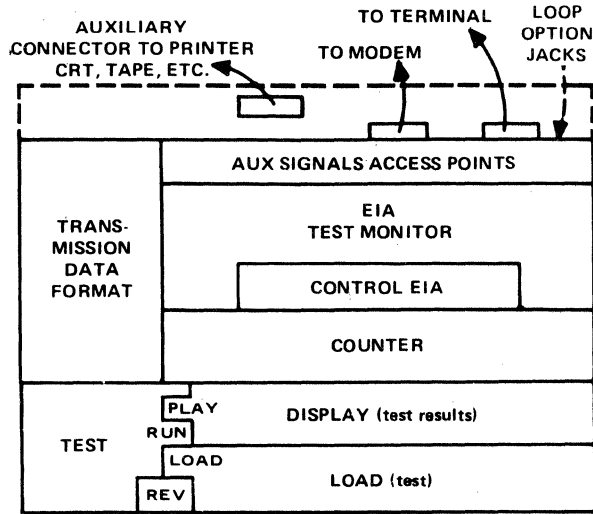
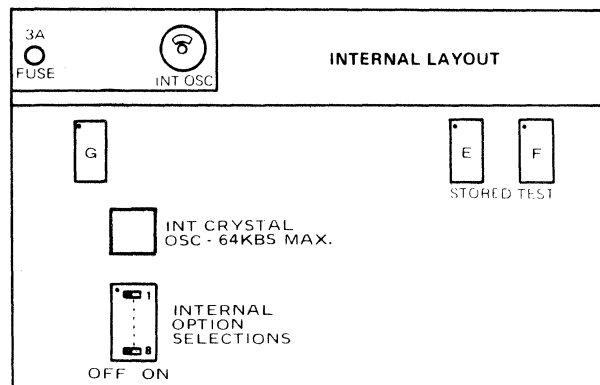


Figure 1-9. RS-232 Interface Signal Flow.



a) Panel Zones



b) Internal Controls (Lift Panel)

Figure 1-10. Panel Zones and Internal Controls.

CHAPTER II

CONTROLS AND INDICATORS

2.1 GENERAL

The information in this chapter covers the use of all controls and indicators which are normally used in performing test operations with the INTERSHAKE II.

2.2 LOCATION OF CONTROLS AND INDICATORS

The controls and indicators of the INTERSHAKE II are divided into functional groups. Each functional group (zone) is assigned to a discrete area of the front panel. The control areas are set apart by background colors (gray, yellow, blue), in an overall background of white.

For purposes of explanation, each group of controls and indicators is referred to as a "control zone." The first eight control zones are located on the front panel of the equipment, and are shown in Figure 2-1. Zone 9 controls are located inside the equipment, and are accessed by lifting the front panel on its hinges. Zone 9 controls are shown in Figure 2-2.

2.3 CONTROL AND INDICATOR FUNCTIONS

All controls and indicators of the INTERSHAKE II and their specific functions are listed in Tables 2-1 through 2-9 as follows:

| | |
|------------|--|
| Table 2-1: | Zone 1. – Transmission Data Format |
| Table 2-2: | Zone 2. – Test Patch Panel |
| Table 2-3: | Zone 3. – Test Controls |
| Table 2-4: | Zone 4. – Mode Controls |
| Table 2-5: | Zone 5. – EIA Monitor – Control EIA (V.24) |
| Table 2-6: | Zone 6. – Counter Controls |
| Table 2-7: | Zone 7. – Display Section Controls |
| Table 2-8: | Zone 8. – Program Loading Controls |
| Table 2-9: | Zone 9. – Internal Controls |

2.4 USE OF CONTROLS

Although the information in this chapter outlines the specific functions of all controls and indicators, the operator is advised to refer to Chapter III (Test Program Functions) and Chapter IV (Operating Instructions) to learn "when" and "why" the controls and indicators are used.

Reference should also be made to the INTERSHAKE Applications, a series of application notes (Appendix E) which outline typical problems which may be encountered, and give step-by-step procedures for setting up and executing corresponding test programs.

2.5 TRANSMISSION DATA FORMAT CONTROLS (ZONE 1)

The TRANSMISSION DATA FORMAT controls are located in the upper left corner of the control panel (Zone 1). The controls are used to establish the format characteristics of test data which is either generated or processed by the DTM-2. Format characteristics include bit rate, synchronization, character length, and parity. This group of controls and their functions are listed in Table 2-1.

NOTE

The term *baud*, as used in this manual, refers to the transmission rate of *information bits*, excluding STOP or REST pulse periods.

Table 2-1. Transmission Data Format Controls.

| Control Indicator | Position Function | | | | | | | | | | | | | | | | |
|---|---|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|----------|---------|----------|----------|----------|------------|----------|
| <p>BIT RATE</p> <p>TOGGLE SWITCH</p> <p>ROTARY SELECTOR SWITCH</p> | <p>ESTABLISHES SPEED (BIT RATE) OF TRANSMITTED OR RECEIVED TEST DATA. Controls include an 8-position rotary selector switch and an associated 3-position toggle switch which operate as follows:</p> <p>LEFT POSITION – Enables inner (green) scale of rotary selector switch.</p> <p>CENTER POSITION – Enables outer (blue) scale of rotary selector switch.</p> <p>EXTERNAL SOURCE (RIGHT) POSITION. – Disables rotary selector switch; enables bit rate control from external clock signal supplied on Pin 24 of EIA interface connector, and Modem clock when testing toward MODEM (Pins 15 and 17).</p> <p>Maximum external clock rate is 256 K baud. (Consult factory for higher speeds.)</p> <p>BLUE SCALE – Provides eight positions which allow selection of any of the following data bit rates:</p> <table> <tr> <td>900 BAUD</td> <td>3600 BAUD</td> </tr> <tr> <td>1200 BAUD</td> <td>4800 BAUD</td> </tr> <tr> <td>1800 BAUD</td> <td>7200 BAUD</td> </tr> <tr> <td>2400 BAUD</td> <td>9600 BAUD</td> </tr> </table> <p>GREEN SCALE – Enabled when Toggle Switch is set to LEFT position. Provides eight positions which allow selection of any of the following data bit rates:</p> <table> <tr> <td>50 BAUD</td> <td>150 BAUD</td> </tr> <tr> <td>75 BAUD</td> <td>300 BAUD</td> </tr> <tr> <td>110 BAUD</td> <td>600 BAUD</td> </tr> <tr> <td>134.5 BAUD</td> <td>INT OSC*</td> </tr> </table> | 900 BAUD | 3600 BAUD | 1200 BAUD | 4800 BAUD | 1800 BAUD | 7200 BAUD | 2400 BAUD | 9600 BAUD | 50 BAUD | 150 BAUD | 75 BAUD | 300 BAUD | 110 BAUD | 600 BAUD | 134.5 BAUD | INT OSC* |
| 900 BAUD | 3600 BAUD | | | | | | | | | | | | | | | | |
| 1200 BAUD | 4800 BAUD | | | | | | | | | | | | | | | | |
| 1800 BAUD | 7200 BAUD | | | | | | | | | | | | | | | | |
| 2400 BAUD | 9600 BAUD | | | | | | | | | | | | | | | | |
| 50 BAUD | 150 BAUD | | | | | | | | | | | | | | | | |
| 75 BAUD | 300 BAUD | | | | | | | | | | | | | | | | |
| 110 BAUD | 600 BAUD | | | | | | | | | | | | | | | | |
| 134.5 BAUD | INT OSC* | | | | | | | | | | | | | | | | |

* See page 2-3.
2-2

Table 2-1. Transmission Data Format Controls (Continued).

| Control Indicator | Position Function | | | | | | |
|---|---|------------|------------|------------|------------|------------|------------|
| <p>ROTARY SELECTOR SWITCH (continued)</p> | <p>*The INT OSC position enables an internal oscillator (tunable- or crystal-controlled fixed frequency) to provide data bit rates other than those shown on the front panel. The tunable oscillator is enabled by internal DIP switches and can be tuned in three ranges for bit rates of 45 to 2400 baud. The crystal-controlled oscillator is also enabled by an internal DIP switch, and by using interchangeable crystals provides bit rates of:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>19.2 KBAUD</td> <td>50.0 KBAUD</td> </tr> <tr> <td>40.8 KBAUD</td> <td>56.0 KBAUD</td> </tr> <tr> <td>48.0 KBAUD</td> <td>64.0 KBAUD</td> </tr> </table> <p>(Crystal Oscillator modules are available as options and are ordered according to speed required.)</p> <p>(Operation of the internal DIP switches is covered in Table 2-9.)</p> | 19.2 KBAUD | 50.0 KBAUD | 40.8 KBAUD | 56.0 KBAUD | 48.0 KBAUD | 64.0 KBAUD |
| 19.2 KBAUD | 50.0 KBAUD | | | | | | |
| 40.8 KBAUD | 56.0 KBAUD | | | | | | |
| 48.0 KBAUD | 64.0 KBAUD | | | | | | |
| <p>ASYNC/SYNC</p> <p>ROTARY SELECTOR SWITCH</p> <p>ENTER SYN BITS SWITCH</p> <p>STOP BIT INDICATOR</p> | <p>ESTABLISHES SYNCHRONIZATION CHARACTERISTICS OF TRANSMITTED TEST DATA; DUPLICATES CHARACTERISTICS OF RECEIVED TEST DATA. Controls include two switches (rotary and push button) and two indicators (SYNC and STOP BIT) which operate as follows:</p> <p>LEFT THREE POSITIONS – ASYNC operation is initiated with choice of 1, 1.5 or 2 STOP BITS as required for specific format. For 5-level codes, only the 1 or 1.5 stop bits are active; for 6-, 7- and 8-level codes, only the 1 and 2 stop-bit positions are valid.</p> <p>RIGHT POSITION – SYNC operation is enabled.</p> <p>DEPRESSED – Enters SYNC character bit pattern set by the eight MARK/SPACE switches in Zone 8. The number of bits selected must agree with the characteristics entered by the INFO BITS and PARITY switches discussed below.</p> <p>IMPORTANT! – The ENTER SYN BITS switch is used <i>only</i> when the DTM-2 is used to examine <i>received</i> data where synchronizing characters must be detected in the received data stream. <i>Transmitted</i> SYNC characters are simply entered as part of any test program (FUNCTION 50).</p> <p>ENTER SYN BITS may be used only in the LOAD mode. Entering new SYN BITS will simply update the previous pattern and <i>will not</i> cause loss of synchronization.</p> <p>LIGHTS when ASYNC operation has been initiated.</p> | | | | | | |

2.7 TEST PATCH PANEL (ZONE 2)

The TEST panel provides a variety of test and control functions which may be used independently or in conjunction with other DTM-2 test sequences. The signal jacks, indicators and controls located in this TEST panel are listed and described in Table 2-2.

Table 2-2. Test Patch Panel.

| Control/Indicator | Position/Function |
|--|---|
| <p>MONITOR IN TEST POINT</p> <p>>+3 <- 3 INDICATOR</p> <p>HIT INDICATOR</p> <p>RESET PUSH BUTTON</p> <p>SPEAKER CONTROL</p> | <p>This test jack is an input to the following test functions:</p> <p style="text-align: center;">3-VOLT SIGNAL THRESHOLD HIT INDICATOR SPEAKER AMPLIFIER</p> <p>These test functions operate as follows:</p> <p>LIGHTS RED WHEN TEST SIGNAL BECOMES MORE POSITIVE THAN +3.0 VOLTS. LIGHTS GREEN WHEN TEST SIGNAL BECOMES MORE NEGATIVE THAN -3.0 VOLTS.</p> <p>Any signal voltage which remains within the above limits will not activate indicators. Accuracy of the threshold indicator circuit is within 10%.</p> <p>LIGHTS AND REMAINS LIT when input signal exceeds the ± 3-volt limits for a period greater than 50 microseconds.</p> <p>DEPRESSED TO RESET THE HIT INDICATOR</p> <p>CONTROLS OUTPUT LEVEL OF SPEAKER AMPLIFIER. (Speaker amplifier is used to provide audible monitoring of any data or test signal.) Alarm Function 71 provides alarm of fixed volume.</p> <p>Control is turned clockwise to increase speaker level.</p> |
| <p>COUNTER (+ -) TEST POINTS</p> | <p>INPUT TERMINALS TO THE COUNTER portion of the DTM-2 INTERSHAKE. The (+) Test Point is used as an input for positive-going signals of 2 volts amplitude or more and the (-) Test Point is the input for negative-going signals of 2 volts amplitude or more. Measured pulses must be at least 1-microsecond duration. Input impedance of both test points is 22K ohms.</p> |
| <p>7X DETECT IN TEST POINT</p> | <p>PROVIDES AN INPUT TO A DETECTING CIRCUIT WHICH SENSES ANY VOLTAGE MORE POSITIVE THAN 2.5 VOLTS AS ON AND ANY VOLTAGE LESS THAN 2.5 VOLTS AS OFF. Any lead can be tested by patching a jumper from the EIA connector test point to the 7X DETECT IN test point.</p> |

Table 2-2. Test Patch Panel (Continued).

| Control/Indicator | Position/Function |
|--|--|
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">7X DETECT IN</div> TEST POINT (continued) | The ON-OFF detection at this test point is used in programmed tests or sequences which employ the 70-series functions as steps in the test. The ON-OFF condition at this point may be sampled at some point during a test sequence as criteria for test failure, test continuance, etc. See FUNCTION 71. |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">7X CONTROL OUT</div> TEST POINT | PROVIDES A ±12-VOLT (EIA-COMPATIBLE) ON-OFF SIGNAL, which results from a program-controlled test sequence. Any RS-232 pin can be patched to the CONTROL OUT test point for control during a test sequence as determined by a specific test program. The resulting signal can then be monitored or used as criteria for subsequent test functions. The signal (+12 volts = ON, -12 volts = OFF) is current-limited at 20 milliamperes. |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">+12V, -12V</div> TEST POINTS | PROVIDES THE VOLTAGE SHOWN, current-limited by an internal 1,000-ohm resistor. The potentials available at these two test points are used to hardwire or force certain control conditions as required during tests. |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">3K</div> TEST POINT | PROVIDES A 3,000-ohm TERMINATION TO SIGNAL GROUND, and is used to provide selective loading when testing EIA driver circuits. |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">SIGS OUT</div> TEST POINT | USED TO MONITOR ANY DATA SIGNAL GENERATED BY THE DTM-2 which is transmitted on the TD or RD leads. The signal is EIA-compatible (±12 volts) and is independent of other test controls such as ON-LINE, OFF-LINE, etc. |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">CHAR SYNC Tx Rx</div> TEST POINTS | PROVIDE NEGATIVE-GOING PULSE SIGNALS, GENERATED WITHIN THE DTM-2 which characterize the synchronization of each transmitted or received character. Timing relationship of the Tx and Rx CHAR SYNC signals are as follows: Tx Asynchronous: +5 volts pulsed to ground for duration of STOP ELEMENT. Tx Synchronous: +5 volts pulsed to ground for duration of last character bit (either information bit or parity bit whichever is used in the character). Rx Asynchronous: +5 volts pulsed to ground for approximately 1.5 μ sec with leading edge coincident with the 50% point of the first STOP ELEMENT. Rx Synchronous: +5 volts pulsed to ground for approximately 1.5 μ sec with leading edge coincident with the 50% point of LAST CHARACTER BIT (information or parity bit) time duration. |

Table 2-2. Test Patch Panel (Continued).

| Control/Indicator | Position/Function |
|--|--|
| <p>CHAR SYNC Tx Rx TEST POINTS (continued)</p> <p>EIA/MIL SWITCH</p> | <p style="text-align: center;">NOTE</p> <p>The <i>first</i> SYN character(s) received <i>will not</i> generate an Rx SYNC pulse; all characters following the first detected SYN character(s) <i>will</i> generate an Rx SYNC pulse. 1 or 2 SYN characters are selected internally.</p> <p>EIA POSITION – Provides an EIA-compatible nominal 12-volt data signal as follows:</p> <p style="text-align: center;">-12 Volts = MARK; +12 Volts = SPACE</p> <p>MIL POSITION – Provides a 12-volt data signal compatible to the requirements of MIL-STD-188 as follows:</p> <p style="text-align: center;">+12 Volts = MARK; -12 Volts = SPACE</p> <p>(When required, the DTM-2 can be furnished with optional circuits which limit the test signals to ±6 volts.) (Clock leads are not inserted.)</p> <p style="text-align: center;">NOTE</p> <p>Program Function 93 will provide an electrical override and automatic selection of EIA or MIL signal.</p> |
| <p>POWER SWITCH</p> | <p>ON POSITION – Energizes the DTM-2 for operation.</p> <p>OFF POSITION – Deenergizes the DTM-2 after operation.</p> |

2.8 TEST CONTROLS (Zone 3)

The TEST controls are used to establish the overall mode of testing which the DTM-2 performs. The TEST controls, indicators and their functions are listed in Table 2-3.

Table 2-3. Test Controls.

| Control/Indicator | Position/Function |
|-----------------------------------|---|
| <p>ROTARY SELECTOR SWITCH</p> | <p style="text-align: center;">NOTE</p> <p>The five positions of the rotary selector switch are grouped into two divisions marked ON-LINE MONITOR and OFF-LINE TEST.</p> <p>The three ON-LINE MONITOR positions are used to connect the DTM-2 to the Modem and Terminal interface connectors without disrupting data flow. In these positions, received data may be processed; all transmitting functions are disabled.</p> <p>The two OFF-LINE TEST positions disrupt the data and control lines to permit a variety of tests either toward the Terminal or toward the Modem.</p> |

Table 2-3. Test Controls (Continued).

| Control/Indicator | Position/Function |
|---|---|
| <p>ROTARY SELECTOR SWITCH (continued)</p> | <p><u>ON LINE MONITOR DIVISION:</u></p> <p><u>TD/RD</u> – In this position the DTM-2 monitors <i>both</i> the TD and RD leads for the active communication line. This position should be used when the idle path is in a continuous <i>MARKING</i> or <i>SPACING</i> condition.</p> <p><u>TD</u> – In this position the DTM-2 monitors the data transmitted by the Terminal (DTE) on Pin 2 (TD) of the EIA interface connector.</p> <p><u>RD</u> – In this position the DTM-2 monitors the data transmitted by the Modem on Pin 3 (RD) of the EIA interface connector.</p> <p><u>OFF-LINE TEST DIVISION:</u></p> <p><u>TERM</u> – In this position data communications are interrupted and tests are conducted <i>toward</i> the Terminal. The DTM-2 must exercise control over the CTS, DSR, RLSD and RI leads of the EIA interface. This control can be performed manually through the EIA CONTROL portion of Zone 5, or automatically by the use of programmed test functions. (See the 70-group of Functions.)</p> <p><u>MODEM</u> – In this position data communications are interrupted and tests are conducted <i>toward</i> the Modem. The DTM-2 must exercise control over the RTS and DTR leads of the EIA interface. This control is performed manually or automatically as described above.</p> |
| <p>CONTROL EIA/OFF TOGGLE SWITCH</p> | <p><u>OFF</u> – In this position (ON-LINE testing) all EIA leads between the Modem and Terminal interface connectors are metallically straight-through connected with no leads interrupted. For OFF-LINE testing, this position allows <i>only</i> the leads required as outputs to be controlled.</p> <p><u>CONTROL EIA</u> – In this position the EIA leads are interrupted and control of these leads is transferred to the Zone 5 control switches where further manual control may be exercised or automatic programmed control may be initiated. (See Table 2-5.)</p> |
| <p>MON SIGS OUT/NORMAL TOGGLE SWITCH</p> | <p><u>MON SIGS OUT</u> – In this position any external signal under test is <i>disconnected</i> and the internally-generated signal is monitored as a received signal for self-test purposes.</p> <p><u>NORMAL</u> – This position enables normal monitoring of received signals. Transmission of generated test signals through the applicable EIA interface connector is not affected by this switch.</p> |

Table 2-3. Test Controls (Continued).

| Control/Indicator | Position/Function |
|-----------------------------|---|
| RUN INDICATOR | <p>LIGHTS RED when a programmed test has been started by depressing the START push button.</p> <p style="text-align: center;">NOTE</p> <p>The RUN indicator MUST be ON for normal operation of the INTERSHAKE and control of auxiliary devices.</p> <p>The RUN indicator will extinguish when any of the following occur:</p> <ul style="list-style-type: none"> • The test program completes to Function 99. • A MODE switch other than RUN has been selected prior to test completion. • The programmed test is terminated by depressing either the MARK or SPACE button. |
| COMPLETE INDICATOR | <p>LIGHTS GREEN when a programmed test has been completed and stopped at Function 99.</p> <p>Extinguishes (resets) when START button is depressed or when RUN mode is started.</p> |
| SIGS OUT INDICATOR | <p>LIGHTS RED when a spacing conditions exists in the DTM-2 <i>output</i> data regardless of spacing polarity selected by the EIA/MIL toggle switch (Zone 2).</p> <p style="text-align: center;">NOTE</p> <p>During fast transmission of data, the indicator will appear to be lit constantly since transitions cannot be discerned by the eye. (See red-green indicator for TD or RD.)</p> |
| SIGS IN INDICATOR | <p>LIGHTS RED when a spacing condition exists in <i>received</i> data. Operation basically the same as SIGS OUT indicator above.</p> |
| SPACE PUSH BUTTON | <p>MOMENTARY DEPRESSED – Initiates a steady SPACE output signal. Initiates transmission of reversals in mode other than RUN. Reset by depressing either MARK or START push button.</p> |
| MARK PUSH BUTTON | <p>MOMENTARY DEPRESSED – Initiates a steady MARK output signal. Terminates any test in progress. Reset by depressing either SPACE or START push button.</p> |

Table 2-3. Test Controls (Continued).

| Control/Indicator | Position/Function |
|--|--|
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">START</div> PUSHBUTTON | <p>MOMENTARY DEPRESSED – When released initiates a programmed test. Lights the RUN indicator (when in the RUN mode) and initiates the following:</p> <ul style="list-style-type: none"> ● Resets COUNTER DURATION (Zone 6). ● Resets all EIA interface controls to OFF (Zone 5). ● Starts test at STEP 00 (Zone 7). ● Resets Time Delay Generator. ● Starts SYNC SEARCH in received data. ● Extinguishes COMPLETE indicator. ● Enables all panel controls. |

2.9 NOTES ON USE OF TEST PANEL CONTROLS

The START push button incorporates a 400-millisecond time delay to prevent rapid multiple starts.

While a test is running, depressing the START push button stops the test and restarts it at STEP 00.

2.10 MASTER RESET

Master reset can be accomplished by depressing the START push button while *holding* down the MARK push button in the ANY mode.

2.11 MODE CONTROLS (ZONE 4)

The MODE controls are used to establish the testing method or mode of operation the DTM-2 is used in during the course of any specific test. The group of controls consists of four push buttons located in Zone 4 (see Figure 2-1). The functions of these controls are outlined in Table 2-4.

NOTE

Each of the MODE push buttons, when depressed, locks out all other MODE push buttons. This feature permits only *one* push button to be depressed at one time.

Table 2-4. Mode Controls.

| Control/Indicator | Position/Function |
|---|--|
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">REV</div> PUSHBUTTON | DEPRESSED TO TRANSMIT REVERSAL SIGNALS (alternating continuously between MARK and SPACE) as a test signal. The reversal signal will occur at a bit rate selected by the TRANSMISSION DATA FORMAT controls or as selected by program control using FUNCTION 92 in a test sequence. |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">LOAD</div> PUSHBUTTON | DEPRESSED – The operator may load a test sequence program into the DTM-2 by using the digital switches in Zone 8 and the readouts in Zone 7. |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">RUN</div> PUSHBUTTON | DEPRESSED – The operator may initiate transmission of the loaded program sequence using the controls and indicators in Zone 3 previously discussed. |
| <div style="border: 1px solid black; display: inline-block; padding: 2px;">PLAY</div> PUSHBUTTON | DEPRESSED – After a test sequence has been entered and run the PLAY push button is depressed to play or review the results of the test. The PLAY mode enables controls and indicators of Zone 7 to be used in stepping through the test results. |

2.12 EIA (V.24) TEST MONITOR AND CONTROL EIA CONTROLS (ZONE 5)

This group of controls, indicators and test points provide the operator with a means of monitoring all EIA (V.24) interface leads and the ability to control or test the RTS, CTS, DSR, RLSD, DTR and RI leads.

The row of red/green indicators are numbered to correspond with *Interface Connector Pin Assignments* in accordance with EIA Specification RS-232. Each indicator is further identified by the signal function associated with the specific connector pin. The test points located directly below their corresponding indicators are identified by the *Signal Circuits* conventionally assigned to the connector pins. The toggle switches in this control group are interactive with the controls in the TEST control group (Zone 3). See Table 2-3 for interactive control functions.

Table 2-5. EIA (V.24) Test Monitor and Control.

| Control/Indicator | Position/Function |
|----------------------------------|--|
| EIA TEST MONITOR TEST POINTS: | PROVIDE ACCESS TO EACH OF THE 25 EIA LEADS IN THE EIA INTERFACE CONNECTIONS. The test points are connected to either the modem or terminal source. The color coding of the test-point titles represents the following: GREEN – Represents signals generated by the Modem. BLUE – Represents signals generated by the Terminal. BLACK – Represents undefined signals. |

Table 2-5. Mode Controls (Continued)

| Control/Indicator | Position/Function |
|--|---|
| <p>EIA TEST MONITOR INDICATORS:</p> <p>CONTROL EIA TOGGLE SWITCHES</p> <p>CONTROL EIA TEST POINTS</p> | <p>INDICATES THE POLARITY OF SIGNAL ON EACH OF THE EIA LEADS. The red indicators are lighted when the signal on the associated leads are "positive."</p> <p>The clear indicators can light either red or green; a red indication occurs when a signal is more positive than +3 volts and a green indication occurs when a signal is more negative than -3 volts.</p> <p>These six switches are associated with the RTS, CTS, DSR, RLS, DTR and RI leads of the EIA interface connectors. Each of the switches can be placed in one of three positions to perform the following control functions:</p> <p>ON – A +12-volt signal, current limited internally, is applied to the lead under test in the direction selected for test.</p> <p>THRU – Provides normal operation with amplitude detectors and driver circuits connected between the Modem and Terminal interface connectors.</p> <p>OFF (7X) – A -12-volt signal is applied to the lead under test in the direction selected for test. The 12-volt signal is under control of the 70-group of program functions.</p> <p>The Test Points located above each toggle switch are used to access the test signal being applied to the lead by the DTM-2.</p> |

Table 2-6. Counter Controls.

| Control/Indicator | Position/Function |
|--|--|
| <p>DISPLAY INDICATOR</p> <p>INPUT SELECTOR SWITCH</p> | <p>DISPLAYS COUNTING/MEASURING RESULTS – The three-digit numerical readout is used to display the results of any counting or measuring function which incorporates the counter portion of the DTM-2. In addition to the three significant digits of numerical readout, the display includes an END indicator to the right of the display to signify a completed measurement function and an OVERFLOW indicator to show when a particular measurement exceeds the maximum limit of the counter display. The count continues after the OVFL indicator lights.</p> <p>PERMITS SELECTION OF EIGHT (8) COUNTING AND MEASURING FUNCTIONS. The switch positions and the related measuring functions are listed in the following paragraphs:</p> <p style="text-align: center;">NOTE</p> <p>Positions containing () require program functions to operate. BCC(39) 10X, EVENTS (8X), DURATION (8X), EVENTS (8X) in 10X.</p> |

Table 2-6. Counter Controls (Continued).

| Control/Indicator | Position/Function |
|---|---|
| <p>INPUT SELECTOR SWITCH (continued)</p> | <p>*EVENTS – This position enables the counter to advance to 999 events prior to overflow.</p> <p>DURATION (8X) RTS-CTS 86 – This switch position enables an automatic test which connects the counter input to the test being run. A step of the test containing FUNCTION 87-(01) will first reset the counter to 000 and then start the timer. Another test step containing FUNCTION 87-(02) stops the timer. The START switch in Zone 3 (see Table 2-3) will also reset the counter to 000 automatically.</p> <p>Program function 86 will start the timer when the RTS lead is detected ON and stop the timer when CTS is detected ON. The DURATION range can be set from a maximum of 9.99 milliseconds to 999 seconds using the range selector switch.</p> <p>EVENTS (8X) – This is also an automatic test position which connects the counter input to the test being run. Each occurrence of a test step with FUNCTION 87-(03) will advance the counter one step. The counter should be reset manually to 000; during test, counter can reach a count of 999 plus OVERFLOW indication.</p> <p>EVENTS (8X) in 10^X – This switch position enables the program to separately increment the two (2) counters on the panel:</p> <ol style="list-style-type: none"> 1. The 3 digit display counter is incremented by using Function 87 (same as using the EVENTS (8X) position). 2. The Base Count (Length selector) or 10 to 108 is incremented by using Function 85. <p style="text-align: center;">NOTE</p> <p>OVERFLOW responds to the EVENT count. END responds to the BASE count and initiates any further EVENT counts.</p> |
| <p>COUNT/RESET PUSH BUTTON</p> | <p>DEPRESSED – This momentary-contact push button is depressed to reset the counter and display to 000 in all positions of the INPUT switch.</p> |
| <p>LENGTH/DURATION FREQUENCY RANGE SELECTOR SWITCH</p> | <p>LENGTH – This switch scale is lettered in blue and provides eight (8) measurement ranges which are related to the PE 10^X, BCC (39) 10^X and EVENTS (8X) 10^X positions of the INPUT switch. These switch positions establish the number of characters or data blocks measured during error rate tests.</p> |

Table 2-6. Counter Controls (Continued).

| Control/Indicator | Position/Function | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|--|---------------|----------|--|----------|--|---------|----------|----------|--|----------|--|---------|------------|---------|--|----------|--|----------|--------|---------|--|----------|--|----------|
| RANGE SELECTOR SWITCH (Continued) | <p>DURATION – This switch scale is lettered in black and provides six (6) measurement ranges of time duration as follows:</p> <table> <tr> <td>Milliseconds:</td> <td>0 – 9.99</td> </tr> <tr> <td></td> <td>0 – 99.9</td> </tr> <tr> <td></td> <td>0 – 999</td> </tr> <tr> <td>Seconds:</td> <td>0 – 9.99</td> </tr> <tr> <td></td> <td>0 – 99.9</td> </tr> <tr> <td></td> <td>0 – 999</td> </tr> </table> <p>The scale is related to the Counter Test Point and Duration (8X) positions of the INPUT switch. Each switch setting places the DISPLAY decimal point appropriately to yield the above ranges.</p> <p>FREQUENCY – This switch scale is lettered in red and relates only to the Counter (\pm) test points in Zone 2. The switch provides two bands of three positions each for the following measurement ranges:</p> <table> <tr> <td>Kilohertz:</td> <td>0 – 999</td> </tr> <tr> <td></td> <td>0 – 99.9</td> </tr> <tr> <td></td> <td>0 – 9.99</td> </tr> <tr> <td>Hertz:</td> <td>0 – 999</td> </tr> <tr> <td></td> <td>0 – 99.9</td> </tr> <tr> <td></td> <td>0 – 9.99</td> </tr> </table> | Milliseconds: | 0 – 9.99 | | 0 – 99.9 | | 0 – 999 | Seconds: | 0 – 9.99 | | 0 – 99.9 | | 0 – 999 | Kilohertz: | 0 – 999 | | 0 – 99.9 | | 0 – 9.99 | Hertz: | 0 – 999 | | 0 – 99.9 | | 0 – 9.99 |
| Milliseconds: | 0 – 9.99 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 – 99.9 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 – 999 | | | | | | | | | | | | | | | | | | | | | | | | |
| Seconds: | 0 – 9.99 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 – 99.9 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 – 999 | | | | | | | | | | | | | | | | | | | | | | | | |
| Kilohertz: | 0 – 999 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 – 99.9 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 – 9.99 | | | | | | | | | | | | | | | | | | | | | | | | |
| Hertz: | 0 – 999 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 – 99.9 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 – 9.99 | | | | | | | | | | | | | | | | | | | | | | | | |

2.13 DISPLAY SECTION CONTROLS AND INDICATORS (ZONE 7)

The Display Section, set against a yellow background, is primarily associated with the PLAY mode of operation, where the results of a test sequence is "played back" from the Results Memory for overall test evaluation.

Although the Display Section is primarily associated with (and most useful in) the PLAY mode of operation, it is also operational in the RUN mode to provide valuable visual indication to the operation of the progress and status of the test being run; and in the LOAD mode, it gives the operator assurance that his data has been correctly entered into the instrument. The indicators and controls of the Display Section (Zone 7) and their functions are listed in Table 2-7.

Table 2-7. Display Section Controls.

| Control/Indicator | Position/Function |
|---------------------------|---|
| STEP DISPLAY | <p>The STEP display is a two-digit number which shows the step of a program within a page. The display covers 64 steps (00-63) which is the maximum number of steps which can be contained on a program page.</p> |
| PAGE DISPLAY | <p>The PAGE display is a one-digit hexadecimal (09,A-F) readout which shows the specific page of a program being processed or of a test result being played back.</p> <p>In the LOAD and RUN modes, a test program can take up to four (4) pages of 64 steps each or two (2) pages of 64 steps each depending upon the setting of the program control switches in Zone 9 (under front panel). See Table 2-9. This provides a total of either 128 or 256 steps.</p> <p>In the PLAY mode, where the RESULTS MEMORY is played back, the PAGE display can progress through 16 pages of 64 characters each for a total of 1024 test steps. In this instance the PAGE display can progress from 0 to 9 and then A to F.</p> |
| PAGE DECIMAL LEFT | <p>The Left Decimal indicator lights to show that an internal control (DIP switch, Zone 9) has been set to provide a 256-step program cell. The indicator will not light when a 128-step program cell is being used.</p> |
| PAGE DECIMAL RIGHT | <p>The Right Decimal indicator lights intermittently to show that data is being stored in the RESULTS MEMORY. (The indicator lights for 16 steps, and is then off for the next 16 steps.)</p> |
| DATA DISPLAY | <p>The DATA display is a two-digit hexadecimal (0-9, A-F) display which indicates the data character associated with program functions entered while in the LOAD mode, or the data character which is received and logged while in the PLAY mode, or real-time data while in the RUN mode.</p> <p style="text-align: center;">NOTE</p> <p>Decimal points to the left and right of the DATA digits indicates that the data shown in TRANSMIT data. Absence of the decimals indicates RECEIVED data.</p> |
| FUNCTION DISPLAY | <p>The FUNCTION display is a two-digit numeric display (00-99) which indicates the function entered into a test program in the LOAD mode by the switches in Zone 8. While in the PLAY mode, the display indicates the function which caused certain data to be recorded into the results memory.</p> <p>If a function is entered that is not contained on the Program Function listing, decimal points will appear on the display (e.g., .2.9).</p> |

2.14 PROGRAM LOADING CONTROLS (ZONE 8)

The controls in this control group are used to select, program, and enter the primary test program sequences performed by the DTM-2.

Test programs can be loaded from internal STORED TEST memory (PROM) into Program memory (RAM).

Test programs may also be entered manually from the front panel, a step at a time, directly into the Program Memory (RAM) by using the Mark/Space and Function Switches. All such programs are stored until "written over" by another program. The RAM is nonvolatile, and memory remains intact for up to 1 month when the DTM-2 is not in use.

The Program Loading Controls and their functions are listed in Table 2-8.

Table 2-8. Program Loading Controls.

| Control/Indicator | Position/Function |
|---|---|
| <p>LOAD STORED TEST SWITCH</p> | <p>This switch can be set to any of eight (8) positions (A through H) to provide selection of up to 15 test program cells. Eight program cells are available from PROM and up to seven (when programs have been entered and stored previously) are available from nonvolatile RAM (see AUTO/SINGLE STEP/MANUALLY ENTERED PROGRAM switch below).</p> <p>Each switch position permits a stored program to be entered and then run or permits a program to be entered manually and run or stored.</p> <p style="text-align: center;">NOTE</p> <p>One program cell will normally contain several (3-8) individual complex test programs.</p> |
| <p>AUTO/SINGLE STEP/MANUALLY ENTER PROGRAM TOGGLE SWITCH</p> | <p>AUTO – Permits any of the eight test program cells stored in PROM (A through H) to be accessed and loaded into RAM (nonvolatile memory) cell A by depressing the ENTER switch.</p> <p style="text-align: center;">NOTE</p> <p>All steps in the selected program are automatically loaded into nonvolatile (RAM) memory cell "A." The LOAD STORED TEST switch (described above) must then be set to the "A" position to run the test.</p> <p>SINGLE STEP</p> <p style="text-align: center;">NOTE</p> <p>This position is NOT USED in DTM-2 series.</p> |

2.15 NOTES ON OPERATION OF PROGRAM LOADING CONTROLS

Avoid the use of RAM Cell "A" for manual entry of a test program. Any program entered into Cell A (and also into Cell B when 256-step format is selected) will automatically be written over when a program is recalled from PROM.

Manually-entered programs can be either 128 steps (2 pages of 64 steps each) or 256 steps (4 pages of 64 steps each). This is controlled by a DIP switch in Zone 9 under the front panel. When a 256-step program is used, the LOAD STORED TEST switch should be set to either C, E or G. When the switch is set to C the first 128 steps are entered into Cell C, and the next 128 steps will automatically be entered into Cell D. If set to E the second 128 steps automatically enter into F; if set to G the second 128 steps are automatically entered into Cell H.

A decimal point appearing to the left of the PAGE indication shows that a 256-step test program has been selected.

2.16 INTERNAL CONTROLS (ZONE 9)

Access to the internal controls is made by loosening the two captive screws at the top of the front panel and raising the front panel to the vertical position. (Avoid putting excessive pressure on the front panel.) The controls are located on the left-hand side of the equipment case and are shown in Figure 2-2. The Internal Controls and their functions are listed in Table 2-9.

Table 2-9. Internal Controls.

| Control/Indicator | Position/Function |
|-----------------------|--|
| OSC FREQ CONTROL | <p>This control is used to tune the variable-frequency oscillator when it is used to provide a nonstandard bit rate. The oscillator is enabled when the BIT RATE switch in Zone 1 is set to INT OSC.</p> <p>Tuning may be monitored by connecting a REV signal (SIGS OUT test point) to the COUNTER INPUT test points in Zone 2 with patch cords. Tuning is then accomplished by turning the OSC FREQ control until a counter reading is obtained that is <i>one-half</i> the baud rate desired. (One cycle of input signal is considered to be a MARK followed immediately by a SPACE or vice-versa; One cycle = 2 Bits).</p> |
| 8-POSITION DIP SWITCH | <p>No. 1 ON – Enables the Crystal-Controlled Oscillator for high-speed operation.</p> <p>No. 2 ON – Enables the HIGH range of the variable-frequency oscillator (160-2500 Baud).</p> <p>No. 3 ON – Enables the MIDDLE range of the variable-frequency oscillator (60-1000 Baud).</p> <p>No. 4 ON – Enables the LOW range of the variable-frequency oscillator (30-500 Baud).</p> |

Table 2-9. Internal Controls (Continued).

| Control/Indicator | Position/Function | | | | | | | | | | | | | | | | | | | | | |
|--|--|-------------------------|-------------------|--------------|-------|------|-------|--------|------|-------|--------|------|-------|--------|------|-------|--------|------|-------|--------|------|-------|
| <p>8-POSITION DIP SWITCH (Continued)</p> | <p style="text-align: center;">WARNING</p> <p>Do not set more than <i>one</i> of the above switches ON at one time. When more than one switch is set to ON, oscillator operation will be erratic and may damage the equipment.</p> <p>No. 5 ON – Enables 256-Step Program format. The OFF position enables the 128-Step Program format.</p> <p>No. 6 ON – SYNC Mode Internal Clock Rec. Enables internally-generated clock signal when no clock is supplied by system Modem. Clock is then synchronized to DATA. OFF position is used when clock is supplied from system modem.</p> <p>No. 7 ON – Enables recognition of only one SYN character in lieu of the two characters normally required for recognition. For normal use, 2 SYNC is selected. DO NOT USE ISYN with AUTO SYNC.</p> <p>No. 8 – Not used.</p> | | | | | | | | | | | | | | | | | | | | | |
| <p>CRYSTAL</p> | <p>The Crystal is used to control the Baud Rate oscillator at high speeds. The crystal can be removed and interchanged to provide several standard baud rates as follows:</p> <table border="1"> <thead> <tr> <th>Crystal Frequency (MHz)</th> <th>Baud Rate (Kbaud)</th> <th>ARC Part No.</th> </tr> </thead> <tbody> <tr> <td>6.144</td> <td>19.2</td> <td>36942</td> </tr> <tr> <td>13.056</td> <td>40.8</td> <td>36944</td> </tr> <tr> <td>15.360</td> <td>48.0</td> <td>36945</td> </tr> <tr> <td>16.000</td> <td>50.0</td> <td>36946</td> </tr> <tr> <td>17.920</td> <td>56.0</td> <td>36947</td> </tr> <tr> <td>20.480</td> <td>64.0</td> <td>36948</td> </tr> </tbody> </table> | Crystal Frequency (MHz) | Baud Rate (Kbaud) | ARC Part No. | 6.144 | 19.2 | 36942 | 13.056 | 40.8 | 36944 | 15.360 | 48.0 | 36945 | 16.000 | 50.0 | 36946 | 17.920 | 56.0 | 36947 | 20.480 | 64.0 | 36948 |
| Crystal Frequency (MHz) | Baud Rate (Kbaud) | ARC Part No. | | | | | | | | | | | | | | | | | | | | |
| 6.144 | 19.2 | 36942 | | | | | | | | | | | | | | | | | | | | |
| 13.056 | 40.8 | 36944 | | | | | | | | | | | | | | | | | | | | |
| 15.360 | 48.0 | 36945 | | | | | | | | | | | | | | | | | | | | |
| 16.000 | 50.0 | 36946 | | | | | | | | | | | | | | | | | | | | |
| 17.920 | 56.0 | 36947 | | | | | | | | | | | | | | | | | | | | |
| 20.480 | 64.0 | 36948 | | | | | | | | | | | | | | | | | | | | |
| <p>FUSE</p> | <p>3AG, 3A Fuse used as overcurrent protection for equipment.</p> | | | | | | | | | | | | | | | | | | | | | |
| <p>MESSAGE PROM</p> | <p>Contains 8 messages of up to 127 characters each. (See Functions 60-67.) Special messages are available from factory.</p> | | | | | | | | | | | | | | | | | | | | | |
| <p>MESSAGE PROM</p> | <p>Message PROMs delivered prior to June 1977 contained messages listed by Appendix F, page 1. This PROM is identified by "FT." June 1977 and later included messages listed by Appendix F, pages 2, 3, 4 and 5. This PROM is identified as "842G-001A." If different messages are desired the contents of each 127 character message should be identified as illustrated by Appendix F.</p> | | | | | | | | | | | | | | | | | | | | | |

Table 2-9. Internal Controls (Continued).

| Control/Indicator | Position/Function |
|-------------------|--|
| STORED TEST PROM | <p>Contains 8 cells of 128 steps or 4 cells of 256 steps for stored test programs. See Chapter 4 for contents of stored test cells. (Consult factory for custom-programmed PROM.) The desired program should be prepared using standard program sheets (TP-139-3-77) Special "Data" and "Function" for each step including all cells A thru H.</p> <p style="text-align: center;">NOTE</p> <p>Message and Stored Test PROMs are INTEL 2708 Plug-in chips which may be removed/replaced by lifting the front panel. Locations are illustrated by Figure 2-2. These PROMs may be reprogrammed using an INTEL UPP (Universal PROM Programmer)/MDS or equivalent for field replacement.</p> |

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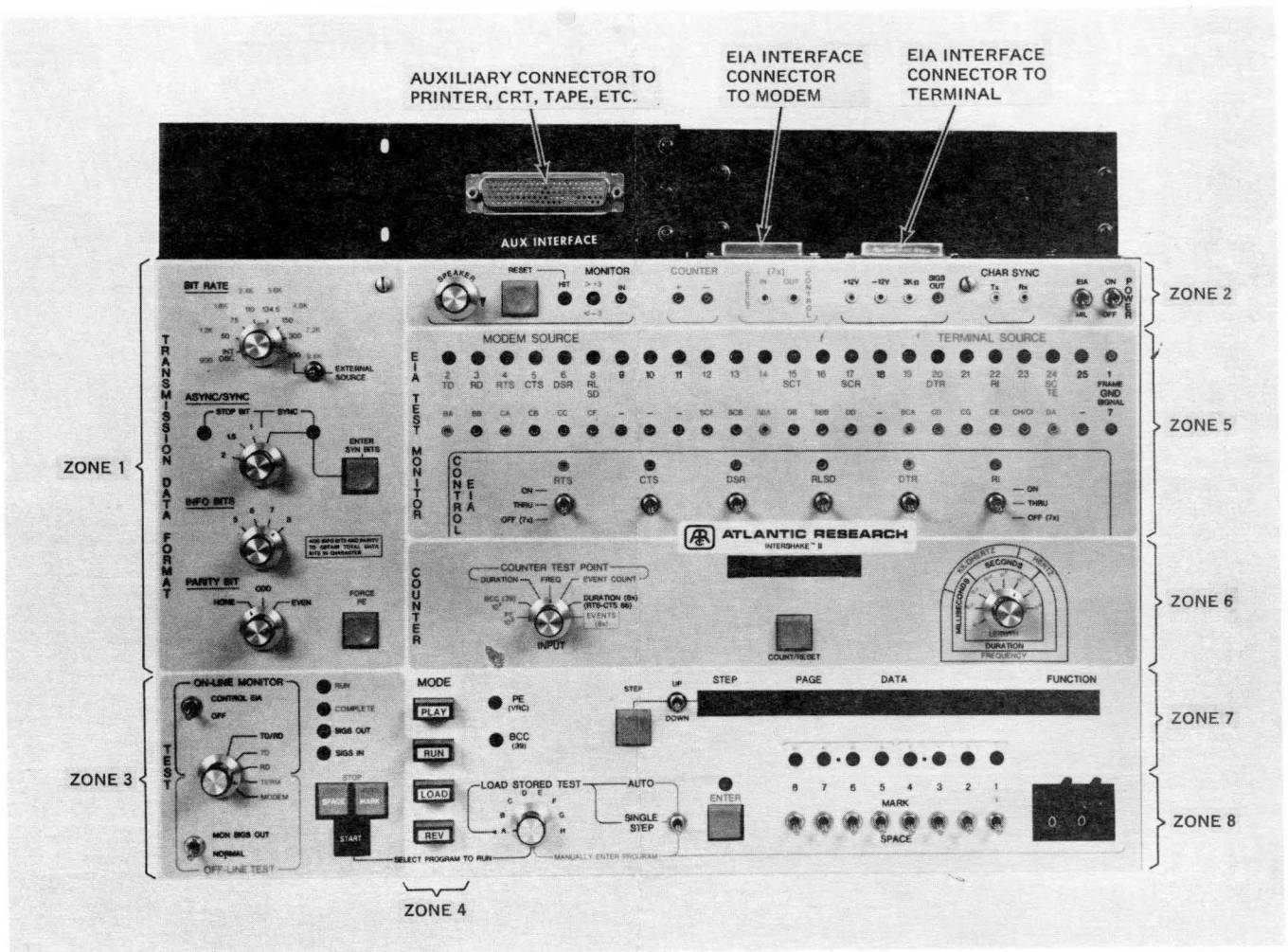


Figure 2-1. DTM-2 Front Panel Controls and Indicators.

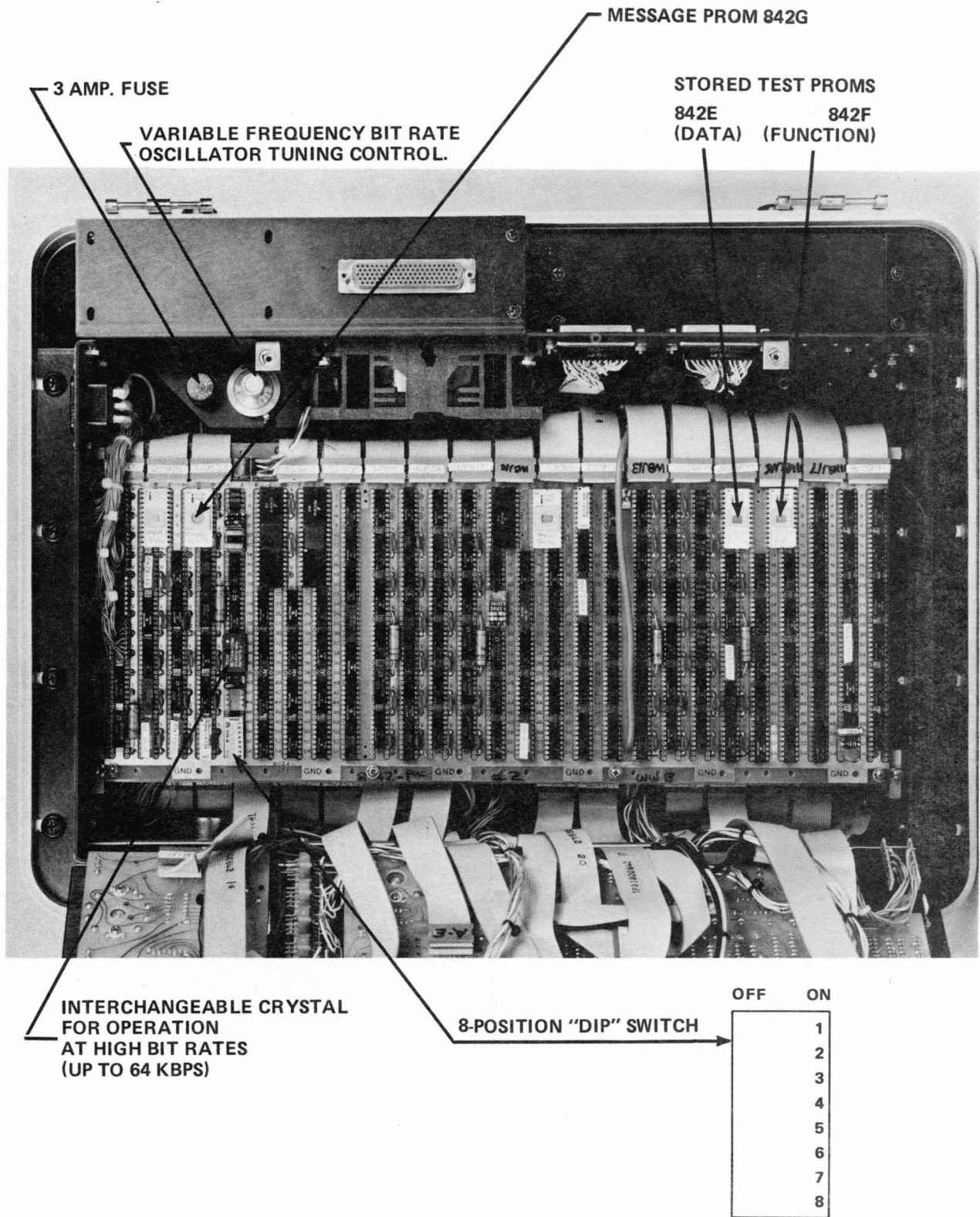


Figure 2-2. Location of Operator's Controls in Zone 9 (Under Front Panel).

CHAPTER III

INTERSHAKE FUNCTIONS

3.1 INTRODUCTION

The purpose of this section is to describe, in detail, each function available to the operator using the INTERSHAKE II. Functions are numbered from 00 to 99. They are individual instructions, entered by the operator in any desired order, to make up a test sequence. The operator should familiarize himself with the range of functions available and use this section as a reference for constructing specific test sequences.

In order to expand the capability of INTERSHAKE II, the entry of a function may be accompanied by the entry of DATA. For example, an instruction to "trap" a character is Function 20. The specified character to be trapped must also be entered as DATA via the bit switches on the front panel. Functions are entered via the thumbwheel switches on the lower right corner of the panel.

Functions which perform closely related tests are grouped for operating convenience. The functions which are grouped follow (with several minor exceptions):

| <u>Test Operation</u> | <u>Function Group(s)</u> |
|-----------------------|--------------------------|
| Receive/Record | 0X, 1X, 2X, 3X |
| Jump | 4X |
| Transmit | 5X, 6X |
| RS-232 (V.24) | 7X |
| Timing | 8X |
| Test Conditions | 9X |

Table 3.1 presents a summary of the INTERSHAKE II functions according to basic groups. Paragraphs 3.2 to 3.24 describe the individual groups and functions. The method for entering each function is described, as well as the recorded display from Results Memory. It is not necessary to complete a test in order to observe data recorded in Results Memory earlier during a test. Operation in PLAY mode immediately displays Results Memory.

Table 3-1. Intershake II Function List.

| Paragraph Number | Group | Function | Description |
|--|---|--|--|
| 3.2 3.2.1 | <u>Halt</u> | 00 | Halt |
| 3.3 3.3.1 3.3.2 3.3.3 3.3.4 3.3.5 | <u>Monitor</u> Library | 01 02 03 04 05 | Start Library Trap Only TD Trap Only RD Trap TD and RD End Monitor Library |
| 3.4 3.4.1 3.4.2 3.4.3 | <u>Record</u> | 07 08 09 | Record Bit Switch Record Loop "L" Count Record Interrupt Step |
| 3.5 3.5.1 3.5.2 3.5.3 3.5.4 3.5.5 3.5.6 3.5.7 3.5.8 3.5.9 | <u>Receive</u> Index | 10 11 12 13 14 15 16 17 19 | Wait Until TD \rightleftharpoons RD Change Record Until TD \rightleftharpoons RD Change Record TD/RD & RS-232 (V.24) Status Time Out or TD \rightleftharpoons RD Change Wait N Receive Character Wait to Complete XMT Character Wait Until = Character Wait Until \neq Character Enter INTERRUPT Character |
| 3.6 3.6.1 3.6.2 3.6.3 3.6.4 3.6.5 3.6.6 | <u>Receive</u> Trap | 20 21 22 23 25 26 | Trap Character Trap First Character In Sequence Trap Middle Character(s) In Sequence Trap Last Character In Sequence Record Until Trap Record Next \neq Character |
| 3.7 3.7.1 3.7.2 3.7.3 3.7.4 3.7.5 3.7.6 3.7.7 | <u>Subrouting</u> <u>Receive</u> Record | 30 31 32 33 34 35 36 | Record Next Character Record Character N Record N Characters Record Character Before Trap Jump and Record PE Record Latch Mode Record Current Character |
| 3.8 3.8.1 3.8.2 | <u>RCV/BCC</u> | *37 38 39 | Force In Sync Start BCC Jump If = BCC Error |

Table 3-1. (Continued).

| Paragraph Number | Group | Function | Description |
|--|--|--|--|
| 3.9 3.9.1 3.9.2 3.9.3 3.9.4 3.9.5 3.9.6 3.9.7 3.9.8 3.9.9 3.9.10 | <u>Jump and Test</u> | 40 41 42 43 44 45 46 47 48 49 | Unconditional Jump To Step XY Preset The Jump To Step XY Repeat Test (Loop) "L" Times Jump Until "L" Loops Jump If = Character Jump If ≠ Character Retest And Jump If = Character Flags: Set And Jump Select Results Memory Step Select Results Memory Page and Step 00 |
| 3.10 3.10.1 3.10.2 3.10.3 3.10.4 3.10.5 | <u>Send Data</u> | 50 51 52 53 54 | Send Character Send A Progression Send Single RM Character Send RM Incl Trap Character Send RM Until Trap Character |
| 3.11 3.11.1 3.11.2 3.11.3 | <u>Send Modes</u> | 55 56 57 | MODE: Echo/Mark/Space, [CRC] Parity Bit Mode Load Fill Character |
| 3.12 3.12.1 3.12.2 | <u>Send BCC</u> | 58 59 | Start BCC Send BCC |
| 3.13 3.13.1 | <u>Send Message</u> (Fox) | 60 61 62 63 64 65 66 67 | Send Message, ASCII Send Message, ASCII Send Message, ASCII Send Message, EBCDIC Send Message, EBCDIC Send Message, EBCD Send Message, SELECTRIC Send Message, BAUDOT |
| 3.14 3.14.1 | <u>Code Translate</u> | 68 | Code Translate Mode |
| 3.15 3.15.1 3.15.1 3.15.2 3.15.2 3.15.3 3.15.3 3.15.3 3.15.4 3.15.4 | <u>RS-232 (V.24)</u> <u>Controls and Decision</u> | 70 71 72 73 74 75 76 77 78 | Turn ON Leads Turn OFF Leads Detect Lead ON Detect Lead OFF Interrupt If Lead = ON Interrupt If Lead = OFF Cancel Interrupt, 74 and 75 Jump If Lead = ON Jump If Lead = OFF |

Table 3-1. (Continued).

| Paragraph Number | Group | Function | Description |
|--|---------------------------|----------------------------|---|
| 3.16 3.16.1 3.16.1 3.16.1 3.16.2 3.16.3 | <u>Timer</u> | 80 81 82 83 84 | 01-99 Milliseconds 0.01-0.99 Second 0.1-9.9 Seconds Generate Count Bit Periods Delay Enter Time Out for Interrupt or Jump |
| 3.17 3.17.1 3.17.1 3.17.2 3.17.3 3.17.4 | <u>Counter</u> | 85 86 87 88 89 | Advance Base Count 10X Measure RTS-CTS Delay Counter Control Jump If C > Data Record: Counter |
| 3.18 3.18.1 3.18.2 3.18.3 3.18.4 | <u>Auto Panel</u> | 90 91 92 93 | Enter SYN Character A (SYNC), Info Bits, Parity Bit Rate Test Mode, EIA/MIL, Ext Clock, Control EIA |
| 3.19 3.19.1 | <u>Peripheral Control</u> | 94 | Peripheral Controller |
| 3.20 3.20.1 | <u>RCV Sync</u> | 95 | Sync Search |
| 3.21 3.21.1 | <u>SDLC</u> | 96 | SDLC/ADCCP |
| 3.22 3.22.1 | <u>RCV Delay</u> | 96 | Receive Input Delay |
| 3.23 3.23.1 | <u>Interrupts</u> | 97 | Interrupts |
| 3.24 3.24.1 3.24.2 | <u>End</u> | 98 99 | Recycle/Restart/Skip Stop |

The Following Functions Have Been Added For Serial Number Series "F" and Above.

- 06 Jump Bit Switches
- 24 Increment Results Memory Advance
- 27 Preset Return Address
- 28 Return
- 29 Jump Results Memory ≠ Character
- 37 Force In Sync
- 85 Advance Base Count 10^X

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Function Descriptions

The following paragraphs describe each group and function. Individual function descriptions may be located by the large numbers on the outer edge of the page.

Appendix E presents examples of tests using these functions.

3.2 HALT GROUP

00 HALT

The HALT group is comprised of a single instruction that permits the operator to halt the test at any step and then manually continue the test from that step.

3.2.1 HALT GROUP HALT,FUNCTION 00

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 00 |

DESCRIPTION:

Function 00 causes the test program to halt at the selected step. The program will continue the next step upon manual operation of the STEP button, while the unit is in the RUN mode, and the RUN indicator is ON. When in the RUN mode, with the RUN indicator OFF, the STEP button will cause the program to step through the entire program without executing any of the steps.

APPLICATIONS:

1. Function 00 is useful to cause a test program to halt at various points in a test sequence so the operator can verify – observe – or change parameters.
2. Function 00 is used to “debug” tests by showing the operator that a certain sequence of test steps has been accomplished.
3. Function 00 can be deleted later by overwriting with Function 98 DATA 02 (skip NO-OP function).

3.3 MONITOR LIBRARY GROUP

| | |
|----|----------------|
| 01 | START LIBRARY |
| 02 | TRAP TD |
| 03 | TRAP RD |
| 04 | TRAP TD AND RD |
| 05 | END LIBRARY |

The MONITOR LIBRARY GROUP enabled the operator to compare each received character with a library of characters.

When the received character matches a library character, the character is recorded in the Results Memory. All library characters are recorded in the Results Memory in the order received. Monitor is usually used in the TEST TD/RD (FDX) mode. The size of the library is related to the operating speed as follows:

LIBRARY SIZE (for 8-bit character):

| | | |
|----------|---|----------------|
| 9600 BPS | — | 138 characters |
| 64 KBPS | — | 37 characters |
| 256 KBPS | — | 8 characters |

APPLICATIONS:

1. Determine exact sequence of control characters in the protocol.
2. Identify missing protocol characters.

NOTES

1. DO NOT USE monitor group with the TD/RD test mode when there exists simultaneous transmission on both data paths.
2. Function 46, Retest and Jump if = Character, will also search for specific characters and move the program to a designated step, as opposed to the monitor library group which continuously monitors.
3. An INTERRUPT ON MEM OVFL may be used to stop (FUNCTION 99) the test when the memory becomes full.

3.3.1 MONITOR LIBRARY GROUP START LIBRARY, FUNCTION 01

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 01 |

DESCRIPTION:

This function signals the beginning of the library. Function 01 must precede each sequence of monitor library functions. Data 00 should be entered to avoid confusion in reviewing test results.

3.3.2 MONITOR LIBRARY GROUP TRAP ONLY TD, FUNCTION 02

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 02 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 02 |

DESCRIPTION:

This function instructs INTERSHAKE II to compare each character on the TD lead (Pin 2) with the character(s) entered in the library. When a match occurs, the character is recorded in the results memory and displayed as shown above (where FUNCTION 02 indicates Pin 2).

(Character) represents the character(s) entered by the operator, as they would appear in a two-character hex in the display.

As many steps containing Function 02 may be entered as permitted by the operating speed, (for example, 138 characters at 9600 BPS) or within the size of the program cell.

APPLICATION:

Function 02 permits the operator to detect only characters of interest occurring on the TD lead in their sequence of occurrence.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 03 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 03 |

DESCRIPTION:

With this function, INTERSHAKE II will compare each character monitored on the RD lead (Pin 3) with the character(s) entered in the library. When a match occurs, the character is recorded in the results memory and displayed as shown above (where Function 03 indicated Pin 3).

(Character) represents the character(s) entered by the operator as they would appear in the two-character hex display.

As many steps containing Function 03 may be entered as permitted by the operating speed, or the size of the program cell.

APPLICATION:

Function 03 permits the operator to detect only characters of interest on the RD lead in their sequence of occurrence.

3.3.4 MONITOR LIBRARY GROUP

TRAP TD and RD, FUNCTION 04

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 04 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 02 or 03 |

DESCRIPTION:

INTERSHAKE II will compare characters monitored on either the TD or RD leads with the character(s) entered in the library. When a match occurs, the character is recorded in the results memory and displayed as shown above. The function displayed will be either Function 02, indicating that the character occurred on the TD lead (Pin 2), or Function 03, for RD (Pin 3).

APPLICATIONS:

1. Observing the Function as 02 or 03 will clearly indicate whether the character occurred as receive or transmit data.
2. Verifying that the characters expected are present and to determine their sequence, even when interleaved between transmit and receive data, or if out of "normal" sequence.

3.3.5 MONITOR LIBRARY GROUP

END MONITOR LIBRARY, FUNCTION 05

LOAD-ENTER

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 05 |

DESCRIPTION:

Function 05 MUST ALWAYS follow the last character in the monitor library to signal the end of the library. DATA 00 is entered. Function 05 will not be displayed as a test result. Function 05 will automatically return the program to the step containing Function 01.

3.4 RECORD GROUP

| | |
|----|-----------------------------|
| 06 | JUMP BIT SWITCH = CHARACTER |
| 07 | BIT SWITCH |
| 08 | LOOP "L" COUNTER |
| 09 | INTERRUPT STEP |

The Record Group provides the capability of recording specific data into the results memory at certain steps during the test to identify that certain bench marks have occurred.

In certain applications, it is useful for these functions to be preceded by Function 49 to address a specific location in the results memory. This permits recording specific/different data in different pages of Results Memory.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (XY) | 07 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| Z | 0-F | (XY) | 07 |

(XY = same pattern as loaded)

DESCRIPTION:

Function 07 records in the results memory a specific data word (XY) whenever the test program proceeds through the step N. XY is selected by the operator.

APPLICATIONS:

1. Use Function 07 as an index marker in the test program so that on playback the operator can easily observe how far the test has proceeded.
2. In complex tests utilizing loops (Functions 42 and 43), Function 07 can be used to correlate and identify repeated operations.
3. When transmitting from Results Memory (Function 54), Function 07 may be detected to terminate the transmission.
4. When outputting the contents of Results Memory to another device, the data (XY) content of Function 07 can be used to generate specific desired characters. One example is to unite "OF" to denote an off-line terminal that did not respond to a poll:
5. Clear or Initialize Results Memory.

| STEP | DATA | FUNCTION |
|------|-------------------|----------|
| 00 | 00 | 07 |
| 01 | 00 | 41 |
| 02 | 82 | 47 |
| 03 | NEXT PROGRAM STEP | |

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 08 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|---------|----------|
| Z | 0-F | (00-0F) | 08 |

DESCRIPTION:

The count in the loop counter (from 0-15) is written as one Hex digit into the results memory each time the test executes the step containing Function 08. Function 42 is used to specify the number of loops or repeats of a series of test steps.

Even though Function 42 may be programmed as BCD Fun 00-99, the "L" count logged is a maximum of 16 (0-F, HEX), where Function 42 exceeds 16. Function 08 will simply repeat the count (0-F), etc. for the total count entered by Function 42.

The X Hex digit is usually zero; however, if Function 08 is used several places in a program, the X digit can be entered as 1, 2, 3, etc. to identify its significance in the test.

APPLICATIONS:

1. Function 51 will send sequential terminal addresses up to a maximum of 16 different addresses. Using Function 08 will identify the terminal sending the NAK after receiving a NAK response to the poll.
2. When using the loop counter to repeat a test sequence until a condition is met to exit the loop, Function 08 can be used to record how many times the test sequenced or "tried" before the default (or success) occurred.

EXAMPLE:

Testing for 10 correct responses "EOT" to a poll "ENQ" and recording the ≠EOT character responses, and the poll number of the response:

| RESS (ONE) | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → |
|---------------|-------|------|----------|----------------------------------|----------------|
| | STEP | DATA | FUNCTION | | |
| 0 | 0 | 10 | 42 | Preset Loop To Send ENQ 10 Times | |
| 0 | 1 | ENQ | 50 | Send ENQ | |
| | 2 | 07 | 41 | Preset | |
| | 3 | EOT | 45 | Jump ≠ EOT | "≠ EOT" |
| 0 | 4 | 01 | 41 | Preset | "TEST LOOP" |
| | 5 | 00 | 43 | Jump Until "L" | "SEND ENQ" |
| | 6 | XY | 40 | UNCONDX JUMP | "NEXT TEST" |
| 0 | 7 | 00 | 08 | RECORD Loop Count | "= EOT" |
| | 8 | 00 | 36 | RECORD Current Character | |
| | 9 | 04 | 40 | UNCONDX JUMP | "TEST LOOP" |
| A | 10 | | | | |

3.4.3 RECORD GROUP

RECORD INTERRUPT STEP, FUNCTION 09

LOAD-ENTER:

STEP PAGE DATA FUNCTION

| | | | |
|---|-----|----|----|
| N | 0-3 | 00 | 09 |
|---|-----|----|----|

PLAY:

STEP PAGE DATA FUNCTION

| | | | |
|---|-----|-------------|----|
| Z | 0-F | 00-FF (HEX) | 09 |
|---|-----|-------------|----|

DESCRIPTION:

The address of the test step in progress at the time of an interrupt is saved and may be later written into the results memory by using Function 09.

APPLICATIONS:

1. Write into results memory (in sequence) where the interrupt(s) occurred.
2. The results memory will display that an interrupt has occurred but will *not* record which one occurred. Precede Function 09 by Function 07 to identify which interrupt occurred when desired.

3.5 RECEIVE INDEX GROUP

| | |
|-----|---------------------------------------|
| *10 | WAIT Until TD/RD Change |
| *11 | Record until TD/RD Change |
| 12 | Record TD/RD and RS-232 (V.24) Status |
| *13 | Time out <i>OR</i> TD/RD Change |
| 14 | Wait N Receive Characters |
| 15 | Wait to Complete XMT Character |
| 16 | Wait until = Character |
| 17 | Wait until \neq Character |
| 19 | Enter INTERRUPT Character |

The Receive Index Group permits indexing within the receive data, transmit data, and interface to establish specific markers.

*In order to ensure proper operation, Functions 10, 11 and 13 should be used only where data cannot *simultaneously* occur on both the TD and RD leads.

3.5.1 RECEIVE INDEX GROUP

WAIT UNTIL TD/RD CHANGE, FUNCTION 10

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N1 | 0-3 | 00 | 10 |

DESCRIPTION:

TD/RD MODE: Function 10 is used to detect a change in activity from either the TD lead to the RD lead or from the RD lead to TD lead.

The step containing Function 10 will not be completed until a data transition is detected on the other lead.

The TEST switch *MUST* be in the TD/RD ON-LINE MONITOR position.

TD or RD or TEST TERM or TEST MODEM MODE: Function 10 will complete when the next transition occurs on the receive signal path.

APPLICATIONS:

1. On Half Duplex (operated) systems, the DTM-2 will automatically assign itself (in the TD/RD test) to the ACTIVE DATA CHANNEL. Turn-around timing measurements are enhanced by using Function 10 to terminate or initiate the duration timer when there is no modem control lead or terminating data character.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 11 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 11 |
| Z+1 | | (Character) | 11 |
| Z+n | | (Character) | 11 |

DESCRIPTION:

TD/RD MODE: Function 11 will record into results memory each received data character until a data transition is detected in the other data path.

The step will then complete.

The TEST switch *must* be in the TD/RD ON-LINE MONITOR position.

NOTE

Do not use Function 11 in TD or RD or TEST TERM or TEST MODEM modes.

APPLICATIONS:

1. Recording messages of unknown length where there is no END OF TEXT or equivalent character to terminate the message, or no modem control lead activity.
2. Function 12 is often used in conjunction with Function 11 to indicate clearly the lead (TD or RD) that the data is recorded on by Function 11.

3.5.3 RECEIVE INDEX GROUP RECORD TD/RD and RS-232 (V.24) STATUS, FUNCTION 12

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 12 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-----------------|----------|
| Z | 0-F | (RS-232 STATUS) | 02 or 03 |

DESCRIPTION:

- The DATA bit display will display the status of the RS-232 (V.24) leads according to the following bit assignments:

| Bit | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|-----|-----|-----|-----|------|-----|----|---------------------------|-----------------------|
| | RTS | CTS | DSR | RLSD | DTR | RI | (7X) DETECT TEST POINT | FUNCTION 47 FLAG 7 |

"1" or Mark indicates ON or plus voltage on the RS-232 (V.24) lead.

- FUNCTION will display 02 to indicate presence of data on TD (Pin 2) or 03 to indicate presence of data on RD (Pin 3).
- The Detect T.P. can be patched to any other lead, including DATA and CLK.

APPLICATIONS:

- Identify at any time the status of the RS-232(V.24) interface signals and data activity.
- Upon receipt of an "erroneous" character, the status of the RS-232(V.24) leads can be recorded to determine if the error was caused by a control lead malfunction.
- After an INTERRUPT signal on Carrier Dup-Out (NOISE HIT) on an FDX circuit, FUNCTION 12 will enable a record of all other RS-232 leads of interest within 3 microseconds.

3.5.4 RECEIVE INDEX GROUP TIME OUT or TD/RD CHANGE, FUNCTION 13

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N | 0-3 | 01-99 | 13 |

DESCRIPTION:

The step containing Function 13 will complete as a result of *any* of three criteria:

1. TD/RD Mode: Activity changes from one data path to the other data path, *or*
2. A transition occurs on the receive data path in TD, RD, Test Term, Test Modem, *or*
3. Time elapsed exceeds the limit selected by the operator (0.1-9.9 seconds).

NOTES

1. 01-99 corresponds to 0.1-9.9 seconds. Enter the time duration desired by use of the bit switches in BCD.
2. INTERRUPT (Function 97) TIME OUT can also be used to accomplish a similar requirement.

APPLICATIONS:

1. Permits the operator to continue a test after a time out, even if an ACK or NAK (any response) is not received.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N | 0-3 | 01-99 | 14 |

DESCRIPTION:

Function 14 will cause the test to wait until N characters have been received. The receipt of character N will complete the step. Enter the number of characters to be received, 1 to 99, using the front panel switches. Counting is in BCD.

Function 14 permits indexing within a character string to a specific character location (similar to a TAB function on a typewriter).

TEST MODES: In the OFF-LINE TEST mode (TERMINAL or MODEM) and in the ON-LINE MONITOR, TD or RD modes, received characters will only be counted on the designated lead.

In the TD/RD ON-LINE MONITOR mode, characters will be counted on either the TD or RD lead.

SYNC MODE: The required Sync characters (1 or 2 as selected) will not be counted. Characters will be counted only after the unit is in SYNC.

SYNC IDLE: After the receiver is in SYNC, it will remain in Sync until the OUT SYNC or RESYNC conditions are met. Function 14 will therefore count PAD characters following a transmission until the receiver is taken out of Sync. Refer to Function 95 Sync Search for a more detailed description of OUT SYNC criteria.

APPLICATIONS:

1. Long strings of preceding SYN characters can be skipped over (test can also use FUNCTION 17, wait \neq SYN).
2. Where the 7th character is known to be STX and intervening different address characters are not of interest as in a CRC Error Rate test, Function 14 will give immediate access to character 7. Next following step is Function 46, RETEST and JUMP if = STX, to enter the CRC subroutine.
3. Function 14 should *not* be used where there is a potential of less than N characters being received as the step will not complete.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 15 |

DESCRIPTION:

In order to operate full duplex, DTM-2 will complete an instruction to transmit a character in 3μ sec, thus leaving the DTM-2 free to monitor receive data. However, the transmitted character has not been completely transmitted in this time interval, and it is possible that a subsequent instruction, such as "Turn Off Request to Send" could interfere with the character being transmitted.

In SYNC mode, Function 15 will complete within 3μ sec of the *last* transition of the character currently being transmitted (for any preceding transmit function). This ensures that the character will be transmitted. This also establishes the *precise* end of the transmit character in SYNC mode, and can be used for accurate timing measurements.

NOTES

1. In SYNC mode, the DTM-2 must send fill characters for Function 15 to operate. Therefore, a Function 57, Load Fill Character, must appear in any preceding step.
2. Function 15 is *required* between the "last" transmit character and RS-232(V.24) control lead operation (unless other time delay instructions are used, such as Functions 80, 81, 82, 83 or 50). See Paragraph 3.10. In ASYNC mode, Function 15 will complete at the exact mid-point of the FIRST STOP bit. No other functions are required to "support" Function 15.

APPLICATION:

1. When DTM-2 is sending: Use Function 15 after EOT or ENQ in HDX systems to establish the precise end of the character.
2. Follow Function 15 with either time count or bit count (Functions 80, 81, 82 and 83) before operating the appropriate RS-232(V.24) control lead(s).
3. For accurate turn-around-time measurements on a switched-carrier multi-drop, after Function 15 (following a "last character" such as ENQ), the timer may be started 01-87 and stopped after either RLSD (comm. facility delay) or after the first \neq SYN character (System Delay in Terminal Software Time).

3.5.7 RECEIVE INDEX GROUP WAIT UNTIL = CHARACTER, FUNCTION 16

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-F | (Character) | 16 |

DESCRIPTION:

The step containing Function 16 will only complete when the character specified by the operator is received. The correct parity must also be observed. Enter the character using the front panel bit switches.

If the character is not received, the test will remain at the step containing Function 16.

Function 20 performs the same function except the character is recorded in Results Memory when received.

APPLICATIONS:

Function 16 is useful in waiting to detect known protocol characters such as STX, SOH, ETX. This permits the operator to ignore long texts and concentrate on protocol only.

NOTE

A similar operation may be performed by using Function 41, Preset Jump and Function 45, Jump \neq Character. Each character, such as EOT will be tested and the test step recycled or looped until EOT is received. Then the test will exit the loop and proceed to the next step.

3.5.8 RECEIVE INDEX GROUP WAIT UNTIL \neq CHARACTER, FUNCTION 17

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 17 |

DESCRIPTION:

The step containing Function 17 will only complete when a received character *not equal* to the specified character is received.

Correct parity must be observed; thus, a parity error on a received character will cause this step to complete.

APPLICATION:

The primary use of Function 17 is to index to the *end* of a long string of SYN characters. The SYN character would be entered as data and the first NON SYN character will complete the step. Analysis may then begin to determine if the NON SYN character is an erroneous SYN character or an anticipated control character such as SOH, ENQ, EOT.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 19 |

DESCRIPTION:

Function 97 will interrupt a test any time a selected character is received and will cause the test to immediately go to step 62 of the last page of the test memory cell.

Function 19 is the means for specifying the character to be loaded into the detector circuit. Function 19 loads the character into the detector circuit. Function 97 must be used to access the output of the detector, so that the Function 19 character will be enabled. Function 19 should precede Function 97.

APPLICATIONS: (Also see Function 97)

1. Detecting characters in a data stream such as SYN or DLE. SYN characters are not included in BCC calculations but their presence and/or quantity is of interest in certain applications.
2. In Full Duplex, the interrupt character could be used to recognize an interruption or termination command while DTM-2 is transmitting a message.

3.6 RECEIVE – TRAP GROUP

| | |
|-------------------------|--------------------------------------|
| 20 | Trap Character |
| 21 | Trap First Character in Sequence |
| 22 | Trap Middle Character(s) in Sequence |
| 23 | Trap Last Character in Sequence |
| *24 | Increment Results Memory Address |
| 25 | Record Until Trap Character |
| 26 | Record Next \neq Character |
| *Out of Group Function. | |

The Receive Trap Group functions depend on a received character matching the entered reference character (including parity if used).

Each TRAP function will cause the selected character to be recorded or "logged" into results memory, thus combining several functions into one for ease of programming tests.

Alternate techniques of determining a selected character's presence in a data stream are provided by Functions 16, 17, 19, 33, 44, 45 and 46.

Each function in the 20 series will complete at the midpoint of the last data bit in SYNC mode or at the midpoint of the first stop bit in ASYNC mode.

In the SYNC mode, characters are *NOT* analyzed or compared until the system is in sync. When out of sync, the last valid character will remain displayed as DATA (usually FF for idle Mark).

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 20 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 20 |

DESCRIPTION:

The character of interest is entered. When this character is received, it is detected, recorded in the results memory and the test advances to the next step.

Function 16 performs the same function, except the character specified is *not* recorded.

APPLICATIONS:

1. Function 20 is used to trap control characters, such as STX and SOH and record their presence.
2. Function 20 can be used to verify the presence of the third SYN character and record it for reference in starting each analysis sequence on a data stream. Subsequent information in the results memory will be identified as: (a) after a Function 20, and (b) have other function numbers.
3. If the character is *not* present, the test will remain at the step containing Function 20.

3.6.2 RECEIVE – TRAP GROUP TRAP FIRST CHARACTER IN SEQUENCE, FUNCTION 21

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 21 |

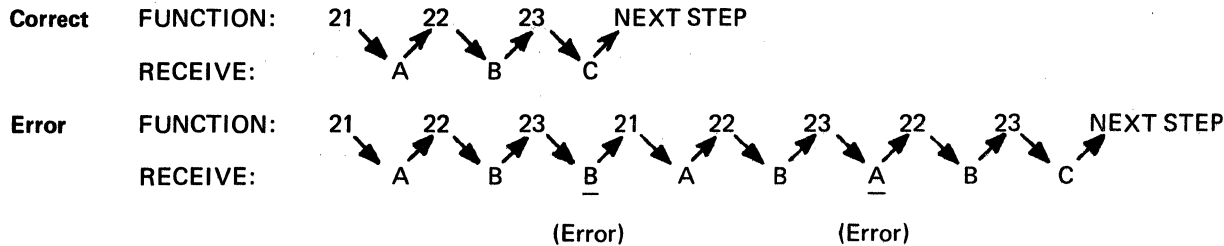
PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 21 |

DESCRIPTION:

Function 21 is very similar to Function 20 with the additional *expectation* that one or more characters are specified to follow consecutively. If the sequence is interrupted, the error character will be automatically *retested* for agreement as the first character in the sequence. When equal, the first character Function 21 will complete immediately and advance to either Function 22 or 23, as appropriate.

Observing operation will show the sequence properly of Functions 21, 22 and 23; however, if the third (last) character is not correct for Function 23, the test will return to Function 21.



Note that in the above example, the Results Memory will contain A B B A B A B C.

APPLICATIONS:

1. Detecting sequences of characters of any length from 2 up and logging their occurrence.
2. Determining the number of "tries" to send a specific character sequence.
3. Starting a test for a specific terminal (address).

3.6.3 RECEIVE – TRAP GROUP TRAP MIDDLE CHARACTERS(S) IN SEQUENCE, FUNCTION 22

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 22 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 22 |

DESCRIPTION:

Function 22 is used to detect and record one or more middle characters in a sequence. If the character received does not match the character entered, the test will revert to the step containing Function 21, Trap First Character in Sequence.

Refer to Function 21 for full description and applications.

NOTE

For a two-character sequence, use Function 21 (first character) and Function 23 (last character) as there is no "middle" character.

3.6.4 RECEIVE – TRAP GROUP TRAP LAST CHARACTER IN SEQUENCE, FUNCTION 23

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 23 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 23 |

DESCRIPTION:

Function 23 is used to detect and record the *LAST* character in a sequence. If the character received is different than the character expected, the test will revert to the preceding Function 21, unless the character received satisfies Function 21. In this special case, Function 22 will be the next step.

See Function 21 for further discussion and applications.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 25 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|----------------|----------|
| X | 0-F | Any Character | 25 |
| X+1 | | Any Character | 25 |
| X+2 | | Trap Character | 25 |

DESCRIPTION:

Function 25 will cause all received characters to be recorded in the results memory until the TRAP character.

The trap character will also be recorded into results memory to provide an index that the step did complete.

Function 25 operates similarly to Function 35, RECORD LATCH, except the DTM-2 is *dedicated* to recording in Function 25.

APPLICATIONS:

1. Recording messages of random length which end in a known character (EOT, ETB, PAD, etc.).
2. Applications where only the variable part of a message is to be recorded, e.g., various address lengths before STX.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 26 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|---------------------|----------|
| Z | 0-F | (\neq Character) | 26 |

DESCRIPTION:

Function 26 will detect the next character received that is *not equal* to the character specified. The \neq Character will be recorded in the results memory. Parity is observed where applicable. Thus a character with a parity error will be detected and recorded and the test will advance to the next step.

Function 26 is similar to Function 17, except that the character is recorded in the results memory.

APPLICATIONS:

1. Function 26 can be used to detect and record protocol errors.
2. Use to record protocol characters on systems using idle SYN characters.
3. Use to record erroneous SYN characters in a system containing idle SYN characters. Function 26 will also record all protocol characters following the SYN character if set up to record \neq SYN.

3.7 RECEIVE – RECORD GROUP

| | |
|----|------------------------------|
| 30 | Record Next Character |
| 31 | Record Character N |
| 32 | Record N Characters |
| 33 | Record Character Before Trap |
| 34 | Jump and Record Parity Error |
| 35 | Record Latch Mode |
| 36 | Record Current Character |

The purpose of the Receive-Record Group functions is to record an unknown character or series of characters into results memory.

Whereas the TRAP functions (2X) match, detect and record specific characters, often the correct character is *not* received and the erroneous character should be recorded. Usually only the position or relative position of the character is known.

Full Duplex operation is permitted by using Function 35 to record received characters even though the transmitter may be sending characters or messages simultaneously.

Functions 30, 31, 32, 33 and 34 complete at the middle of the last data bit on SYNC and at the middle of the first STOP bit on ASYNC.

Functions 35 and 36 complete in 3 μ sec and will not be observed on the Function display when running.

3.7.1 RECEIVE – RECORD GROUP**RECORD NEXT CHARACTER, FUNCTION 30**

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 30 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 30 |

DESCRIPTION:

Function 30 will cause the *next* character received to be recorded into results memory. Also, refer to Function 36, which records the current (last received) character.

APPLICATIONS:

1. Record the first character following STX to verify the proper header for the block format.
2. Record the next character after the address is verified.
3. Function 30 can be used as an index in a long test sequence and also will verify the existence of the correct character.
4. Function 30 can be followed by Function 32, 25, 11, to "mark" the first characters of a string of recorded characters.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N | 0-3 | 01-99 | 31 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 31 |

DESCRIPTION:

Function 31 will cause INTERSHAKE II to count "N" characters and record the Nth character received in the results memory. The N count will begin when the step containing Function 31 is reached in the test sequence.

Function 31 is similar to Function 14 except Function 31 records the Nth character.

APPLICATIONS:

1. In formatted transmissions, a specific character will occur at specified locations (as a TAB). Each of these can be recorded for later observation.
2. Often only certain data characters in a block are of significance in a test. Use Function 31 to index to the first character of interest.
3. When running a longer test with a lot of data in Results Memory, Function 31 can be used as an index or as a "sort" to skip over the recording of nonessential characters.
4. In fixed block transmission, Function 31 can be used to verify the positional accuracy of certain (control) characters.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N | 0-3 | 01-99 | 32 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 32 |
| Z+1 | | (Character) | 32 |
| Z+N | | (Character) | 32 |

DESCRIPTION:

Function 32 causes all received characters to be recorded until and including the Nth characters. The N count will begin when the step containing Function 32 is reached in the test sequence.

APPLICATIONS:

1. Use Function 32 to record the next several characters every time the receiver gets in SYNC. The Results Memory will then contain a record of the protocol.
2. Use Function 32 to record a multicharacter address (and ignore the data content of the message).
3. Use Function 32 to record the two BCC (CRC) characters following ETX. Function 16 (Wait = ETX) or Function 20 (Trap ETX) would precede Function 32.

NOTE

Function 32 is "related" to Function 26, RECORD NEXT \neq CHARACTER. There are, therefore, several techniques for terminating a RECORD function.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 33 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|---------------|----------|
| Z | 0-F | (Character-1) | 33 |

DESCRIPTION:

Function 33 causes the character preceding a designated character to be recorded into the results memory.

NOTE

1. The Sync character will not be accessed by this function, e.g., SYN₁, SYN₂ ENQ: Function 33 trap ENQ will not record the SYN₂ character in the 2 SYN character mode.
2. Alternative techniques for recording characters preceding a specific character (or event) can be achieved by using Function 96 (in Sync).

APPLICATION:

In messages of variable length, Function 33 can be used to obtain access to the character preceding EOT.

3.7.5 RECEIVE – RECORD GROUP

JUMP AND RECORD PE, FUNCTION 34

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N-1 | 0-3 | (XY) | 41 |
| N | | (QQ) | 34 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 34 |

DESCRIPTION:

This function waits for the next character and tests it for a parity error. If no parity error exists, the test will proceed to the next step. If a parity error is detected, the test will jump to the step preset by the most recent (preceding) Function 41 (XY as shown). However, it is good practice to place the Preset Jump to Step XY, Function 41 *immediately* before Function 34.

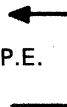
APPLICATIONS:

1. By recording all characters with parity errors, an indicator can be obtained regarding the type of problem occurring:
 - a. A hardware or software problem is indicated if parity errors occur in a recurring character or bit.
 - b. A communication problem (noise) is indicated if parity errors occur in random characters or bit patterns.

EXAMPLE:

To monitor line and record Parity Error Characters:

| STEP | DATA | FUNCTION | |
|------|------|----------|----------------------|
| 0 | 00 | 41 | Preset Return |
| 1 | 00 | 34 | Jump and Record P.E. |
| 2 | 00 | 40 | Jump to Stop 00 |



Counter switch is set to PE $\times 10^x$ for this example.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-----------------------------|----------|
| N | 0-3 | 00 OFF | 35 |
| | | 01 RECORD RECEIVE DATA | |
| | | 02 SELF MONITOR | |
| | | 03 RECORD ALL TRANSMIT DATA | |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|-----------|------|-------------|----------|
| X | 0-F | (Character) | M* |
| X+. . . . | | (Character) | M* |

*The Function in results memory is undefined, and should be disregarded, since it relates to the Function being executed as the instant the received character was recorded.

DESCRIPTION:

Function 35 causes all data received to be recorded in the results memory. This permits recording data while simultaneously transmitting from INTERSHAKE II. While simultaneously latched in the record mode, no other data can be recorded in the results memory, although certain functions which trap and record will perform their trap functions.

There are actually four subfunctions included under Function 35. These subfunctions permit the operator to terminate as well as initiate the log latch function. The four are:

- 00 Turn off record latch condition
- 01 Record all received data in results memory
- 02 Turn ON the SELF MONITOR switch in the Test Zone of the front panel, but do *not* record received data
- 03 Record in Results Memory all data being transmitted.

NOTES

- 1. The MON SIGS OUT/NORMAL switch must be set to NORMAL position.
- 2. 00 turns off 01, 02 or 03.
- 3. While using Function 35, Functions 52, 53 and 54 may not be used simultaneously, as these require transmitting *from* results memory.
- 4. When the results memory is full, the data being recorded will be overwritten.

APPLICATION:

Record Latch is useful to record the return signals on a Full Duplex system while the DTM is transmitting either poll codes or data blocks.

3.7.7

RECEIVE – RECORD GROUP

RECORD CURRENT CHARACTER, FUNCTION 36

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 36 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| Z | 0-F | (Character) | 36 |

DESCRIPTION:

Function 36 causes the received character to be recorded in results memory. Thus, a character received and being analyzed may be recorded upon completion of analysis. This is useful where the analysis does not yield the expected character and the operator wishes to record the "unknown" character for later analysis. For example, when Function 44, Jump if = Character, 45, Jump if \neq Character, 46 Retest or Jump if = Character do not identify the character being received, Function 36 will cause the character to be recorded in memory for later analysis.

The last complete character presented to the INTERSHAKE is the current character available for analysis and is the character recorded.

Function 36 requires 3 μ sec and will not show on the display.

APPLICATION:

A test sequence using a series of Function 46 to sort a received character, and as ENQ, SOH or ACK may fail to complete if the expected received characters are distorted. Use Function 36 at the end of a series of Function 46 to identify the character received and advance the test.

After an unanticipated protocol situation, Function 36 can be used to record the last character received.

NOTE

Function 12 Record TD/RD and RS-232(V.24) status is often used with Function 36.

3.8 RECEIVE-BCC GROUP (RCV-BCC)

| | |
|----|---------------------|
| 38 | Start BCC |
| 39 | Jump if = BCC Error |

Functions 38 and 39 permit on-line calculation of the Block Check Character and comparison with the received BCC.

Positioning the Counter to BCC 10^X allows an on-line BCC error rate to be measured on a Base of 10 to 10^8 blocks.

B (Block) is a generic term that includes either the LRC (Longitudinal Redundancy Character) or the CRC (Cyclic Redundancy Check Character).

LRC is usually associated with ASYNC systems and is comprised of *one* character.

CRC is usually associated with SYNC systems and is comprised of *two* characters.

SYN characters are excluded from the calculation of either LRC and CRC according to standard practice. LRC and CRC are usually calculated only on the data by the transmitting source software. As the message is being transmitted, SYN characters may be inserted automatically by the communication hardware; therefore, the BCC is not knowledgeable of the inserted SYNs. In the DTM-2, BCC is calculated as the characters are received with SYN characters deleted.

The character contained in Function 90 (or entered manually as SYN) will always be deleted from BCC calculations.

After STX, Function 90 is used to enter *any* characters to be deleted from the BCC calculation; e.g., DLE.

The INTERSHAKE II contains any one calculator that must be assigned appropriately to Transmit (Function 58) or Receive (Function 38).

| |
|--|
| <p>The following additions have been added for serial number series "F" and above.</p> |
|--|

LRC

LRC is calculated on the INFO BITS selected. LRC is *not* calculated on the *parity* bit. BI-SYNC and most other systems use the convention where the LRC character contains a parity bit of the same sense as the parity used in the data.

NOTE

There are special cases where the data uses Parity, and the LRC character calculates LRC for the parity bit. In this case the LRC character does not have to conform to the parity convention, and may generate a parity error. The INTERSHAKE may be used for LRC calculation in such a system by selecting the PARITY: None, and including the Parity Bit in the INFO BITS setting. Since LRC may generate a parity error, the counting of Parity Errors is of little value in such a system.

3.8 RECEIVE-BCC GROUP (RCV-BCC) (Cont'd)

Typical Program Application: to test BCC, the program must first start the BCC calculation after the STX (or other appropriate leader character) and test the BCC after the ETX (or other appropriate ending character).

EXAMPLE:

FUNCTION

| | | |
|----|-------------------|---------------------|
| 16 | Wait until = STX | |
| 38 | Start BCC | } Other diagnostics |
| 16 | Wait until = ETX | |
| 41 | Preset JUMP | |
| 39 | Jump on BCC ERROR | |

LOAD-ENTER:

STEP PAGE DATA FUNCTION

| | | | |
|---|-----|------|----|
| N | 0-3 | (XY) | 38 |
|---|-----|------|----|

DESCRIPTION:

Function 38, start BCC, places the BCC calculator logic on the receive data path, initializes the calculator, and selects the proper mathematical calculation model. Selection of the proper DATA entry is used to select the proper type of BCC calculation.

DATA "X"

- 0 Normal calculation of CRC and EVEN LRC
- 1 Inverts data for CRC calculation and ODD LRC

DATA "Y"

- 0 EBCDIC/CRC-16 $[X^{16} + X^{15} + X^2 + 1]$
- 1 CRC-16 Reverse $[X^{16} + X^{14} + X + 1]$
- 2 Old IBM $[X^{16} + X^{15} + X^{13} + X^7 + X^4 + X^2 + X + 1]$
- 3 CRC-12 $[X^{12} + X^{11} + X^3 + X^2 + X + 1]$
- 6 CCITT/SDLC-CRC $[X^{16} + X^{12} + X^5 + 1]$
- 7 CCITT CRC Reverse $[X^{16} + X^{11} + X^4 + 1]$
- 8 LRC (6, 7, 8 level)

Function 38 requires 3 μ sec to complete and will not be observed on the Display.

If the BCC Error light has been ON due to a past BCC error, Function 38 will clear the BCC Error light to OFF.

APPLICATION:

Use the CRC calculation for checking system errors.

NOTES

1. BCC will not be calculated to include the character entered by Function 90 (which may or may not be SYN character).
2. LRC will be calculated based on the setting of the INFO BITS and PARITY switches, or Auto-Panel, Function 91. For example, with 7-level ODD parity, the LRC will be calculated and tested on seven bits, with the eighth bit conforming to character parity.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|---|----------|
| N-1 | | (XY) | 41* |
| N | | (00 JUMP ON ERROR) (01 JUMP & RECORD ON ERROR) | 39 |

(*Function 41 presets the jump to the desired test step, XY)

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| Z | 0-F | LRC | 39 |

| STEP | PAGE | DATA | FUNCTION |
|------|------|------------------|----------|
| Z | 0-F | CRC ₁ | 39 |
| Z+1 | 0-F | CRC ₂ | 39 |

DESCRIPTION:

- Function 39 must follow the last character for which BCC is calculated.
- It is good practice to always precede Function 39 with the associated preset step, Function 41.
- When LRC or the 2 CRC characters are received, a check is made for an error.
- Each error will light the BCC error light (and the next Function 38 will clear the light).
- If the counter is set to BCC 10^X , errors will accumulate on the display until the *End* light indicates the base block count 10 to 10^X has been reached.
- If no error is found the test will resume at the next step.

For DATA 01, the number of characters recorded is automatically determined by the preceding Function 38; for example, one character for LRC, two for CRC.

NOTE

Function 39 is *not* to be used in the SDLC mode. (Use Function 47 data FY.)

APPLICATIONS:

- Use the Jump to verify that a correct CRC got an ACK response and an incorrect CRC got a NAK response and any erroneous responses are accurately classified and recorded.
- In the MONITOR mode, jump on error could go to a test to look for a NAK response. In the OFF-LINE mode, the jump on error could go to a step to transmit a NAK response.

3.9 JUMP & TEST GROUP

| | |
|-----|--|
| 40 | Unconditional Jump to Any Step |
| 41 | Preset the "Jump To" Step (for a later test) |
| 42 | Preset Loop Count L |
| *43 | Jump until "L" Loops |
| *44 | Jump if = Character |
| *45 | Jump if \neq Character |
| *46 | Retest & Jump if = Character |
| *47 | Flags: Set and Jump |
| 48 | Select Results Memory Step |
| 49 | Select Results Memory Page and Step 00 |

Other Jump Functions not in the 40 Jump and Test Group, but which are useful in certain tests are:

- *34 Jump and Record PE
- *39 Jump = BCC Error
- *77 Jump = RS-232(V.24) ON
- *78 Jump = RS-232(V.24) OFF
- *88 Jump if Counter $>$ Data (2 high order digits of Counter)
- *94 Peripheral Controller; Jump on 8 I/O leads

*Functions with an asterisk should be preceded by Function 41.

These are described under the specific function headings.

The basic purpose of the Jump Functions is to permit the operator to choose alternate test routines at critical junctions of a test, rather than to simply continue or stop. This capability to select alternate paths, referred to as "branching," has broad application in testing and fault isolation. For example, receipt of an incorrect character may be used to initiate a diagnostic subroutine, while the correct character received simply repeats the test again.

Except for Functions 40 and 42, the JUMP functions must be preceded by Function 41 which specifies the next step if a JUMP is executed. This may be any step in the test sequence, forward or backwards.

Loops are subroutines that can be repeated a specified number of times until the test exits the loop and advances.

NOTE

Step to which a jump moves are specified as an ADDRESS in Hex. The Program Forms contain a built-in translation of Steps to Hex Address. The eight-bit data specifies an address of up to 256 steps. See Appendix D. A NON JUMP continues to the *next* step.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (XY) | 40 |

DESCRIPTION:

Function 40 causes the test program to jump to any other designated step in the program memory.

There are 8 data bits which can directly address up to 256 steps which represents the maximum program memory cell size. In order to reach any of the 256 steps, the data must be entered as a pure BINARY number representing the step (and page) of the intended step next to be acted upon. (XY) is, therefore, a BINARY number. Note that the steps in memory are designated 00 to 63. Therefore, Step 64 is actually Page 01 Step 00.

Program sheets provide equivalent Address and Step columns.

Code charts are provided in Appendix "D" to convert any step and page to a binary value.

APPLICATIONS:

1. In a program cell of 128 or 256 steps, there may be numerous "self-contained" tests. Use Function 40 in Step 00 Page 0 to select the desired test to be run. When the START switch is pressed (and released) the test will always begin at Step 00 Page 0, at which time the Function 40 will direct the test to begin at the specified step.
2. At the end of a series of diagnostic tests, use Function 40 to continue the test at any other step in another test series.
3. In a long test sequence, use Function 40 to direct the test to begin at *any* of the steps internal to the test sequence.
4. When using Interrupts, place a Function 40 at the program memory interrupt location specified.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (XY) | 41 |

DESCRIPTION:

Function 41 is used before a jump function to direct the test to the desired page and step of the test. It is required in the test sequence to "preset" the jump destination address, since most jump functions must include in their DATA the condition requiring a jump or *when* to jump. Thus, Function 41 provides the answer to the question of *where* to jump, which cannot be included in the basic jump instruction.

It is good practice to use Function 41 immediately preceding the selected JUMP function.

Function 41 instruction is stored in a memory latch and executes immediately. Subsequent JUMP functions will use the same instructions unless updated by a new Function 41.

The page and step are entered as binary data. Program Sheets contain equivalent Address and Step columns. A code conversion chart is also supplied in Appendix D for converting the page and step to binary.

APPLICATION:

There are 11 "Jump" instructions which will normally require Function 41 in the step that precedes immediately.

- 34 JUMP and Record PE
- 39 JUMP = BCC Error
- 43 Jump until "L" Loops
- 44 Jump if = Character
- 45 Jump if ≠ Character
- 46 Retest and Jump if = Character
- 47 Flags: Set and Jump
- 77 Jump = RS-232(V.24) ON
- 78 Jump = RS-232(V.24) OFF
- 88 JUMP if Counter > Data
- 94 Peripheral Controller; Jump on 8 I/O leads

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|---------|----------|
| N | 0-3 | (01-99) | 42 |

DESCRIPTION:

Function 42 enables the operator to program the number of times (01-99) a sequence of program step(s) may be repeated or looped. Function 42 *must* precede the sequence to be repeated, Function 43 marks the end of the loop (and count the loops) while Function 41 directs the test to the beginning of the loop if the required number of subtests or loops have not been completed.

The number of loops desired is entered as a BCD number and is held in a latch as a reference for Function 43.

Function 42 **must not be included** in the sequence of program steps that are repeated, or the loop counter will be preset each time the test repeats.

See Function 43, Application Note 4.

NOTE

1. Access to the L counter by other Functions is only provided for a count up to 16, e.g., Function 51 Send A Progression and Function 08 Record L uses the four lower order bits of the counter yielding a count of 0-15 or 0-F in Hex.
2. Loops cannot be nested (interlocked).
3. FLAGS (FUN 47) can be used as multiple short counters of 2, 4, 8.

EXAMPLE: (See Function 43 Applications).

| | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → |
|---|-------|------|----------|-------------------------------|----------------|
| | STEP | DATA | FUNCTION | | |
| 0 | 0 | 12 | 42 | Preset LOOP Count (LONG) | |
| 1 | 1 | 01 | 70 | Audible ON "AGAIN" | |
| 2 | 2 | 50 | 80 | Delay 50 ms | |
| 3 | 3 | 01 | 71 | Audible OFF | |
| 4 | 4 | 10 | 81 | Delay 100 ms | |
| 5 | 5 | 03 | 87 | Event Count | |
| 6 | 6 | 01 | 41 | Preset "AGAIN" | |
| 7 | 7 | 00 | 43 | Jump Until "L" | |
| 8 | 8 | 00 | 00 | HAIT | |

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N-1 | 0-3 | (XY) | 41 |
| N | | 00 | 43 |

DESCRIPTION:

Function 43 is the *last step* in a sequence of steps to be repeated or looped. The Loop Count entered by Function 42 is examined, and if the looping has not reached the count, the address next step will be specified by the preceding Function 41. When the Loop Count is complete (equal to the preset value from Function 42), the next step will be Step (N + 1) following Function 43.

Always precede Function 43 with Function 41.

NOTE

The L counter is also utilized by these functions:

- 08 Record Loop "L" Count
- 51 Send a Progression

APPLICATIONS:

1. A single character may be repeated up to 99 times by looping. This can be used to transmit a selected block length for simulating text.
2. A subset of a program test may be repeated "L" times before indicating that the problem is severe.
3. For polling, the loop is used to increment the address character (Function 51).
4. The example shown for Function 42 contains a "long" alarm, followed by a "short" alarm, by using Function 42 at different locations in a program to give a recognizable characteristic to the audible alarm.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N-1 | 0-3 | (XY) | 41 |
| N | | (Character) | 44 |

DESCRIPTION:

Function 44 compares the next character received with the character specified. If they match, the test will jump to the address (X,Y) specified by the preceding Function 41 and may be anywhere in the Program Cell.

For a *nonmatch*, the next step will be the step immediately following Function 44.

NOTE

In Sync mode, the receiver will not recognize any characters until after the receiver is in SYNC. If four (4) SYN characters are used, the 44 will test the #3 SYN character when set for two SYN characters.

APPLICATIONS:

Testing a response to determine ACK or NAK is a primary use for Function 44. When a transmission from DTM-2 is NAK'd, the jump should repeat the same transmission.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N-1 | 0-3 | (XY) | 41 |
| N | | (Character) | 45 |

| | | | |
|-----|-----|-------------|----|
| N-1 | 0-3 | (XY) | 41 |
| N | | (Character) | 45 |

DESCRIPTION:

Function 45 compares the next character received with a specified character. If they match, the next step (N + 1) immediately following Function 45 is executed. If they do *not* match, the test will immediately jump to the address defined (XY) by the preceding Function 41.

NOTE

In Sync mode, Function 45 will *not* operate until after the receiver is in SYNC, since the receiver will not recognize any characters until then. If four (4) SYN characters are used, the 45 will test the #3 SYN character when set for two SYN characters.

APPLICATIONS:

1. Testing a response to determine ACK or NAK is a primary use for Function 45. When a transmission from DTM-2 is not ACK's, the jump should repeat the same transmission.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N-1 | 0-3 | (XY) | 41 |
| N | | (Character) | 46 |

DESCRIPTION:

Function 46 immediately compares the *last* received character (still on the receiver parallel data bus) with the Function 46 character.

For a match the test will continue at the address (XY) specified by the preceding Function 41.

A *nonmatch*, will continue the test at the Step N + 1 immediately following Function 46.

Function 46 can be repeated many times to retest one received character for many possibilities.

APPLICATIONS:

- For any given protocol, there is an "anticipated" response that can be detected by using Function 44 or 45. When the anticipated character is not received, then use Function 46 to test for other *potential* characters. The jump permits taking the correct action corresponding to the determination of what character was received.

- Receive "filter" will direct the test to take appropriate action:

17 WAIT \neq SYNC
 41 PRESET
 46 RETEST AND JUMP = EOT \rightarrow REPEAT POLL
 41 PRESET
 46 RETEST AND JUMP = ENG \rightarrow REPLY WITH EOT OR MESSAGE
 41 PRESET
 46 RETEST AND JUMP = ACK \rightarrow REPEAT POLL
 41 PRESET
 46 RETEST AND JUMP = NAK \rightarrow REPEAT MESSAGE
 36 LOG CURRENT CHARACTER

NOTE

Since this function is similar to the Library Functions, the same limitations apply. That is,

9600 Bps — 138 characters
 64 KBPS — 37 characters
 250 KBPS — 8 characters

LOAD-ENTER:

STEP PAGE DATA FUNCTION

| | | | |
|------|-----|------|----|
| N-1* | 0-3 | (XY) | 47 |
|------|-----|------|----|

*Function 47 also includes jumps which must be preceded by Function 41, Preset Jump.

GENERAL DESCRIPTION:

Function 47 contains two types of flags:

- 8 "settable" and resettable and testable flags
- 8 testable "fixed internal/signal flags"

Function 47 provides the operator with the capability to automatically modify or update a test, depending on the results in previous steps.

DESCRIPTION OF "SETTABLE FLAGS:"

The X Hex digit is used to select Flag 0 through Flag 7 using digits 0-7. All FLAGS are reset/cleared to "0" by the START switch.

Once selected, the Flag is set or tested as determined by the "Y" Hex digit:

- | | |
|---|--------------------------------|
| 0 | Set Flag to 0 (Clear or Reset) |
| 1 | Set Flag to 1 |
| 2 | Jump if = 0 |
| 3 | Jump if = 1 |

APPLICATION OF "SETTABLE FLAGS:"

1. The operator can update the settable flags in response to specified results as the test progresses. These flags can also be tested by using the JUMP test to make appropriate decisions within the test program.
2. Flags can be used to construct a SOFTWARE COUNTER (e.g., to extend the capability of the Loop Counter).
3. Flags can be used to keep track of ACK1, ACK0 and out of sequence responses.
4. An extended test program may be executed automatically by preceding each subtest with a jump on Flag = 1. Since the START switch sets all flags to "0", the program will run continuously through all steps. If the first step in the program is edited to set a flag to "1", jumps will cause HALTS at each appropriate point in the program to allow manual verification and intervention.

DESCRIPTION OF "FIXED INTERNAL SIGNAL FLAGS:"

The X Hex digit selects one of the eight fixed assigned signals:

- 8 MEMORY OVERFLOW (Results Memory) See Note 2
- 9 Parity Error
- A OVFL Counter (on front panel)
- B END Counter (on front panel)
- C Timeout Function 84
- D Out of Sync
- E Frame Det (SDLC – ADCCP)
- F BCC Error (SDLC – ADCCP)

The Y Hex digit selects the desired action:

- 2 Jump if = 0 (False)
- 3 Jump if = 1 (True)

The Signal name when true equals a "1." For example, a Parity Error is a "1" when there is a parity error. Data 93 will Jump for a Parity Error and pass to the next step for No Error.

NOTES

1. The Internal Signal Flags are generated within the DTM-2 in response to the operating parameters selected.
2. After JUMP ON MEMORY OVERFLOW – WHEN THE MEMORY HAS OVERFLOWED, FUNCTION 49 may be used to ensure that the results memory is properly initialized.

APPLICATIONS:

Refer to SDLC Receive for use of E and F above.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N | 0-3 | 00-3F | 48 |

DESCRIPTION:

The results memory contains 16 pages of 64 steps each, for a total of 1024 positions. To find a result more easily, the operator may wish to specify the results memory location he wishes the results to be recorded in. Function 48 is used to address the step desired within a preselected (existing) page. Function 49 addresses the page. These two functions precede the test step yielding the data to be recorded into the results memory or transmitted from the results memory. Function 48 *must* be preceded by Function 49.

The step is a binary number, 00 to 63 (Hex 00-3F). Refer to Appendix D.

NOTE

The results memory is a sequentially recording memory. When one page is filled, the first step of the next page is used, and so forth. Note also that new data writes over old data in the results memory.

APPLICATIONS:

1. Assigning specific locations in the results memory into which specific data can be written (recorded) by category.
2. When a certain category of data is in a specific location in memory already, the results memory can be addressed to extract the specific data, e.g., for transmission using Functions 52, 53 and 54.

3.9.10 JUMP AND TEST GROUP SELECT RESULTS MEMORY PAGE AND STEP 00, FUNCTION 49

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|---------|----------|
| N | 0-3 | (00-0F) | 49 |

DESCRIPTION:

The Results Memory contains 16 pages of 64 steps (or 1024 total locations) to assist in writing specifically into certain locations, the results memory may be addressed by PAGE using Function 49.

Note that the Selected Page automatically begins at Step 00.

The Page is selected by using the Y Hex digit with a Value of 0-F for Page 0-15.

Function 49 resets the MEM OVFL condition.

APPLICATIONS:

1. Refer to Function 48.
2. When recording an erroneous Block (i.e., with a BCC Error or a NAK response), the recording preceded by Function 49 Page 00 so that all blocks start recording at the beginning of memory. Therefore, good blocks will continually overwrite the preceding data.

When a BCC Error is detected (or a NAK), the logging process stops, leaving the last message in Results Memory which is the one containing the Error.

3.10 SEND DATA GROUP

The Send DATA Group includes the following functions:

| | |
|----|---|
| 50 | Send Character |
| 51 | Send a Progression |
| 52 | Send Results Memory-Single Character |
| 53 | Send Results Memory, including Trap Character |
| 54 | Send Results Memory Until Trap Character |

Associated transmit functions include:

| | |
|-------|---------------------|
| 59 | Send BCC |
| 60-67 | Send Messages (FOX) |

The Send Group provides a mechanism for sending:

- Any specific character(s) (Function 50)
- An automatically incrementing character (Function 51)
- Contents of the Results Memory, e.g., usually previously recorded on-line data (Functions 52, 53 and 54)

The step containing the character to be sent will complete at the 0% or leading transition of the first bit of the designated character. This permits a series of other functions to be performed *while the character is being transmitted* and then the next character is directed to be sent.

SYNC:

- If DTM-2 is sending FILL characters (Function 57), the character to be sent will follow after the end of the current fill character.
- If the DTM-2 is sending IDLE Mark or Space, Function 55, and at each START, the character will be initiated by the next clock at the RS-232(V.24) interface.
- After sending the "specified" character, DTM-2 will revert to either IDLE MARK, IDLE SPACE or FILL Characters.

When Parity is selected in the Data Format Zone or by Function 56, the correct or specified Parity is calculated and transmitted in lieu of the Parity entered on the bit switches as data or obtained from results memory or the messages, i.e., the selection of Parity overrides the parity convention in the source of the data.

Selection of the DATA FORMAT is important and affects the operation of the SEND functions. Data Format includes:

SYNC – ASYNC – STOP BITS
 INFO BITS
 PARITY

3.10 SEND DATA GROUP (Cont'd)

For example, where a message is selected that contains 8 info bits and 5 INFO BITS are selected, the LOWER ORDER 5 BITS will be transmitted and the higher 3 bits ignored. Conversely, if 8 INFO BITS are selected and a 5-bit message is selected, the high bits will be transmitted as contained in the message ROM.

NOTES

1. ASYNC mode is NOT TO BE USED ABOVE 9.6 KBS.
2. During the transmission of Functions 50, 51, 52, 53, 54 and 60 through 67, the decimal points on the DATA display will indicate TRANSMIT DATA.
3. Each character transmitted will produce a pulse at the CHAR SYNC TX test point on the DTM-2 front panel. See Table 2.2.
4. Use Function 15, Wait to Complete XMT Character, after the the last character of a sequence to establish the exact end of the character. This allows the character to be completely clear of the DTM-2 interface before, for example, turning off the RTS lead or starting a time function.

3.10.1 SEND DATA GROUP**SEND CHARACTER, FUNCTION 50****LOAD-ENTER:**

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 50 |

DESCRIPTION:

This function causes the character entered on the Bit Switches as Data to be transmitted.

In ASYNC the start and stop bits are automatically appended.

NOTE

The data is transmitted serially with Bit 1 first.

APPLICATIONS:

1. Control characters such as SOH, STX, EOT, etc., can be sent using Function 50.
2. Message and Address characters use Function 50.
3. In SYNC mode, the SYN characters are sent by using Function 50 or 57.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (XY) | 51 |

DESCRIPTION:

Function 51 sends a character pattern that increments by one, up to 16, as the program recycles or loops.

The character to be transmitted obtains the 4 lower order bits 1, 2, 3 and 4 (Hex "Y" digit) from the internal Loop counter L (Hex 0-F).

The higher order bits 5, 6, 7 and 8 (Hex "X" digit) are entered with the bit switches. For most codes, order bits select the alpha or numeric fields, thereby enabling a 16-character numeric sequence from 0, 1, 2 . . . 9; <= >? or alpha sequence @ ABCDEFGHIJKLMNO.

The program must contain a Loop using Functions 41, 42 and 43 in order to generate the incrementing action.

Function 42 may preset the loop counter to any value from 1 through 99; however, Function 51 will simply recycle at a maximum count of 16 due to the limitation of having access to only 4 bits.

APPLICATIONS:

1. Multidrop CPU ports can poll several terminals. Using Function 51 allows the program in DTM-2 to easily address up to 16 terminals in a Poll.
2. For EBCDIC, the Alpha Character poll sequence is limited to eleven (local terminal address plus ten remote terminals). BISYNC protocol specifies address sequence of 40, C1, C2 and C3. "0" specific 40 should be sent, using Function 50. The loop count function is then continued using Function 51 to send C1, C2, etc.
3. Function 51 cannot be preset to start with the 7-digit at other than "0."

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (00) | 52 |

DESCRIPTION:

Function 52 will send the contents of the active results memory (RM) location at that step in the program. Normally Functions 48 and 49 will be used in prior steps to preselect a specific location in Results Memory for transmission.

After Function 52 sends the Results Memory character, the Results Memory address will be advanced one step automatically, thereby permitting a series of Function 52 to send characters one by one from a sequence of consecutive locations in Results Memory without intervening use of Functions 48 and 49.

NOTE

Code translate and Hex translate (Function 68) will operate in conjunction with Function 52.

APPLICATIONS:

1. An undertermined address character or message number can be recorded at a specific location in results memory and accessed by Functions 48 and 49, then transmitted with a DTM-2 response.
2. Data previously recorded into the Results Memory can be transmitted through the serial RS-232 interface, or displayed on INTERVIEW.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 53 |

DESCRIPTION:

Function 53 permits sending a block of up to 1024 characters from the Results Memory. Transmission begins at the current Results Memory location, at the time the test reaches the step containing Function 53, or as preselected by Functions 48 and 49.

Transmission from Results Memory continues until a data character in the Results Memory matches the character specified with Function 53. The match or trap character will also be sent.

After the trap character is sent, the Results Memory address will be automatically advanced one step.

APPLICATIONS:

1. Function 53 can be used to retransmit a previously recorded message.
2. The "trap" character that ends the message is usually EOT, ETX, or ETB. The BCC may then be sent either from Results Memory as received using Function 52 or as calculated by DTM-2 using Function 59 or as an erroneous BCC using either Function 50 or Function 58 (invert-even odd preselection).
3. Function 53 is useful for retransmitting, as a Block Echo, messages of unknown length (up to 1024 characters).

3.10.5

SEND DATA GROUP

SEND RM UNTIL TRAP FUNCTION, FUNCTION 54

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N | 0-3 | 00-99 | 54 |

DESCRIPTION:

Function 54 permits sending any number of characters, e.g., a block from the Results Memory. Transmission begins at the current Results Memory location at the time the test reaches Function 54, or as preselected by Functions 48 and 49.

Transmission from Results Memory continues until the function in the Results Memory step matches the function in the Data associated with the Function 54.

The data in results memory associated with the Trap Function will *not* be sent.

After the transmission ceases (the last character sent is the step prior to the step in Results Memory containing the Trap Function), the Results Memory address step is automatically advanced to the next step after the step containing the Trap Function.

The Trap Function is entered in BCD as DATA.

APPLICATIONS:

1. Function 54 can be used to retransmit a previously logged message.
2. The message need not contain an ending control character by using the technique of RECORD LATCH and wait for RLSD to drop Function 73 (DETECT OFF) and then record Function 07. Transmission would use Function 54 to transmit from results memory until Function 07 is detected. (The Function(s) recorded into Results Memory during Record Latch is *undefined*.)

3.11 SEND MODES GROUP

| | |
|----|---|
| 55 | Mode: ECHO/MARK/SPACE [CRC] |
| 56 | PARITY BIT MODE [MULTIPLE MESSAGE ENABLE] |
| 57 | LOAD FILL CHARACTER |

Other Functions associated with the Send Mode are:

- 15 Wait End of XMT Character
- 35 Record Latch Mode
- 58 Start BCC
- 96 SDLC Mode Selection
- 97 Interrupts

DESCRIPTION:

The Send Modes Group functions are used in lieu of the front panel data format switches, and take priority over these switches. These functions are useful in setting up stored tests in advance for an operator unfamiliar with the data format of the line being tested. They also provide a means for changing data format during a test at precise points in the test.

A subset of Function 55 permits controlled suspension of the CRC calculation on transmit and on receive.

A subset of Function 56 permits consecutive messages to be used within one message function.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | XY | 55 |

DESCRIPTION:

Function 55 "DATA Y" preconditions the Serial transmitter to the selected MODE. The DATA entered instructs the DTM-2 to operate in one of the four modes shown:

DATA Y

- X0 NORMAL – Cancels any preceding Function 55 and returns the transmitter to NORMAL.
- X1 IDLE MARK – Immediately forces the output of DTM-2 of MARK.
- X2 IDLE SPACE – Immediately forces the output of DTM-2 to SPACE.
- X4 ECHO MODE – Latches the internal receive parallel data path to the internal transmit parallel data path. Each character thereafter received will be retransmitted "Echo'd" with a one-character delay. The data will appear as the normal Receive data and may be analyzed with any of the appropriate functions while the ECHO MODE is operative. In SYNC mode, the receiver will not pass the first two (2) SYNC characters to the transmitter.

APPLICATIONS:

1. IDLE MARK-IDLE SPACE can be used with selected time periods to generate pauses used in some protocols for control purposes. The "Break" key on a teleprinter is an example. The pause introduced by DTM-2 can accurately test the system time detection logic.
2. ECHO can be used for loopback type test while maintaining the ability to perform diagnostics such as BCC error at the Remote(DTM-2) end of the circuit.

NOTE

Function 55, DATA 01, 02, 03 cancels Function 57 (Fill).

| |
|---|
| The following additions have been added for serial number series "F" and above. |
|---|

DESCRIPTION:

Function 55 "DATA X" permits special control of the CRC calculator for transparent text and other similar applications.

DATA X

- 0Y Continue CRC calculation (beginning with previous character) Enables automatic SYNC stripping from CRC calculation on receive data.
- 1Y Suspend CRC calculation (beginning with previous character).
- 2Y Disable automatic SYNC stripping on receive data.
- 3Y Suspend CRC calculation. Disable automatic Sync stripping on receive data.

NOTES:

1. 1Y applies to both transmit and receive modes. This allows transmitting or receiving characters which are contained within a data block that are excluded from the CRC calculation. Examples are buried SYNC characters and transparent text in BISYNC. This Sub Function 1Y is only applicable to CRC and does not apply to LRC suspension.
2. Disable Receive Sync Delete Circuit. Normally, the DTM-II will "strip" buried sync characters out of the receive BCC Calculation. For Transparent Bisync, however, it is necessary to disable this circuit (e.g., for a data byte = HEX 32). This Sub Function 2Y only applicable to CRC and does not apply to LRC stripping.

EXAMPLE 1

TRANSMIT

Transmit A Block Of Data With Buried Syncs.

| <u>STEP</u> | <u>DATA</u> | <u>FUNCTION</u> | | |
|-------------|-------------|-----------------|-------|----------------|
| 00 | 32 | 50 | SEND | SYNC |
| 01 | 32 | 50 | SEND | SYNC |
| 02 | 32 | 50 | SEND | SYNC |
| 03 | 02 | 50 | SEND | STX |
| 04 | 00 | 58 | START | CRC |
| 05 | C1 | 50 | SEND | A |
| 06 | C2 | 50 | SEND | B |
| 07 | C3 | 50 | SEND | C |
| 08 | 32* | 50 | SENT | SYNC |
| 09 | 10 | 55 | STOP | CRC CALCULATOR |

3.11.1 SEND MODES GROUP

MODE: ECHO/MARK/SPACE, FUNCTION 55 (Cont'd)

| STEP | DATA | FUNCTION | | |
|------|------|----------|---------|----------------|
| 10 | 32* | 50 | SEND | SYNC |
| 11 | C4 | 50 | SEND | D |
| 12 | 00 | 55 | RESTART | CRC CALCULATOR |
| 13 | C5 | 50 | SEND | E |
| 14 | C6 | 50 | SEND | F |
| 15 | 03 | 50 | SEND | ETX |
| 16 | 00 | 59 | SEND | CRC |

*SYNC characters *not* included in CRC.

EXAMPLE 2

RECEIVE

Below is a simplified Program Chart of a method of 1) Deleting the control characters within a Transparent Bisync Block, 2) Deleting TRANSPARENT SYNC sequences and the DLE characters which precede Control Characters from the CRC Calculation. The example begins after it has been determined that the block is a Transparent Text Block and The CRC Calculation has begun, (e.g., by detecting DLE STX sequence).

NOTE

RECEIVE TRANSPARENT (FOR CRC) calculation may also be implemented using the Interrupt on DLE character and assignment of the Function 90 (Sync) to either SYNC or DLE.

DESCRIPTION: DATA X

MULTIPLE MESSAGE ENABLE (associated with FUNCTION 60-67). Normally, the stored messages start at the beginning of the message each time they are called by the program. Using this Function and a special message prom, a group of short messages can be "nested" within one message function. Each time the message function is called, the next short message will be sent. When this function is used, care must be taken *not* to use the other message functions 60-67 and disturb the message counter except to call the next message in sequence from the same.

DATA X

- 0Y Restores Normal Operation. So next FUNCTION 60-67 will start at character *one*.
- 1Y Inhibits Normal Message Counter Reset when selecting FUNCTION 60-67.

NOTE

The first character transmitted in each message "sub-lock" will be all mark (FF HEX).

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | XY | 56 |

DESCRIPTION: DATA Y

The parity convention for the transmitter is controlled by using Function 56, which supersedes the Front Panel DATA FORMAT switch selections. The following modes are selected by the DATA entered:

DATA Y

- 00 NORMAL – Cancel prior Function 56 instructions and allows control to revert to the Front Panel.
- 01 INVERT PARITY BIT – If the parity is selected on the front panel, the parity will be inverted, e.g., if EVEN is selected, Function 56 Data 01 will cause ODD parity to be transmitted.
- 02 PARITY BIT MARK – The front panel parity selection is ignored and the parity bit is held MARK.
- 03 PARITY BIT SPACE – The front panel parity selection is ignored and the parity bit is held SPACE.

NOTE

The parity bit is the highest order bit and is sent at the end of the sequential pulse string comprising a character.

APPLICATIONS

1. Certain protocol treat the parity convention of control characters differently from data or test characters.
2. Inverting the parity bit permits injecting a single error or a group of parity errors for control purposes.
3. Simulation of certain teleprinters requires holding the parity bit Mark.

The following additions have been added for serial number series "F" and above.

DESCRIPTION: DATA X

MULTIPLE MESSAGE ENABLE (associated with FUNCTION 60-67). Normally, the stored messages start at the beginning of the message each time they are called by the program. Using this Function and a special message prom, a group of short messages can be "nested" within one message function. Each time the message function is called, the next short message will be sent. When this function is used, care must be taken *not* to use the other message functions 60-67 and disturb the message counter except to call the next message in sequence from the same.

DATA X

- 0Y Restores Normal Operation. So next FUNCTION 60-67 will start at character *one*.
- 1Y Inhibits Normal Message Counter Reset when selecting FUNCTION 60-67.

NOTE

The first character transmitted in each measure "sub-block" will be all mark (FF HEX).

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 57 |

DESCRIPTION:

Function 57 is applicable only in the SYNC mode of operation. In the SYNC mode, the transmitter output must be defined as IDLE MARK,* IDLE SPACE or an idle pattern called the FILL CHARACTER.

Function 57 loads this fill character into the transmitter. If a character is not designated to be sent using Functions 50, 51, 52, 53, 54, 59 and 60 through 67, the output will automatically send the Fill Character until the next character is designated, or until Function 55 is used to send IDLE MARK or SPACE.

Function 57 is cancelled by Function 55, Data 01, 02, 04.

*Operation of the START Switch places the transmitter output IDLE MARK.

NOTE

The parity specified by either the front panel or Function 56 takes priority. Thus, if odd parity were selected, a fill character FF which is eight bits, all mark, would be transmitted with bit eight as a space. If idle mark is desired, use Function 55.

APPLICATIONS:

1. Send idle SYN characters with Function 57.
2. In SDLC, use Function 57 to send the Flag or 7E Sync character.
3. Function 57 *must* be used ahead of Functions 15 and 59 in order to operate properly.
4. A fill character will always follow CRC.

3.12 SEND BCC GROUP

| | |
|----|-----------|
| 58 | Start BCC |
| 59 | Send BCC |

BCC (Block Check Character) is a generic term that includes LRC (Longitudinal Redundancy Character) and CRC (Cyclic Redundancy Character).

LRC is a single character and is usually associated with ASYNCHRONOUS systems and some ASCII code Synchronous systems.

CRC is a double character and is usually associated with SYNCHRONOUS systems particularly those using EBCDIC code.

Functions 58 and 59 calculate and transmit either the correct BCC or force an invalid BCC.

All transmitted characters are included in the BCC calculation; therefore, SYNC characters should not be inserted in a transmitted message as they will be deleted from the received LRC-CRC calculation.

Refer to Functions 38 and 39 in the RECEIVE BCC GROUP.

NOTE

The INTERSHAKE II will not generate CRC while in the ASYNC mode of operation.

| |
|---|
| The following additions have been added for serial number series "F" and above. |
|---|

LRC

LRC is calculated on the INFO BITS selected. LRC is *not* calculated on the *parity* bit. BI-SYNC and most other systems use the convention where the LRC character contains a parity bit of the same sense as the parity used in the data.

NOTE

There are special cases where the data uses Parity, and the LRC character calculates LRC for the parity bit. In this case, the LRC character does not have to conform to the parity convention, and may generate a parity error. The INTERSHAKE may be used for LRC calculation in such a system by selecting the PARITY: None, and including the Parity Bit in the INFO BITS setting. Since LRC may generate a parity error, the counting of Parity Errors is of little value in such a system.

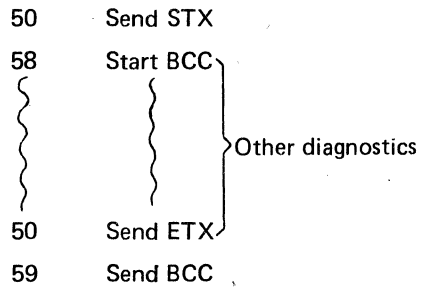
3.12 SEND BCC GROUP (Cont'd)

TYPICAL PROGRAM APPLICATION

To generate BCC the program must first start the BCC calculation after the STX (or other appropriate Leader character) and send the BCC after the ETX (or other appropriate ending character).

EXAMPLE

Function



LOAD-ENTER:

STEP PAGE DATA FUNCTION

| | | | |
|---|-----|------|----|
| N | 0-3 | (XY) | 58 |
|---|-----|------|----|

DESCRIPTION:

Data (X) selects even/odd LRC or normal/invert CRC and entry of data (Y) selects LRC or one of several CRC polynomials.

Function 58, start BCC, places the BCC calculator logic on the transmit data path, initializes the calculator, and selects the proper mathematical calculation model. Selection of the proper DATA entry is used to select the proper type of BCC calculation.

DATA "X"

- 0 Normal calculation of CRC and EVEN LRC
- 1 Inverts data for CRC calculation and ODD LRC

DATA "Y"

- 0 EBCDIC/CRC-16 $[X^{16} + X^{15} + X^2 + 1]$
- 1 CRC-16 Reverse $[X^{16} + X^{14} + X + 1]$
- 2 IBM Special $[X^{16} + X^{15} + X^{13} + X^7 + X^4 + X^2 + X + 1]$
- 3 CRC-12 $[X^{12} + X^{11} + X^3 + X^2 + X + 1]$
- 6 CCITT/SDLC-CRC $[X^{16} + X^{12} + X^5 + 1]$
- 7 CCITT CRC Reverse $[X^{16} + X^{11} + X^4 + 1]$
- 8 LRC (6, 7, 8 level)

Function 58 requires 3 μ sec to complete and will not be observed on the Display.

APPLICATIONS:

1. Start BCC Function 58 must always be used just before the first character to be included in the calculation, e.g., normally *after* STX.
2. Inverting CRC provides a useful way to generate a known error CRC to verify that the CRC checker in the receiver device under test is properly working. In most systems, a NAK will be received for an incorrect CRC or LRC.
3. Some terminals reject the Block if there is a BCC error; however, some terminals will display the message anyhow and light an ERROR light.
4. SDLC sends *inverted* CRC. Data 16 is used.

59 BCC

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 59 |

DESCRIPTION:

Function 59 will send *one* character for LRC and *two* characters for CRC, as predetermined by Function 58.

CRC:

Function 59 must be the next step after the last character to be included in the calculation, e.g., normally follows EOT, ETX, ETB.

When sending a CRC, some prior step *must select a Fill Character* (Function 57). The Fill Character selected will be sent *immediately* following the second CRC character.

Function 59 step will complete at the trailing edge of the last bit of the BCC.

If Idle Mark is to follow the BCC either use (FF) as Fill Character or, use Function 55 next after Function 59. Note that Fill Characters Function 57 must always be used at any step prior to Function 59 for CRC to be sent. One Fill Character will be automatically sent after CRC.

LRC:

Function 59 Step will complete at the first bit of the LRC character (same timing as Function 50). Function 15 is not required for LRC timing.

APPLICATIONS:

1. Generation of the correct BCC for any transmission.
2. Generate BCC for a batch of data being sent from results memory.
3. Generate a BCC error to validate the receiving device's BCC calculation.

3.13 SEND MESSAGE GROUP

The messages and associated functions are:

| Function | Description | Message | No. of Characters | | Applications |
|----------|-------------|---------|-------------------|-------|--|
| | | | Total | Print | |
| 60 | Send ASCII | Fox | 74 | 72 | TTY Model 33, 35, 37 |
| 61 | " ASCII | Msg | 82 | 80 | IBM 2260 CRT |
| 62 | " ASCII | " | 124 | 122 | IBM 2260 Printer & TTY Wide Platen #38 |
| 63 | " EBCDIC | " | 82 | 80 | IBM 3270 CRT |
| 64 | " EBCDIC | " | 124 | 122 | IBM 3270 Printer |
| 65 | " EBCD | " | 127 | 122 | IBM 2740 Printer |
| 66 | " SELECTRIC | " | 127 | 122 | 2741 Printer |
| 67 | " BAUDOT | Fox | 77 | 72 | EARLIER TTY MODELS |

BCD, Field Data and Reverse Codes are available on Special Order.

The contents of the messages are shown in the Appendix H.

Fixed messages may be transmitted one or more times with a single command. Eight fixed messages are stored in read-only memory. These messages may be altered by special factory order.

A few applications of the fixed messages are:

1. Fill a line on a printer or CRT.
2. Duplicate the block length encountered in the system under test.
3. Generate many character fonts (bit combinations) to validate the printer/CRT display generator.
4. Highlight an erroneous character by visual identification of a known, readable text.

Message may contain up to 127 characters and be repeated up to 99 times by a single step instruction. Loops and repeated steps can be used to build virtually *any* controlled block length from a few characters to over 300×10^6 characters. (127 characters per step \times 251 steps \times 99 loops = 312,426,477 characters.)

NOTE

Using a CRC 16, the maximum block length should not exceed 8000 characters (8 bits each). For CRC 12, the maximum block length should not exceed 680 characters (6 bits).

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|---------|----------|
| N | 0-3 | (00-99) | 6X |

DESCRIPTION:

Functions 60 through 67 select a specific message containing up to 127 characters. The message may be repeated up to 99 times without the use of the loop functions. The message may be part of a larger sequence of steps that may all be contained in a loop.

The appropriate function selected will be displayed while the message is being transmitted. The step completes as the last character is beginning to be transmitted. (Refer to SEND CHARACTER GROUP for timing.)

APPLICATIONS:

1. Generate a full line of text for display terminals.
2. Simulate the specific system block length so the BCC error rate achieved under test conditions matches that experienced with the system.
3. Allows the operator to recognize that the message is a test message and not normal traffic.

NOTES

1. The DATA display decimal points will be ON while Function 6X is sending.
2. Data transmitted will be displayed by INTERVIEW.
3. If Functions 60-67 is interrupted, a FUN 98 (01) return to interrupt step will RESTART the message. It will not continue from the interrupted character.

3.14 CODE TRANSLATE

| |
|------------------------|
| 68 Code Translate Mode |
|------------------------|

Code Translate permits transmitting the contents of the results memory in a different code. For example, the contents of results memory can be translated from ASCII to Hex. A single 8-bit byte or character in the results memory is transmitted as three characters (two HEX + one Space), as shown below:

| | | |
|-------------|-------|------------------------------|
| Character | | A |
| BITS | | 0100•0001 |
| HEX | | 4•1 |
| Transmitted | | 4•1•SPACE (ASCII characters) |

NOTE

Function 68 operates *only* with and precedes either Functions 52 or 53.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (XY) | 68 |

DESCRIPTION:

Function 68 permits transmitting the contents of the Results Memory in different codes. The X and Y digits select the code translate criteria.

(X) Digit

- 0 This digit disables Function 68 so that no translation occurs. The Y digit is ignored. Listing below is invalid for Y digit.
- 1 HEX ASCII – Translates contents of the Results Memory to HEX ASCII. The Y digit in this instance must be "0."
- 2 CODE – Enables the Y digit to select the translation desired.
- 3 HEX ASCII *AND* CODE – Permits the HEX ASCII to be further converted via the Y digit selection for HEX in EBCDIC (Y = 2), EBCD (Y = 5), SELECTRIC (Y = 7).

(Y) Digit

- 0 Translate EBCDIC to ASCII
- 2 Translate ASCII to EBCDIC
- 4 Translate EBCD to ASCII
- 5 Translate ASCII to EBCD
- 6 Translate SELECTRIC to ASCII
- 7 Translate ASCII to SELECTRIC

Note the EBCD and selectric contain *SHIFT* characters. The Conversion process will translate the SHIFT characters into ASCII. When converting from ASCII to the shift codes, the ASCII *MUST* contain the appropriate extra shift characters, otherwise the shifts will *NOT* occur.

REFER TO the Appendix I for the exact translation tables.

APPLICATIONS:

1. A transmission (from a terminal) including all control characters may be logged into results memory and later retransmitted in HEX. This message from results memory could contain the proper header and other protocol. The results memory data would be displayed on the terminal as HEX, *including* all the control characters CRC, etc. Refer to Functions 52 and 53.
2. Collection of data into results for one code can be retransmitted to another code-oriented terminal/system.

OM 842A

3.15 RS-232(V.24) CONTROLS AND DECISION GROUP

| | |
|-----|-------------------------|
| 70 | Turn ON Leads |
| 71 | Turn OFF Leads |
| 72 | Detect Lead ON |
| 73 | Detect Lead OFF |
| 74 | Interrupt If Lead = ON |
| 75 | Interrupt If Lead = OFF |
| 76 | Cancel Interrupt 74, 75 |
| *77 | Jump If Lead ON |
| *78 | Jump If Lead OFF |

*Functions 77 and 78 must be immediately preceded by Function 41.

The RS-232(V.24) interface plays an extremely important part in all data communication systems. Not only is the sequence of operation of the leads important, but the timing relationship is critical, especially in half duplex systems. The 7X group permits complete access to these leads for control diagnostic purposes.

In order to facilitate the programming operation, six of the bits in Data Character have been assigned to a specific RS-232(V.24) lead. These are:

| | | | | | | | | |
|------------------|------|------|------|------|------|------|-------------|---|
| DATA (BITS) | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| | RTS | CTS | DSR | RLSD | DTR | RI | — | — |
| STAND-ALONE CODE | (80) | (40) | (20) | (10) | (08) | (04) | (See Below) | |

Bit 2:

For Functions **70** and **71**, Bit 2, controls the front panel test point output CONTROL OUT (7X). This can then be patched to any RS-232(V.24) interface circuit test point.

For Functions **72** through **78**, the DTM-2 will detect the input to DETECT IN (7X). Thus, it is possible to patch from any RS-232(V.24) lead into DETECT IN (7X) and sense the status of that lead. CONTROL OUT (7X) and DETECT (7X) are also available at the AUX I/O connector as TTL-level signals.

Bit 1:

For Functions **70** and **71**, Bit 1, is assigned to control an audible alarm. The frequency of the alarm is 2 kHz ± 0.01% (square wave). The alarm uses the DTM-2 speaker and is sounded at a preset fixed volume. The speaker may also be used at the same time to listen to data. To utilize the alarm, no patching is required.

For Functions **72** through **78**, Bit 1 causes the DTM-2 to sense a TTL input on Pin 83 of the AUXILIARY CONNECTOR. A logic "0" is equal to ON. This may be used to sense the status of auxiliary devices, such as the INTERVIEW CRT option 18 (Screen Full is used as an Interrupt signal).

NOTE

Refer to Fig 1-9 for a simplified schematic of the RS-232 INTERFACE SIGNAL FLOW.

3.15.1 RS-232(V.24) CONTROLS AND DECISION GROUP **TURN ON LEADS, FUNCTION 70**
TURN OFF LEADS, FUNCTION 71

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|----------------|----------|
| N | 0-3 | (One or More)* | 70/71 |

*Refer to Paragraph 3.15 for the bit assignments.

DESCRIPTION:

Function 70 permits the program to turn ON one or more of the RS-232(V.24) leads. Function 71 permits the program to turn OFF one or more leads.

The RS-232(V.24) leads can be controlled *ONLY* under the following conditions:

1. ON-LINE MONITOR MODE: The CONTROL EIA toggle switch in the TEST ZONE must be ON.
2. OFF-LINE TEST MODE: Only the output leads can be controlled unless the CONTROL EIA toggle switch in the TEST ZONE is ON.
3. In addition to the above, the respective toggle switches in the CONTROL EIA ZONE must be in the OFF (7X) position for Functions 70 and 71 to operate.

Operation of the instruction is completed in 3μsec.

The START Switch initializes all outputs to OFF (for toggles in the OFF (7X) position).

APPLICATIONS:

1. Exercising modem control leads, e.g., RTS when the DTM-2 simulates a terminal or CPU port.
2. Providing an audible alarm upon an error/or complete condition in a test.
3. Operating the test point operation will turn on or control an external device such as a chart recorder or oscilloscope, requiring a ±12-Volt signal. TTL signals are available through the Auxiliary I/O Connector, using Function 94.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-----------------|----------|
| N | 0-3 | (First of Any)* | 72/73 |

*Refer to Paragraph 3.15 for other bit assignments.

DESCRIPTION:

The step containing Functions 72 or 73 will test one or more specified RS-232(V.24) leads. The program will stop at Function 72 or 73 and wait until any one of the leads specified is detected. The step will then complete. If the lead is already in the proper condition, the step will complete in 3 μ sec.

The leads are specified by the bit switches as described in Paragraph 3.15.

Bit 2 is connected to the DETECT IN (7X) on the panel. ON responds to (+) positive voltage.

Bit 1 is connected to an input (TTL) on Pin 83 of the Aux interface connector.

APPLICATIONS:

1. Timing criteria can either start or terminate in response to a control lead, e.g., RTS-CTS delay.
2. Data timing is also related to control leads such as measuring the time from the end of the last character to RTS OFF (to ensure sufficient PAD time for the Modem to stabilize).

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|------------|
| N | 0-3 | (ONE LEAD)* | 74, 75, 76 |

*Bit 2 and Bit 1 are treated as described in Functions 72 and 73.
Refer to Paragraph 3.15 for bit assignments.

DESCRIPTION:

Functions 74 and 75 allow any one of the RS-232(V.24) leads specified to be constantly monitored for an illegal condition. When the condition is detected, an INTERRUPT will occur that causes the program to enter into a specific diagnostic sequence. Only one lead should be tested for Functions 74 and 75. These Functions remain active during the entire test unless cancelled.

Function 76 cancels INTERRUPT Functions 74 and 75.

See INTERRUPTS, FUNCTION 97.

APPLICATIONS:

1. Detection of Carrier Dropouts.
2. Tracking "hits" of short duration on any control lead $> 10 \mu\text{sec}$.

NOTES

1. When the selected lead turns ON (Function 74), the next Function executed will be at STEP 59 of the last page.
2. When the selected lead turns off (Function 75), the next Function executed will be at STEP 60 of the last page.

3.15.4 RS-232(V.24) CONTROLS AND DECISION GROUP

**JUMP IF LEAD = ON, FUNCTION 77
JUMP IF LEAD = OFF, FUNCTION 78**

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N-1 | 0-3 | (XY) | 41 |
| N | 0-3 | (ONE LEAD)* | 77, 78 |

*See Paragraph 3.15 for bit assignments.

DESCRIPTION:

Functions 77 and 78 test the state of any one of RS-232(V.24) leads specified by the operator. Function 77 will cause the test to jump to a step designated by the preceding Function 41 if the lead is ON. Function 78 causes the test to jump if the lead is OFF. Only one lead should be tested for each Function 77 or Function 78. If the test condition is not met, the test advances to the next step.

Note that provision is made to test a lead for either ON or OFF. This provides greater versatility in program test development.

The step executes in 3 μ sec.

Refer to the general section on JUMP & TEST GROUP 4X (Paragraph 3.9).

APPLICATIONS:

1. Decisions in the test program can be used to select the most appropriate next test sequence.
2. By combining Function 77 or Function 78 with a time delay measurement, a test may be set up to either jump if the lead is in the correct position within the specified time or continue recording the elapsed time if it is not.
3. A program may contain two tests, and during operations, will select either test depending upon the status of a control switch. For example, when the RI control is patched to the DETECT Test Point.

3.16 TIMER GROUP

| | | |
|----|---|--------------------|
| 80 | Generate Time Delay | 01-99 Milliseconds |
| 81 | Generate Time Delay | 0.01-0.99 Second |
| 82 | Generate Time Delay | 0.1-9.9 Seconds |
| 83 | Generate Bit Period Delay | 0.1-99 Bit Periods |
| 84 | Enter Time Out for Interrupt or Jump (Function 47-C3) | |

Each of the Timer Functions causes the program sequence to Halt for the specified duration of time. The Function number will be displayed for the duration specified.

Accuracy of the time delays is $\pm 0.01\% \pm 3 \mu\text{sec}$.

The Bit Period delay is clocked from the same signal that appears at the RS-232(V.24) interface generated by the transmitter.

The time delays are valuable to generate preset time thresholds by using the Jumps without the counter.

Function 88 permits using the time to generate preset thresholds.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N | | 00-99 | 80/81/82 |

DESCRIPTION:

Define the time delay using the bit switches in a two-digit BCD format. The program will wait the specified delay before proceeding to the next step. The three functions provide a range of time from 1 msec to 9.9 seconds, as shown below:

| | |
|----|--------------------|
| 80 | 01-99 Milliseconds |
| 81 | 0.01-0.99 Second |
| 82 | 0.1-9.9 Seconds |

The specified time interval is selected by the operator, keeping in mind the location of the decimal for each of the three functions. For example, a BCD 20 would provide a time delay as shown below:

| | |
|----|-----------------|
| 80 | 20 Milliseconds |
| 81 | 0.2 Second |
| 82 | 2.0 Seconds |

APPLICATIONS:

1. The most common use of the time delay function is when simulating the modem turn-around time. After detecting RTS ON from the terminal the delay times out followed by CTS being returned to the terminal. When this type delay is introduced toward the CPU, a performance measurement can be made easily to determine the CPU error detection and error recovery software routine, when a delayed or no answer occurs from the modem interface.
2. Many time delays occur in any protocol and their introduction into a simulation vastly improves the authenticity of the test results achieved. A common delay often overlooked is the time after the last transmit character until the RTS is turned OFF.
3. Time delay can be used for the audible ON-Time for alarm "beeps."
4. Polling frequency can be adjusted by using an IDLE Delay time between polls.

LOAD-ENTER:

STEP PAGE DATA FUNCTION

| | | | |
|---|-----|-------|----|
| N | 0-3 | 00-99 | 83 |
|---|-----|-------|----|

DESCRIPTION:

At higher data rates, timing is more correctly related to data bit periods rather than absolute units of time. Function 83 is provided to generate bit delays based on transmit clock for counts up to 99 bits of delay. The bit is counted at the 50% or *midpoint* of the bit (when the clock pulse on synchronous circuits would sample the Bit). Function 83 may be used for "OFF LINE" tests "TERM" or "MODEM;" Function 83 is inoperative for "ON-LINE" test modes "TD/RD," "TD" and "RD."

APPLICATION:

In most BI-SYNC systems the multidrop poll is terminated by an EOT character followed by "several" (3-6) mark bits followed by the next SYN character for addressing the first terminal on the network. This idle PAD is *NOT* a full (FF) 8-bit mark period and causes problems to some non-IBM terminals and Software. DTM-2 can therefore simulate the variable bit delay between EOT and the next poll.

NOTE

Operation of Function 83 requires transmit clock from DTM-2 (Int Timing) or from modem or term in EXT. Test "TERM" requires clock on Pin 24; test modem requires clock on Pin 15.

Send data group completes the step at the first bit of the last character; therefore, if bit delays are being added following a send character, the first bits of the delay will occur while the character is being transmitted, i.e. for 8 info bit character 7 bit delay will not appear as delay between characters.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N | 0-3 | 01-99 | 84 |

DESCRIPTION:

Function 84 starts a timer for a selected duration of 0.1 to 9.9 seconds as selected by the data.

The timer continues to run even when the DTM-2 is proceeding through other test program functions.

Function 84 completes in 3 μ sec.

Function 97 data OC must be used with Function 84 to cause an Interrupt to the program, when the specified time has elapsed. Function 47, Data C2 or C3 may be used to test the timer for elapsed time and set the appropriate flag.

APPLICATION:

1. For a polling and response test, where the polling continues for a specified time (even if *NO* response is received) use Function 84 to preset the time criteria.
2. Bi-Sync protocols often time-out after 3 seconds when a polled terminal fails to respond.
3. Function 84 must be executed as the step prior to Function 97 to ensure proper initialization of the timer.

3.17 COUNTER GROUP

| | |
|-----|--|
| 85 | Advance Base Count |
| 86 | Measure RTS-CTS Delay |
| 87 | Counter Control for reset, duration, or Events |
| *88 | Jump if Counter is greater than data |
| 89 | Record: Counter |

*Function 88 must be preceded immediately by Function 41.

Additional Functions utilizing the counter are:

| | |
|----|----------------------------------|
| 47 | Data (A.Y) Jump on Overflow |
| 47 | Data (B.Y) Jump on End |
| 97 | Data (O A) Interrupt on Overflow |
| 97 | Data (O B) Interrupt on End |

The front panel of the DTM-2 contains a versatile counter that can be controlled by the test program using Functions 85 through 89.

In using these functions, the panel switches in the Counter Zone *must* be manually positioned to select the proper operational criteria.

Note that Function 87 data (00) or (01) will cause the counter to reset regardless of the position of the counter selector switch.

Program access to the counter is restricted to the two HIGH ORDER DIGITS for Jump comparison and Recording. Numbers 1 and 8 are the high-order digits for a reading of 182.

The Loop Functions 42, 43 can be used to multiply or divide the counter reading. The Counter will continue to Count after the OVFL light comes on. This permits higher resolution measurements by "throwing away the high order digits."

Precision of the Counter time base for duration and frequency is $\pm 0.01\%$ (typically $\pm 0.001\%$).

The Counter is reset by the START Switch as well as Function 87 and the counter reset switch.

It is wise to avoid using the counter in more than one mode in a single test until the operator is familiar with its characteristics. There is only one display; however, the Counter can be recorded into Results Memory to provide up to 1,024 stored counts.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 86 |

DESCRIPTION:

Function 86 is a single function that automatically measures the time between RTS ON and CTS ON.

Function 86 is to be used in the MONITOR mode. TD/RD only, since the function monitors both RTS and CTS.

The front panel Counter Switches must be positioned to DURATION RTS-CTS (8X) and the appropriate time period range selected. Range of the counter may be selected from a maximum resolution of 10 μ sec to a maximum count of 999 seconds.

NOTES

1. CTS must be OFF when RTS turns ON to start the measurement.
2. The same measurement may also be achieved using this longer sequence:

| | |
|----|---------------|
| 72 | Detect ON RTS |
| 87 | Start Timer |
| 72 | Detect ON CTS |
| 87 | Stop Timer |

APPLICATION:

Precise measurement of RTS-CTS delay with a single function.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|----------------|----------|
| N | 0-3 | 00, 01, 02, 03 | 87 |

DESCRIPTION:

Function 87 controls the Counter for measurement duration and event counts. Selection of the measurement is accomplished by placing the counter Zone panel switch in the DURATION (8X) position or event count position and using the DATA bits to select the appropriate action, either RESET, STOP or ADVANCE.

DATA 00 RESET – Resets the Counter to zero, for any mode selected. This is useful when the counter is panel selected to measure any other signal such as Frequency, BCC in 10X Error rate when an END or OVFL signal from the counter occurs.

DATA 01 – RESET TO 0 AND START (Timer Duration Measurement) – Resets counter and starts the accumulation of time duration at a rate selected by the Counter Zone Switch in milliseconds, seconds, etc.

DATA 02 – STOP TIMER – Stops the duration measurement initiated by data 01. The Counter reading will be maintained until it is reset.

DATA 03 – ADVANCE COUNTER BY ONE EVENT – Each occurrence of the Function will add one count when the Counter Zone Switch is in the EVENTS (8X) or EVENTS X 10^X positions.

NOTE

The reset operation clamps the counter circuit for 10 μ sec thereby limiting its resolution to 10 μ sec.

APPLICATIONS:

1. Reset is useful to reinitialize the count for each error rate test.
2. Duration is useful for determining actual delay times on operational circuits.
3. Event Counts can be used to display the number of loops through which the test has progressed.
4. Event Count is useful to count the number of characters received or transmitted by manually setting the counter dial to the COUNTER TEST POINT – EVENTS COUNT position and manually patching the TX or TX Sync test points to the COUNTER + IN test point.
5. Duration is useful to determine actual service time or Queue to each terminal.

3.17.3 COUNTER GROUP JUMP IF COUNTER IS GREATER THAN DATA, FUNCTION 88

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------|----------|
| N-1 | 0-3 | XY | 41 |
| N | | 00-99 | 88 |

DESCRIPTION:

Function 88 permits comparison of a selected two-digit data number with the TWO HIGH ORDER DIGITS of the counter. Function 88 tests the counter and if the counter digits are numerically greater than the data digits, the program will jump and continue at the step preset by the preceding Function 41. Function 88 is totally independent of the type of measurement being performed. It may be Time, Events, or Errors being counted.

NOTES:

1. Function 88 must be immediately preceded by Function 41.
2. The Low-Order digit of the counter is disregarded (not recorded).
3. Where desired, Function 47 can be used to test either the OVFL or END indicators.

APPLICATIONS:

1. Thresholds for RTS-CTS delay that can cause excessive delays may be detected and recorded into results memory.
2. Thresholds can be set for excessive block or character error rates and the actual number encountered, recorded into results memory.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 89 |

PLAY:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| Z | 0-F | XY | 89 |

DESCRIPTION:

Function 89 will cause the two HIGH ORDER DIGITS (first two digits), on the counter to be recorded into results memory.

APPLICATIONS:

1. Acquisition of on-line performance characteristics such as actual block error rate. By using Function 88 to test for a preset criteria, only the excessive Error rate is recorded.
2. Counter obtained data may be stored in results memory as an on-line source of system performance, which may then be transmitted from the results memory to a central site for reduction purposes.

3.18 AUTO PANEL GROUP

| | |
|----|--|
| 90 | ENTER SYN CHAR |
| 91 | A(SYNC), INFO BITS, PARITY |
| 92 | BIT RATE |
| 93 | TEST MODE, EIA/MIL, EXT CLOCK, CONTROL EIA |

Other Functions which relate to the operation of the Front Panel Controls are:

- 00 HALT
- 07 Record Bit Switch
- 35 Record Latch Mode (Mon Sigs Out)
- 56 Parity Bit Mode
- 7X All 70 Series Functions

The Auto Panel Functions permit the test Program to control the DTM-2. The capability of automatically programming the controls eliminates setup errors and permits simplified operation by untrained operators.

Controls are restored to manual operation by operating the START Switch or when the RUN LED is OFF.

Once Functions 90, 91, 92 and 93 are used in a test, control may not be restored to the panel switches during the program.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N | 0-3 | (Character) | 90 |

DESCRIPTION:

Function 90 will permit the program to enter the SYN character.

Function 90 may be used repeatedly to change the SYN character in the program.

Once Function 90 is used in a test program, control is taken away from the Enter SYN BITS Panel Switch until the test is terminated and the DTM-2 is returned to the LOAD mode.

NOTE

The character entered by Function 90 is *deleted* by the BCC calculation performed by Function 38. The character to be deleted from the BCC calculation may be changed in the program.

APPLICATIONS:

1. Stored tests that are to be used as reference standards for operational system checks can reduce opportunities for operator error by using Function 90 to enter the SYN bits.
2. A Stored test can be programmed to automatically search for the correct SYN character by using Function 90 to Enter several potential codes. When the correct SYN code permits the DTM-2 to get into SYNC, the output message can clearly inform the operator.

NOTE

Function 90 must be used with Interview in FDX. When using Interview in FDX (only in FDX), PRIOR to DTM-2 SN C Series. Refer to Interview manual for loading SYN Character.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-----------|----------|
| N | 0-3 | (Code 91) | 91 |

DESCRIPTION:

Function 91 permits the program to control/override *three* of the Data Format panel switches: ASYNC-SYNC, INFO BITS, PARITY.

When *ANY* switch is to be controlled, *All Switches associated with Function 91 must be controlled in the same step.* Function 91 cannot be used to selectively control only one of the 3 switches.

| | | CODE 91 | | | | | | | | |
|----------------|---|---------|---|---|---|---|---|---|---|---|
| | | X | | | | | Y | | | |
| | | 8 | 7 | 6 | 5 | • | 4 | 3 | 2 | 1 |
| ASYNC: 1 STOP | | 0 | 0 | Z | Z | • | Z | Z | 0 | 0 |
| ASYNC: 2 STOP | | 1 | 0 | Z | Z | • | Z | Z | 0 | 0 |
| SYNC | | 0 | 1 | Z | Z | • | Z | Z | 0 | 0 |
| INFO BITS | 5 | Z | Z | 0 | 0 | • | Z | Z | 0 | 0 |
| | 6 | Z | Z | 1 | 0 | • | Z | Z | 0 | 0 |
| | 7 | Z | Z | 0 | 1 | • | Z | Z | 0 | 0 |
| | 8 | Z | Z | 1 | 1 | • | Z | Z | 0 | 0 |
| PARITY NONE | | Z | Z | Z | Z | • | 1 | 0 | 0 | 0 |
| PARITY ODD | | Z | Z | Z | Z | • | 0 | 0 | 0 | 0 |
| PARITY EVEN | | Z | Z | Z | Z | • | 0 | 1 | 0 | 0 |
| 1 RECEIVE SYNC | | Z | Z | Z | Z | • | Z | Z | 0 | 1 |

NOTES

1. Z indicates a selection *must* be made to complete the instruction of the DTM-2.
2. ASYNC 2 STOP selects 1.5 stop bits for 5 info Bit code only.
3. Bit 1 provides program selection of 1 or 2 receive Sync Characters. Data 0 for Bit 1 result in 2 sync characters for receive. If the Internal Switch selects 2 SYN, the FUN 91 will select 1 SYN. If the Internal Switch selects 1 SYN, FUN 91 is ignored (for SYN control). This subfunction (Bit 1) applies only to Serial "F" and later.

APPLICATIONS:

1. EBCDIC, SYNC use HEX 78 to select SYNC, INFO 8, PARITY NONE, 2 SYNC characters.

| | | | | | | | | |
|-----|---|---|---|---|-----|---|---|---|
| 8 | 7 | 6 | 5 | • | 4 | 3 | 2 | 1 |
| 0 | 1 | 1 | 1 | • | 1 | 0 | 0 | 0 |
| (7) | | | | | (8) | | | |

2. ASYNC, ASCII, ODD PARITY use HEX (10) to select ASYNC: 1 STOP, INFO 7, PARITY ODD.

| | | | | | | | | |
|-----|---|---|---|---|-----|---|---|---|
| 8 | 7 | 6 | 5 | • | 4 | 3 | 2 | 1 |
| 0 | 0 | 0 | 1 | • | 0 | 0 | 0 | 0 |
| (1) | | | | | (0) | | | |

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-----------|----------|
| N | 0-3 | (Code 92) | 92 |

DESCRIPTION:

Function 92 controls/overrides the Bit Rate Switch in the Data Format Zone of the panel.

Multiple speed changes can be used within the same program.

CODE 92

| | (Hex) |
|------------|-------|
| INT OSC | 00 |
| 50 Baud | 10 |
| 75 Baud | 20 |
| 110 Baud | 30 |
| 134.5 Baud | 40 |
| 150 Baud | 50 |
| 300 Baud | 60 |
| 600 Baud | 70 |
| 900 Baud | 80 |
| 1.2 KBaud | 90 |
| 1.8 KBaud | A0 |
| 2.4 KBaud | B0 |
| 3.6 KBaud | C0 |
| 4.8 KBaud | D0 |
| 7.2 KBaud | E0 |
| 9.6 KBaud | F0 |

The Baud clocks are not reset when a new Function 92 is activated.

NOTE

For INT OSC operation, Refer to Table 2-9.

APPLICATIONS:

1. Preprogramming the baud for testing a specific terminal or system.
2. AUTO BAUD operation of the newer modems and terminals can be treated. One example is to generate Synchronous signals at 2400 bps for several characters and then shift the speed to 9600 bps.

NOTE

EXT Clock selection (either by front panel controls or by use of Function 93) overrides Bit Rate selection by Function 92.

3.18.4 AUTO PANEL GROUP TEST MODE, EIA/MIL, EXT CLOCK, CONTROL EIA, FUNCTION 93

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-----------|----------|
| N | 0-3 | (Code 93) | 93 |

DESCRIPTION:

Function 93 permits the program to control or override four of the Data Format panel switches as follows:

- TEST Selector Switch – Permits selection of TD/RD, TD or RD, TERM, or MODEM.
- BIT RATE Selector Switch – Permits selection of INT or EXT Clock.
- CONTROL EIA/OFF Toggle Switch – Permits selection of either position.
- EIA/MIL Toggle Switch – Permits selection of either position.

NOTES

1. When EXT CLK is selected, Function 92 is disregarded.
2. When *any* function is to be controlled, *all* switches associated with Function 93 must be controlled. Function 93 *cannot* be used to control only one of the four above functions. All eight bits associated with the function must be set to control all four parameters as follows:

| | CODE 93 | | | | | | | | |
|----------------|---------|---|---|---|---|-----|---|---|---|
| | (X) | | | | | (Y) | | | |
| POSITION | 8 | 7 | 6 | 5 | | 4 | 3 | 2 | 1 |
| TD/RD | 0 | 1 | 1 | 1 | • | 1 | Z | Z | Z |
| TD | 1 | 0 | 1 | 1 | • | 1 | Z | Z | Z |
| RD | 1 | 1 | 0 | 1 | • | 1 | Z | Z | Z |
| TERM | 1 | 1 | 1 | 1 | • | 1 | Z | Z | Z |
| MODEM | 1 | 1 | 1 | 1 | • | 0 | Z | Z | Z |
| INT BIT RATE | Z | Z | Z | Z | • | Z | 1 | Z | Z |
| EXTERNAL CLOCK | Z | Z | Z | Z | • | Z | 0 | Z | Z |
| OFF (NORMAL) | Z | Z | Z | Z | • | Z | Z | 1 | Z |
| CONTROL EIA | Z | Z | Z | Z | • | Z | Z | 0 | Z |
| EIA | Z | Z | Z | Z | • | Z | Z | Z | 1 |
| MIL | Z | Z | Z | Z | • | Z | Z | Z | 0 |

3.18.4 AUTO PANEL GROUP

TEST MODE, EIA/MIL,
EXT CLOCK, CONTROL EIA, FUNCTION 93 (Cont'd)

Note that *ALL* 8 bits *MUST* be selected to retain the Correct Modes for ALL FOUR panel switches.

"Z" in the Code above indicates a "1" or "0" as required for the other switches.

Examples:

1. Program is to TEST MODEM, EXTERNAL CLOCK, OFF control EiA, EIA.

| (X) | | | | | (Y) | | | |
|-----|---|---|---|---|-----|---|---|---|
| 8 | 7 | 6 | 5 | • | 4 | 3 | 2 | 1 |
| 1 | 1 | 1 | 1 | • | 0 | 0 | 1 | 1 |

Hex Code = F3

3.19 PERIPHERAL CONTROLLER GROUP

94 Peripheral Controller

Function 94 is used to control peripheral equipment by controlling outputs or detecting inputs at the auxiliary interface. Details of how this is accomplished are described in Paragraph 3.19.1.

The following table summarizes the Function 94 DATA selectors available; and the diagram below illustrates this function pictorially.

OUTPUTS: SET TO "1" OR "0"

| <u>X</u> | <u>Y</u> |
|---|--|
| 0-7 assignable by the user, depending on the peripheral equipment | 0 output set to "0" 1 output set to "1" |

INPUTS: JUMP = "1" OR "0"

| <u>X</u> | <u>Y</u> |
|----------------------------|--|
| 0-7 assignable by the user | 2 jump if input = "0" 3 jump if input = "1" |

OUTPUTS: SELECTED

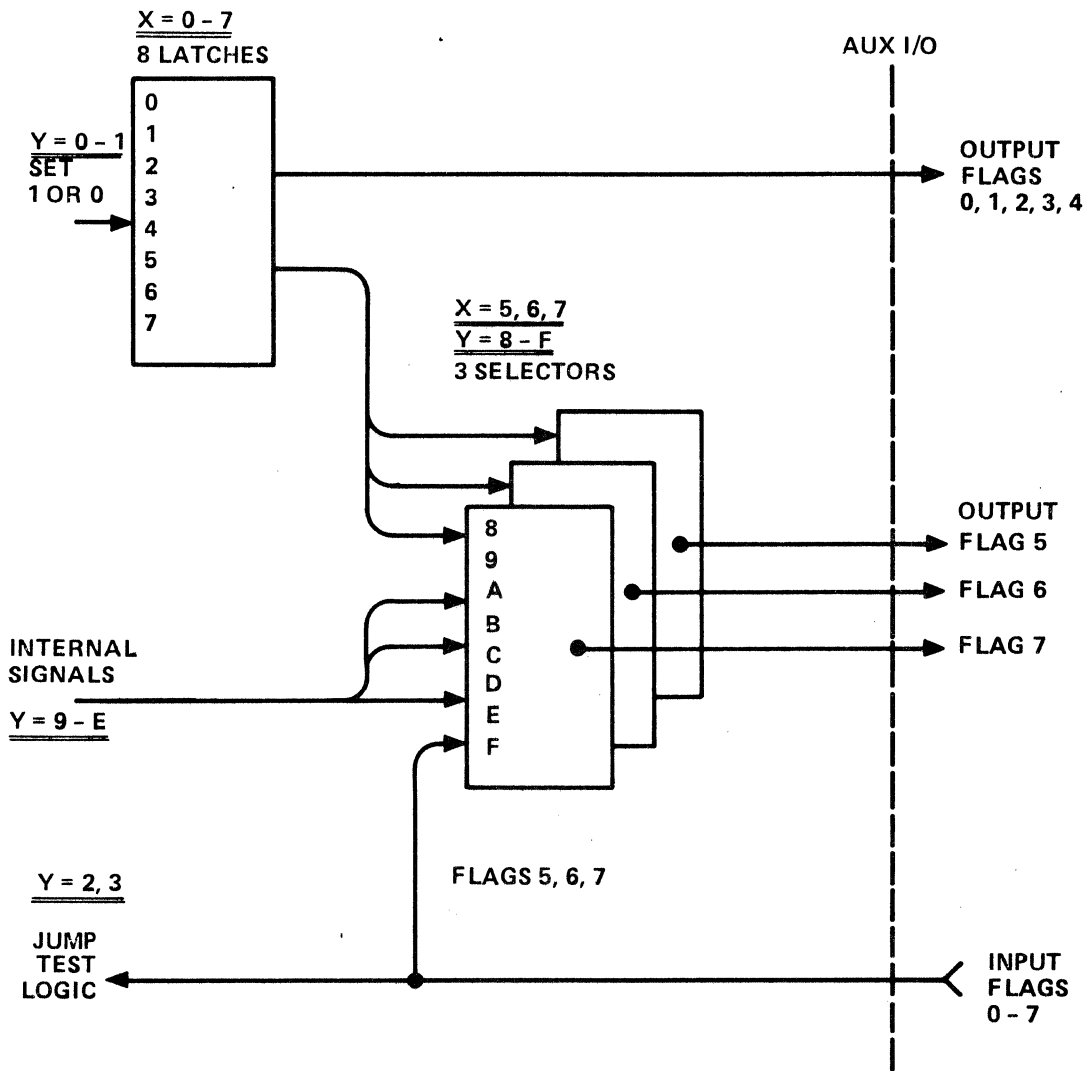
| <u>X</u> | <u>Y</u> |
|-----------------|--|
| 5, 6, or 7 only | 8 thru (Set to "0" or "1") |
| 5, 6, or 7 only | 9 RD Status |
| 5, 6, or 7 only | A RLSD Status |
| 5 and 6 only | B Detect Test Point Status (Flags 5 and 6) |
| 7 only | B Detect Test Point Off Latched (Flag 7) |
| 5, 6 and 7 only | C Detect Parity Error |
| 5, 6 and 7 only | D Time delay - 1 ms, 10 ms, 100 ms |
| 5 only | E Pulse 900 ns (Flag 5) |
| 6 and 7 only | E Unassigned |
| 5, 6 and 7 only | F Input 5, 6, 7 |

3.19 PERIPHERAL CONTROLLER GROUP (Cont'd)

Other Functions associated with peripheral devices are:

- 70/71 Turn ON/OFF Bit 1 Alarm
- 70/71 Turn ON/OFF Bit 2 Control Test Point*
- 72-78 Detect ON/OFF Bit 1
- 72-78 Detect ON/OFF Bit 2 Detect Test Point*

*These signals also appear as TTL logic signals at the AUX interface. Refer to AUX I/D Manual, SI 842.



LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (XY) | 94 |

DESCRIPTION:

Function 94 is the single function in the peripheral controller group. It is used to control output signals to the auxiliary interface (AUX CONNECTOR), and to detect input signals from peripheral equipment.

Function 94 services a 16-wire interface at the Auxiliary Connector. There are eight leads at the Auxiliary Interface assigned as outputs, and eight assigned as inputs.

The electrical characteristics of the signal interface are TTL-compatible. Each output signal is provided by a 74LS Driver; input signals drive one 74LS load, except that input leads designated by Flags 5, 6, and 7 present two 74LS loads.

Outputs

The eight *output* leads are designated by Flags 0 through 7. For a Data XY, the X-digit is set to select one of these flags. The Y-digit is set OFF ("0") or ON ("1").

NOTE

Operation of the START pushbutton initializes ALL OUTPUTS to 0.

Inputs

When the Y-digit is set to 2 or 3, the program detects one of the eight *input* leads which has been designated 0-7 by the X-digit. These are eight *different* leads. The program will jump if there is a logic 0 signal on the lead for Y = 2. For Y = 3, the program will jump if there is a Logic signal on the lead.

Assigned Outputs

For three of the eight output flags X = 5, X = 6, or X = 7, the Y setting of 8 through F will assign one of several internal DTM signals to the respective output lead. The internal signal will then be "hard-wired" to the peripheral device, and will require no further program control. This eliminates the need for the program to continue turning the leads ON and OFF in response to rather commonly-used criteria.

APPLICATIONS:

Data 59 can be used to reverse image on a CRT Display (X = 5 is reverse image) when the Receive data lead in ON, or "1." (Y = 9 is RD Status.)

3.19.1 PERIPHERAL CONTROLLER GROUP PERIPHERAL CONTROLLER, FUNCTION 94 (Cont'd)

Y = 8 "THRU"

This assignment restores that assignable output to the SET 1, SET 0 mode. When a flag is "set", e.g. 51, the selector assignment is cancelled. Y = 8 is not required to be used in the program because where the flag is set to "1" or "0," the assignment is cancelled automatically.

Y = 9 "RD STATUS"

When data is received on the RD lead of the RS-232(V.24) interface, the output is a "1."

This can be used as a CRT display enhancement to reverse all images produced by the data on the RD lead. USE *ONLY* in TD/RD mode.

Y = A "RLSD"

This assignment causes the output lead to generate a "1" which is coincident with the RLSD lead turning OFF. This can be used to control the CRT to produce Reverse Image or Low Intensity in response to the condition of the RLSD lead. In this manner, it is easy to distinguish between displayed Transmit and Receive signals.

Y = B "DETECT TEST POINT" (Flags 5 and 6)

When a +12-volt signal is detected at the Test Point, the output is a "1."

This can be used to assign the CRT Reverse to Test Point control. With the Test Point patched to the RLSD lead, Receive data will be displayed by the CRT in REVERSE (Black on White).

Y = B "DETECT POINT OFF LATCHED" (Flag 7 Only)

When a transient OFF (+ To-CHANGE) is sensed by the Detect Test Point *during* a character, the output signal remains "1" until the complete character is clocked into the external device.

Using Function 94, Data 7A, with the DET Test Point patched to the RLSD lead, a CRT display (INTERVIEW) can be caused to blink any character with a carrier drop-out.

Y = C "PARITY ERROR"

This assignment causes the output lead to generate a "1", coincident with a character containing a parity error. The PARITY switch *must* be set to EVEN or ODD, as required. This assignment can be used to generate a CRT Display enhancement, such as a Reverse Image, Blink, or Low Intensity for displaying a character with a parity error.

Y = D "1 mSec, 10 mSec, 100 mSec"

This assignment causes the respective output lead to generate timing signals with periods of 1, 10 or 100 mSec. For example, the output will be "1" for 5 mSec and OFF for 5 mSec when the period is set to 10 mSec.

This can be used to provide a clock or general timing signal to an external time base, tape drive, or audible alarm.

3.19.1 PERIPHERAL CONTROLLER GROUP PERIPHERAL CONTROLLER, FUNCTION 94 (Cont'd)

Y = E "PULSE 900 ns" (Flag 5 Only)

When Function 94, Data 5E is executed, a single 900-nSec positive pulse is generated on the assigned lead. This is useful since many external or peripheral devices require a pulse for start, initialize, restart, etc.

The program step produces the pulse with just one step, whereas separate ON-OFF steps would require two steps to produce a 3 μ sec μ .

Y = E UNASSIGNED (Flag 6, 7)

Two signals may be custom assigned for special purposes.

Y = F INPUTS 5, 6, and 7

These outputs are connected to the respective assigned inputs. This function permits looping a signal from an external device back to itself in such a way as to permit the INTERSHAKE to monitor the signal using Data Y = 2 or Y = 3.

3.20 RECEIVE SYNC GROUP

95 SYNC SEARCH

DESCRIPTION:

Function 95 may be used in either (or both) of two ways, for AUTO SYNC or SYNC SEARCH.

With AUTO SYNC enabled, the INTERSHAKE II receiver will continually search received data for a sixteen-bit synchronization pattern for 2 SYN (or 8 bit Pattern for 1 Syn Mode). When the pattern is detected, the receiver automatically assumes synchronization with the received data.

Auto Sync is enabled by setting "X" data character. It is disabled by setting the "X" character to "0" (all zero).

SYNC SEARCH causes the INTERSHAKE II to lose synchronization automatically, and initiate a search for a synchronization pattern when either of two specified conditions are met:

1. A change in direction of data, from TD to RD or vice versa. (Only when in TD/RD mode.)
2. Detection of a selected number of pad characters, either all marks or all spaces.

For Y = 0 data, the Receiver will lose synchronization when data changes direction, and eight consecutive idle mark or idle space (PAD) characters.

*For Y = 1 through 7, the Receiver will lose synchronization when the data signal changes direction or when a selected number of pad characters are received.

NOTES

1. Function 95 is operative only in the SYNC Mode.
2. When operating in the SDLC or ADCCP Mode, Function 95 AUTO SYNC *must* be used.
3. The START switch initializes the INTERSHAKE II to the Data 00 condition (Auto-Sync OFF, Sync Search on TD/RD change of *signal direction*, or 8 idle mark pad characters).
4. It is generally good practice *not* to use AUTO SYNC when the internal switch is used to select only one Sync character since the probability of receiving an "accidental" SYN character in the data stream is quite high.
5. When using AUTO SYNC with the INTERVIEW CRT Display, and there is a short PAD (less than eight bits) between the end of one message and the SYN characters of the following message, two garbled characters *may* be displayed. These characters are the two SYN characters skewed by the short PAD bits before the receiver is resynchronized.

3.20 RECEIVE SYNC GROUP (Cont'd)

APPLICATIONS:

1. Efficient use of a CRT display or Results Memory for only data of interest. The receiver is quiet when it is out of synchronization, and will not output characters to a CRT or Results Memory. By using one PAD character to unsynchronize the receiver, the number of extra PAD characters is eliminated from the CRT or Results Memory.
2. For protocols using less than a full eight-bit pad character for idle time, the INTERSHAKE will automatically resynchronize upon receipt of a SYN character. For example, a poll may contain SYN SYN EOT (5 bits idle) SYN SYN ADDRESS . . . With Function 95, synchronization would occur automatically when the second set of SYN characters are received thus *eliminating* the need to search the memory *manually slipping* a bit at a time to recover the data.

NOTE

For SERIES F and later the digits Y = 1 to Y = 7 have been modified to permit *inhibiting* the out sync on Pads altogether.

Function 95 with Bit 1 = Mark will now disable the idle pad character deleter from causing the receiver to go out of SYNC.

FUNCTION 95

X0 = Sync Search After 8 Pad/Null Characters

*X1 = Idle Sync Search Disabled

X2 = Sync Search After 2 Pad/Null Characters

X4 = Sync Search After 4 Pad/Null Characters

X6 = Sync Search After 6 Pad/Null Characters

*Changed definition.

X3, X5, X7 are deleted.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (XY) | 95 |

DESCRIPTION:

Function 95 Data 10 is normal: out of SYNC with COS or 8 PAD (FF or 00) characters, however, function will also cause the DTM to go out of SYNC whenever the step is executed. This may be useful where it is desired to cause DTM to go out of SYNC and stop displaying CRT data until a new SYNC condition occurs. Any data combination with Function 95 causes DTM to go out of SYNC.

It is generally a good practice *not* to use AUTO SYNC when the internal switch selects ONE SYN character.

When using AUTO SYNC with the CRT and there is a short PAD (less than 8 bits) between the end of one message and the SYN characters of the next message, two garbage characters *may* be displayed. These characters are the two SYN characters skewed by the short PAD bits before the receiver is resync'd.

Y = SYNC SEARCH

Y = 0 conditions the DTM-2 receiver to go out of SYNC when data changes signal (COS) direction from TD to RD or RD to TD, or when 8 consecutive Idle Mark or Idle Space characters (PADS) are received.

Y = 1 through 7 conditions the DTM-2 receiver to go out of SYNC for COS or the selected number of PADS (1 through 7).

APPLICATION:

Efficient use of the CRT display or Results Memory for only the data of interest; e.g., the receiver is "QUIET" when it is out of Sync and will not output characters to a CRT or to Results Memory. By using one PAD to send the receiver OUT OF SYNC, the number of extra baggage PAD characters is eliminated from the CRT or Results Memory.

NOTE

DTM will go out of SYNC any time 8 or more consecutive 00 or FF characters are detected. There are cases where this is intolerable, for instance if NUL (00) is used as a filler character in a message, count of eight 00 or FF can be disabled by removing A74LS191 IC on the top wire wrap board at location "B D 30." "B D 30" is the second D left to right, down to number 30. When this IC is removed, "out of SYNC" will be initiated whenever change of state (COS) or Function 95 is executed.

3.21 SDLC – RECEIVE DELAY GROUP

| | |
|----|-----------------------------|
| 96 | SDLC RECEIVE INPUT DELAY |
|----|-----------------------------|

Function 96 is more easily considered as TWO independent functions as determined by the X and Y data.

SDLC operation requires special consideration and Function 96 *must* be used to preselect the correct SDLC mode.

NOTE

That the compatible protocol of ADCCP is sufficiently similar as to be controlled by DTM-2 in the same manner.

RECEIVE INPUT DELAY extends the flexibility of the DTM-2 to delay a received signal a predetermined amount (number of bits) until the DTM-2 is capable of thoroughly analyzing the received data. Maximum delay length is 512 characters (8 bit), or 4,096 bits.

3.21.1 SDLC GROUP SDLC/ADCCP, FUNCTION 96

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (X) | 96 |

DESCRIPTION FUNCTION 96 DATA (X):

SDLC modes condition the transmit data stream by inserting (stuffing) "0" bits where required to prevent more than five (5) consecutive 1 bits.

The Received data stream is also processed to delete (destuff) the "extra" 0 bits prior to its presentation to the DTM-2 receiver circuit.

Provision is made to inhibit the transmitter "0 insert" circuit to permit sending the frame character Hex 7E which must contain 6 consecutive 1 bits.

Function 47 data E2 or E3 is used to test the receiver frame detect circuit before the "0" is destuffed.

- DATA X = 0 SDLC Modes OFF
- DATA X = 1 SDLC Mode ON
- DATA X = 5 SDLC Mode ON (inhibit "0" insert)
- DATA X = 3 SDLC/NRZI ON
- DATA X = 7 SDLC/NRZI ON (inhibit "0" insert)

The NRZI circuit is enabled with data X = 3 and 7 for cases where the SDLC signal is sent over a communication channel without the clock and an alternating pattern is used to provide sufficient transitions to enable clock to be derived from the data. Some Systems refer to this as ASYNC SDLC.

APPLICATION:

See Application Note on SDLC in Appendix E.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (Y) | 96 |

DESCRIPTION:

Function 96 (data Y) inserts a shift register delay between the RS-232(V.24) interface receive data and the receive processing for logic in the DTM-2.

A duplicate delay is also inserted between the DETECT test point and the processing logic in the DTM-2.

In SYNC mode this delay has 6 selectable taps:

| | |
|------------|------------|
| Data Y = 0 | Zero delay |
| Data Y = 1 | 64 bits |
| Data Y = 2 | 128 bits |
| Data Y = 3 | 1024 bits |
| Data Y = 4 | 2048 bits |
| Data Y = 5 | 3072 bits |
| Data Y = 6 | 4096 bits |

In the ASYNC mode the delay is clocked at 16 times the bit rate to provide the following 6 selectable taps:

| | |
|------------|------------|
| Data Y = 0 | Zero delay |
| Data Y = 1 | 4 bits |
| Data Y = 2 | 8 bits |
| Data Y = 3 | 64 bits |
| Data Y = 4 | 128 bits |
| Data Y = 5 | 192 bits |
| Data Y = 6 | 256 bits |

Sampling at 16 times per bit will accurately reproduce a nonclocked ASYNC signal into the receiver.

NOTES

1. In ASYNC that the delay bits include Start, Stop, and IDLE Mark periods.
2. In Loop-Back or Self-Monitor applications, the delay must be inserted prior to *transmitting*.

APPLICATIONS:

1. CRC loopback Block error rate tests where the delay selected is longer than the block transmitted (maximum length 512 characters SYNC). This type test can operate with HDX or FDX modems. Using the same size blocks and the same CRC polynomial as the system will yield an Error rate measurement that duplicates exactly the system operation.
2. Five different analyses of the *same* receive data (e.g., less than 128 characters) can be obtained by starting at 0 delay, testing, then selecting the 1024 delay tap and performing another type analysis, then selecting the 2048 delay tap and performing a third type analysis followed by the 3072 tap then the 4096 tap last.
3. Since the Detect Test Point is also delayed, its status can also be analyzed accurately to within the time of the associated data bit.

3.23 INTERRUPTS GROUP

97 Interrupts

Other Interrupt related Functions:

- 09 Record Interrupt Step
- 19 Enter Interrupt Character
- 74 Interrupt RS-232(V.24) ON
- 75 Interrupt RS-232(V.24) OFF
- 76 Cancel Interrupt 74 and 75
- 84 Enter Interrupt Time Out
- 98 (01) Restart at Interrupted Step

An Interrupt permits the operation of various test program functions proceed normally until a PRESELECTED criteria is automatically detected. The function in process at the time an Interrupt occurs is preempted immediately and is not permitted to complete.

The step containing the Interrupted Function is stored automatically so the program can restart (Function 98) there (often without causing any evidence of an Interrupt; however, provision is made to Record the step (Function 09) which was interrupted for later analysis).

The Interrupt is identified and forces the test program to a predetermined step. The predetermined step identifies the source of the Interrupt. This process is called a VECTORED Interrupt.

There are 5 Vectored Interrupt locations preassigned in the Program Memory. Usually a Function 40 (JUMP) is located in each Interrupt location to direct the test program to continue with a specific analysis pertaining to which Interrupt occurred.

After the Interrupt is so SERVICED, the program usually restarts at the interrupted step.

Vectored interrupt locations are at the "End" of the test program memory so they can be quickly accessed; e.g., by stepping DOWN from Step 00 Page 0 to Step 63 Page 1 and again to Step 62 Page 1, Step 61 Page 1, etc.

Good programming practice suggests using care in activating more than one Interrupt at a time (however, in case of conflict the highest priority is assigned to the highest Vectored Step; e.g., 63 down to 59).

Remember to *disable* all enabled Interrupts when in the process of servicing an Interrupt. The DTM-2 will only restart at the most recent Interrupt Step; i.e., it cannot keep track of servicing more than one Interrupt at a time.

START initializes all Interrupts OFF.

3.23 INTERRUPTS GROUP (Cont'd)

*Of major importance is the time required to service an Interrupt and return to the test step that was interrupted. For the case of servicing the Interrupt by counting the Interrupt as an event, recording the Interrupted step, then returning to the Interrupted step:

| <u>STEP</u> | <u>PAGE</u> | <u>DATA</u> | <u>FUNCTION</u> | |
|-------------|-------------|-------------|-----------------|--------------------------------|
| 63 | 1 | 70 | 40 | (70 represents Step 00 Page 1) |
| 00 | 1 | 03 | 87 | EVENT COUNT |
| 01 | 1 | 00 | 09 | Record Int Step |
| 02 | 1 | 03 | 98 | Restart at Int Step |
| N | X | X | Z | Interrupted Step |

Five steps require 15 μ sec or only 7 percent of one bit at 9600 baud.

*Returning to any multiple count function will reinitiate the Function at a Count of 0. For example: Returning to an interrupted step with a 60 through 67 Function will cause the message to restart at the *first* character. Returning to timer Functions 80 through 83 will cause the time to begin at 0 again.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | (XY) | 97 |

DESCRIPTION:

Functions 97 controls 3 of the 5 Vectored Interrupts. (Functions 74 and 75 control the other 2.)

RESULTS MEMORY – Vectors to Step 63 last Page.

Data 00 Disable

Data 01 ENABLE MEMORY FULL INTERRUPT.

As soon as the results memory has completed writing into the last location No. 1023; i.e., Step 63 Page F, the interrupt occurs. Note: If the writing *started* at Step 00 Page F the Interrupt will occur after 64 locations have been written into. The Interrupt will also occur after the Results Memory has been READ at location No. 1023 as when transmitting from Results Memory!

Step 63 of the last page should contain either Functions 00, 99, 98 or 40.

APPLICATIONS:

1. Use the memory Interrupt to terminate a test when the memory is Full. This leaves Results Memory location 0 (Step 00 Page 0) as the very start of the test data and analysis can begin there.
2. Since the CRT Screen (Interview) contains 1024 characters (same size as the results memory), ceasing the test on Memory Full will also Freeze the CRT screen when it is full also. By starting at a preset page or step in Results Memory any fixed number of characters can be selectively displayed on the CRT.

CHARACTER INTERRUPT – Vectors to Step 62 last page

Data 02 Disable

Data 03 CHARACTER INT ENABLE

Function 19 stores the character to be detected as an interrupt into a comparator. Data 03 enables the output of the comparator to generate an Interrupt.

Step 62 last page should contain either Functions 99, 98, or 40.

APPLICATION:

When transmitting the receiver is awake looking for the Function 19 Interrupt character. There are several protocols that will respond with an ACK or NAK to a message during the next message.

INTERRUPT GROUP 8-F – Vectors to Step 61 last page

| | | |
|------|----|------------------------|
| Data | 08 | Disable 09-0F |
| Data | 09 | Parity Error |
| Data | 0A | OVFL counter |
| Data | 0B | End counter |
| Data | 0C | TIMEOUT (Function 84) |
| Data | 0D | OUT OF SYNC |
| Data | 0E | FRAME DETECT (SDLC 7E) |
| Data | 0F | IDLE (SDLC FF) |

One of these seven can be selected as an Interrupt (and disabled by 08). The Selection can be changed without an intervening 08 disable.

APPLICATIONS:

09 – Parity Error. Recording characters with Parity Errors can be easily accomplished by servicing the PE Interrupt with a Function 36 Record Current Character then returning to the Interrupt Step with Function 98 data 03.

0A – OVFL Counter. When the Front Panel Counter overflows an Interrupt can be serviced by using Function 07 and recording a data pattern indication of an OVFL condition after which the counter can be reset and the count recorded when the END Interrupt occurs.

0B – END Counter. To Record the BCC error rate an Interrupt on END will be serviced by recording the counter followed by a counter reset Function 87 (03) and continuing until a memory Full Interrupt Stops the test. The Results Memory will then contain 1024 measurements of BCC error rate that can be transmitted to data collection terminal or CPU.

0C – Timeout. Response time criteria is important and if a response does not occur within the preset time (and the Timeout Interrupt is disabled) the Timeout will interrupt the program. Such an Interrupt might then wait for the criteria and continue measuring the delay. When the criteria is met the actual excessive delay can be recorded into Results Memory. Function 84 is used immediately prior to Function 97 to initialize (the timer to the) 0.1 – 9.9 second range.

OD – Out of SYNC. Counting of characters in a block must stop when the receiver goes out of Sync. Such a test would recycle through a simple sequence as follows:

| | | | | |
|----|----|----|-------------------------|-------------------------------|
| 00 | 00 | 41 | Preset jump | } Waits for In-Sync Condition |
| 01 | 03 | 47 | Jump if Out Sync | |
| 02 | 0D | 97 | Enable Out Sync | |
| 03 | 01 | 14 | Wait one Character Loop | } Loop |
| 04 | 03 | 87 | Event Count Loop | |
| 05 | 03 | 40 | Jump to Step 03 Loop | |
| 61 | P1 | 00 | 99 | Stop at Vectored Int Step. |

OE – Frame DET. SDLC Modes utilize the Frame Det to automatically indicate the Frame or Flag character ending the message. See INTERSHAKE Applications for SDLC programs.

OF – Idle (SDLC FF). Detects an "abort" condition on an SDLC circuit.

3.24 END GROUP

| | |
|----|----------------------|
| 98 | RECYCLE/RESTART/SKIP |
| 99 | Stop |

Another Function useful in determining the status or progress of a test as it is being Run:

00 Halt

After a test has run through its intended step sequence (or an Interrupt service routine is complete), the operator has two basic choices: CONTINUE the test or STOP.

When continuing the test, it is necessary to specify where the test is to continue.

3.24.1 END GROUP

RECYCLE/RESTART/SKIP, FUNCTION 98

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 98 |
| | | 01 | |
| | | 02 | |
| | | 03 | |

DESCRIPTION:

- 00 Restarts the test at Step 00 Page 0 in the same manner as operating the START Switch *EXCEPT* circuits are *NOT* initialized as when the Start Switch is actually operated.

NOTE

Flags (Function 47) usually must be reinitialized to zero when a test is recycled.

- 01 Restarts the test at the Interrupted Step.
- 02 Skips the step, also referred to as NO-OP. Good practice suggests using many of these *every* few steps during program development. They are transparent to the program (require only 3 μ sec each) and reduce the rewrite time to insert steps later. Simply put the necessary Function in place of the Skip Step.
- 03 Initializes start CRC calculation for SDLC only. Refer to application notes for SDLC in Appendix E.

LOAD-ENTER:

STEP PAGE DATA FUNCTION

| | | | |
|---|-----|------|----|
| N | 0-3 | (00) | 99 |
|---|-----|------|----|

DESCRIPTION:

Function 99 will terminate (STOP) the test operation.

Function 99 is the ONLY function that causes the GREEN COMPLETE light to come ON.

After Function 99, the test will *stop*, and all other latched functions will cease to operate. For example, *do no use* Function 99 after Function 35 (if recording is expected to continue). Use Function 00 (HALT) where the program is to stop but operation (e.g., CRT display) is to continue.

APPLICATION:

1. Function 99 gives the operator a visual indication that the test has stopped in a known manner (result obtained is defined).
2. Function 99 can be used to follow a certain HALT, whereas another HALT in the same program can cause the test to repeat or advance to another different test.

The following functions have been added
for Serial Number Series "F" and above.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N-1 | 0-3 | XY | 41 |
| N | 0-3 | (Character) | 06 |

DESCRIPTION:

This program step containing Function 06 will test the Bit Switches on the front panel and will jump to the preset address. Function 06 is provided in serial number F Series and later.

APPLICATIONS:

1. Using FUN 06 in an operating program permits the operator to cause different program variations to be performed (e.g., "Break-Points").
2. Set Data 01 for test without Modem and Data 02 for test with Modem. The Jump will take the program into a sequence of RS-232 control then return to the data part of the main program.
3. Set Data 10 to jump to start BAD BCC so a manually injected error can be generated without halting the program.
4. A cell may contain several tests that are independent. Using Data 01 could select test ONE, Data 02 for test two etc.
5. Certain tests could be considered "coded" where the operator *must* enter his own data code for the program to advance.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 24 |

DESCRIPTION:

Advances Results Memory one step. This is generally used with Function 29 to search the memory for a specific character or character sequence. Function 24 is provided in Serial F Series and later.

OM 842A

SUBROUTINE GROUP

| | |
|----|-----------------------|
| 27 | Preset Return Address |
| 28 | Return |

The purpose of the subroutine group is to permit multiple usage of short program sequences. These Functions are provided in Serial F series and later.

Subroutines may also be developed by using Functions 41 and 47 provided Function 41 is not used in the subroutine itself.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------------|----------|
| N | 0-3 | (Return ADRS) | 27 |
| N+1 | 0-3 | (Subroutine ADRS) | 40 |

DESCRIPTION:

Function 27 is comparable to Function 41 which presets the address (HEX) to which the program will Jump.

Function 27 is used only to preset the address to which the program will Jump when Function 28 is executed.

Function 27 is usually *followed* by Function 40 to direct the program to another part of the program (called a subroutine). Function 28 is placed at the END of the subroutine and causes the program to *return* to the address specified by Function 27.

APPLICATION (EXAMPLE):

| <u>STEP</u> | <u>DATA</u> | <u>FUNCTION</u> | |
|-------------|-------------|-----------------|---------------------------------|
| 27 | 29 | 27 | Preset Return Address |
| 28 | ADRSN | 40 | Jump to S.R. (1st CALL) |
| 29 | | | Next Functions after Subroutine |
| 30 | | | |
| 31 | | | |
| 32 | | | Program continues |
| 33 | | | |
| 44 | 46 | 27 | Preset Return Address |
| 45 | ADRSN | 40 | Jump to S.R. (2nd CALL) |
| 46 | | | Next Functions after S.R. |
| 47 | | | |
| 48 | | | Program continues |
| 49 | | | |
| 50 | | | |
| 51 | | | |
| ADRSN | — | — | |
| N+1 | — | — | SUBROUTINE |
| N+2 | — | — | |
| N+3 | 00 | 28 | Return |

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
|------|------|------|----------|

| | | | |
|---|-----|----|----|
| N | 0-3 | 00 | 28 |
|---|-----|----|----|

DESCRIPTION:

Function 28 causes a dedicated jump to the address previously preset by Function 27.

Function 28 is used as the last step in a subroutine.

Further explanation and examples are contained with Function 27.

This Function is provided in Serial F series and later.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|-------------|----------|
| N-1 | 0-3 | (Address) | 41 |
| N | 0-3 | (Character) | 29 |

DESCRIPTION:

Comparison is made between the Programmed character and the data contents of the CURRENT results memory step. If no match is found, the program will proceed to the address preset by the preceding Function 41. This address can contain Function 24 to increment the Results Memory to the next step and then jump back to test that location for the character. Memory can be quickly "searched" for a specific character (or character sequence).

When a match is found the program proceeds to the next step.

Function 29 is provided in Serial F series and later.

APPLICATIONS:

1. To search the RM for a character (or any other data) use FUN 24 and a sequence of FUN 29 to test the contents of the RM address step.
2. To skip over a step for transmit RM character (FUN 52) or position the RM to record a character in a relative location using FUN 36.
3. Locate the starting character in Results Memory to begin a transmit sequence.

NOTE

When searching results memory a means is required to exit the search after one pass through the memory, if the character is *NOT* present. A recommended approach is to select Page 00 then begin the search. Stopping the search may be accomplished by using FUN 97 to Interrupt on Mem OVFL or FUN 47 to test for Mem Full after each Results Memory test *prior* to incrementing the Results Memory.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 37 |

FUNCTION 37 "FORCE IN SYNC" applicable only to Synchronous Mode. Forces the DTM's receive logic into sync. The next negative clock edge will define the first bit of the first character received. Function 37 is provided in Serial F series and later.

APPLICATION:

1. Force in sync on RLSD on and start assembling characters. This permits looking at Data *PRIOR* to the first SYNC character.

LOAD-ENTER:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| N | 0-3 | 00 | 85 |

DESCRIPTION:

This function is used to provide independent access to the Base Counter. The counter selector switch should be set to the EVENTS in 10^X position, and the corresponding LENGTH setting should be made. For example, when set to 10⁴, the END light of the counter will energize after 10⁴ repeated occurrences of Function 85.

Independent use of Function 87, Data 03 will increment the displayed EVENT count to a maximum of 999 (then OVFL) until the END light energizes. The lighted END indicator shows that the base count of 10^X has been completed, and no further events can be counted until:

1. RESET switch on the counter is depressed.
2. START switch is depressed to initiate another test program.
3. FUNCTION 87 (data 00) is executed to reset the counter.

Refer to EVENTS in 10^X Switch in Table 2-6.

Function 85 and EVENT in (10^x) permits an event count for a given base count similar to the BCC – 10^X and PE – 10^X counts, where conditions for the base are independently chosen by the INTERSHAKE program.

APPLICATIONS:

1. NAK error rate can be determined by implementing Function 85 for each poll and incrementing the EVENT COUNT Function 87-03 for each NAK.
2. SDLC Error Rate can be determined by incrementing Function 85 for every test of the CRC, and incrementing the EVENT COUNT for each error calculated.

NOTE

FUNCTION 85 is applicable *only* for INTERSHAKE II equipment with Serial No. C238 and above.

CHAPTER IV

OPERATING INSTRUCTIONS

4.1 INTRODUCTION

The operating instructions contained in this chapter are designed to teach the operator an overall sequence of operation, common to a wide variety of tests. Before attempting to operate the INTERSHAKE II, reference should be made to Chapter II (Controls and Indicators) for specific functions of each control and indicator, and to Chapter III (Program Functions) to see the variety of the software instructions available to program a test sequence.

Information is also included for operating the INTERSHAKE II with certain peripheral options, such as the INTERVIEW CRT (Option 18), CASSETTE (Option 17), and PRINTER (Option 08).

4.2 GENERAL OPERATION

4.2.1 Operating Steps

In performing any test or measurement with the INTERSHAKE II, the operator must follow a sequence of steps to make certain that the test is performed correctly, and that critical data signal paths are not interrupted inadvertently. A simplified flow chart of operating sequence, showing the major functions of each step, is shown in Figure 4-1. (Each of these steps is explained in detail later in this chapter, and examples are given based on test requirements.)

4.2.2 Operating Variations

Execution of test steps can vary in many instances. For example, program loading can be performed either manually or automatically as follows:

1. Manual Loading – Used to originate a program, step-by-step, and load it into nonvolatile (RAM) memory.
2. Automatic Loading – Stored Test used to load a program from firmware (PROM) memory to the nonvolatile (RAM) memory.

Other operating variations will become evident as the INTERSHAKE II is used in a variety of testing applications. Further typical examples are:

- In one instance, a test may be conducted using the INTERSHAKE II as a programmable monitor. In other instances, a test may be transmitted either to a Terminal, or to a Modem.
- Some test functions may be performed without programming a test such as measuring parity errors, clock frequency, and generating reference reversal signals.

Through this chapter, operating variations are detailed, to guide the operator in making proper control settings based upon specific test requirements.

4.3 DETAILED OPERATING INSTRUCTIONS

4.3.1 General

The following paragraphs provide instructions for each of the general operating steps shown in Figure 4-1.

4.3.2 Initial Test Setup ①

The "Initial Test Setup" for INTERSHAKE II is performed primarily to ensure that the data communications system under test is not disrupted unintentionally. The control settings shown represent a safe starting point for any test configuration. It is a good policy to adopt these control settings as a starting point for any test, regardless of how the settings may change during the course of any specific testing procedure.

The initial control settings shown in Figure 4-2 are made as follows:

- a. Set the MON SIGS OUT/NORMAL switch (Zone 3) to the NORMAL position.
- b. Set the TEST Selector Switch (Zone 3) to the TD/RD position. This setting provides for on-line monitoring, and will not interrupt signal flow.
- c. Set the CONTROL/EIA-OFF Switch (Zone 3) to the OFF position. This setting combined with on-line monitor conditions the DTM for "metallic through" connections between the MODEM and TERMINAL.
- d. Connect INTERSHAKE II (and other equipment as required) to a primary power source.
- e. Connect the INTERSHAKE II to the system under test, using the MODEM or TERMINAL EIA Interface connector(s) as required.
- f. Set the EIA/MIL Switch (Zone 2) for the type of signal common to the system under test.
- g. Set POWER Switch (Zone 2) to the ON position. In the POWER OFF condition the MODEM and TERMINAL leads are "metallic through."

NOTE

With the communications system in operation, activity of data on the EIA Interface lines may be monitored by observing the indicators on the EIA TEST MONITOR panel (Zone 5).

The following EIA lines use bipolar indicators (RED=SPACE, Positive for EIA; GREEN=MARK, Negative for EIA):

LINE 2 (TD)
 LINE 3 (RD)
 LINE 15 (SCT)
 LINE 17 (SCR)

4.3.3 Test DATA SETUP

In this step, the INTERSHAKE II controls are set to establish the *general* type of test which is to be performed. This process may be performed *manually*, by setting front panel controls appropriately, or it may be performed *automatically*, by using (running) a test that contains FUNCTIONS 90, 91, 92 and 93.

Manual Control Settings – The following data must be set into the front panel controls to establish certain basic characteristics of a test when a test is to be performed manually, or when a test *does not* contain FUNCTIONS 90, 91, 92 and 93.

Control settings are made as follows:

1. Set the TEST Selector Switch to TERM or MODEM if an *Off-Line* test is to be performed. The test will be run *toward* the TERMINAL or MODEM as selected.

In this test mode, the INTERSHAKE II simulates the function of a Terminal (when testing toward Modem), or of a Modem (when testing toward Terminal).

OR

Set the TEST Selector Switch to either the TD/RD, TD or RD positions if an On-Line (Monitor) test is to be performed.

When set to the TD/RD position, INTERSHAKE II monitors data on the *active* line. (The inactive line must be in the "idle" condition (mark or space). When set to the TD position, only the data on the TD line (Pin 2) is monitored. When set to the RD position, only the data on the RD line (Pin 3) is monitored.

2. Set the CONTROL EIA/OFF toggle switch to the OFF position to *disable* the six toggle switches in Zone 5, or to the CONTROL EIA position to *enable* the six toggle switches in Zone 5, as desired for testing.

NOTE

When the TEST switch is set to TD/RD, TD or RD positions, the CONTROL EIA/OFF toggle switch is used to enable or disable *all* six switches in Zone 5. When the TEST switch is set to TERM, the CTS, DSR, RLSD and R1 toggle switches in Zone 5 are automatically enabled. When the TEST switch is set to MODEM, the RTS and DTR toggle switches in Zone 5 are automatically enabled.

Automatic Control Settings – When a test program is to be conducted automatically, the control settings listed under the preceding paragraph must be made *only if the test program does not contain* FUNCTIONS 90, 91, 92 and 93. When the test program contains these functions, no control settings are necessary, since these functions override the controls electrically during the course of the program. (See Chapter III, AUTO PANEL GROUP, Paragraph 3.18).

4.3.4 Transmission Data Setup III

In this step, the INTERSHAKE controls are set to establish the test parameters, such as bit rate, character length, parity, and synchronization. This may be performed *manually*, by setting front panel controls to the desired positions, or it may be performed *automatically* by using a test that contains FUNCTIONS 90, 91 and 92.

Manual Control Settings – The following transmission data must be set into the front panel control when a test is performed manually, or when an automatic preprogrammed test is used that *does not* contain FUNCTIONS 90, 91, 92 and 93. Control settings are as follows:

1. Set the BIT RATE Rotary Selector Switch to the desired position, or to INT OSC if the desired bit rate is not shown on the switch scale, (Disregard this setting if an external clock source is to be used.)
2. Set the 3-position toggle switch to the desired position. The LEFT position enables the green scale of the rotary selector switch for bit rates of 50 to 600 Baud, or the INTERNAL OSCILLATOR. The CENTER position enables the blue scale of the rotary selector switch for bit rates of 900 to 9.6K BAUD. The EXTERNAL SOURCE position disables the internal oscillator and derives the bit rate from the clock signal of the equipment under test.

NOTE

Maximum bit rate usable for EXTERNAL SOURCE operation is
256 kBs.

3. If the INT OSC position was selected in Step 2 above, set up the desired bit rate by tuning the variable oscillator or by plugging in the proper crystal, as outlined in detail in Table 2-9.
4. For ASYNC operation, set the SYNC/ASYNC switch to either the 1, 1.5 or 2 STOP BIT positions, depending on the desired stop bit characteristic. The STOP BIT INDICATOR will light.
5. For SYNC operation, set the SYNC/ASYNC switch to the SYNC position. Then establish the characteristics of the SYNC CHARACTER as follows:
 - a. Using the MARK-SPACE toggle switches in Zone 8, set up the SYNC character.

| | | | | | |
|----------|----------------|---|---------|--|---------|
| EXAMPLE: | Sync Character | = | 0 0 0 1 | | 0 1 1 0 |
| | Toggle Switch | = | S S S M | | S M M S |
| | Bit Number | = | 8 7 6 5 | | 4 3 2 1 |

This represents an ASCII Syn character with ODD parity. (16 in Hexadecimal Code.)

- b. Set to LOAD mode, using ZONE 4 push button.
 - c. Depress the ENTER SYN BITS push button. The SYNC lamp will light intermittently indicating a "Sync Search" condition.

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6. Set the number of *information* bits used in the test or system code by setting the INFO BITS switch in the desired position. (Note: *Total* bits in character are info bits *plus* parity.)
7. Set the PARITY BIT switch to the desired position.

The FORCE PE push button is used to transmit characters with parity errors during the course of a test, and is not applicable during the setup phase of operation.

Automatic Control Settings — Control settings for automatic programmed tests are identical to those required for Manual operation, when the programmed test *does not* contain FUNCTIONS 90, 91, 92 and 93. If the programmed test contains these functions, no control setting is necessary, since the program functions override the settings of the above switches electrically.

4.3.5 Unique Test Data Setup **IV**

The control settings performed in this step include signal patching (Zone 2), and other controls in Zones 5 and 6 which are implemented to facilitate certain measurements or occurrences during a preprogrammed test, or to enable tests which are not compatible to the standard signal format of EIA Specification RS-232.

These control settings are applicable to both automatic and manual modes of operation, as may be required for any specific test sequence or program function.

A complete listing of all control settings and signal patches that could be implemented during this step is beyond the scope of this manual. However, the following list of signal patches and control settings is included to serve as a guide to show the *types* of control which may be implemented:

1. Patching from any of the EIA TEST MONITOR Test Points in Zone 5 to the (7X) DETECT IN and/or (7X) CONTROL OUT Test Points in Zone 2, to monitor the occurrence of significant signals in the system under test.
2. Patching from any of the EIA TEST MONITOR Test Points in Zone 5 to the COUNTER input test points in Zone 5. Such a signal patch facilitates the measurement of signal frequency, duration, or quantity (events per time unit).
3. Setting any of the CONTROL EIA toggle switches to the ON or OFF (7X) positions to exercise control over these lines during manual tests or automatic test program sequences.
4. Patching from the EIA TEST MONITOR Test Points in Zone 5 to the MONITOR IN Test Points in Zone 2, to activate the $>+3$, <-3 Volt Indicators, the HIT indicator, or the speaker amplifier.
5. Patching between the +12V, -12V, Test Points to implement control of a line.
6. Patching the Tx or Rx Test Points to COUNTER or other test point to examine the transmitted or received data signal.

4.3.6 Preparation for Loading Program Sequence (V)

This step is performed to ensure that the INTERSHAKE II is ready to accept a program sequence from either manual or automatic entry. This brief preparation step is performed as follows:

Manual Loading Preparation – The following control settings are made when a test program sequence is to be entered manually, or when a previously programmed test program is to be manually edited in the same manner:

1. Depress the LOAD push button in Zone 4.
2. Depress the STEP push button in Zone 6.
3. Note the STEP indicator. It should read 00 to indicate access to initial step of Page 0.
4. Set the AUTO-SINGLE STEP-MANUALLY ENTER PROGRAM toggle switch to the MANUALLY ENTER PROGRAM (down) position.
5. Select a cell (A-H) for nonvolatile storage.

Automatic Loading Preparation – For automatic loading, Steps 1, 2 and 3 (above) are followed. However, Step 4 must be performed by setting the AUTO SINGLE MANUALLY ENTER PROGRAM toggle switch to the AUTO position for instant loading of a *complete* preprogrammed test from PROM, or to the SINGLE STEP position for loading selected steps of a preprogrammed test. All stored tests will load an entire 128 or 256 steps in the AUTO position.

NOTES

1. After the ENTER indicator deenergizes, the display will return to STEP 00, PAGE 0. The DATA and FUNCTION display will blink during loading in AUTO mode. Data associated with STEP "00", PAGE "0" should be disregarded.
2. Select position A of LOAD STORED TEST switch to observe the program which has been entered.

4.3.7 Enter Steps, (Functions and Data) of Program Sequence (VI)

In this step, the test program is entered into the nonvolatile (RAM) memory and stored until the program is run. The program functions and data can be entered manually or automatically as follows:

Manual Loading – Manual loading is performed in steps as follows:

- STEP 1: Select memory cell to be programmed (A-H).
- STEP 2: Set appropriate FUNCTION (00-99) into the lever-switch.
- STEP 3: Set the MARK-SPACE toggle switches in Zone 8 to represent the desired DATA bits.
- STEP 4: Depress the ENTER push button.

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OBSERVE: The FUNCTION and DATA will appear briefly in the DISPLAY section. The display will then advance to STEP 01.

This observation shows that the entry of function and data has been made in STEP 00, and that STEP 01 is now ready for function and data entry.

STEP 5: Repeat STEPS 2 through 4 until complete program is entered. To review a step, momentarily set the UP-DOWN switch to the DOWN position to display the previously entered step; then advance the program to the desired step by momentarily placing the UP-DOWN switch to the UP position.

EXAMPLE LOADING EXERCISE:

REQUIREMENT – Load a SYN character to be sent as part of a test sequence.

PROCEDURE – For Manual Program Loading: Step 1:

STEP 1: Set FUNCTION 50 (Send Character) into the lever-switch.

STEP 2: Set the MARK-SPACE toggle switches in Zone 8 to "32," the hexadecimal equivalent to the SYN character. Since the MARK-SPACE switches must be set to the BCD equivalent, the setting will be:

| | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|
| BIT: | 8 | 7 | 6 | 5 | 5 | 3 | 2 | 1 |
| M/S: | S | S | M | M | S | S | M | S |
| Bit Pattern: | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| HEX: | 3 | | . | 2 | | | | |

STEP 3: Depress ENTER push button. Then proceed to enter next step.

To write over, or edit a previously-entered program, simply access the desired program step by using the UP-DOWN toggle switch, which will advance or regress the program step by step, or will advance or regress the program quickly by scrolling when the switch is held up or down. When the desired step is accessed, simply write over the old step by entering a new one as outlined above.

STEP 4: The last function used in the sequence is usually a 99 (STOP) or 98 (RECYCLE).

Automatic Program Loading – Automatic Loading is performed in steps as follows:

STEP 1: Select the desired test program from PROM by setting the LOAD STORED TEST switch to any position from A through H.

STEP 2: Depress the ENTER push button.

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STEP 3: OBSERVE:

The ENTER indicator will flash ON, and the DISPLAY Data and Function will blink. Step 00, page 0 then appears as a steady display.

EXAMPLE:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 00 | 0 | (XY) | (NN) |

This indication shows that the stored test has completely entered the entire program cell of 128 (or 256) steps. The entire cell is always loaded in AUTO.

STEP 4: Set AUTO/SINGLE STEP/MANUALLY ENTER PROGRAM Switch to the MANUALLY ENTER PROGRAM (bottom) position. This prevents inadvertent reloading of another test automatically.

STEP 5: Set the LOAD STORED TEST switch to position A to run the test. If the switch is left in any other position, a Program in nonvolatile RAM at that position will be run.

NOTE

The program has now been loaded into nonvolatile memory Cell A and is ready to be RUN. As mentioned previously, *any* program loaded from PROM is automatically loaded into Cell "A."

If test program functions (from 7X series) require the use of patch cords to access counter or test point, make certain that patches are made as part of function entry before test is run. Make certain that counter controls are set properly to make correct measurement.

4.3.8 Run Test Program Sequence (VII)

After loading the test program as outlined in the preceding paragraphs, the test program is RUN in steps as follows:

STEP 1: Select the test program to be run by setting the LOAD STORED TEST switch to any position A through H as desired.

NOTE

If program has been loaded from PROM, switch must be set to position A, since the firmware program was loaded *into* Cell A during the AUTO loading process.

Switch positions B through H may be selected to run a program which has been entered manually into one of the nonvolatile memory Cells B through H.

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STEP 2: Depress the RUN push button in Zone 4.

STEP 3: Depress the START push button in Zone 3.

STEP 4: OBSERVE:

- The RUN indicator lights while test program is running.
- The DISPLAY and BIT lights show received data (or transmit data).
- The SIGS IN and SIGS OUT indicators light to show that data is being transmitted and received. (The indicators light ON while in the SPACE condition.)
- When the test has been completed (Function 99 has been executed) the COMPLETED indicator will light.

NOTE

The test may stop before completion (RUN indicator off, COMPLETE indicator off) when the AUTO/SINGLE STEP/MANUALLY ENTER PROGRAM switch is operated.

4.3.9 Review of Test Results **VIII**

After a test has been run and completed, the results of the test have been stored in the Results Memory. To review the results of the test, the Results Memory is simply played back step by step while the operator observes and evaluates the data produced by the steps and functions of the test.

Test results are reviewed as follows:

STEP 1: Depress the PLAY push button in Zone 4.

STEP 2: Select all data bit switches to 00.

STEP 3: Depress the STEP push button in Zone 7 to initialize the Results Memory to Step 00, page 0.

STEP 4: Operate the UP/DOWN Toggle Switch in Zone 7 to advance or regress the results display.

STEP 5: OBSERVE:

The DISPLAY will show the STEP, PAGE and FUNCTION of the test which produced the displayed DATA.

For example:

In the following display,

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 03 | 1 | 53 | 20 |

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This display indicated that the fourth step (first step is 00) of the second page (first page is 0) is being observed. The data in this step (53) is the letter S in even-parity ASCII. The data shown has resulted from the execution of FUNCTION 20, which required that Character 53 be trapped and recorded.

Test programs which require the COUNTER to be used, such as Function 87, will cause the measurement to be displayed by the COUNTER. Range selector switch setting will determine the units of measurement.

For example:

The COUNTER indication

```
OV    020    END  
FL
```

with COUNTER INPUT set to DURATION (8X) and RANGE set to MILLISECONDS, the measurement is 20 milliseconds.

4.4 OPERATIONAL EXERCISES

The operational exercises outlined in the following paragraphs have been included to serve as a guide in setting up the INTERSHAKE II for specific test applications, and also to serve as a self-teaching reference guide which can be studied to increase familiarity with the controls and indicators of the unit.

All exercises are supplemented with full-page illustrations which show all steps required for a specific type of tests, and the controls which must be used in each step. All steps are keyed by *Roman Numerals*, consistent with Figure 4-1 and Paragraph 4-3.

Reference should be made to the Appendices of this manual for Bit Switch Conversions, Code Conversions, and Character Definitions.

4.4.1 Initial Setup Exercise

For this exercise, refer to Figure 4-2. Use an INTERSHAKE II unit if one is available.

The purpose of this exercise is to familiarize the operator with Step 1 of the general operating procedure. It is not intended that the operator "go On-Line" at this time. The Step I procedure is placed here as the first exercise for the purpose of emphasis and to establish a habit of starting with a nondisruptive control setting for each use of INTERSHAKE II. You will note that Step I settings are mentioned in full in Figures 4-3 through 4-8.

4.4.2 Manual Loading Exercise

For this exercise, review the appendices for an understanding of the Bit Switch values and their relation to code conversion to HEX, Binary, etc. Refer to Figure 4-3 and, if available, use an INTERSHAKE II unit to provide "hands-on" experience with the study of this exercise.

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The purpose of this exercise is to familiarize the operator with the process of manually loading a sequence of characters (H, E, L, L & O) into nonvolatile memory and reviewing the operation. The test is written:

| <u>STEP</u> | <u>PAGE</u> | <u>DATA</u> | <u>FUN</u> | <u>DESCR</u> |
|-------------|-------------|-------------|------------|--------------|
| 00 | 0 | C8 | 50 | H |
| 01 | 0 | 45 | 50 | E |
| 02 | 0 | 4C | 50 | L |
| 03 | 0 | 4C | 50 | L |
| 04 | 0 | 4F | 50 | O |
| 05 | 0 | 00 | 99 | STOP |

For purposes of this exercise, assume the transmission data is to be seven-bit ASCII, with ODD parity, at 600 bps.

Proceed, using the eight steps of the general operating procedure, as follows:

- STEP I: Set controls as indicated in foldout, Figure 4-3.
- STEP II: Not applicable for this exercise.
- STEP III: Set Controls as indicated in foldout, Figure 4-3.
- STEP IV: Not applicable for this exercise.
- STEP V: Set controls as indicated in Figure 4-3.
- STEP VI: Enter the Program sequence as follows:
 - A. Set Function 50 (Send Character) into thumblever switch, Zone 8. See Function List (Chapter 3).
 - B. Set Bit Switches, Zone 8, to represent character "H." (See "odd parity ASCII" in universal code chart in Appendix C for bit arrangement of character "H.")

Bit Lights ● ● 0 0 ● 0 0 0
 (0 = Off, ● = On)

Bit Switches M M S S M S S S
 (Mark Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered, Zone 7:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 00 | 0 | C8 | 50 |

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NOTE

DISPLAY and ENTER indicators will confirm entry for approximately one second and then will advance to the next step to be entered. Also note that the two-digit display under "DATA" is the HEX representation of the Bit Switch Mark/Space arrangement.

If necessary to review, step "DOWN" and observe using the UP/DOWN toggle switch. Make certain that display is stepped UP again when ready to enter the next step.

NEXT ENTRY

- A. Set Function 50 into Function switch in Zone 8.
- B. Set Bit Switches, Zone 8, to represent character "E." (Use Universal Code Chart as before and determine bit arrangement for character "E.")

Bit Lights 0 ● 0 0 0 ● 0 ●
 (0 = Off, ● = On)

Bit Switches S M S S S M S M
 (Mark Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered, Zone 7:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 01 | 0 | 45 | 50 |

NEXT ENTRY

- A. Set Function 50 into Function switch.
- B. Set Bit switches, Zone 8, to represent character "L." (Use Universal Code Chart as before and determine bit arrangement for character "L.") chart as before and determine bit arrangement for character "L.")

Bit Lights 0 ● 0 0 ● ● 0 0
 (0 = Off, ● = On)

Bit Switches S M S S M M S S
 (Mark/Space)

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- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered, Zone 7:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 02 | 0 | 4C | 50 |

NEXT ENTRY

All settings from previous step are used for entering second "L."

- Press ENTER push button, Zone 8.

Observe momentary display of information entered, Zone 7:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 03 | 0 | 4C | 50 |

NEXT ENTRY

- A. Set Function 50 into FUNCTION switch, Zone 8.
 B. Set Bit Switches, Zone 8, to represent character "O" (again, using Universal Code Chart).

Bit Lights 0 ● 0 0 ● ● ● ●
 (0 = Off, ● = On)

Bit Switches S M S S M M M M
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered, Zone 7:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 04 | 0 | 4F | 50 |

NEXT ENTRY

- A. Set Function 99 (END TEST) FUNCTION switch into thumblevers, Zone 8.
 B. Set Bit Switches, Zone 8, to represent "00" in HEX (or BCD) (see Appendix A).

Bit Lights 0 0 0 0 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S S S S S S S
 (Mark/Space)

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C. Press ENTER push button, Zone 8.

Observe momentary display of information entered, Zone 7:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 05 | 0 | 00 | 99 |

STEPS VII These steps of the operating procedure are not applicable for this exercise. and VIII:

REVIEW

Note that the nonvolatile cell at position "C" of the Load Stored Test rotary switch is now loaded in the first six steps, ready to send characters, H, E, L, L, O, and then end sequence. This program sequence will remain ready at position "C" as long as it is not written over with another program sequence or otherwise erased. INTERSHAKE II can be de-energized, then weeks later made ready for use and the program sequence of position "C" will be intact.

Step through the program sequence and compare the information displayed in Zone 7 with that shown in the previous text. Note that there are six steps, i.e., 00 through 05.

4.4.3 A Lead Control and Time Generation Exercise

The purpose of this exercise is to increase the operation familiarity with INTERSHAKE II control, the manual loading procedure, and at the same time demonstrate lead control and time generation in a program sequenced (refer to Figure 4-4). For purposes of this exercise, the type of signal transmitted is not important. Use the following program:

| | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → |
|---|-------|------|----------|-------------------------------|----------------|
| | STEP | DATA | FUNCTION | | |
| 0 | 00 | FF | 70 | Turn ON All EIA Leads | |
| 1 | 01 | 05 | 82 | Delay 0.5 Second | |
| 2 | 02 | FF | 71 | Turn OFF All EIA Leads | |
| 3 | 03 | 05 | 82 | Delay 0.5 Second | |
| 4 | 04 | 00 | 98 | Recycle to 00 | |
| 5 | 5 | | | | |

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Proceed using the eight steps of the general operating procedures as follows:

STEPS I, II and III: Set controls as indicated in Figure 4-4.

STEP IV: Not Applicable

STEP V: Operate controls as indicated in Figure 4-4.

STEP VI: Enter the Program Sequence as follows:

- A. Set Function 70 (turn on control lead) into FUNCTION switch, Zone 8.
- B. Set Bit Switches, Zone 8, to turn on desired control leads. Assume that all control leads are to be turned on.

Bit Lights ● ● ● ● ● ● ● ●
 (0 = Off, ● = On)

Bit Switches M M M M M M M M
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered, Zone 7:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 00 | 0 | FF | 70 |

NEXT ENTRY

- A. Set Function 82 (generate 0.1 to 9.9 seconds) into FUNCTION switch, Zone 8.
- B. Set Bit Switches, Zone 8, to 05 in BCD (or HEX) to represent 0.5 second.

Bit Lights 0 0 0 0 0 ● 0 ●
 (0 = Off, ● = On)

Bit Switches S S S S S M S M
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 01 | 0 | 05 | 82 |

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NEXT ENTRY

- A. Set Function 71 (turn OFF control lead) into FUNCTION switch, Zone 8.
- B. Set Bit Switches, Zone 8, to turn OFF desired control leads. Assume that all control leads are to be turned OFF.

Bit Lights ● ● ● ● ● ● ● ●
 (0 = Off, ● = On)

Bit Switches M M M M M M M M
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 02 | 0 | FF | 71 |

NEXT ENTRY

- A. Set Function 82 (generate 0.1 to 9.9 seconds) into FUNCTION switch, Zone 8.
- B. Set Bit Switches, Zone 8, by setting 05 in BCD to represent 0.5 second.

Bit Lights 0 0 0 0 0 ● 0 ●
 (0 = Off, ● = On)

Bit Switches S S S S S M S M
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 03 | 0 | 05 | 82 |

NEXT ENTRY

- A. Set Function 98 (recycle test) into FUNCTION switch, Zone 8.
- B. Set Bit Switches, Zone 8, to represent "00" in HEX (or BCD) (see Appendix "A").

Bit Lights 0 0 0 0 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S S S S S S S
 (Mark/Space)

Observe momentary display of information entered:

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| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 04 | 0 | 00 | 98 |

STEP VII: Operate controls and make observations as indicated in Figure 4-4.

STEP VIII: Not Applicable.

4.4.4 An Automatic Load Exercise

The purpose of this exercise is to familiarize the operator with the process of loading a program sequence which was previously programmed into a Stored Test firmware cell.

For purposes of this exercise, do not consider application of the stored test, i.e., whether or not the AUTO PANEL Functions match the test configuration or whether they are part of the program sequence.

Proceed using the eight steps of the general operating procedures as follows:

STEP I: Set controls as indicated in Figure 4-5.

STEPS II, III and IV: These steps of the operating procedure are not applicable for this exercise.

STEPS V and VI: Operate controls as indicated in Figure 4-5.

STEPS VII AND VIII: These steps of the operating procedure are not applicable for this exercise.

REVIEW

Note that the nonvolatile cell at position "A" of the Load Stored Test rotary switch is now loaded with the contents of the selected Stored Test firmware cell.

The program sequence is now ready for use from position "A."

Step through the program sequence now loaded in position "A".

4.4.5 Off-Line Exercise with a Local Terminal

The purpose of this exercise is to demonstrate exercise of a data communications terminal and familiarize the operator with this operation.

System parameters are assumed to be as follows:

Bit Rate: 110 bps, Asynchronous, 1.5 stop bit.

Code: ASCII – or, to match *available* terminal.

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Proceed, using the eight steps of the general operating procedure as follows:

STEPS I, II and III: Set controls as indicated in Figure 4-6.

STEP IV: This step of the procedure is not applicable.

STEP V: Operate controls as indicated in Figure 4-6.

STEP VI: Enter the program sequence as follows:

- A. Set Function 73 (detect off) into FUNCTION switch, Zone 8 (see Function List, Appendix "B").
- B. Set Bit Switches, Zone 8, to detect RTS OFF from the terminal.

Bit Lights ● 0 0 0 0 0 0 0
 (0 = Off, ● = On)

Bit Switches M S S S S S S S
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 0 | 0 | 80 | 70 |

| <u>STEP</u> | <u>PAGE</u> | <u>DATA</u> | <u>FUN</u> | <u>DESC</u> |
|-------------|-------------|-------------|------------|-----------------------|
| 00 | 0 | 80 | 73 | Detect RTS OFF |
| 01 | 0 | 10 | 70 | Turn on RLSD |
| 02 | 0 | 23 | 67 | Send message 23 times |
| 03 | 0 | 00 | 99 | END |

NEXT ENTRY

- A. Set Function 70 (turn on) into FUNCTION switch, Zone 8.
- B. Set Bit Switches, Zone 8, to turn RLSD ON.

Bit Lights 0 0 0 ● 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S S M S S S S

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- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 01 | 0 | 10 | 70 |

NEXT ENTRY

- A. Set Function 60 (send Baudot Fox N times) into FUNCTION switch, Zone 8.
 B. Set Bit Switches to send Baudot Fox 23 times by arranging Bit Switches to represent 23 HEX.

Bit Lights 0 0 ● 0 0 0 ● ●
 (0 = Off, ● = On)

Bit Switches S S M S S S M M
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 02 | 0 | 23 | 67 |

NEXT ENTRY

- A. Set Function 99 (End Test) into FUNCTION Switch, Zone 8.
 B. Set Bit Switches, Zone 8, to "00" in HEX (or BCD).

Bit Lights 0 0 0 0 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S S S S S S S
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 03 | 0 | 00 | 99 |

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STEP VII: Operate controls as indicated in Figure 4-6.

STEP VIII: Review results as indicated in Figure 4-6.

4.4.6 Off-Line and Log Exercise with a Local Asynchronous Terminal

The purpose of this exercise is to demonstrate interaction with a data communications system component and to familiarize the operator with this operation.

For purposes of study of this exercise, the system parameters are as follows:

Bite Rate: 1800 bps, Asynchronous, 1-Stop Bit
Code: 7-level ASCII with EVEN parity
Station (terminal) Address: "B"
(or, set the parameters as appropriate for an available terminal)

Table with 5 columns: STEP, PAGE, DATA, FUNCTION, DESCRIPTION. Rows include: 00 0 80 73 Detect RTS OFF, 01 0 10 70 Turn on RLSD, 02 0 00 50 Send NULL, 03 0 05 50 Send ENQ, 04 0 42 50 Send Address "B", 05 0 10 71 Turn off RLSD, 06 0 20 32 Record 20 Characters, 07 0 00 99 END

Proceed, using the eight steps of the general operating procedure as follows:

STEPS I, II and III: Set controls as indicated in Figure 4-7.

STEP IV: This step of the procedure is not applicable for this exercise.

STEP V: Enter the program sequence as follows:

- A. Set Function 73 (Detect Off) into Function Switch Zone 8.
B. Set Bit Switches, Zone 8, to detect RTS lead off.

Bit Lights 0 0 0 0 0 0 0 0
(0 = Off, 0 = On)

Bit Switches M S S S S S S S
(Mark/Space)

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- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 00 | 0 | 80 | 73 |

NEXT ENTRY

- A. Set Function 70 (Turn On) into Function Switch, Zone 8.
 B. Set Bit Switches, Zone 8, to turn RLSD (carrier detect) on.

Bit Lights 0 0 0 ● 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S S M S S S S
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 01 | 0 | 10 | 70 |

NEXT ENTRY

- A. Set Function 50 (Send Character) into Function Switch, Zone 8.
 B. Set Bit Switches, Zone 8, to send "NUL" character for even parity ASCII (or as appropriate for your terminal). See Universal Code Chart in the Appendix for bit arrangement for "NUL."

Bit Lights 0 0 0 0 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S S S S S S S
 (Mark/Space)

(or, as appropriate for terminal in use)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 02 | 0 | 00 | 50 |

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NEXT ENTRY

- A. Set Function 50 (Send Character) into Function Switch, Zone 8.
- B. Set Bit Switches, Zone 8, to send "ENQ" character (use Universal Code Chart as before).

Bit Lights 0 0 0 0 0 ● 0 ●
 (0 = Off, ● = On)

Bit Switches S S S S S M S M
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 03 | 0 | 05 | 50 |

NEXT ENTRY

- A. Set Function 50 (Send Character) into Function Switch, Zone 8.
- B. Set Bit Switches, Zone 8, to send "B" address character (use Universal Code Chart as before).

Bit Lights 0 0 ● 0 0 0 ● 0
 (0 = Off, ● = On)

Bit Switches S M S S S S M S
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 04 | 0 | 42 | 50 |

NEXT ENTRY

- A. Set Function 71 (Turn OFF) into Function Switch, Zone 8.
- B. Set Bit Switches to turn RLSD OFF.

Bit Lights 0 0 0 ● 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S S M S S S S
 (Mark/Space)

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- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 05 | 0 | 10 | 71 |

NEXT ENTRY

- A. Set Function 32 (Log Next Characters) into Function Switch, Zone 8.
 B. Set Bit Switches, Zone 8, to log 20 characters by setting 20 in BCD.

Bit Lights 0 0 ● 0 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S M S S S S S
 (Mark/Space)

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 06 | 0 | 20 | 32 |

NEXT ENTRY

- A. Set Function 99 (END TEST) into Function Switch, Zone 8.
 B. Set Bit Switches, Zone 8, to "00" in HEX or BCD.

Bit Lights 0 0 0 0 0 0 0 0
 (0 = Off, ● = On)

Bit Switches S S S S S S S S
 (Mark/Space)

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 07 | 0 | 00 | 99 |

STEP VII: Operate controls as indicated in Figure 4-7.

STEP VIII: Review results as indicated in Figure 4-7.

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4.4.7 Storage of Test Program for Auto Panel

The purpose of this exercise is to demonstrate setup of the Auto Panel Functions by a test entered into a nonvolatile cell position.

For purposes of this exercise, the system parameters are as follows:

Bit Rate: 9600 bps, Synchronous
 Code: EBCDIC
 Station Address: "Q"

(or set the Auto Panel Functions appropriate to a particular configuration as desired):

| S E) J | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → |
|--------------|-------|------|----------|--------------------------------|----------------|
| | STEP | DATA | FUNCTION | | |
| 0 | 0 | 32 | 90 | Select SYN | |
| | 1 | 78 | 91 | SYN, 8 INFO, NO PARITY | |
| | 2 | F0 | 92 | BIT RATE 9600 BPS | |
| | 3 | EF | 93 | TERM, INCLK, CONTROL EIA, EIA | |
| | 4 | | | | |
| | 5 | | | FIRST FUNCTION OF TEST PROGRAM | |
| | 6 | | | | |

Proceed using the eight steps of the general operating procedure as follows:

STEP I: Set controls as indicated in Figure 4-8.

STEPS II, III and IV: The settings of Steps II, III and IV will be programmed in Step VI.

STEP V: Operate controls as indicated in Figure 4-8.

STEP VI: Enter program sequence as follows:

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- A. Set Function 90 (Syn Character) into Function Switch, Zone 8. See Function List, Chapter III.
- B. Set Bit Switches, Zone 8, to represent EBCDIC "SYN" in HEX (32).

Bit Lights 0 0 ● ● 0 0 ● 0
 (0 = Off, ● = On)

Bit Switches S S M M S S M S

- C. Press ENTER push button, Zone 8

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 00 | 0 | 32 | 90 |

NEXT ENTRY

- A. Set Function 91 (Sync-Bits-Parity) into Function Switch, Zone 8.
- B. Set Bit Switches, Zone 8, to represent SYNC, 8 Info Bits, Parity NONE (78). See Paragraph 3.18.2 for Code 91.

Bit Lights 0 ● ● ● 0 0 0 0
 (0=Off, ●=On)

Bit Switches S M M M M S S S
 (Mark/Space)

- C. Press ENTER push button, Zone 8.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 01 | 0 | 78 | 91 |

NEXT ENTRY

- A. Set Function 92 (Bit Rate) into Function Switch, Zone 8.
- B. Set Bit Switches, Zone 8, to select 9600 bps in HEX (FO). See Paragraph 3.18.3 for Code 92.

Bit Lights ● ● ● ● 0 0 0 0
 (0 = Off, ● = On)

Bit Switches M M M M S S S S
 (Mark/Space)

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- C. Press ENTER push button, Zone 7.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 02 | 0 | F0 | 92 |

NEXT ENTRY

- A. Set Function 93 (Test Terminal, Internal Clock, Control EIA OFF, EIA) into Function Switch, Zone 8.
- B. Set Bit Switches, Zone 8, to select proper data. See Paragraph 3.18.4 for Code 93 (HEX EF).

Bit Lights 1 1 1 0 1 1 1 1
(0 = Off, ● = On)

Bit Switches M M S M M S S S
(Mark/Space)

- C. Press ENTER push button, Zone 7.

Observe momentary display of information entered:

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 03 | 0 | EF | 93 |

NOTE

This nonvolatile cell position is now ready for entry of any test which has parameter known to be the same as that entered in the first 4 steps above. An applicable test would be entered starting at Step 5 (04). When desired, another applicable test may be entered by "writing over" starting at Step 5.

A Stored Test firmware cell will normally have the Auto Panel Functions which can also be used as above. After the Stored Test is readied in position "A," test which has required parameters known to be the same as that which exists in the Stored Test may be made ready for application by "writing over" after the initial Auto Panel Function Steps.

STEPS VII and VIII: These steps are not applicable for purposes of this exercise.

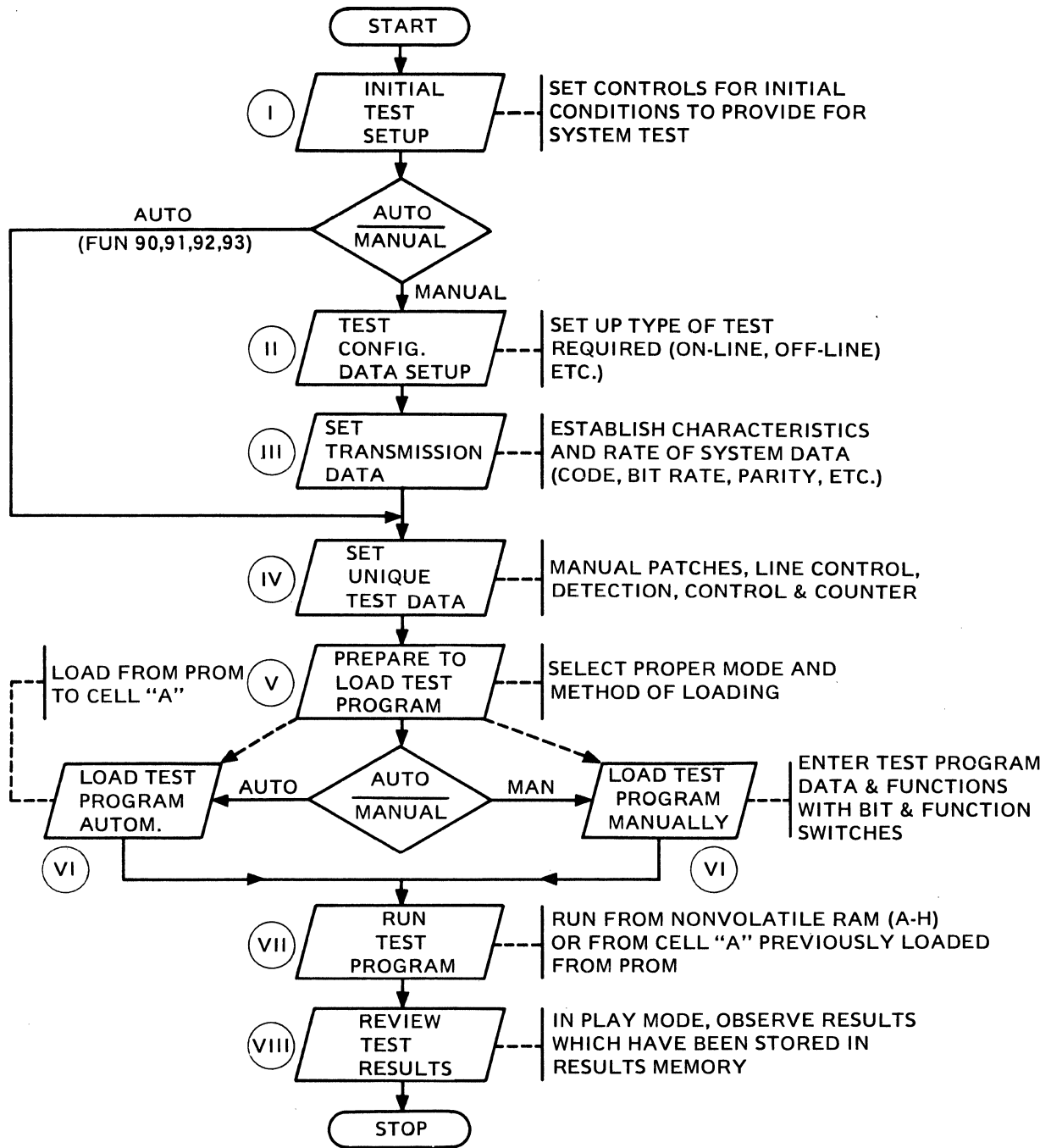


Figure 4-1. Simplified Flow Chart for INTERSHAKE II Operation Sequence.

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PURPOSE OF EXERCISE:

1. To familiarize operator with STEP I of operating procedure.
2. To show control settings which are used initially for all types of test setups.

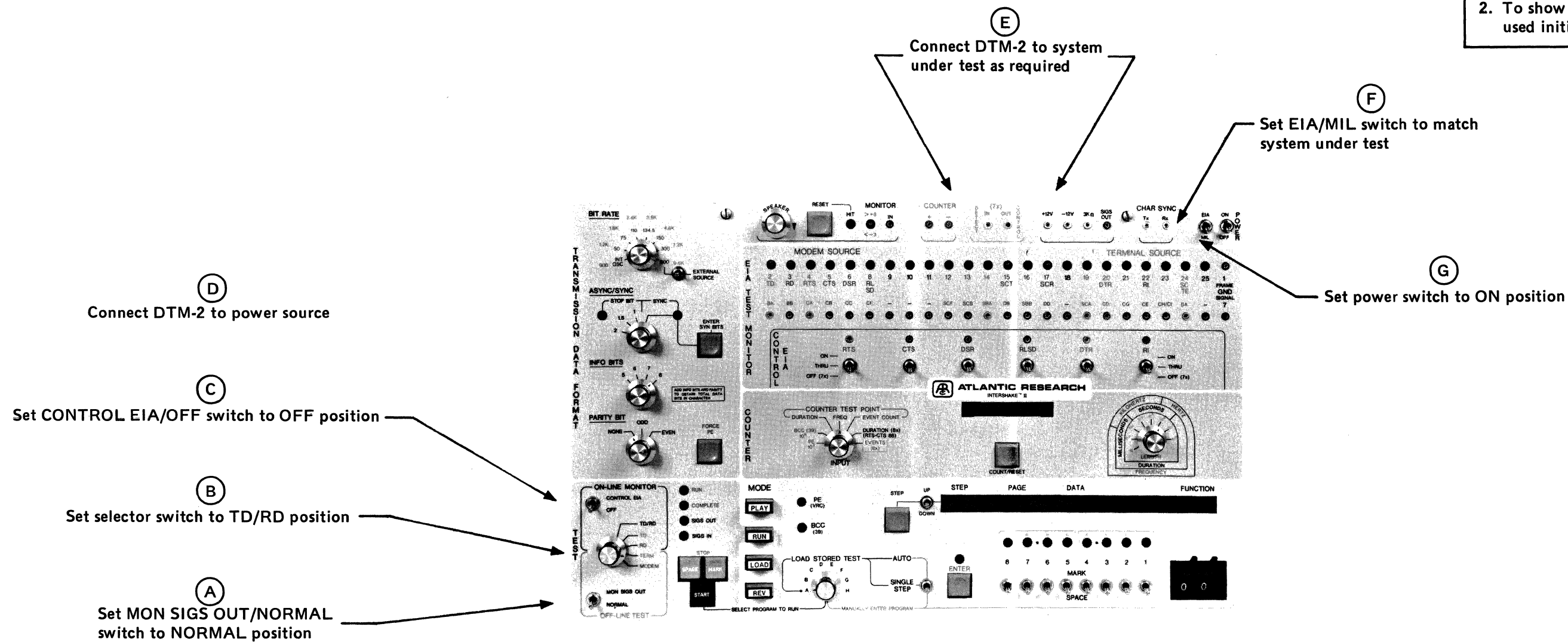


Figure 4-2. Initial Test Setup Exercise.

STEP I

PERFORM INITIAL TEST SETUP

(As shown in Figure 4-2)

- (A) Set MON SIGS OUT/NORMAL switch to NORMAL position
- (B) Set selector switch to TD/RD position
- (C) Set CONTROL EIA/OFF switch to OFF position
- (D) Connect DTM-2 to power source
- (E) Connect DTM-2 to system under test as required
- (F) Set EIA/MIL switch to match system under test.
- (G) Set power switch to ON position

STEP II

TEST CONFIGURATION DATA

Requires no settings for this example. Initial settings can be used.

STEP III

SET TRANSMISSION DATA

- 1. BIT RATE selector to 600.
- 2. Toggle switch to left position.
- 3. SYNC/ASYNC switch to ASYNC; STOP BIT = 1.0.
- 4. INFO BITS switch to 7.
- 5. PARITY BIT switch to ODD.

STEP IV

UNIQUE DATA SETUP

(Not required for this example)

STEP V

PREPARE TO LOAD TEST PROGRAM

- 1. Press LOAD pushbutton
- 2. Select Cell C
- 3. Press STEP pushbutton
- 4. Set toggle switch to MANUALLY ENTER PROGRAM

STEP VI

LOAD PROGRAM SEQUENCE

Use zone 8 controls as shown to enter word. MARK-SPACE switches are set from right to left.

PURPOSE OF EXERCISE:

- 1. To familiarize the operator with the procedure required to load a simple word sequence (H-E-L-L-O) into the INTERSHAKE II nonvolatile memory.

NOTE: The Transmission Data settings are nominally set to 7-bit ASCII, Asynchronous with 1-bit STOP, ODD parity, at 600 Baud.

Steps VII (Run Program) and VIII (Review Results) are not required for this exercise.

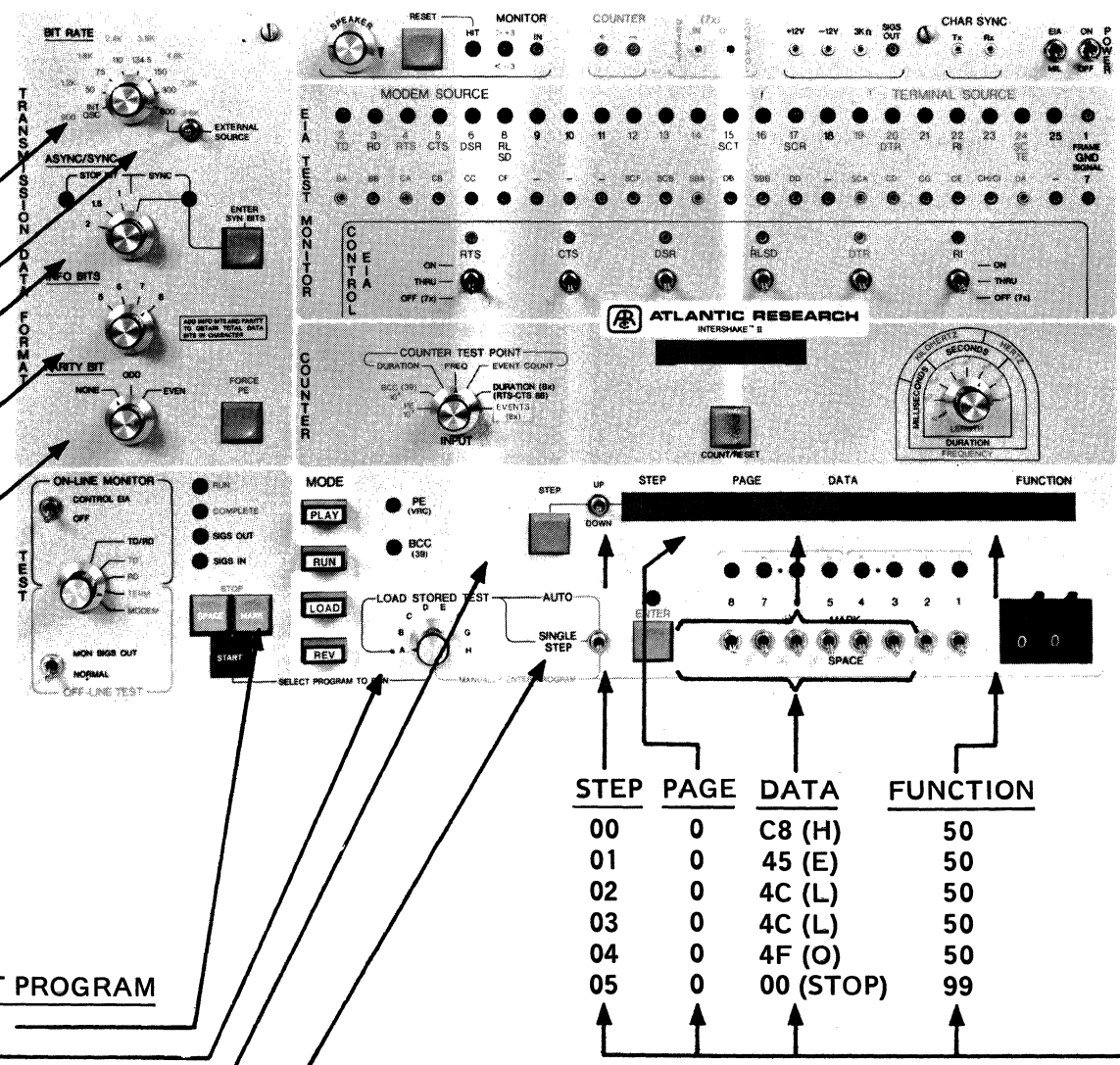


Figure 4-3. Manual Loading Exercise.

STEP I

PERFORM INITIAL TEST SETUP

(As shown in Figure 4-2)

- (A) Set MON SIGS OUT/NORMAL switch to NORMAL position
- (B) Set selector switch to TD/RD position
- (C) Set CONTROL EIA/OFF switch to OFF position
- (D) Connect DTM-2 to power source
- (E) Connect DTM-2 to system under test as required
- (F) Set EIA/MIL switch to match system under test.
- (G) Set power switch to ON position

STEP II

SET TEST CONFIGURATION DATA

- 1. Controls remain the same as set in STEP I.

STEP III

SET TRANSMISSION DATA

- 1. Set selector switch to 1.2K
- 2. Set toggle switch to center position

STEP VII

RUN PROGRAM SEQUENCE

- 1. Press RUN pushbutton
- 2. Press START pushbutton

STEP V

PREPARE TO LOAD PROGRAM

- 1. Press LOAD pushbutton
- 2. Select Cell "A"
- 3. Press STEP pushbutton
- 4. Set toggle switch to MANUALLY ENTER PROGRAM position

STEP IV

SET DATA UNIQUE TO TEST

- 1. Set all EIA CONTROL switches to "OFF (7X)" position.
- 2. Set CONTROL EIA/OFF switch to CONTROL position.

STEP VIII

REVIEW TEST RESULTS

Try setting the TEST SELECTOR SWITCH in all positions. Note the alarm will be on and off at 1/2 second intervals.

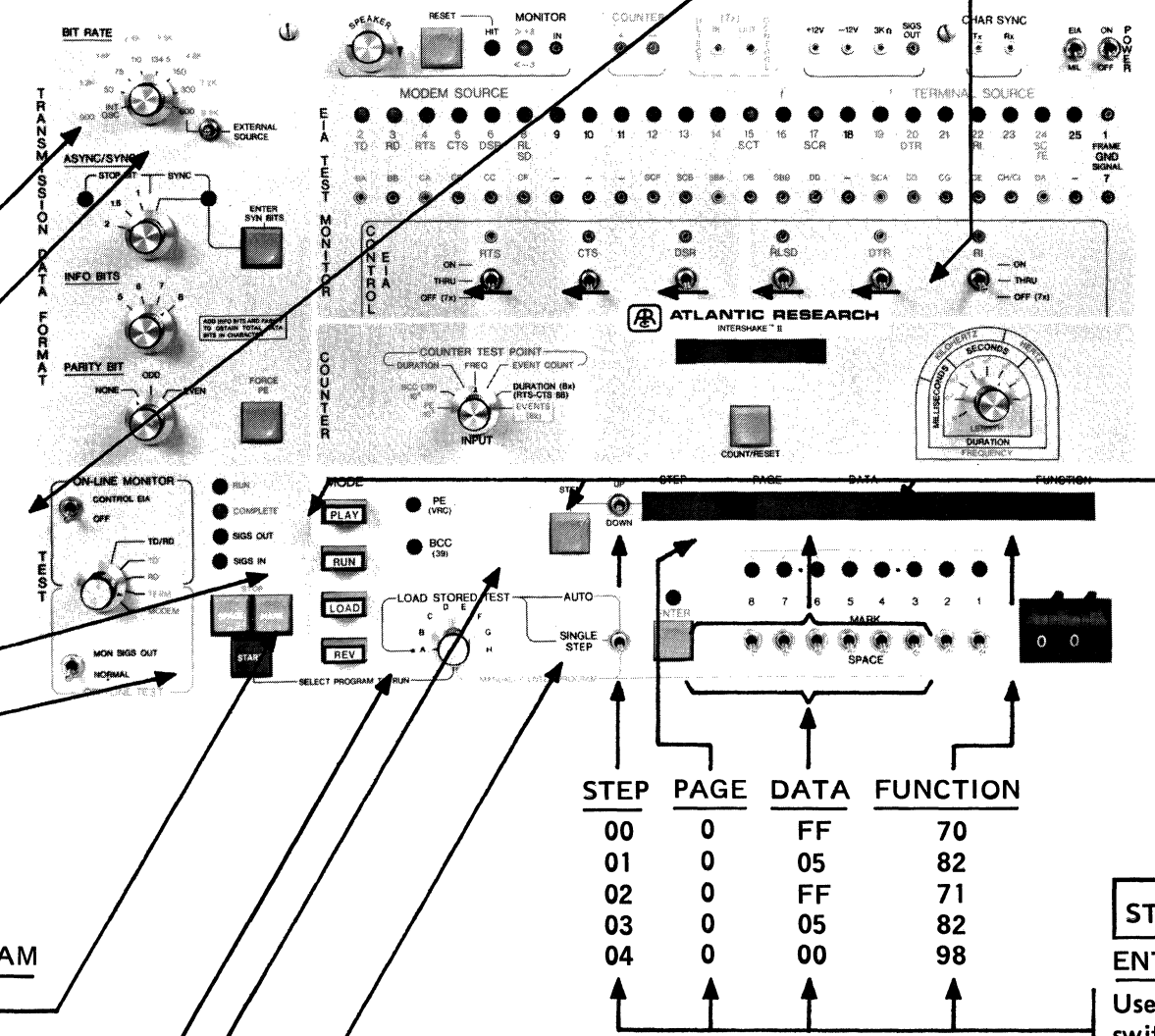
- Case I: a. EIA CONTROL - ON
b. Any TEST SELECTOR position
Results: The following EIA test monitor lights will be flashing, (all controllable leads) RTS, CTS, DSP, RLSD, DTR, RI
- Case II: a. EIA CONTROL - OFF
b. TD, RD or TD/RD selected
Results: None of the monitor lights will flash
- Case III: a. EIA CONTROL - OFF
b. TERM selected
Results: CTS, DSR, RLSD and RI will flash
- Case IV: a. EIA CONTROL - OFF
b. MODEM
Results: RTS and DTR will flash

See Table 2-3, page 2-8 for an explanation of the CONTROL EIA/OFF toggle switch.

STEP VI

ENTER PROGRAM DATA & FUNCTIONS

Use FUNCTION switch and MARK/SPACE switches to enter data and functions. Enter from right to left.



PURPOSE OF EXERCISE:

To increase the operation familiarity with INTERSHAKE II control, and the manual loading procedure and at the same time demonstrate lead control and time generation in a program sequence.

For purposes of this exercise, the Transmission Data is Nominally Set to 1200 Baud.

Figure 4-4. EIA (V.24) Control Lead and Time Generator Exercise.

STEP I

PERFORM INITIAL TEST SETUP

(As shown in Figure 4-2)

- (A) Set MON SIGS OUT/NORMAL switch to NORMAL position
- (B) Set selector switch to TD/RD position
- (C) Set CONTROL EIA/OFF switch to OFF position
- (D) Connect DTM-2 to power source
- (E) Connect DTM-2 to system under test as required
- (F) Set EIA/MIL switch to match system under test.
- (G) Set power switch to ON position

STEP II

SET TEST CONFIGURATION DATA

(Same as STEP 1 above.)

STEP III

SET TRANSMISSION DATA FORMAT

(Not required for this exercise)

STEP IV

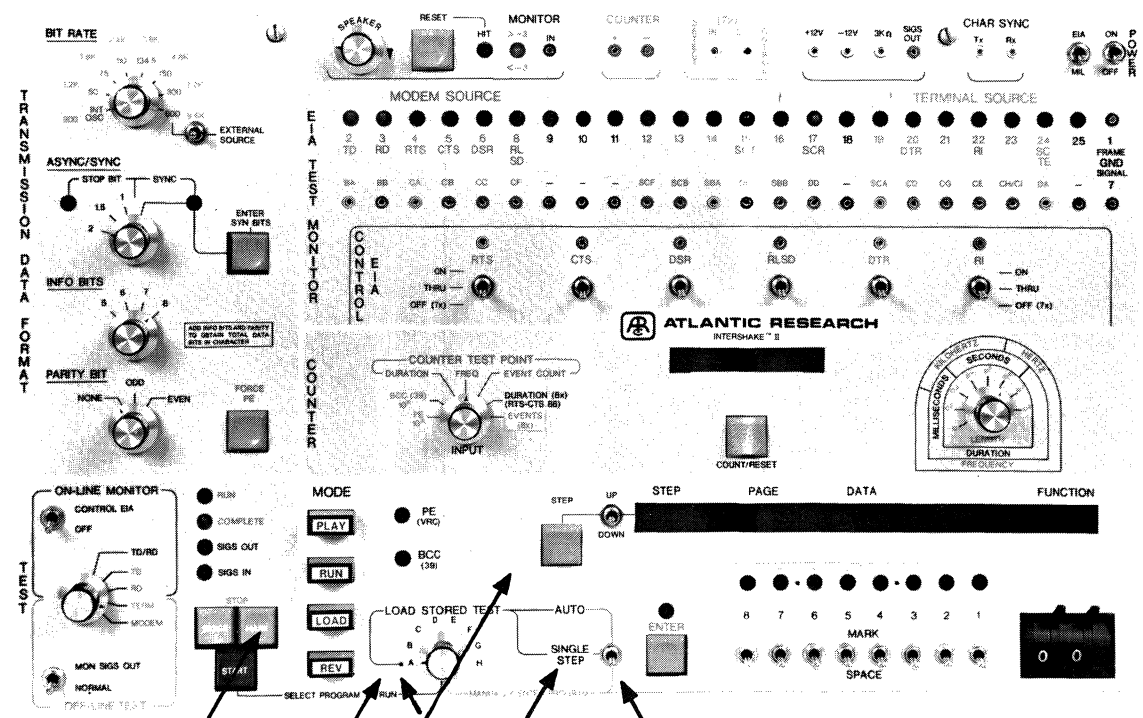
SET DATA UNIQUE TO TEST

(Not required for this exercise)

STEP V

PREPARE TO LOAD PROGRAM

1. Press LOAD pushbutton
2. Set selector switch to position (A-H) where preprogrammed contents are known (PROM)
3. Press STEP pushbutton
4. Set toggle switch up to AUTO position



STEP VI

LOAD PROGRAM SEQUENCE

1. Press ENTER pushbutton (this enters stored program into nonvolatile memory cell "A".)
2. Set selector switch to position A. (Program is now ready to run.)

PURPOSE OF EXERCISE:

To familiarize the operator with the process of loading a program sequence which has been programmed previously into a Stored Test firmware cell (PROM).

For purposes of this exercise, do not consider application of the stored test, i.e., whether or not the AUTO PANEL Functions match the test configuration or whether they are part of the program sequence.

STEP VII

RUN TEST PROGRAM

Not required for this exercise, but could be run by first depressing the RUN pushbutton, then the START pushbutton.

STEP VIII

REVIEW TEST RESULTS

(Not required for this exercise)

Figure 4-5. Automatic Test Program Loading Exercise.

STEP I

PERFORM INITIAL TEST SETUP

(As shown in Figure 4-2)

- (A) Set MON SIGS OUT/NORMAL switch to NORMAL position
- (B) Set selector switch to TD/RD position
- (C) Set CONTROL EIA/OFF switch to OFF position
- (D) Connect DTM-2 to power source
- (E) Connect DTM-2 to system under test as required
- (F) Set EIA/MIL switch to match system under test.
- (G) Set power switch to ON position

STEP IV

SET DATA PECULIAR TO TEST

- 1. Set EIA CONTROL switch for RLSD to "OFF (7X) position. Set all others to THRU position.

STEP III

SET TRANSMISSION DATA FORMAT

- 1. Set selector switch to match terminal bit rate.
- 2. Set toggle switch to left position.
- 3. Set ASYNC/SYNC switch to ASYNC position, 1.5 STOP BIT.
- 4. Set INFO BITS to 5 position.
- 5. Set PARITY BIT switch to NONE position.

STEP II

SET TEST CONFIGURATION DATA

- 1. Set selector switch to TERM (OFF-LINE) position.
- 2. Connect INTERSHAKE II to Terminal, using terminal connector.

STEP VII

RUN TEST PROGRAM

- 1. Depress RUN pushbutton
- 2. Depress START pushbutton
- 3. Observe COMPLETE indicator light when test has run (reached function 99).

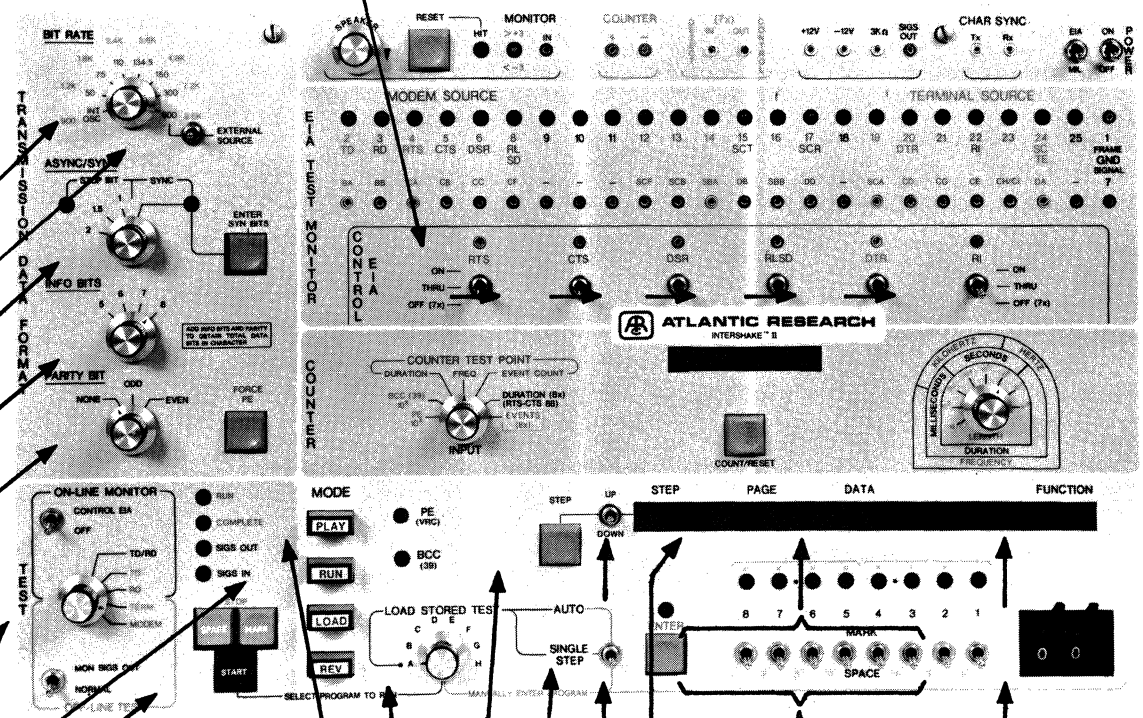
STEP V

PREPARE TO LOAD PROGRAM SEQUENCE

- 1. Depress the LOAD pushbutton
- 2. Select any Storage Cell
- 3. Depress the STEP pushbutton
- 4. Set toggle switch to MANUALLY ENTER PROGRAM

PURPOSE OF EXERCISE:

- 1. To familiarize operator with the process of setting up and transmitting a test message in order to exercise a local terminal, such as a CRT display or TTY Model 33, 35, 37.



STEP VIII

REVIEW TEST RESULTS

- 1. Observe that local terminal has received (printed) the 72 character test message required by function 60.

STEP VI

LOAD PROGRAM SEQUENCE

- 1. Enter the steps of functions and their data by using the Zone 8 controls.
- 2. Refer to function listing (Chapter 3) for explanation of function used.

| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 00 | 0 | 80 | 73 |
| 01 | 0 | 10 | 70 |
| 02 | 0 | 23 | 67 62 |
| 03 | 0 | 00 | 99 |

Figure 4-6. Off-Line Exercise Using a Local Terminal.

STEP I

PERFORM INITIAL TEST SETUP

(As shown in Figure 4-2)

- (A) Set MON SIGS OUT/NORMAL switch to NORMAL position
- (B) Set selector switch to TD/RD position
- (C) Set control EIA/OFF switch to OFF position
- (D) Connect DTM-2 to power source
- (E) Connect DTM-2 to system under test as required
- (F) Set EIA/MIL switch to match system under test.
- (G) Set power switch to ON position

STEP III

SET TRANSMISSION DATA FORMAT

- 1. Set selector switch to 1.8K
- 2. Set toggle switch to center position
- 3. Set ASYNC/SYNC to ASYNC area, 1.0 STEP BIT
- 4. Set INFO BITS switch to 7
- 5. Set PARITY BIT switch to EVEN position

STEP II

SET TEST CONFIGURATION DATA

- 1. Set selector switch to TERM position for OFF-LINE test

STEP VII

RUN TEST PROGRAM

- 1. Depress RUN pushbutton
- 2. Depress START pushbutton
- 3. Observe COMPLETE indicator when test has been run

STEP V

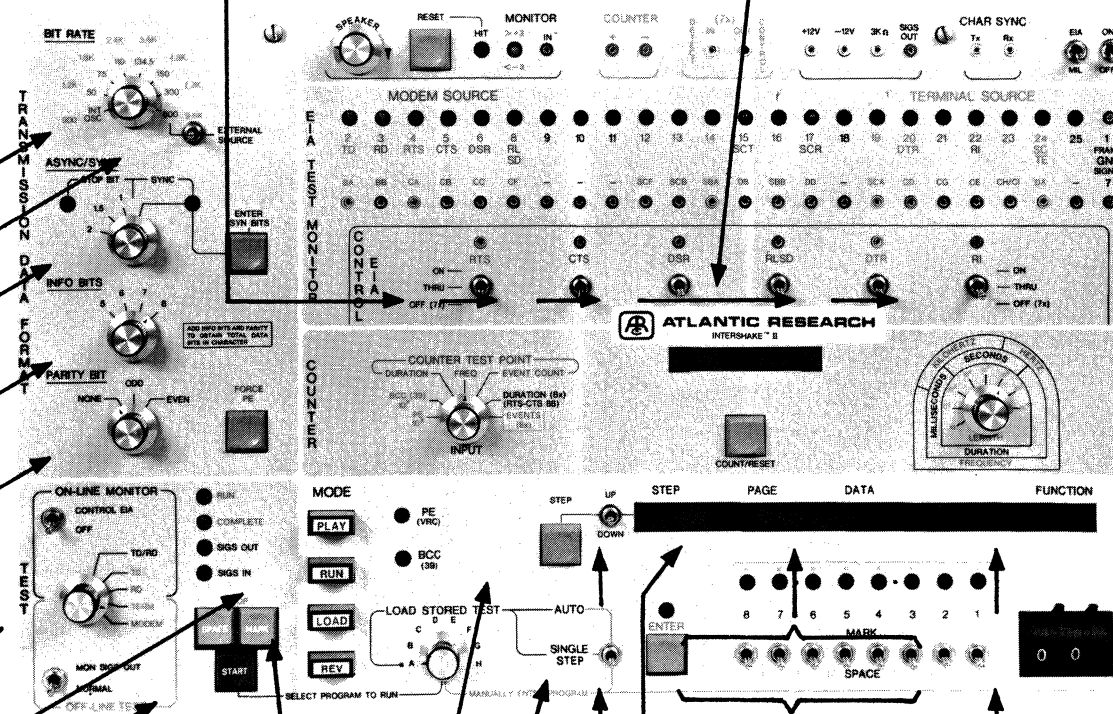
PREPARE TO LOAD PROGRAM SEQUENCE

- 1. Depress LOAD pushbutton
- 2. Depress STEP pushbutton
- 3. Set toggle switch to MANUALLY ENTER PROGRAM position

STEP IV

SET DATA PECULIAR TO TEST

- 1. Set the RLSD EIA CONTROL switch to the OFF(7X) position
- 2. Set all other EIA CONTROL switches to the THRU position



| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 00 | 0 | 80 | 73 |
| 01 | 0 | 00 | 70 |
| 02 | 0 | 00 | 50 |
| 03 | 0 | 05 | 50 |
| 04 | 0 | 42 | 50 |
| 05 | 0 | 20 | 32 |
| 06 | 0 | 00 | 99 |

STEP VI

LOAD PROGRAM SEQUENCE

- 1. Enter steps of function and data by using Zone 8 controls
- 2. Refer to function listing (Chapter 3) for explanation of functions used

PURPOSE OF EXERCISE:

- 1. To familiarize the operator with the procedure required for establishing interaction with a system component.
- 2. To familiarize the operator with Results Memory content after a test has been run, and how to review results.

NOTE: For purposes of this exercise, the system parameters have been set to:

Bit Rate: 1800 Baud, 1-Bit STOP
 Code: 7-Level ASCII
 Parity: EVEN
 Station Address B

STEP VIII

REVIEW TEST RESULTS

When COMPLETE indicator light is on, press the PLAY pushbutton, Zone 4, use the UP/DOWN toggle switch, Zone 7, to review the test results displayed in Zone 7, as follows:

| | | | | |
|----|---|------|----|--------------------|
| 00 | 0 | NULL | 32 | 1st Received Char |
| 01 | 0 | STA | 32 | 2nd Received Char |
| 02 | 0 | STX | 32 | 3rd Received Char |
| 03 | 0 | — | 32 | 4th Received Char |
| 04 | 0 | — | 32 | 5th Received Char |
| 05 | 0 | — | 32 | 6th Received Char |
| 06 | 0 | — | 32 | 7th Received Char |
| 07 | 0 | — | 32 | 8th Received Char |
| 08 | 0 | — | 32 | 9th Received Char |
| 09 | 0 | — | 32 | 10th Received Char |
| 10 | 0 | — | 32 | 11th Received Char |
| 11 | 0 | — | 32 | 12th Received Char |
| 12 | 0 | — | 32 | 13th Received Char |
| 13 | 0 | — | 32 | 14th Received Char |
| 14 | 0 | — | 32 | 15th Received Char |
| 15 | 0 | — | 32 | 16th Received Char |
| 16 | 0 | — | 32 | 17th Received Char |
| 17 | 0 | — | 32 | 18th Received Char |
| 18 | 0 | EOT | 32 | 19th Received Char |
| 19 | 0 | LRC | 32 | 20th Received Char |

Figure 4-7. Off-Line Poll and Record Exercise with Local Asynchronous Terminal.

STEP I

PERFORM INITIAL TEST SETUP

(As shown in Figure 4-2)

- (A) Set MON SIGS OUT/NORMAL switch to NORMAL position
- (B) Set selector switch to TD/RD position
- (C) Set control EIA/OFF switch to OFF position
- (D) Connect DTM-2 to power source
- (E) Connect DTM-2 to system under test as required
- (F) Set EIA/MIL switch to match system under test.
- (G) Set power switch to ON position

STEP VII and **STEP VIII**
(Not required for this exercise)

PURPOSE OF EXERCISE:
To demonstrate set up of the Auto-Panel Functions in a non-volatile cell position.
For purposes of this exercise, the system parameters are as follows:
Bit Rate: 9600 bps, synchronous
Code: EBCDIC
Station Address: "Q"
(or set the Auto-Panel Functions appropriate to a particular configuration as desired).

STEP II

SET TEST CONFIGURATION DATA

No action required. Program functions control this step automatically.

STEP III

SET TRANSMISSION DATA

No action required. Program functions control this step automatically.

STEP IV

SET DATA PECULIAR TO TEST

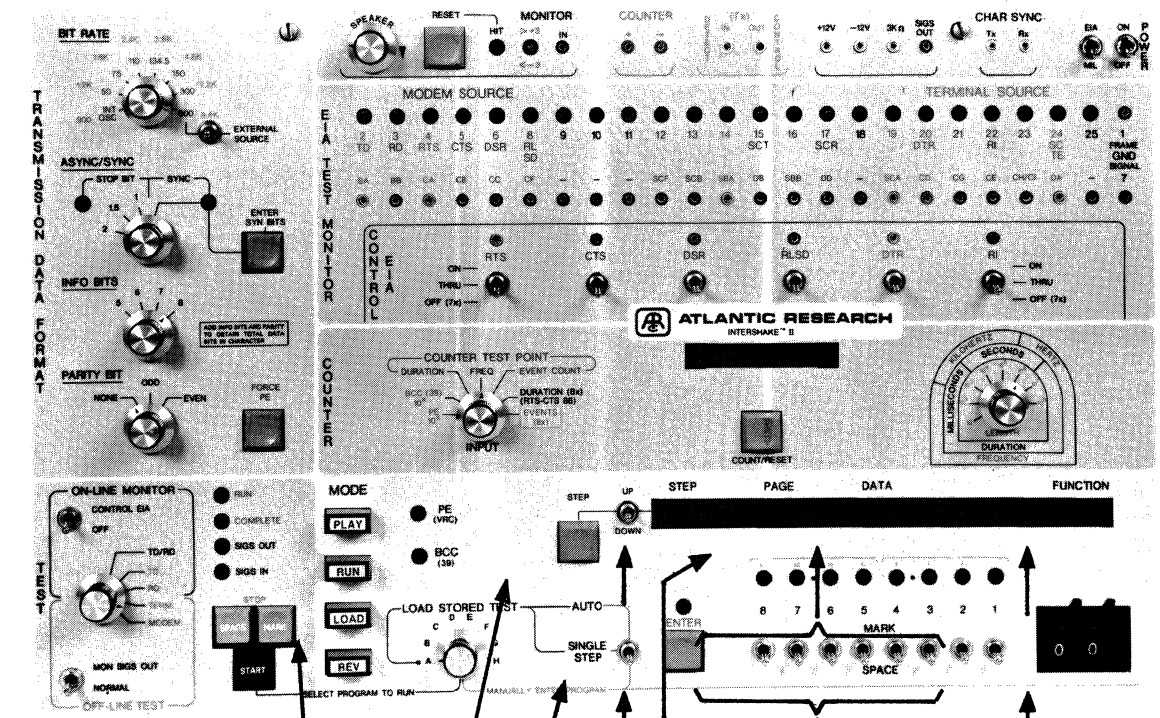
No action required. Program functions control this step automatically.

NOTE: If patching is required for a particular auto-panel set up, patching must be performed each time the test is performed.

STEP V

PREPARE TO LOAD PROGRAM SEQUENCE

1. Depress LOAD pushbutton
2. Depress STEP pushbutton
3. Set toggle switch to MANUALLY ENTER PROGRAM position.



| STEP | PAGE | DATA | FUNCTION |
|------|------|------|----------|
| 00 | 0 | 32 | 90 |
| 01 | 0 | 78 | 91 |
| 02 | 0 | 0F | 92 |
| 03 | 0 | 00 | 93 |

NOTE: This nonvolatile cell position is now ready for entry of any test which has the parameters outlined above. A test would be entered starting at STEP 5 (04). Afterwards, the test may be written over, starting at STEP 5.

STEP VI

LOAD PROGRAM SEQUENCE

1. Enter steps of functions and data by using Zone 8 controls.
2. Refer to function listing (Chapter 3) for explanation of functions used.

Figure 4-8. Storage of Data Into Nonvolatile Memory for Auto Panel Setup.

UNIVERSAL CODE CHART FOR DATA COMMUNICATIONS

| 8-BIT ASCII | | 7-BIT ASCII | | EVEN PARITY ASCII | | ODD PARITY ASCII | | EBCDIC | | 6-BIT TRANSCODE | | 6-BIT TYPESETTER | | EBCD | | PTTC/REV EBCD BINARY C 12 48AB | | PTTC/REV BCD BINARY C 12 8AB | | SELECTRIC BINARY C 12 8AB | | FIELD DATA BINARY HEX | | BAUDOT BINARY HEX | | | |
|-------------|------------|-------------|-----|-------------------|-----|------------------|------------|--------|-----|-----------------|-----|------------------|-------------|--------|-----|--------------------------------|-----|------------------------------|------------|---------------------------|-----|-----------------------|-----|-------------------|------------|---|----------------|
| BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | BINARY | HEX | | |
| A | 11 000 001 | C1 | A | 1 000 001 | 41 | A | 01 000 001 | 41 | A | 11 000 001 | C1 | A | 000 001 | 01 | A | 0100 011 | 23 | A | 00 110 001 | 31 | A | 1 111 001 | 79 | A | 000 110 06 | A | 00 011 03 |
| B | 11 000 010 | C2 | B | 1 000 010 | 42 | B | 01 000 010 | 42 | B | 11 000 010 | C2 | B | 000 010 | 02 | B | 010 011 | 13 | B | 00 110 010 | 32 | B | 1 110 110 | 76 | B | 000 111 07 | B | ? 11 001 19 |
| C | 11 000 011 | C3 | C | 1 000 011 | 43 | C | 11 000 011 | C3 | C | 01 000 011 | C3 | C | 000 011 | 03 | C | 001 110 | 0E | C | 01 110 011 | 73 | C | 1 111 010 | 7A | C | 001 000 08 | C | : 01 110 0E |
| D | 11 000 100 | C4 | D | 1 000 100 | 44 | D | 01 000 100 | 44 | D | 11 000 100 | C4 | D | 000 100 | 04 | D | 001 001 | 09 | D | 00 110 100 | 34 | D | 0 101 010 | 2A | D | 001 001 09 | D | \$ 01 001 09 |
| E | 11 000 101 | C5 | E | 1 000 101 | 45 | E | 11 000 101 | C5 | E | 01 000 101 | C5 | E | 000 101 | 05 | E | 000 001 | 01 | E | 01 110 101 | 75 | E | 1 001 010 | 4A | E | 001 010 0A | E | 3 00 001 01 |
| F | 11 000 110 | C6 | F | 1 000 110 | 46 | F | 11 000 110 | C6 | F | 01 000 110 | C6 | F | 000 110 | 06 | F | 001 101 | 0D | F | 01 110 110 | 76 | F | 1 110 111 | 73 | F | 001 011 0B | F | ! 01 101 0D |
| G | 11 000 111 | C7 | G | 1 000 111 | 47 | G | 01 000 111 | 47 | G | 11 000 111 | C7 | G | 000 111 | 07 | G | 011 010 | 1A | G | 00 110 111 | 37 | G | 0 100 011 | 23 | G | 001 100 0C | G | 8 11 010 1A |
| H | 11 001 000 | C8 | H | 1 001 000 | 48 | H | 01 001 000 | 48 | H | 11 001 000 | C8 | H | 001 000 | 08 | H | 010 100 | 14 | H | 00 111 000 | 38 | H | 0 100 110 | 26 | H | 001 101 0D | H | # 10 100 14 |
| I | 11 001 001 | C9 | I | 1 001 001 | 49 | I | 11 001 001 | C9 | I | 01 001 001 | 49 | I | 001 001 | 09 | I | 000 110 | 06 | I | 01 111 001 | 79 | I | 0 011 001 | 19 | I | 001 110 0E | I | 8 00 110 06 |
| J | 11 001 010 | CA | J | 1 001 010 | 4A | J | 11 001 010 | CA | J | 01 001 010 | 4A | J | 001 011 | 0B | J | 11 001 010 | D1 | J | 00 100 001 | 21 | J | 1 000 011 | 43 | J | 001 111 0F | J | ' 01 011 0B |
| K | 11 001 011 | CB | K | 1 001 011 | 4B | K | 01 001 011 | 4B | K | 11 001 011 | CB | K | 001 111 | 0F | K | 11 010 010 | D2 | K | 01 100 010 | 62 | K | 0 011 010 | 1A | K | 010 000 10 | K | : 01 111 0F |
| L | 11 001 100 | CC | L | 1 001 100 | 4C | L | 11 001 100 | CC | L | 01 001 100 | 4C | L | 010 011 | 12 | L | 010 010 | 12 | L | 00 100 010 | 22 | L | 1 000 110 | 46 | L | 010 001 11 | L |) 10 010 12 |
| M | 11 001 101 | CD | M | 1 001 101 | 4D | M | 01 001 101 | 4D | M | 11 001 101 | CD | M | 010 100 | 14 | M | 011 100 | 1C | M | 01 100 100 | 64 | M | 1 100 001 | 61 | M | 010 010 12 | M | . 11 100 1C |
| N | 11 001 110 | CE | N | 1 001 110 | 4E | N | 01 001 110 | 4E | N | 11 001 110 | CE | N | 010 100 | 15 | N | 001 100 | 0C | N | 00 100 101 | 25 | N | 1 010 010 | 52 | N | 010 011 13 | N | , 01 100 0C |
| O | 11 001 111 | CF | O | 1 001 111 | 4F | O | 01 001 111 | 4F | O | 11 001 111 | CF | O | 010 110 | 16 | O | 011 000 | 18 | O | 00 100 110 | 26 | O | 1 000 101 | 45 | O | 010 100 14 | O | 9 11 000 18 |
| P | 11 010 000 | D0 | P | 1 010 000 | 50 | P | 01 010 000 | 50 | P | 11 010 000 | D0 | P | 010 111 | 17 | P | 010 110 | 16 | P | 01 100 111 | 67 | P | 0 001 011 | 0B | P | 010 101 15 | P | 0 10 110 16 |
| Q | 11 010 001 | D1 | Q | 1 010 001 | 51 | Q | 01 010 001 | 51 | Q | 11 010 001 | D1 | Q | 011 000 | 18 | Q | 010 111 | 17 | Q | 00 101 000 | 68 | Q | 1 011 011 | 5B | Q | 010 110 16 | Q | 1 10 111 17 |
| R | 11 010 010 | D2 | R | 1 010 010 | 52 | R | 01 010 010 | 52 | R | 11 010 010 | D2 | R | 010 011 | 19 | R | 001 010 | 0A | R | 00 101 001 | 29 | R | 0 101 001 | 29 | R | 010 111 17 | R | 4 01 010 0A |
| S | 11 010 011 | D3 | S | 1 010 011 | 53 | S | 01 010 011 | 53 | S | 11 010 011 | D3 | S | 000 101 | 22 | S | 000 101 | 05 | S | 01 010 010 | 52 | S | 0 100 101 | 25 | S | 011 000 18 | S | Bell 00 001 05 |
| T | 11 010 100 | D4 | T | 1 010 100 | 54 | T | 01 010 100 | 54 | T | 11 010 100 | D4 | T | 010 100 | 23 | T | 010 100 | 04 | T | 00 010 011 | 53 | T | 0 000 010 | 02 | T | 011 001 19 | T | 5 10 000 10 |
| U | 11 010 101 | D5 | U | 1 010 101 | 55 | U | 01 010 101 | 55 | U | 11 010 101 | D5 | U | 000 111 | 24 | U | 000 111 | 07 | U | 01 010 100 | 54 | U | 0 110 010 | 32 | U | 010 010 1A | U | 7 00 111 07 |
| V | 11 010 110 | D6 | V | 1 010 110 | 56 | V | 01 010 110 | 56 | V | 11 010 110 | D6 | V | 011 110 | 25 | V | 011 110 | 1E | V | 00 010 101 | 55 | V | 0 110 001 | 15 | V | 011 011 1B | V | ; 11 110 1E |
| W | 11 010 111 | D7 | W | 1 010 111 | 57 | W | 01 010 111 | 57 | W | 11 010 111 | D7 | W | 010 110 | 26 | W | 010 110 | 1F | W | 00 010 110 | 56 | W | 1 110 101 | 75 | W | 011 001 1C | W | 2 10 011 13 |
| X | 11 011 000 | D8 | X | 1 011 000 | 58 | X | 01 011 000 | 58 | X | 11 011 000 | D8 | X | 100 111 | 27 | X | 011 101 | 1D | X | 01 010 111 | 57 | X | 1 100 010 | 62 | X | 011 101 1D | X | / 11 101 1D |
| Y | 11 011 001 | D9 | Y | 1 011 001 | 59 | Y | 01 011 001 | 59 | Y | 11 011 001 | D9 | Y | 101 000 | 28 | Y | 010 101 | 15 | Y | 00 011 000 | 58 | Y | 1 100 111 | 67 | Y | 011 110 1E | Y | 6 10 101 15 |
| Z | 11 011 010 | DA | Z | 1 011 010 | 5A | Z | 01 011 010 | 5A | Z | 11 011 010 | DA | Z | 101 001 | 29 | Z | 010 001 | 11 | Z | 00 011 001 | 59 | Z | 1 010 100 | 54 | Z | 011 111 1F | Z | " 10 001 11 |
| a | 11 100 001 | E1 | a | 1 100 001 | 61 | a | 01 100 001 | 61 | a | 11 100 001 | E1 | a | 10 000 001 | 81 | a | 10 000 001 | 81 | a | 00 100 001 | 60 | a | 1 011 011 | 70 | a | 010 011 11 | a | { 11 111 1F |
| b | 11 100 010 | E2 | b | 1 100 010 | 62 | b | 01 100 010 | 62 | b | 11 100 010 | E2 | b | 010 000 010 | 82 | b | 010 000 010 | 82 | b | 00 010 010 | 61 | b | 1 011 011 | 71 | b | 010 011 12 | b | } 11 111 1F |
| c | 11 100 011 | E3 | c | 1 100 011 | 63 | c | 01 100 011 | 63 | c | 11 100 011 | E3 | c | 10 000 011 | 83 | c | 10 000 011 | 83 | c | 00 011 011 | 62 | c | 1 011 011 | 72 | c | 010 011 13 | c | } 11 111 1F |
| d | 11 100 100 | E4 | d | 1 100 100 | 64 | d | 01 100 100 | 64 | d | 11 100 100 | E4 | d | 010 000 100 | 84 | d | 010 000 100 | 84 | d | 00 010 100 | 63 | d | 1 011 011 | 73 | d | 010 011 14 | d | } 11 111 1F |
| e | 11 100 101 | E5 | e | 1 100 101 | 65 | e | 01 100 101 | 65 | e | 11 100 101 | E5 | e | 10 000 101 | 85 | e | 10 000 101 | 85 | e | 00 011 101 | 64 | e | 1 011 011 | 74 | e | 010 011 15 | e | } 11 111 1F |
| f | 11 100 110 | E6 | f | 1 100 110 | 66 | f | 01 100 110 | 66 | f | 11 100 110 | E6 | f | 10 000 110 | 86 | f | 10 000 110 | 86 | f | 00 011 110 | 65 | f | 1 011 011 | 75 | f | 010 011 16 | f | } 11 111 1F |
| g | 11 100 111 | E7 | g | 1 100 111 | 67 | g | 01 100 111 | 67 | g | 11 100 111 | E7 | g | 10 000 111 | 87 | g | 10 000 111 | 87 | g | 00 011 111 | 66 | g | 1 011 011 | 76 | g | 010 011 17 | g | } 11 111 1F |
| h | 11 101 000 | E8 | h | 1 101 000 | 68 | h | 01 101 000 | 68 | h | 11 101 000 | E8 | h | 10 001 000 | 88 | h | 10 001 000 | 88 | h | 00 011 000 | 67 | h | 1 011 011 | 77 | h | 010 011 18 | h | } 11 111 1F |
| i | 11 101 001 | E9 | i | 1 101 001 | 69 | i | 01 101 001 | 69 | i | 11 101 001 | E9 | i | 10 001 001 | 89 | i | 10 001 001 | 89 | i | 00 011 001 | 68 | i | 1 011 011 | 78 | i | 010 011 19 | i | } 11 111 1F |
| j | 11 101 010 | EA | j | 1 101 010 | 6A | j | 01 101 010 | 6A | j | 11 101 010 | EA | j | 10 010 010 | 91 | j | 10 010 010 | 91 | j | 00 011 010 | 69 | j | 1 011 011 | 79 | j | 010 011 20 | j | } 11 111 1F |
| k | 11 101 011 | EB | k | 1 101 011 | 6B | k | 01 101 011 | 6B | k | 11 101 011 | EB | k | 10 010 010 | 92 | k | 10 010 010 | 92 | k | 00 011 011 | 70 | k | 1 011 011 | 80 | k | 010 011 21 | k | } 11 111 1F |
| l | 11 101 100 | EC | l | 1 101 100 | 6C | l | 01 101 100 | 6C | l | 11 101 100 | EC | l | 10 010 101 | 93 | l | 10 010 101 | 93 | l | 00 011 100 | 71 | l | 1 011 011 | 81 | l | 010 011 22 | l | } 11 111 1F |
| m | 11 101 101 | ED | m | 1 101 101 | 6D | m | 01 101 101 | 6D | m | 11 101 101 | ED | m | 10 010 100 | 94 | m | 10 010 100 | 94 | m | 00 011 101 | 72 | m | 1 011 011 | 82 | m | 010 011 23 | m | } 11 111 1F |
| n | 11 101 110 | EE | n | 1 101 110 | 6E | n | 01 101 110 | 6E | n | 11 101 110 | EE | n | 10 010 101 | 95 | n | 10 010 101 | 95 | n | 00 011 110 | 73 | n | 1 011 011 | 83 | n | 010 011 24 | n | } 11 111 1F |
| o | 11 101 111 | EF | o | 1 101 111 | 6F | o | 01 101 111 | 6F | o | 11 101 111 | EF | o | 10 010 110 | 96 | o | 10 010 110 | 96 | o | 00 011 111 | 74 | o | 1 011 011 | 84 | o | 010 011 25 | o | } 11 111 1F |
| p | 11 110 000 | F0 | p | 1 110 000 | 70 | p | 01 110 000 | 70 | p | 11 110 000 | F0 | p | 10 010 111 | 97 | p | 10 010 111 | 97 | p | 00 011 000 | 75 | p | 1 011 011 | 85 | p | 010 011 26 | p | } 11 111 1F |
| q | 11 110 001 | F1 | q | 1 110 001 | 71 | q | 01 110 001 | 71 | q | 11 110 001 | F1 | q | 10 011 000 | 98 | q | 10 011 000 | 98 | q | 00 011 001 | 76 | q | 1 011 011 | 86 | q | 010 011 27 | q | } 11 111 1F |
| r | 11 110 010 | F2 | r | 1 110 010 | 72 | r | 01 110 010 | 72 | r | 11 110 010 | F2 | r | 10 011 001 | 99 | r | 10 011 001 | 99 | r | 00 011 010 | 77 | r | 1 011 011 | 87 | r | 010 011 28 | r | } 11 111 1F |
| s | 11 110 011 | F3 | s | 1 110 011 | 73 | s | 01 110 011 | 73 | s | 11 110 011 | F3 | s | 10 010 010 | A2 | s | 10 010 010 | A2 | s | 00 011 011 | 78 | s | 1 011 011 | 88 | s | 010 011 29 | s | } 11 111 1F |
| t | 11 110 100 | F4 | t | 1 110 100 | 74 | t | 01 110 100 | 74 | t | 11 110 100 | F4 | t | 10 010 101 | A3 | t | 10 010 101 | A3 | t | 00 011 100 | 79 | t | 1 011 011 | 89 | t | 010 011 30 | t | } 11 111 1F |
| u | 11 110 101 | F5 | u | 1 110 101 | 75 | u | 01 110 101 | 75 | u | 11 110 101 | | | | | | | | | | | | | | | | | |

HEX TO CHARACTER CODE FOR DATA COMMUNICATIONS

| EBCDIC | EVEN PARITY ASCII | ODD PARITY ASCII | 7-BIT ASCII | EBCD | | PTTC/REV EBCD | | PTTC/REV BCD | | SELECTRIC | | EBCDIC | EVEN PARITY ASCII | ODD PARITY ASCII | 7-BIT ASCII | EBCD | | PTTC/REV EBCD | | PTTC/REV BCD | | SELECTRIC | | |
|------------|-------------------|------------------|-------------|------------|-----|---------------|-----|--------------|-----|------------|--------|--------|-------------------|------------------|-------------|------|----|---------------|----|--------------|----|-----------|----|----|
| | | | | UC | LC | UC | LC | UC | LC | UC | LC | | | | | UC | LC | UC | LC | UC | LC | UC | LC | UC |
| 00 NUL | NUL | | 00 NUL | | | | | | | | 40 SP | | @ | 40 @ | | SP | | SP | | | | | SP | |
| 01 SOH | | SOH | 01 SOH | = | 1 | = | 1 | = | 1 | O I | 41 A | A | @ | 41 A | | | | | | | | | | |
| 02 STX | | STX | 02 STX | < | 2 | < | 2 | < | 2 | T t | 42 B | B | | 42 B | | | | | | | | | | |
| 03 ETX | ETX | | 03 ETX | : | 3 | : | 3 | : | 3 | | 43 C | C | | 43 C | | | | | | | | | | |
| 04 PF | | EOT | 04 EOT | * | 4 | * | 4 | * | 4 | \$ 4 | 44 D | D | | 44 D | | | | | | | | | | |
| 05 HT | ENQ | | 05 ENQ | : | 5 | : | 5 | : | 5 | | 45 E | E | | 45 E | | | | | | | | | | |
| 06 LC | ACK | | 06 ACK | : | 6 | : | 6 | : | 6 | | 46 F | F | | 46 F | | | | | | | | | | |
| 07 DEL | | BEL | 07 BEL | H h | > | 7 | > | 7 | > | ? 1 | 47 G | G | | 47 G | | | | | | | | | | |
| 08 RLF | HT | | 08 BS | : | 8 | : | 8 | : | 8 | % 5 | 48 H | H | | 48 H | | | | | | | | | | |
| 09 SMM | LF | | 09 HT |) | |) | |) | | (9 | 49 I | I | | 49 I | | | | | | | | | | |
| 0A VT | | VT | 0A LF | D d | " | # | " | # | " | 0 | 4A J | J | | 4A J | | | | | | | | | | |
| 0B VT | | | 0B VT | " | # | " | # | " | # | 0 | 4B K | K | | 4B K | | | | | | | | | | |
| 0C FF | FF | | 0C FF | " | # | " | # | " | # | 0 | 4C L | L | | 4C L | | | | | | | | | | |
| 0D CR | | CR | 0D CR | RES | RS | | | PN | RS | RES | 4D (| (| | 4D (| | | | | | | | | | |
| 0E SO | | SO | 0E SO | RES | RS | | | PN | RS | RES | 4E + | + | | 4E + | | | | | | | | | | |
| 0F SI | SI | | 0F SI | BYP | UC | | | EOT | UC | BY | 4F O | O | | 4F O | | | | | | | | | | |
| 10 DLE | | DLE | 10 DLE | < | 2 | < | 2 | < | 2 | @ 2 | 50 & | P | | 50 P | | | | | | | | | | |
| 11 DC1 | DC1 | | 11 DC1 | < | 2 | < | 2 | < | 2 | @ 2 | 51 Q | Q | | 51 Q | | | | | | | | | | |
| 12 DC2 | DC2 | | 12 DC2 | < | 2 | < | 2 | < | 2 | @ 2 | 52 R | R | | 52 R | | | | | | | | | | |
| 13 DC3 | | DC3 | 13 DC3 | B b | T t | T t | T t | T t | T t | + - | 53 S | S | | 53 S | | | | | | | | | | |
| 14 RES | DC4 | | 14 DC4 | | | | | | | | 54 T | T | | 54 T | | | | | | | | | | |
| 15 NL | | NAK | 15 NAK | V v | v v | V v | v v | V v | v v | | 55 U | U | | 55 U | | | | | | | | | | |
| 16 BS | | SYN | 16 SYN | W w | w w | W w | w w | W w | w w | | 56 V | V | | 56 V | | | | | | | | | | |
| 17 IL | ETB | | 17 ETB | | | | | | | | 57 W | W | | 57 W | | | | | | | | | | |
| 18 CAN | CAN | | 18 CAN | O o | Z z | Z z | Z z | Z z | Z z | | 58 X | X | | 58 X | | | | | | | | | | |
| 19 EM | | EM | 19 EM | W w | | | | | | | 59 Y | Y | | 59 Y | | | | | | | | | | |
| 1A CC | | SUB | 1A SUB | | | | | | | | 5A Z | Z | | 5A Z | | | | | | | | | | |
| 1B ESC | ESC | | 1B ESC | | | | | | | | 5B [| [| | 5B [| | | | | | | | | | |
| 1C IFS | | FS | 1C FS | UPPER CASE | BYP | | | BYP | | UPPER CASE | 5C * | * | | 5C * | | | | | | | | | | |
| 1D IGS | GS | | 1D GS | | | | | | | | 5D] |] | | 5D] | | | | | | | | | | |
| 1E IRS | RS | | 1E RS | | | | | | | | 5E ^ | ^ | | 5E ^ | | | | | | | | | | |
| 1F IUS | | US | 1F US | LOWER CASE | PRE | | | PRE | | LOWER CASE | 5F _ | _ | | 5F _ | | | | | | | | | | |
| 20 DS | ! | SP | 20 SP | = | 1 | = | 1 | = | 1 | [z] 1 | 60 - | - | | 60 - | | | | | | | | | | |
| 21 SOS | " | | 21 ! | | | | | | | | 61 / | / | | 61 / | | | | | | | | | | |
| 22 FS | | | 22 " | | | | | | | | 62 b | b | | 62 b | | | | | | | | | | |
| 23 | | # | 23 # | A a | L l | L l | L l | L l | L l | G g | 63 c | c | | 63 c | | | | | | | | | | |
| 24 BYP | \$ | | 24 \$ | | | | | | | | 64 d | d | | 64 d | | | | | | | | | | |
| 25 LF | | % | 25 % | R r | N n | N n | N n | N n | N n | S s | 65 e | e | | 65 e | | | | | | | | | | |
| 26 EOB/ETB | | & | 26 & | Z z | O o | O o | O o | O o | O o | H h | 66 f | f | | 66 f | | | | | | | | | | |
| 27 ESC/PRE | | | 27 | | | | | | | | 67 g | g | | 67 g | | | | | | | | | | |
| 28 | (|) | 28 (| | | | | | | | 68 h | h | | 68 h | | | | | | | | | | |
| 29 |) | | 29) | N n | R r | R r | R r | R r | R r | D d | 69 i | i | | 69 i | | | | | | | | | | |
| 2A SM | * | | 2A * | V v | | | | | | | 6A j | j | | 6A j | | | | | | | | | | |
| 2B | + | | 2B + | | | | | | | | 6B k | k | | 6B k | | | | | | | | | | |
| 2C | | | 2C | RS | RES | | | RES | RS | | 6C l | l | | 6C l | | | | | | | | | | |
| 2D ENQ | - | | 2D - | | | | | | | | 6D m | m | | 6D m | | | | | | | | | | |
| 2E ACK | | | 2E | | | | | | | | 6E n | n | | 6E n | | | | | | | | | | |
| 2F BEL | / | | 2F / | HT | IL | | | IL | HT | | 6F o | o | | 6F o | | | | | | | | | | |
| 30 | 0 | 1 | 30 0 | : | 3 | : | 3 | : | 3 | | 70 p | p | | 70 p | | | | | | | | | | |
| 31 | | 2 | 31 1 | L l | A a | A a | A a | A a | A a | V v | 71 q | q | | 71 q | | | | | | | | | | |
| 32 SYN | | 3 | 32 2 | T t | B b | B b | B b | B b | B b | U u | 72 r | r | | 72 r | | | | | | | | | | |
| 33 | | 4 | 33 3 | " | # | " | # | " | # | | 73 s | s | | 73 s | | | | | | | | | | |
| 34 PN | | 5 | 34 4 | " | # | " | # | " | # | | 74 t | t | | 74 t | | | | | | | | | | |
| 35 RS | | 6 | 35 5 | | | | | | | | 75 u | u | | 75 u | | | | | | | | | | |
| 36 UC | | 7 | 36 6 | | | | | | | | 76 v | v | | 76 v | | | | | | | | | | |
| 37 EOT | | 8 | 37 7 | | | | | | | | 77 w | w | | 77 w | | | | | | | | | | |
| 38 | | 9 | 38 8 | > | 7 | > | 7 | > | 7 | * | 8 | x | | 78 x | | | | | | | | | | |
| 39 | : | | 39 9 | | | | | | | | 79 \ | \ | | 79 \ | | | | | | | | | | |
| 3A | | | 3A : | G g | | | | | | | 7A z | z | | 7A z | | | | | | | | | | |
| 3B | | | 3B ; | | | | | | | | 7B # | # | | 7B # | | | | | | | | | | |
| 3C DC4 | < | | 3C < | | | | | | | | 7C @ | @ | | 7C @ | | | | | | | | | | |
| 3D NAK | | > | 3D > | IL | HT | | | PF | HT | IL | 7D ~ | ~ | | 7D ~ | | | | | | | | | | |
| 3E | | | 3E | PRE | LC | | | LC | PRE | | 7E = | = | | 7E = | | | | | | | | | | |
| 3F SUB | | | 3F ? | | | | | | | | 7F DEL | DEL | | 7F DEL | | | | | | | | | | |

| EBCDIC | EVEN PARITY ASCII | ODD PARITY ASCII | 8-BIT ASCII | EBCDIC | EVEN PARITY ASCII | ODD PARITY ASCII | 8-BIT ASCII | FIELD DATA | 6-BIT TYPESETTER | | 6-BIT TRANSCODE | BAUDOT | |
|--------|-------------------|------------------|-------------|--------|-------------------|------------------|-------------|------------|------------------|---------|-----------------|--------|------|
| | | | | | | | | | SHIFT | UNSHIFT | | LTRS | FIGS |
| 80 | | NUL | NUL | C0 { | @ | | | 00 | | | SOH | | |
| 81 a | SOH | | SOH | C1 A | A | | | 01 & | E | e | A | E | 3 |
| 82 b | STX | | STX | C2 B | B | | | 02 ^ | ELEVATE | | B | LF | |
| 83 c | | ETX | ETX | C3 C | C | | | 03 | A | a | C | A | |
| 84 d | | EOT | EOT | C4 D | D | | | 04 | SPACE | | D | SP | |
| 85 e | | ENQ | ENQ | C5 E | E | | | 05 SP | S | s | E | S | BEL |
| 86 f | | ACK | ACK | C6 F | F | | | 06 A | I | i | F | I | 8 |
| 87 g | BEL | | BEL | C7 G | G | | | 07 B | U | u | G | U | 7 |
| 88 h | BS | | BS | C8 H | H | | | 08 C | RETURN | | H | CR | |
| 89 i | | HT | HT | C9 I | I | | | 09 D | D | d | I | D | \$ |
| 8A | | LF | LF | CA | J | | | 0A E | R | r | J | R | 4 |
| 8B | VT | | VT | CB | K | | | 0B F | J | j | K | J | |
| 8C | | FF | FF | CC | L | | | 0C G | N | n | L | N | |
| 8D | CR | | CR | CD | M | | | 0D H | F | f | M | F | |
| 8E | SO | | SO | CE | N | | | 0E I | C | c | N | C | |
| 8F | | SI | SI | CF | O | | | 0F J | K | k | O | K | |
| 90 | DLE | | DLE | D0 { | P | | | 10 K | T | t | P | T | 5 |
| 91 j | | DC1 | DC1 | D1 J | Q | | | 11 L | Z | z | Q | Z | " |
| 92 k | | DC2 | DC2 | D2 K | R | | | 12 M | L | l | R | L | |
| 93 l | DC3 | | DC3 | D3 L | S | | | 13 N | W | w | S | W | 2 |
| 94 m | | DC4 | DC4 | D4 M | T | | | 14 O | H | h | T | H | # |
| 95 n | NAK | | NAK | D5 N | U | | | 15 P | Y | y | U | Y | 6 |
| 96 o | SYN | | SYN | D6 O | V | | | 16 Q | P | p | V | P | 0 |
| 97 p | | ETB | ETB | D7 P | W | | | 17 R | Q | q | W | Q | 1 |
| 98 q | | CAN | CAN | D8 Q | X | | | 18 S | O | o | X | O | 9 |
| 99 r | EM | | EM | D9 R | Y | | | 19 T | B | b | Y | B | 7 |
| 9A | SUB | | SUB | DA | Z | | | 1A U | G | g | Z | G | 8 |
| 9B | | ESC | ESC | DB | | | | 1B V | SHIFT | | | | FIGS |
| 9C | FS | | FS | DC | | | | 1C W | M | m | | M | |
| 9D | | GS | GS | DD | | | | 1D X | X | x | | X | / |
| 9E | | RS | RS | DE | | | | 1E Y | V | v | | V | |
| 9F | US | | US | DF | | | | 1F Z | UNSHIFT | | | DLE | LTRS |
| A0 | SP | | SP | E0 \ | | | | 20 | THIN SPACE | | | | |
| A1 ~ | | | | E1 | a | | | 21 - | 3 | / | | | |
| A2 s | | | | E2 S | b | | | 22 + | PF | | S | | |
| A3 t | # | | # | E3 T | c | | | 23 < | ! | \$ | T | | |
| A4 u | | \$ | \$ | E4 U | d | | | 24 = | ADD THIN SPACE | | U | | |
| A5 v | % | | % | E5 V | e | | | 25 > | EM SPACE | | V | | |
| A6 w | & | | & | E6 W | f | | | 26 # | 8 | W | | | |
| A7 x | | | | E7 X | g | | | 27 \$ | 7 | X | | | |
| A8 y | | | | E8 Y | h | | | 28 * | V | v | Y | | |
| A9 z | | | | E9 Z | i | | | 29 (| @ | - | Z | | |
| AA | * | | * | EA | j | | | 2A % | 4 | ESC | | | |
| AB | | | | EB | k | | | | | | | | |

INTERSHAKE II FUNCTION LIST

THESE FUNCTIONS CAN BE COMBINED IN ANY ORDER TO SIMULATE OR TEST DATA COMMUNICATION SYSTEMS AND EQUIPMENT.

NOTE: The "Bit Entry Method" shown in the following Table is All Space, Mark/Space, BCD, Binary or "XY". No method is shown where a language character is to be entered. When a character must be entered, the user should utilize the method familiar to him, i.e., HEX, Octal, Bit Switch arrangement, etc.

| LOAD INTO MEMORY | | | | | | | | READ OUTCOME IN RESULTS MEMORY (when applicable) | | |
|------------------|---|---|-----------------------------|------------------|---------------------|---------|--------------------------|---|---|------------------|
| GROUP | FUNCTION | DESCRIPTION | ENTER | BIT ENTRY METHOD | BIT SWITCH POSITION | | DATA HEX DISPLAY (Range) | DATA HEX DISPLAY (Range) | ITEM REPRESENTED | FUNCTION |
| HALT | 00 | Stop Program, Operate Step To Continue | 00 | All Space | SSSS | SSSS | 00 | - | - | - |
| MONITOR | 01 | Start Character Search | 00 | All Space | SSSS | SSSS | 00 | - | - | - |
| | 02 | Trap Characters On TD Only | Character | | | | 00-FF | 00-FF | Character | 02 |
| | 03 | Trap Characters On RD Only | " | | | | " | " | " | 03 |
| | 04 | Trap Characters On TD or RD | " | | | | " | " | " | 02(TD) or 03(RD) |
| | 05 | End Character Search | 00 | All Space | SSSS | SSSS | 00 | " | " | - |
| RECORD | 07 | Record Bit Switch Arrangement Entered | Desired Tab Mark | Mark/Space | As | Desired | 00-FF | 00-FF | Tab Mark/Space | 07 |
| | 08 | Record Loop "L" Count (See Fun 42 & 43) | 00 | All Space | SSSS | SSSS | 00 | 00-0F | No. of Loops (in BCD) | 08 |
| | 09 | Record Interrupt Step | " | " | " | " | " | 00-FF | Step (in Binary) | 09 |
| RECEIVE | #10 | Wait Until TD/RD Change | 00 | All Space | SSSS | SSSS | 00 | - | - | - |
| | #11 | Record Until TD/RD Change | " | " | " | " | " | 00-FF | Character | 11 |
| | 12 | Record TD/RD and RS-232(V.24) Status | " | " | " | " | " | " | (Continues until TD/RD change) | 02(TD) or 03(RD) |
| INDEX | #13 | Time Out or TD/RD Change | 01-99 (for 0.1 to 9.9 Sec.) | BCD | 80 40 20 10 | 8 4 2 1 | 01-99 | - | - | - |
| | 14 | Wait N Received Characters | No. of Characters | " | " | " | " | - | - | - |
| | 15 | Wait To Complete Transmit Character (Must be used with Function 57 when in synchronous operation) | 00 | All Space | SSSS | SSSS | 00 | - | - | - |
| | 16 | Wait Until = Character | Character | " | " | " | 00-FF | - | - | - |
| | 17 | Wait Until ≠ Character | " | " | " | " | " | - | - | - |
| | 19 | Enter Interrupt Character (Enable with Function 97 (03)) | " | " | " | " | " | - | - | - |
| | # | The Test Selector Switch must be in the TD/RD position. | | | | | | | | |
| TRAP | 20 | Trap Character | Character | | | | 00-FF | 00-FF | Character | 20 |
| | 21 | Trap First Character in Sequence | " | | | | " | " | " | 21 |
| | 22 | Trap Middle Character(s) in Sequence | " | | | | " | " | " | 22 |
| | 23 | Trap Last Character in Sequence | " | | | | " | " | (Continues until Trap Last Character) | 23 |
| RECORD | 25 | Record Until Trap Character | Trap Character | | | | " | " | Any Character | 25 |
| | 26 | Record Next ≠ Character | = Character | | | | " | " | (Continues until Trap Character) | 25 |
| | 30 | Record Next Character | 00 | All Space | SSSS | SSSS | 00 | 00-FF | Trap Character | 26 |
| | 31 | Record Character N | Character No. | BCD | " | " | 01-99 | " | Character | 30 |
| | 32 | Record N Characters | No. of Characters | " | " | " | " | " | " | 31 |
| | | | | | | | | | (Continues until Nth Character is recorded) | 32 |
| | 33 | Record Character Before Trap | Trap Character | | | | 00-FF | 00-FF | Character -1 | 33 |
| | *34 | Jump and Record PE | 00 | All Space | SSSS | SSSS | 00 | " | PE Character | 34 |
| | 35 | Record Latch Mode | | | | | | | | |
| | | Normal OFF | 00 | All Space | SSSS | SSSS | 00 | - | - | - |
| | | Record Receive Data | 01 | BCD | SSSM | | 01 | 00-FF | Character | Undefined |
| | | Self Monitor | 02 | " | " | SSMS | 02 | - | - | - |
| | Record All Transmit Data | 03 | " | " | SSMM | 03 | 00-FF | Character | Undefined | |
| 36 | Record Current Character | 00 | All Space | " | SSSS | 00 | 00-FF | (Continues until turned OFF by 35(00)) | 36 | |
| | * Preceded by Function 41 for Jump Instruction. ° This Function is latched into Memory and must be restored to Normal OFF (00) at the point in the program sequence where it is desired that subsequent Functions not be effected. | | | | | | | | | |

INTERSHAKE II FUNCTION LIST

(Continued)

| LOAD INTO MEMORY | | | | | | | READ OUTCOME IN RESULTS MEMORY (when applicable) | | | | | | | | | |
|---------------------|-------------------------------------|--|--------------|------------------|---------------------|----------|---|--------------------------|----------------------------|----------|---|-------|-------|--|--|--|
| GROUP | FUNCTION | DESCRIPTION | ENTER | BIT ENTRY METHOD | BIT SWITCH POSITION | | DATA HEX DISPLAY (Range) | DATA HEX DISPLAY (Range) | ITEM REPRESENTED | FUNCTION | | | | | | |
| RECEIVE (cont'd) | 38 | Start BCC | | XY | X | | | | | | | | | | | |
| | | Define "X" for: | | | 8 4 2 1 | | Y | | | | | | | | | |
| | | Normal calculation of CRC and EVEN LRC | 0- | | SSSS | | 8 4 2 1 | | | | | | | | | |
| | | Inverted data for calculation of CRC and ODD | 1- | | SSSM | | | | 00-08 | | | | | | | |
| | | Define "Y" for: | | | | | | | 10-18 | | | | | | | |
| | | EBCDIC/CRC-16 | -0 | | | | | SSSS | 00 or 10 | | | | | | | |
| | | CRC-16 Reverse | -1 | | | | | SSSM | 01 or 11 | | | | | | | |
| | | Old IBM | -2 | | | | | SSMS | 02 or 12 | | | | | | | |
| | CRC-12 | -3 | | | | SSMM | 03 or 13 | | | | | | | | | |
| | CCI TT/SDLC-CRC | -6 | | | | SMMS | 06 or 16 | | | | | | | | | |
| CCI TT/CRC Reverse | -7 | | | | SMMM | 07 or 17 | | | | | | | | | | |
| LRC (6, 7, 8 Level) | -8 | | | | MSSS | 08 or 18 | | | | | | | | | | |
| *39 | Jump If = BCC Error | | | BCD | | | | | | | | | | | | |
| | Jump on Error | 00 | | | SSSS | SSSS | 00 | | | | | | | | | |
| | Jump and Record on Error | 01 | | " | " | SSSM | 01 | 00-FF | LRC Character | 39 | | | | | | |
| | | | | | | | | or | | | | | | | | |
| | | | | | | | | 00-FF | CRC ₁ Character | 39 | | | | | | |
| | * | Preceded by Function 41 for Jump Instruction. | | | | | | 00-FF | CRC ₂ Character | 39 | | | | | | |
| JUMP AND TEST | 40 | Unconditional Jump to Program Step XY | Step No. | Binary | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 | 00-FF | | | |
| | 41 | Preset to Instruct Subsequent "Jump(s)" to Jump to Step "XY" | | " | " | " | " | " | " | " | " | " | " | | | |
| | 42 | Repeat (Loop) "L" Times | No. of Loops | BCD | 80 | 40 | 20 | 10 | 8 | 4 | 2 | 1 | 01-99 | | | |
| | *43 | Jump Until "L" Loops | 00 | All Space | SSSS | SSSS | | | | | | | 00 | | | |
| | *44 | Jump If = Character | Character | " | | | | | | | | | 00-FF | | | |
| | *45 | Jump If ≠ Character | " | | | | | | | | | | " | | | |
| | *46 | Retest and Jump If = Character | " | | | | | | | | | | " | | | |
| | *47 | Flags: Set and Jump | | | XY | | | | | | | | | | | |
| | | Define "X" for: | | | | | | | | | | | | | | |
| | | Eight Settable and Testable Flags | 0- | | | SSSS | | | | | | | 00-03 | | | |
| | | | 1- | | | SSSM | | | | | | | 10-13 | | | |
| | | | 2- | | | SSMS | | | | | | | 20-23 | | | |
| | | | 3- | | | SSMM | | | | | | | 30-33 | | | |
| | | | 4- | | | SMSS | | | | | | | 40-43 | | | |
| | | | 5- | | | SMMS | | | | | | | 50-53 | | | |
| | | | 6- | | | SMMS | | | | | | | 60-63 | | | |
| | | | 7- | | | SMMM | | | | | | | 70-73 | | | |
| | | Define "Y" for: | | | | | | | | | | | | | | |
| | | Eight Selectable and Testable Flags | -0 | | | | | | | | | | 00-70 | | | |
| | | Set Flag to 0 | -1 | | | | | | | | | | SSSS | | | |
| | Set Flag to 1 | -2 | | | | | | | | | | SSSM | | | | |
| | Jump If = 0 | -3 | | | | | | | | | | SSMS | | | | |
| | Jump If = 1 | | | | | | | | | | | SSMM | | | | |
| | Define "X" for: | | | | | | | | | | | | | | | |
| | Internal Signals (Jump Only) | | | | | | | | | | | | | | | |
| | Memory Overflow | 8- | | | MSSS | | | | | | | 82,83 | | | | |
| | Parity Error | 9- | | | MSSM | | | | | | | 92,93 | | | | |
| | Overflow Counter (on Front Panel) | A- | | | MSMS | | | | | | | A2,A3 | | | | |
| | END Counter (on Front Panel) | B- | | | MSMM | | | | | | | B2,B3 | | | | |
| | Timeout (Function 84 Presets Timer) | C- | | | MMSS | | | | | | | C2,C3 | | | | |
| | Out of Sync | D- | | | MMMS | | | | | | | D2,D3 | | | | |
| | Frame Detect (SDLC) | E- | | | MMMS | | | | | | | E2,E3 | | | | |
| | SDLC BCC Error | F- | | | MMMM | | | | | | | F2,F3 | | | | |
| | Define "Y" for: | | | | | | | | | | | | | | | |
| | Internal Signals (Jump Only) | | | | | | | | | | | | | | | |
| | Jump If = 0 | -2 | | | | | | | | | | SSMS | | | | |
| | Jump If = 1 | -3 | | | | | | | | | | SSMM | | | | |
| | * | Functions 43 through 47 must be preceded by Function 41 for Jump Instructions. | | | | | | | | | | | | | | |

NOTE: Results Memory is not applicable for Functions 40 through 99 (except for 89). However, this column space is continued for the purpose of:

REMARKS AND USERS NOTES

Binary Address 0-255
Binary Address 0-255

Functions 43 through 47 must be preceded by Function 41 for "Jump To" Instructions.

The "X" digit is used to select Flag 0 through Flag 7. All Flags are reset cleared to "0" by the start switch. Once selected, the Flag is set or tested as determined by the "Y" digits 0, 1, 2 or 3 (see below).

All "Y" digits 1 through 3 are applicable to "X" digits 1 through 7.

The "X" digit selects one of eight fixed assigned signals. Once selected, the Flag is provided Jump Instructions as determined by the "Y" digits 2 and 3 (see below).

Only the "Y" digits 2 and 3 are applicable to "X" digits 8 through F.

INTERSHAKE II FUNCTION LIST

(Continued)

| LOAD INTO MEMORY | | | | | | | REMARKS AND USERS NOTES | | | | |
|---|---|--|---|------------------|----------------------|--------------------------|---|--|---|-----|-----|
| GROUP | FUNCTION | DESCRIPTION | ENTER | BIT ENTRY METHOD | BIT SWITCH POSITION | DATA HEX DISPLAY (Range) | | | | | |
| RESULTS MEMORY | 48 | Select Results Memory Step | Step No. | Binary | 126 64 32 16 8 4 2 1 | 00-3F | Binary Address 0-63 | | | | |
| | 49 | Select Results Memory Page and Step 00 | Page No. | " | SSSS | 00-0F | | Binary Address 0-15 | | | |
| TRANSMIT | 50 | Send Character | Character | XY | X Y | 00-FF | Must be used in a program containing a loop using Functions 41, 42 and 43 in order to generate the incrementing action. | | | | |
| SEND DATA | 51 | Send a Progression High order "X" digit bits are used to position the sequence in the alpha or numeric field of the desired code. The amount of Progression is obtained from incrementing action provided by Functions 41, 42 and 43. | 0-F for "X" All Space for "Y" | " | 8 4 2 1 SSSS | 00-FF | | Although "All Space" is set in for the low order "Y" digits, the information actually transmitted for "Y" is a Hex ("Y") representation of the increment number obtained from the Loop Counter, Function 43. | | | |
| | SEND FROM RM | 52 | Send Single Results Memory (RM) Character | 00 | All Space | SSSS | SSSS | 00 | Functions 52, 53 and 54 are normally used with Functions 48 and 49. Also, Function 68. | | |
| 53 | | Send from RM including Trap Character | Trap Character | " | " | " | 00-FF | | | | |
| 54 | | Send from RM until Trap Function | 00-99 | BCD | 80 40 20 10 | 8 4 2 1 | 00-99 | | | | |
| SEND MODE | 55 | Mode: Echo/Mark/Space | 00 | BCD | SSSS | SSSS | 00 | Receive data is transmitted with one bit delay. | | | |
| | | Normal OFF | 01 | " | " | SSSM | 01 | | | | |
| | | Send Steady Mark | 02 | " | " | SSMS | 02 | | | | |
| | | Send Steady Space | 04 | " | " | SMSS | 04 | | | | |
| | 56 | Parity Bit Mode | 00 | " | " | SSSS | 00 | | | | |
| Normal OFF | | 01 | " | " | SSSM | 01 | | | | | |
| Invert Parity Bit | | 02 | " | " | SSMS | 02 | | | | | |
| 57 | Parity Bit Mark | 03 | " | " | SMMS | 03 | | | | | |
| | Parity Bit Space | 00-FF | | | | | | | | | |
| | | Load Fill Character | Fill Character | | | | | | | | |
| | | This Function is latched into Memory and must be restored to normal OFF (00) at the point in the program sequence where it is desired that subsequent Functions not be effected. | | | | | | | | | |
| SEND BCC | 58 | Start BCC | | XY | X Y | | | Function 59 (below Function 58) will send one character for LRC and two characters for CRC as determined by Function 58. When sending CRC, Function 57 is used prior to Function 59 to select a fill character after the second CRC character. Function 59 must be the next step after the last character to be included in the calculation. If Idle Mark is to follow BCC, use Function 55 next after Function 59. | | | |
| | | Define "X" for: | 0- | | SSSS | | 00-08 | | | | |
| | | Normal calculation of CRC and EVEN LRC | 1- | | SSSM | | 10-18 | | | | |
| | | Inverted data for calculation of CRC and ODD LRC. | | | | | | | | | |
| | | Define "Y" for: | -0 | | SSSS | | 00 or 10 | | | | |
| | | EBCDIC/CRC-16 (ASCII SYNC) | -1 | | SSSM | | 01 or 10 | | | | |
| | | CRC-16 Reverse | -2 | | SSMS | | 02 or 12 | | | | |
| | | IBM Special | -3 | | SMMS | | 03 or 13 | | | | |
| | | CRC-12 | -6 | | SMMS | | 06 or 16 | | | | |
| | | CCITT/SDLC-CRC | -7 | | SMMS | | 07 or 17 | | | | |
| CCITT/CRC Reverse | -8 | | MSSS | | 08 or 18 | | | | | | |
| LRC (6, 7, 8 Level) | 00 | All Space | SSSS | SSSS | 00 | | | | | | |
| 59 | Send BCC (Must be preceded by Function 57 when in synchronous operation) | | | | | | | | | | |
| SEND MSG/FOX MSG | 60-67 | No. of Characters | | Times Sent | BCD | 80 40 20 10 | 8 4 2 1 | 01-99 | Applications: TTY Model 33, 35, 37 IBM 2260 CRT IBM 2260 Printer & TTY Wide Platen #38 IBM 3270 CRT IBM 3270 Printer IBM 2740 Printer IBM 2741 Printer EARLIER TTY MODELS | | |
| | | Send ASCII | Fox | | | | | | | 74 | 72 |
| | | " ASCII | Msg | | | | | | | 82 | 80 |
| | | " ASCII | " | | | | | | | 124 | 122 |
| | | " EBCDIC | " | | | | | | | 82 | 80 |
| | | " EBCDIC | " | | | | | | | 124 | 122 |
| | | " EBCD | " | | | | | | | 127 | 122 |
| | | " SELECTRIC | " | | | | | | | 127 | 122 |
| " BAUDOT | Fox | 77 | 72 | | | | | | | | |
| BCD, Field Data and Reverse Codes are available on Special Order. | | | | | | | | | | | |

INTERSHAKE II FUNCTION LIST

(Continued)

| LOAD INTO MEMORY | | | | | | | REMARKS AND USERS NOTES | | | | | | | | | | | | | | |
|---|---------------|---|----------------------------------|-----------------------|---|--|---|----------------------------|---|----------------|------------|------------------|----|-------------------|----|----------------------|----|-----------------------|----|----------------------|----|
| GROUP | FUNCTION | DESCRIPTION | ENTER | BIT ENTRY METHOD | BIT SWITCH 8765 4321 POSITION | DATA HEX DISPLAY (Range) | | | | | | | | | | | | | | | |
| <u>TRANSMIT</u> (Cont'd) | ° 68 | Code Translate Mode | | XY | X 8 4 2 1 | Y 8 4 2 1 | Must be followed by Function 52 or 53. | | | | | | | | | | | | | | |
| | | Define "X" for: Disable Function 68 Results Memory (RM) to HEX ASCII RM to CODE selected by "Y" RM to HEX EBCDIC (Y=2), HEX EBCD (Y=5) and HEX SELECTRIC (Y=7) | 00 10 2- 3- | | SSSS SSSM SSMS SSMM | SSSS SSSS " | | 00 10 20-27 32-37 | Entries 20 through 27 convert from one language text to another language text. Entries 32, 35 and 37 convert Results Memory to HEX EBCDIC, HEX EBCD and HEX SELECTRIC. | | | | | | | | | | | | |
| CODE TRANSLATE | ° | Define "Y" for: EBCDIC to ASCII ASCII to EBCDIC EBCD to ASCII ASCII to EBCD SELECTRIC to ASCII ASCII to SELECTRIC | -0 -2 -4 -5 -6 -7 | | | SSSS SSMS SMSS SMMS SMMS SMMM | 20 22, 32 24 25, 35 26 27, 37 | | | | | | | | | | | | | | |
| | | Other Translations are available on Special Order. This Function is latched into Memory and <u>must</u> be restored to Normal (disable) (00) at the point in the program sequence where it is desired that subsequent Functions not be effected. | | | | | | | | | | | | | | | | | | | |
| <u>RS232/</u> <u>V.24</u> <u>CONTROLS</u> <u>AND</u> <u>DECISIONS</u> | | | | | 80 40 20 10 8 4 2 1 | | | | | | | | | | | | | | | | |
| | 70 | Turn ON Leads | MARK/SPACE | MARK=ON/ SPACE=OFF | 8 7 6 5 4 3 2 1 | 00-FF | For Functions 70 and 71, Bit 1 controls the Audible Alarm. Bit 2 controls the test point output CONTROL OUT (7X). For Functions 72 through 78, Bit 1 is used to sense status of AUX DET devices (e.g., CRT). Bit 2 detects the input to DETECT IN (7X). Note Priority below for Functions 74 and 75: <table border="0"> <tr> <td>Interrupt Source</td> <td>Jumps to Last</td> </tr> <tr> <td>Priority Order</td> <td>Page, Step</td> </tr> <tr> <td>97 (01) Mem Ovfl</td> <td>63</td> </tr> <tr> <td>97 (03) Character</td> <td>62</td> </tr> <tr> <td>97 (09-0F) Selection</td> <td>61</td> </tr> <tr> <td>75 (01-80) Detect OFF</td> <td>60</td> </tr> <tr> <td>74 (01-80) Detect ON</td> <td>59</td> </tr> </table> NOTE: Internal Select Switch toggle number 5 determines if program cell is two pages or four pages, i.e., if last page is page "1" or "3". See "Internal Select Switch" below Function 93. | Interrupt Source | Jumps to Last | Priority Order | Page, Step | 97 (01) Mem Ovfl | 63 | 97 (03) Character | 62 | 97 (09-0F) Selection | 61 | 75 (01-80) Detect OFF | 60 | 74 (01-80) Detect ON | 59 |
| Interrupt Source | Jumps to Last | | | | | | | | | | | | | | | | | | | | |
| Priority Order | Page, Step | | | | | | | | | | | | | | | | | | | | |
| 97 (01) Mem Ovfl | 63 | | | | | | | | | | | | | | | | | | | | |
| 97 (03) Character | 62 | | | | | | | | | | | | | | | | | | | | |
| 97 (09-0F) Selection | 61 | | | | | | | | | | | | | | | | | | | | |
| 75 (01-80) Detect OFF | 60 | | | | | | | | | | | | | | | | | | | | |
| 74 (01-80) Detect ON | 59 | | | | | | | | | | | | | | | | | | | | |
| | 71 | Turn OFF Leads | Any Lead | " | " | " | | | | | | | | | | | | | | | |
| | 72 | Wait Until Lead ON | " | " | " | " | | | | | | | | | | | | | | | |
| | 73 | Wait Until Lead OFF | " | " | " | " | | | | | | | | | | | | | | | |
| | 74 | Interrupt if Lead ON | Any One | " | " | 01-80 | | | | | | | | | | | | | | | |
| | 75 | Interrupt if Lead OFF | " | " | " | " | | | | | | | | | | | | | | | |
| | 76 | Cancel Interrupt 74 and 75 | 00 | " | " | 00 | | | | | | | | | | | | | | | |
| | *77 | Jump if ON | Any One | " | " | 01-80 | | | | | | | | | | | | | | | |
| | *78 | Jump if OFF | " | " | " | " | | | | | | | | | | | | | | | |
| | * | Functions 77 and 78 must be preceded by Function 41 for Jump Instructions | | | | | | | | | | | | | | | | | | | |
| | | | | | See Interrupts priority in Remarks Column | | | | | | | | | | | | | | | | |
| <u>TIMER</u> | 80 | 01 to 99 Milliseconds | 01-99 | BCD | 80 40 20 10 8 4 2 1 | 01-99 | | | | | | | | | | | | | | | |
| | 81 | 0.01 to 0.99 Seconds | " | " | " | " | | | | | | | | | | | | | | | |
| | 82 | 0.1 to 9.9 Seconds | " | " | " | " | | | | | | | | | | | | | | | |
| | 83 | Generate 1-99 Bit Periods of Delay | " | " | " | " | | | | | | | | | | | | | | | |
| | 84 | 0.1 to 9.9 Seconds Timeout Interval for Interrupt Function 97 or Jump Function 47 | " | " | " | " | Enable with Function 97 (0C) or Function 47 (C3) | | | | | | | | | | | | | | |
| <u>COUNTER</u> | △ 85 | Advance Base Count | 00 | All Space | SSSS | SSSS | 00 | | | | | | | | | | | | | | |
| | 86 | Measure RTS-CTS Delay | " | " | " | " | Counter Indication | | | | | | | | | | | | | | |
| | 87 | Counter Control | | | | | | | | | | | | | | | | | | | |
| | | Reset (All Counter Positions) | " | " | " | " | 00 | | | | | | | | | | | | | | |
| | | Reset to 0 and Start Counter | 01 | BCD | " | SSSM | 01 | | | | | | | | | | | | | | |
| | | Stop Counter | 02 | " | " | SSMS | 02 | | | | | | | | | | | | | | |
| | | Advance Counter by One Event | 03 | " | " | SSMM | 03 | | | | | | | | | | | | | | |
| | *88 | Jump if Counter is Greater than DATA | Number | " | 80 40 20 10 8 4 2 1 | 01-99 | | | | | | | | | | | | | | | |
| | 89 | Record Counter | 00 | All Space | SSSS | SSSS | 00 | | | | | | | | | | | | | | |
| | △ | Function 85 not available in early production models. | | | | | | | | | | | | | | | | | | | |
| | * | Preceded by Function 41 for Jump Instructions. | | | | | | | | | | | | | | | | | | | |

INTERSHAKE II FUNCTION LIST

(Continued)

| LOAD INTO MEMORY | | | | | | | REMARKS AND USERS NOTES | | |
|--|--|-------------------------------|------------|------------------|--|--|--------------------------|---|-------|
| GROUP | FUNCTION | DESCRIPTION | ENTER | BIT ENTRY METHOD | BIT SWITCH 8765 4321 POSITION | | DATA HEX DISPLAY (Range) | | |
| <u>AUTO PANEL</u> | 90 | Enter Syn Character | Character | | | | 00-FF | Use Internal Select Switch toggle number 7 for one sync character operation. Function 90 must be used with the INTERVIEW CRT for Full Duplex operation. Async: 2 Stop selects 1.5 Stop Bits for 5 info Bit code only. "Z" indicates other selections which <u>must be made</u> to complete the instruction. For INT OSC selections, use Internal Switch toggles "ON" to select as follows: 1 - Plug-in Crystal thru 64 Kbps. 2 - Var. Osc. 160 to 2500 bps. 3 - Var. Osc. 60 to 1000 bps. 4 - Var. Osc. 30 to 500 bps. (See "Internal Select Switch" below) As is the case for Functions 91 and 92 above, all 8 bits <u>must</u> be selected. "Z" indicates other selections which <u>must be made</u> . | |
| | 91 | Async/Sync, Info Bits, Parity | Mark/Space | XY | X 8 4 2 1 SSZZ MSZZ SMZZ ZZSS ZZMS ZZSM ZZMM ZZZZ | Y 8 4 2 1 ZZSS ZZSS ZZSS ZZSS MSSS SSSS SMSS | 00-88 | | |
| | 92 | Bit Rate | Bit Rate | HEX | | | | | 00-F0 |
| | | INT OSC | 00 | | SSSS | SSSS | | | 00 |
| | | 50 bps | 10 | | SSSM | " | | | 10 |
| | | 75 bps | 20 | | SSMS | " | | | 20 |
| | | 110 bps | 30 | | SSMM | " | | | 30 |
| | | 134.5 bps | 40 | | SMSS | " | | | 40 |
| | | 150 bps | 50 | | SMSM | " | | | 50 |
| | | 300 bps | 60 | | SMMS | " | | | 60 |
| | 600 bps | 70 | | SMMM | " | | 70 | | |
| | 900 bps | 80 | | MSSS | " | | 80 | | |
| | 1.2 Kbps | 90 | | MSSM | " | | 90 | | |
| | 1.8 Kbps | A0 | | MSMS | " | | A0 | | |
| | 2.4 Kbps | B0 | | MSMM | " | | B0 | | |
| | 3.6 Kbps | C0 | | MMSS | " | | C0 | | |
| | 4.8 Kbps | D0 | | MMSM | " | | D0 | | |
| | 7.2 Kbps | E0 | | MMMS | " | | E0 | | |
| | 9.6 Kbps | F0 | | MMMM | " | | F0 | | |
| 93 | Test Mode, EIA/MIL, Ext, Clock Control EIA Position: | Mark/Space | XY | | X 8 4 2 1 SMMM MSMM MMSM MMMS MMMM ZZZZ | Y 8 4 2 1 MZZZ " " " " SZZZ ZMZZ ZSZZ ZZMZ ZZSZ ZZZM ZZZS | 00-FF | | |
| | Function is latched into Memory and remains for the duration of the program sequence unless changed by a subsequent step containing a Function 91, 92 or 93 Instruction. | | | | | | | | |
| <p>The <u>INTERNAL SELECT SWITCH</u> (8-Position DIP Switch) Position:</p> <p>No. 1 ON - Enables the Crystal Controlled Oscillator for high-speed operation. No. 2 ON - Enables the HIGH range of the variable-frequency oscillator (160-2500 Baud). No. 3 ON - Enables the MIDDLE range of the variable-frequency oscillator (60-1000 Baud). No. 4 ON - Enables the LOW range of the variable-frequency oscillator (30-500 Baud). NOTE: Only one of the above switches (1-0) can be turned ON at one time. No. 5 ON - Enables 256-Step Program format. The OFF position enables the 128-Step Program format. No. 6 ON - SYNC Mode Internal Clock Rec. Enables internally-generated clock signal when no clock is supplied by system Modem. Clock is then synchronized to DATA. OFF position is used when clock is supplied from system Modem. No. 7 ON - Enables recognition of only one SYN character in lieu of the two characters normally required for recognition. No. 8 UNASSIGNED.</p> | | | | | | | | | |

INTERSHAKE II FUNCTION LIST

(Continued)

| LOAD INTO MEMORY | | | | | | | REMARKS AND USERS NOTES |
|-----------------------|------------------|---|--|------------------|---|--|---|
| GROUP | FUNCTION | DESCRIPTION | ENTER | BIT ENTRY METHOD | BIT SWITCH 8765 4321 POSITION | DATA HEX DISPLAY (Range) | |
| PERIPHERAL CONTROLLER | 94 OUTPUTS | Peripheral Controller <u>OUTPUTS</u> Define "X" for: User Peripheral (User Fill In) (Typical for INTERVIEW CRT) Clear Screen Select Page 1 Select Page 2 Freeze Display Unassigned Reverse Image Low Intensity Blink Define "Y" for: User Peripheral (User Fill In) (Typical for INTERVIEW CRT) Disable Enable | 0- 1- 2- 3- 4- 5- 6- 7- | XY | X 8 4 2 1 Y 8 4 2 1 | 00-01 10-11 20-21 30-31 40-41 50-51 60-61 70-71 | The Control items for the INTERVIEW CRT have been completed for information and as a sample. The Control items for other external devices should be filled-in by the User from the particular DTM Option Manual. In the case of User furnished option, the User should provide the Control item list. Once selected, the Flag 0 thru 7 is set to "0" or "1" as determined by selection of the "Y". |
| | *94 INPUTS | Sensing eight INPUT leads from external device to be controlled by DTM-2 Define "X" for: User Peripheral (User Fill In) 0- 1- 2- 3- 4- 5- 6- 7- Define "Y" for: User Peripheral (User Fill In) -2 Input Only -3 " | | | X 4 3 2 1 Y 4 3 2 1 | 00,03 12,13 22,23 32,33 42,43 52,53 62,63 72,73 | |
| | 94 OTHER OUTPUTS | Other Assignable <u>OUTPUTS</u> Define "X" for: (Take definition as assigned below) 5- 6- 7- X Y Define "X" and "Y" for: Restore assignable output to SET 1, SET 1 Mode. Generate a "1" when: Data received on RD Lead RLSD Lead Turning OFF DETECT TEST POINT Senses +12V Cause Output Signal to remain "1" when: DETECT TEST POINT Senses a transient OFF Generate a "1" when: Character contains PARITY ERROR Period of 1ms (X=5), 10ms (X=6), 100ms (X=7). Generate 900ns positive pulse Unassigned for X=6 and X=7 Loop signal back from external device Preceded by Function 41 for Jump Instructions. | 5,6,7 8 5,6,7 9 5,6,7 A 5,6 B 7 B 5,6,7 C 5,6,7 D 5 6,7 E 5,6,7 F | XY | X 8 4 2 1 Y 8 4 2 1 MSSS MSSM MSMS MSMM SMMM MSMM MMSS MMSM SMSM 8 4 2 1 MMMM | 58,68,78 59,69,79 5A,6A,7A 5B,6B 7B 5C,6C,7C 5D,6D,7D 5E 6E,7E 5F,6F,7F | INPUT Only: Y=2 causes Jump if Flag = "0" Y=3 causes Jump if Flag = "1" |

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APPENDIX C

**UNIVERSAL CODE CHART
FOR DATA COMMUNICATIONS**

OM 842A

APPENDIX D

CHARACTER CODE CHART

WITH HEX, OCTAL, DECIMAL, PROGRAM STEP AND PAGE

OM 842A

APPENDIX E

INTERSHAKE II

APPLICATION NOTES

OM 842A

APPENDIX E

INTERSHAKE II

APPLICATION NOTES

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APPLICATION NOTES

E.1 INTRODUCTION

This appendix contains examples of INTERSHAKE test programs which have been developed for specific testing applications. The test programs contained herein are *typical* examples, and should be used as a basis for developing custom programs for use in specific systems.

The test programs are grouped as follows:

- Paragraph E.2: Subroutines for Specific Functions
- Paragraph E.3: System Test Routines.

The subroutines cover such basic functions as: getting synchronized, controlling front-panel functions automatically, and several protocol exercises.

The system test routines show how the INTERSHAKE is used to execute complete test programs which systematically use individual functions as building blocks.¹

E.2 SUBROUTINES FOR SPECIFIC FUNCTIONS

The following short program sequences describe the typical actions necessary to perform specific tests.

E.2.1 CLEAR RESULTS MEMORY (File #1)

Many INTERSHAKE II tests are designed to store results in *Results Memory* (RM). File #1 illustrates a simple method of clearing the Results Memory, or setting the complete memory to zero.

E.2.2 GETTING IN SYNC (File #2)

When performing test operations, it is necessary to either position the TRANSMISSION DATA FORMAT switches on the front panel, or include program functions to implement the same test data format in order to be compatible with the system under test.

The subroutine shown in File #2 shows how initial synchronization is established.

¹As the user becomes more familiar with the program techniques and capabilities of the INTERSHAKE II, he may wish to exchange programs and application notes with other users. For this purpose, *Atlantic Research Corporation* will serve as distribution point for any programs submitted, and will give full credit to the program author(s). However, no representation can be made by *Atlantic Research Corporation* as to the accuracy or suitability of such programs.

E.2.3 PANEL SWITCH OVERRIDE (File #3)

The remaining "Transmission Data Format" controls can be set automatically by software functions. Software control can be helpful in reducing the possibility of operator error during test setup.

Functions 91, 92 and 93 are easily inserted near the beginning of a test, or used later in a test program to change data format under strictly-controlled circumstances. Also, the SYN character previously set by Function 90 (File #2) can be reassigned at any point during the test program.

NOTE

Function 91 controls three (3) panel switches. Function 92 controls one more; and Function 94 controls four panel switch settings.

File #3 shows Files #1 and #2, with Functions 91, 92, and 93 used in the beginning of a test program to establish correct test data format.

E.2.4 PROTOCOL EXERCISES (File #4, File #5, File #6)

For all off-line tests, it is necessary to consider the RS-232 (V.24), EIA protocol for the system under test. This requires that all EIA control switches in Zone 5 be set manually, or the leads turned ON and OFF through program control with Functions 70 through 78 in the appropriate sequence.

Files 4, 5, and 6 illustrate software-controlled test programs. Many of the examples can be used to test "toward the terminal," or "toward the modem;" and therefore, different procedures are required for the two cases.

Figure E-1 shows the program flow chart for File #6, to illustrate the program sequence as it is executed.

E.2.5 DEMONSTRATION PROGRAM WITH INTERVIEW[®] (File #7)

In order to demonstrate the program capability of the INTERSHAKE II, in conjunction with the display capabilities of the INTERVIEW, it is possible to set up a variety of exercises which require neither Modem or Terminal to test into. File #7 shows a typical program which requires only the INTERSHAKE and INTERVIEW.

E.3 SYSTEM TEST PROGRAMS

E.3.1 ON-LINE MONITOR TESTS

The following programs are written with the assumption that the INTERSHAKE is set up in a MONITOR mode, to passively watch a communications line and perform selected tests on active data.

In the following examples (Files A-1 through A-8), it is assumed that the following initial conditions are set:

- a. All EIA (V.24) CONTROL switches are set in the THRU position.
- b. The TRANSMISSION DATA FORMAT switches have been set to be compatible with the system under test.
- c. The ON-LINE TEST switch has been set to either the TD, RD, or TD/RD position.
- d. The EIA/MIL switch has been set properly to match the signals being monitored.
- e. Two EIA cables are used. One cable is connected from the Modem to the INTERSHAKE II, and the other is connected from the INTERSHAKE II to the Terminal to provide a complete circuit.

The test programs are listed as follows:

E.3.1.1 BASIC MONITOR, SYNCHRONOUS MODE

See File #A1.

E.3.1.2 LOG POLLING SEQUENCE CHARACTERS, TD-RD LEADS

See File #A2.

E.3.1.3 MEASURE RTS-CTS DELAY

See File #A3.

E.3.1.4 MEASURE EXCESSIVE RTS-CTS DELAY

See File #A4. Figure E-2 is a program flow diagram showing the steps which are executed during the program.

E.3.1.5 LOG 8 RESPONSES FROM SPECIFIC STATION ON MULTI-DROP LINE

See File #A5.

E.3.1.6 CAPTURE NAK DATA ONLY

See File #A6.

E.3.1.7 SELECTIVELY VERIFY CHARACTER GROUP WITHIN LONG BLOCK

See File #A7.

E.3.1.8 AUTOMATIC DETERMINATION OF SYN CHARACTER

See File #A8. (Figure E-3 shows the flow diagram of program steps executed during this test.)

E.3.2 OFF-LINE TESTS

In this series of tests, the INTERSHAKE II is used as an *active* test instrument, to simulate either a Terminal or Modem in an off-line configuration.

For these tests, the INTERSHAKE II must be programmed to perform the necessary "handshaking" to satisfy system hardware and protocol. More specifically, when the INTERSHAKE II is used to test toward a Modem, it must simulate a Terminal; and vice versa. When simulating a Modem, it must control the CTS, DSR, RLSD and RI leads. When simulating a Terminal, it must control the DTR and RTS leads.

The OFF-LINE switch must be set to test *toward* either the TERMINAL or MODEM.

The test programs are listed as follows:

E.3.2.1 GENERATION OF LRC CHARACTERS

See File #B1.

E.3.2.2 MEASUREMENT OF FULL-DUPLEX TURN-AROUND TIME

See File #B2.

E.3.2.3 CRC LOOPBACK ERROR TEST

See File #B3.

E.3.2.4 MEASUREMENT OF SUCCESSFUL TERMINAL RESPONSES WITHOUT PARITY ERROR

See File #B4.

E.3.2.5 SEND SDLC WITH CRC

See File #B5.

E.3.2.6 RECEIVE SDLC WITH CRC

See File #B6. Figure E-4 shows the program flow diagram for this test program.

E.3.2.7 OUTPUT RESULTS MEMORY TO EXTERNAL DEVICE

See File #B7. Figure E-5 shows a typical CRT display of Results Memory where the turn-around time of 64 polls has been previously recorded. When using a Printer up to 512 measurements can be printed out.

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E.4.

INTERSHAKE II PROGRAM

| TITLE: CLEAR RESULTS MEMORY | | | | | | | FILE NO. 1 | | |
|--|---------|---|-----|-------|------|----------|-------------------------------|----------------|--|
| DESCRIPTION: STORE ZEROS IN RESULTS MEMORY UNTIL OVERFLOW OCCURS | | | | | | | SHEET 1 OF 1 | | |
| OBJECTIVE: RESULTS MEMORY WILL BE COMPLETELY FILLED WITH ZEROS. OPERATION REPEATS ANY TIME PROGRAM LOOPS TO STEP 00. | | | | | | | | | |
| PAGE (CIRCLE ONE) 3 2 1 0 | ADDRESS | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
| | 3 | 2 | 1 | STEP | DATA | FUNCTION | | | |
| C | 8 | 4 | 0 0 | 0 | 00 | 07 | Record 00 into R.M. | ← | CODE |
| | | | | 1 | 00 | 41 | Preset | ↻ | SPEED |
| | | | | 2 | 82 | 47 | Jump Mem OVFL = 0 | | ASYNC / SYNC |
| | | | | 3 | 00 | 00 | Or Add Program Steps | | SYN CHARACTER |
| | | | | 4 | | | | | STOP BIT 1.0 , 1.5 , 2.0 |
| | | | | 5 | | | | | INFO BITS 5 , 6 , 7 , 8 |
| | | | | 6 | | | | | PARITY NONE , ODD , EVEN |
| | | | | 7 | | | | | CONTROL EIA / OFF |
| | | | | 8 | | | | | ON-LINE TD/RD , TD , RD |
| | | | | 9 | | | | | OFF-LINE TERM / MODEM |
| | | | | A | | | | | MON SIGS / NORMAL |
| | | | | B | | | | | PATCH CORDS |
| | | | | C | | | | | CONTROL EIA (V. 24) |
| | | | | D | | | | | COUNTER ZONE |
| | | | | E | | | | | INTERRUPTS |
| | | | | F | | | | | FLAGS |
| D | 9 | 5 | 1 | 0 | 16 | | | | LATCH |
| | | | | 1 | 17 | | | | |
| | | | | 2 | 18 | | | | |
| | | | | 3 | 19 | | | | |
| | | | | 4 | 20 | | | | |
| | | | | 5 | 21 | | | | |
| | | | | 6 | 22 | | | | |
| | | | | 7 | 23 | | | | |
| | | | | 8 | 24 | | | | |
| | | | | 9 | 25 | | | | |
| | | | | A | 26 | | | | |
| | | | | B | 27 | | | | |
| | | | | C | 28 | | | | |
| | | | | D | 29 | | | | |
| | | | | E | 30 | | | | |
| | | | | F | 31 | | | | |

CONTINUE ON OTHER SIDE

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CONTINUE ON OTHER SIDE

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| ADDRESS | | | | ENTRY | | | JUMP | ADDITIONAL INFORMATION (WRITE IN) | |
|--|---|---|---|-------|------|------------|------------------|--------------------------------------|--|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | | | | ← → | | |
| E | A | 6 | 2 | 0 | 32 | | | | |
| | | | | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| ADDITIONAL REMARKS | | | | | | | PROGRAM LOCATION | | |
| | | | | | | | DTM S/N | | |
| | | | | | | | CELL | | |
| | | | | | | | RAM | | |
| | | | | | | | PROM | | |
| PROGRAM WRITTEN BY: | | | | | | DATE: | | | |
| | | | | | | June, 1977 | | | |
| COMPANY NAME: | | | | | | TEL. NO. | | | |
| Atlantic Research Corporation | | | | | | | | | |
| ADDRESS: | | | | | | | | | |
| 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | | | | | | | |

FORM NO. TP-139-3-77

INTERSHAKE II PROGRAM

| TITLE: "GETTING IN SYNC" | | | | | | | | | | FILE NO. 2 | |
|---|---|---|---|-------|------|----------|---|----------------|--|-------------------|--|
| DESCRIPTION: OVER-RIDES ENTER SYNC-CHARACTER SWITCHES. ESTABLISHES CRITERIA FOR "BEING IN SYNC". DESCRIBES LINE FILL CHARACTER WHEN DATA IS NOT BEING TRANSMITTED. | | | | | | | | | | SHEET OF | |
| OBJECTIVE: INCLUDE SYN AND IDLE CHARACTERS IN PROGRAM TO ELIMINATE NEED FOR MANUAL SWITCH SETTINGS. | | | | | | | | | | | |
| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | |
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | | | |
| 3 | 2 | 1 | 0 | | | | | | | | |
| C | 8 | 4 | 0 | 0 | 10 | 95 | Select Auto Resync and Normal Sync Search | | CODE | EBCDIC | |
| | | | | 1 | 32 | 90 | Enter Sync Character (32 EBCDIC) | | SPEED | - | |
| | | | | 2 | FF | 57 | Load Fill Character (FF Typical) | | ASYNCR / SYNC | ASYNC / SYNC | |
| | | | | 3 | | | ← Program Continues | | SYN CHARACTER | 32 | |
| | | | | 4 | | | | | STOP BIT | 1.0 , 1.5 , 2.0 | |
| | | | | 5 | | | | | INFO BITS | 5 , 6 , 7 , 8 | |
| | | | | 6 | | | | | PARITY | NONE , ODD , EVEN | |
| | | | | 7 | | | | | CONTROL EIA / OFF | | |
| | | | | 8 | | | | | ON-LINE | TD/RD , TD , RD | |
| | | | | 9 | | | | | OFF-LINE | TERM / MODEM | |
| | | | | A | | | | | MON SIGS / NORMAL | | |
| | | | | B | | | | | PATCH CORDS | | |
| | | | | C | | | | | CONTROL EIA (V. 24) | | |
| | | | | D | | | | | COUNTER ZONE | | |
| | | | | E | | | | | INTERRUPTS | | |
| | | | | F | | | | | FLAGS | | |
| | | | | | | | | | LATCH | | |
| D | 9 | 5 | 1 | 0 | 16 | | | | | | |
| | | | | 1 | 17 | | | | | | |
| | | | | 2 | 18 | | | | | | |
| | | | | 3 | 19 | | | | | | |
| | | | | 4 | 20 | | | | | | |
| | | | | 5 | 21 | | | | | | |
| | | | | 6 | 22 | | | | | | |
| | | | | 7 | 23 | | | | | | |
| | | | | 8 | 24 | | | | | | |
| | | | | 9 | 25 | | | | | | |
| | | | | A | 26 | | | | | | |
| | | | | B | 27 | | | | | | |
| | | | | C | 28 | | | | | | |
| | | | | D | 29 | | | | | | |
| | | | | E | 30 | | | | | | |
| | | | | F | 31 | | | | | | |

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OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|----------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |

ADDITIONAL REMARKS

PROGRAM LOCATION

DTM S/N

CELL

RAM

PROM

PROGRAM WRITTEN BY: _____ DATE *June, 1977*

COMPANY NAME: *Atlantic Research Corporation* TEL. NO. _____

ADDRESS: *5390 Cherokee Avenue, Alexandria, Virginia 22314*

FORM NO. TP-139-3-77

INTERSHAKE II PROGRAM

| | |
|--|----------------------------|
| TITLE: <u>OVER-RIDE PANEL SWITCHES</u> | FILE NO. <u>3</u> |
| DESCRIPTION: | SHEET <u>1</u> OF <u>1</u> |

OBJECTIVE: USE SOFTWARE FUNCTIONS TO ESTABLISH DATA FORMAT OF TEST PROGRAM.

| ADDRESS PAGE (CIRCLE ONE) 3 2 1 0 | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|---|-------|------|----------|--|----------------|---|
| | STEP | DATA | FUNCTION | | | |
| <u>C</u> <u>8</u> <u>4</u> <u>0</u> 0 | 0 | 00 | 07 | } File #1 | | CODE <u>EBCDIC</u> |
| 1 | 1 | 00 | 41 | | | SPEED <u>1200</u> |
| 2 | 2 | 82 | 47 | | | <u>ASYN</u> <input checked="" type="radio"/> <u>SYN</u> |
| 3 | 3 | 02 | 98 | } File #2 | ← | SYN CHARACTER <u>32</u> |
| 4 | 4 | 10 | 95 | | | STOP BIT <u>1.0</u> , 1.5 , 2.0 |
| 5 | 5 | 32 | 90 | | | INFO BITS <u>5</u> , 6 , 7 , <u>8</u> |
| 6 | 6 | FF | 57 | | | PARITY <u>NONE</u> ODD EVEN |
| 7 | 7 | 78 | 91 | <u>Sync Mode, 8 Info Bits, NO Parity</u> | | <input checked="" type="radio"/> <u>CONTROL EIA</u> OFF |
| 8 | 8 | 90 | 92 | <u>Bit Rate = 1200 Baud</u> | | ON-LINE TD/RD <input checked="" type="radio"/> TD RD |
| 9 | 9 | BA | 93 | <u>Mon. TD, EXT Clk., Control EIA OFF, MIL</u> | | OFF-LINE TERM / MODEM |
| A | 10 | ← | | <u>Next Instruction</u> | | MON SIGS / NORMAL |
| B | 11 | | | | | PATCH CORDS |
| C | 12 | | | | | CONTROL EIA (V. 24) |
| D | 13 | | | | | COUNTER ZONE |
| E | 14 | | | | | INTERRUPTS |
| F | 15 | | | | | FLAGS |
| <u>D</u> <u>9</u> <u>5</u> <u>1</u> 0 | 16 | | | | | LATCH |
| 1 | 17 | | | | | |
| 2 | 18 | | | | | |
| 3 | 19 | | | | | |
| 4 | 20 | | | | | |
| 5 | 21 | | | | | |
| 6 | 22 | | | | | |
| 7 | 23 | | | | | |
| 8 | 24 | | | | | |
| 9 | 25 | | | | | |
| A | 26 | | | | | |
| B | 27 | | | | | |
| C | 28 | | | | | |
| D | 29 | | | | | |
| E | 30 | | | | | |
| F | 31 | | | | | |

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| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|--|---|---|---|-------|------|----------|-------------------------------|------------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | | | | | | |
| E | A | 6 | 2 | 0 | 32 | | | | |
| | | | | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| ADDITIONAL REMARKS | | | | | | | | PROGRAM LOCATION | |
| | | | | | | | | DTM S/N | |
| | | | | | | | | CELL | |
| | | | | | | | | RAM | |
| | | | | | | | | PROM | |
| PROGRAM WRITTEN BY: | | | | | | | DATE | | |
| | | | | | | | June, 1977 | | |
| COMPANY NAME: | | | | | | | TEL. NO. | | |
| Atlantic Research Corporation | | | | | | | | | |
| ADDRESS: | | | | | | | | | |
| 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | | | | | | | |

FORM NO. TP-138-3-77

OM 842A

INTERSHAKE II PROGRAM

| | |
|---|------------|
| TITLE: TYPICAL RS-232(V.24) "TOWARD THE TERMINAL" PROTOCOL | FILE NO. 4 |
| DESCRIPTION: PROGRAM WAITS UNTIL RTS IS OFF. TURNS CTS OFF IN RESPONSE. VERIFIES DTR IS ON (DSR SHOULD BE ON INITIALLY). TURNS ON RLSD, SENDS A MESSAGE, WAITS FOR LAST CHARACTER TO BE TRANSMITTED, THEN TURNS RLSD OFF. | |
| OBJECTIVE: TO MANIPULATE EIA LEADS TO SIMULATE A MODEM. | |

| ADDRESS PAGE (CIRCLE ONE) 3 2 1 0 | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|---|-------|------|----------|-----------------------------------|----------------|---|
| | STEP | DATA | FUNCTION | | | |
| C 8 4 0 | 0 | 20 | 70 | Turn ON DSR | | CODE ANY |
| | 1 | 80 | 73 | Wait Until RTS OFF. | | SPEED ANY |
| | 2 | 40 | 71 | Turns CTS OFF | | ASYNCR / SYNC |
| | 3 | 08 | 72 | Wait Until DTR ON | | SYN CHARACTER |
| | 4 | 10 | 70 | Turn ON RLSD | | STOP BIT 1.0 , 1.5 , 2.0 |
| | 5 | 10 | 80 | Wait Time Delay (Typically 10 ms) | | INFO BITS 5 , 6 , 7 , 8 |
| | 6 | | | Send Message | | PARITY NONE , ODD , EVEN |
| | 7 | | | | | <u>CONTROL EIA / OFF</u> |
| | 8 | | | | | ON-LINE TD/RD , TD , RD |
| | A | 10 | | | | OFF-LINE <u>TERM</u> / MODEM |
| | B | 11 | | | | MON SIGS <u>NORMAL</u> |
| | C | 12 | | | | PATCH CORDS |
| | D | 13 | | | | CONTROL EIA (V. 24) DSR-OFF (7X) DTR-THRU RTS-THRU CTS-OFF (7X) RLSD-OFF (7X) |
| | E | 14 | | | | COUNTER ZONE |
| | F | 15 | | (Message Complete) | | INTERRUPTS None |
| D 9 5 1 | 0 | 10 | 80 | Time Delay - (Example 10 ms) | | FLAGS None |
| | 1 | 10 | 71 | Turn OFF RLSD | | LATCH |
| | 2 | 00 | 00 | Halt | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | | | | | |
| | 6 | | | | | |
| | 7 | | | | | |
| | 8 | | | | | |
| | 9 | | | | | |
| | A | | | | | |
| | B | | | | | |
| | C | | | | | |
| | D | | | | | |
| | E | | | | | |
| | F | | | | | |

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CONTINUE ON OTHER SIDE

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|----------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| | | | | 0 | 48 | | | | |
| F | B | 7 | 3 | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | 03 | 40 | | |

Last Page

| | |
|--|------------------------|
| ADDITIONAL REMARKS | PROGRAM LOCATION |
| | DTM S/N |
| | CELL |
| | RAM |
| | PROM |
| PROGRAM WRITTEN BY: | DATE <i>June, 1977</i> |
| COMPANY NAME: <i>Atlantic Research Corporation</i> | TEL. NO. |
| ADDRESS: <i>5390 Cherokee Avenue, Alexandria, Virginia 22314</i> | |

OM 842A

INTERSHAKE II PROGRAM

| | |
|---|------------|
| TITLE: TYPICAL RS-232 (V.24) "TOWARDS THE MODEM" PROTOCOL | FILE NO. 5 |
| DESCRIPTION: | |
| OBJECTIVE: | |

PROGRAM WAITS FOR DSR TO BE ON AND RLSD OFF. RTS IS TURNED ON AND ANOTHER WAIT FOR CTS FROM MODEM OCCURS. A MESSAGE IS SENT. THEN RTS IS TURNED OFF.

TO MANIPULATE EIA LEADS TO SIMULATE A TERMINAL.

| ADDRESS PAGE (CIRCLE ONE) 3 2 1 0 | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|---|-------|------|----------|--------------------------------|----------------|--|
| | STEP | DATA | FUNCTION | | | |
| C 8 4 0 | 0 | 0 | 08 70 | Turn ON DTR (or Sel Switch ON) | | CODE |
| | 1 | 1 | 20 72 | Wait Until DSR ON | | SPEED |
| | 2 | 2 | 10 73 | Wait Until RLSD OFF | | ASYNC / SYNC |
| | 3 | 3 | 80 70 | Turn RTS ON | | SYN CHARACTER |
| | 4 | 4 | 40 72 | Wait Until CTS ON | | STOP BIT 1.0 , 1.5 , 2.0 |
| | 5 | 5 | | Send Message | | INFO BITS 5 , 6 , 7 , 8 |
| | 6 | 6 | | | | PARITY NONE , ODD , EVEN |
| | 7 | 7 | | | | CONTROL EIA OFF |
| | 8 | 8 | | | | ON-LINE TD/RD , TD , RD |
| | 9 | 9 | | | | OFF-LINE TERM (MODEM) |
| | A | 10 | | | | MON SIGS (NORMAL) |
| | B | 11 | | | | PATCH CORDS |
| | C | 12 | | (Message Complete) | | CONTROL EIA (V. 24) DTR-OFF (TX) DSR-THRU RLSD-THRU CTS-THRU RTS-OFF (TX) |
| | D | 13 | 10 80 | Time Delay (Example 10 ms) | | COUNTER ZONE |
| | E | 14 | 80 71 | Turn RTS OFF | | INTERRUPTS |
| | F | 15 | 00 00 | Halt | | FLAGS |
| D 9 5 1 | 0 | 16 | | | | LATCH |
| | 1 | 17 | | | | |
| | 2 | 18 | | | | |
| | 3 | 19 | | | | |
| | 4 | 20 | | | | |
| | 5 | 21 | | | | |
| | 6 | 22 | | | | |
| | 7 | 23 | | | | |
| | 8 | 24 | | | | |
| | 9 | 25 | | | | |
| | A | 26 | | | | |
| | B | 27 | | | | |
| | C | 28 | | | | |
| | D | 29 | | | | |
| | E | 30 | | | | |
| | F | 31 | | | | |

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| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|----------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |

ADDITIONAL REMARKS

| |
|------------------|
| PROGRAM LOCATION |
| DTM S/N |
| CELL |
| RAM |
| PROM |

PROGRAM WRITTEN BY: _____ DATE: *June, 1977*

COMPANY NAME: *Atlantic Research Corporation* TEL. NO. _____

ADDRESS: *5390 Cherokee Avenue, Alexandria, Virginia 22314*

OM 842A

INTERSHAKE II PROGRAM

| TITLE: TYPICAL RS-232 (V.24) RI PROTOCOL | | | | | | | FILE NO. 6 | | |
|---|---------|---|---|-------|------|----------|-------------------------------|----------------|---|
| DESCRIPTION: INTERSHAKE II CONNECTED TOWARD THE MODEM FOR AUTO ANSWER OF DIAL LINE. | | | | | | | SHEET OF | | |
| OBJECTIVE: ANSWER CALL; WHEN RLSD GOES ON, RECORD 10 CHARACTERS; IF ALSO OFF, WAIT 5 SECONDS, SEND TEST MESSAGE AND WAIT AGAIN FOR RLSD. HANGS UP AFTER EXCHANGE. | | | | | | | | | |
| PAGE (CIRCLE ONE) | ADDRESS | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
| | 3 | 2 | 1 | STEP | DATA | FUNCTION | | | |
| C | 8 | 4 | 0 | 0 | 0 | 04 72 | Wait Ring Ind ON | | CODE ASCII |
| | | | | 1 | 1 | 08 70 | Turn DTR ON | | SPEED ANY |
| | | | | 2 | 2 | 10 81 | Wait 100 ms | | ASYNC / SYNC |
| | | | | 3 | 3 | 04 73 | Wait RI OFF | | SYN CHARACTER NONE |
| | | | | 4 | 4 | 50 84 | Preset Timeout = 5 Sec. | | STOP BIT 1.0, 1.5, 2.0 |
| | | | | 5 | 5 | 0C 97 | Int On Time OUT | ← | STOP BIT 5, 6, 7, 8 |
| | | | | 6 | 6 | 10 72 | Wait RLSD ON | | PARITY NONE (ODD), EVEN |
| | | | | 7 | 7 | 08 97 | Disable Interrupt | | CONTROL EIA / OFF |
| | | | | 8 | 8 | 10 32 | Record 10 Character | | ON-LINE TD/RD, TD, RD |
| | | | | 9 | 9 | 10 73 | Det RLSD OFF | | OFF-LINE TERM / (MODEM) |
| | | | | A | 10 | 00 47 | Set Flag 0 = 0 | | MON SIGS (NORMAL) |
| | | | | B | 11 | 05 40 | Jump To STEP (05) | → | PATCH CORDS |
| | | | | C | 12 | | | | CONTROL EIA (V. 24) |
| | | | | D | 13 | | | | RTS & DTR TO OFF/7X |
| | | | | E | 14 | | | | COUNTER ZONE |
| | | | | F | 15 | | | | INTERRUPTS TIME OUT = 84 |
| D | 9 | 5 | 1 | 0 | 16 | 08 97 | Disable Time Out Interrupt | | FLAGS 0 |
| | | | | 1 | 17 | 20 41 | PRESET | | LATCH |
| | | | | 2 | 18 | 03 47 | Jump Flag 0 = 1 | ← | |
| | | | | 3 | 19 | 80 70 | Turn ON RTS | | |
| | | | | 4 | 20 | 40 72 | Wait For CTS ON | | |
| | | | | 5 | 21 | 01 47 | Set Flag 0 to 1 | | |
| | | | | 6 | 22 | 01 60 | Send Message | | |
| | | | | 7 | 23 | 10 81 | Wait 100 ms | | |
| | | | | 8 | 24 | 80 F1 | Turn OFF RTS | | |
| | | | | 9 | 25 | 02 98 | SKIP | | |
| | | | | 1 | A | 40 F3 | Wait CTS OFF | | |
| | | | | B | 27 | 05 40 | Jump To STEP 05 | → | |
| | | | | C | 28 | | | | |
| | | | | D | 29 | | | | |
| | | | | E | 30 | | | | |
| | | | | F | 31 | | | | |

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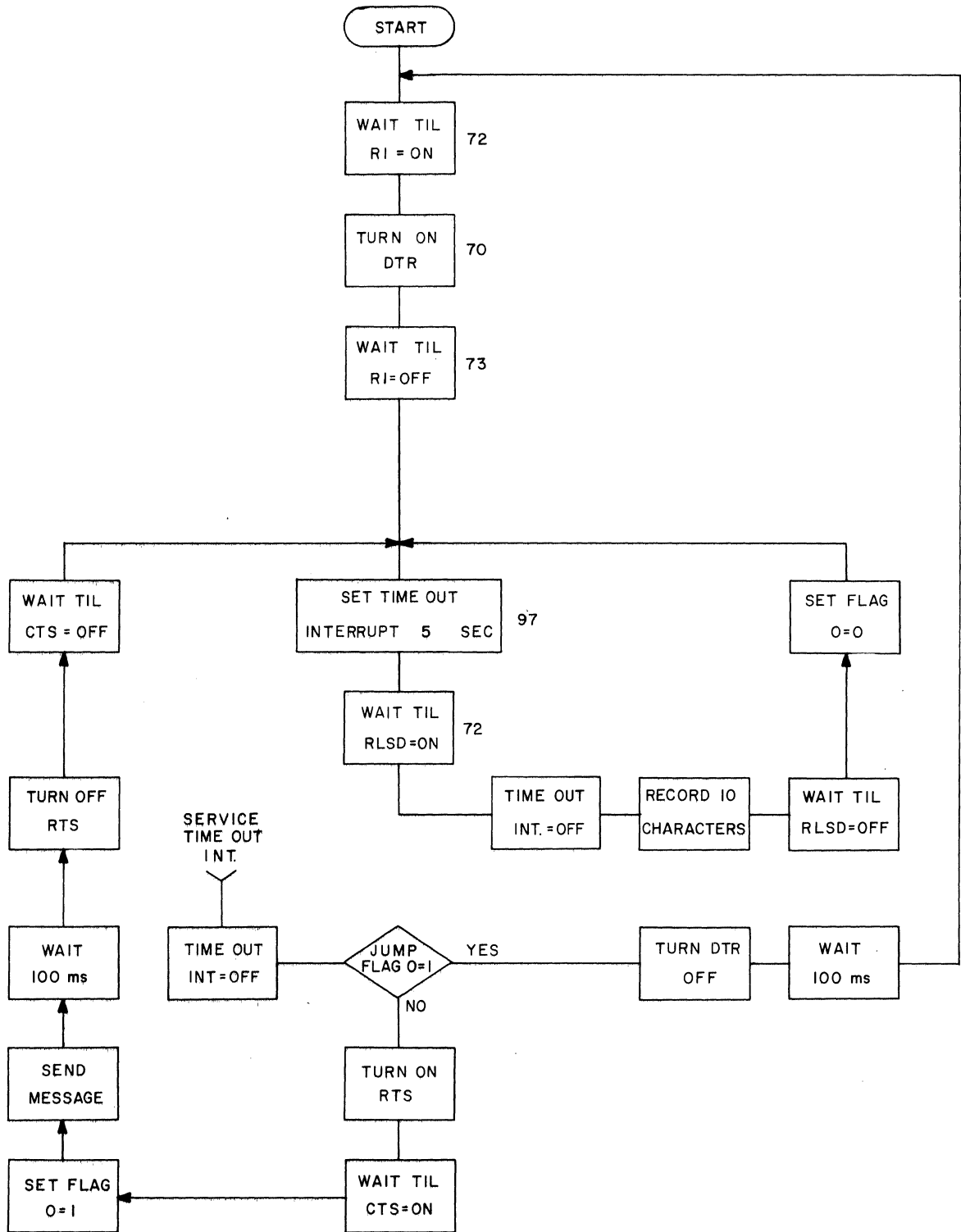


Figure E-1. Auto Answer Flow Diagram.

OM 842A

INTERSHAKE II PROGRAM

| TITLE: CRT DEMONSTRATION PROGRAM | | | | | | | FILE NO. 7 | |
|--|----------|------|----------|-------------------------------|----------------|--|--------------------------|--|
| DESCRIPTION: THIS IS A PROGRAM DESIGNED FOR AN INTERSHAKE II AND AN INTERVIEW. NEITHER A MODEM OR TERMINAL ARE USED. | | | | | | | SHEET 1 OF 2 | |
| OBJECTIVE: DISPLAY DATA ON PAGE 1, PAGE 2, 1 & 2, REVERSE IMAGE. | | | | | | | | |
| ADDRESS PAGE (CIRCLE ONE) | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | |
| | STEP | DATA | FUNCTION | | | | | |
| C 3 2 1 0 | 0 | 0 | 10 | 95 | | CODE | ASCII | |
| | 1 | 1 | 16 | 90 | | SPEED | ANY | |
| | 2 | 2 | FF | 57 | | ASYNC / SYNC | ASYNC / SYNC | |
| | 3 | 3 | 05 | 42 | ← | SYN CHARACTER | 16 | |
| | 4 | 4 | 11 | 94 | ← | STOP BIT | 1.0 , 1.5 , 2.0 | |
| | 5 | 5 | 10 | 82 | | INFO BITS | 5 , 6 , 7 , 8 | |
| | 6 | 6 | 01 | 94 | | PARITY | NONP , ODD , EVEN | |
| | 7 | 7 | 02 | 80 | | CONTROL EIA | OFF | |
| | 8 | 8 | 00 | 94 | | ON-LINE | TD/RD , TD , RD | |
| | 9 | 9 | 16 | 50 | | OFF-LINE | TERM / MODEM | |
| | A | 10 | 16 | 50 | | MON SIGS | NORMAL | |
| | B | 11 | 16 | 50 | | PATCH CORDS | - | |
| | C | 12 | 16 | 50 | | CONTROL EIA (V. 24) | - | |
| | D | 13 | 03 | 60 | | COUNTER ZONE | - | |
| | E | 14 | 03 | 50 | | INTERRUPTS | - | |
| | F | 15 | 04 | 41 | | FLAGS | - | |
| D 9 5 1 | 0 | 16 | 00 | 43 | → | LATCH | - | |
| | 1 | 17 | 51 | 94 | | | | |
| | 2 | 18 | 33 | 50 | | | | |
| | 3 | 19 | 34 | 50 | | | | |
| | 4 | 20 | 50 | 94 | | | | |
| | 5 | 21 | 20 | 50 | | | | |
| | 6 | 22 | 20 | 50 | | | | |
| | 7 | 23 | 71 | 94 | | | | |
| | 8 | 24 | 42 | 50 | | | | |
| | 9 | 25 | 41 | 50 | | | | |
| | A | 26 | 44 | 50 | | | | |
| | B | 27 | 20 | 50 | | | | |
| | C | 28 | 42 | 50 | | | | |
| | D | 29 | 43 | 50 | | | | |
| | E | 30 | 43 | 50 | | | | |
| | F | 31 | 10 | 82 | | | | |

CONTINUE ON OTHER SIDE

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CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP | ADDITIONAL INFORMATION (WRITE IN) | |
|--|---|-------|------|----------|-------------------------------|------------|--------------------------------------|---------|
| PAGE (CIRCLE ONE) | | STEP | DATA | FUNCTION | | | | |
| 3 | 2 | 1 | 0 | 32 | 10 | 94 | Page 1 Select "OFF" | |
| E | A | 6 | 2 | 1 | 33 | 70 | Blink "OFF" | |
| | | | 2 | 2 | 34 | 03 | Loop Counter = 3 | "L" 3 ← |
| | | | 3 | 3 | 35 | 02 | No-Op | |
| | | 2 | 4 | 4 | 36 | 21 | Select Page 2 "ON" | |
| | | | 5 | 5 | 37 | 01 | Clear Display "ON" | |
| | | | 6 | 6 | 38 | 02 | Time Delay 2 ms | |
| | | | 7 | 7 | 39 | 00 | Clear Display "OFF" | |
| | | | 8 | 8 | 40 | 16 | Send Sync | |
| | | | 9 | 9 | 41 | 16 | Send Sync | |
| | | | A | A | 42 | 01 | Send Demo-Message | |
| | | | B | B | 43 | 01 | Send Demo-Message | |
| | | | C | C | 44 | 03 | Send "ETX" | |
| | | | D | D | 45 | 10 | Time Delay 1 Second | |
| | | | E | E | 46 | 24 | Preset Jump | |
| | | | F | F | 47 | 00 | Loop Jump (3 Times) | "L" 3 → |
| F | B | 7 | 3 | 0 | 48 | 51 | Reverse Video "ON" | |
| | | | 1 | 1 | 49 | 35 | Send "5" | |
| | | | 2 | 2 | 50 | 36 | Send "6" | |
| | | | 3 | 3 | 51 | 50 | Reverse Video "OFF" | |
| | | | 4 | 4 | 52 | 20 | Send "SPACE" | |
| | | | 5 | 5 | 53 | 71 | Blink "ON" | |
| | | | 6 | 6 | 54 | 42 | Send "B" | |
| | | | 7 | 7 | 55 | 41 | Send "A" | |
| | | | 8 | 8 | 56 | 44 | Send "D" | |
| | | | 9 | 9 | 57 | 20 | Send "SPACE" | |
| | | | A | A | 58 | 42 | Send "B" | |
| | | | B | B | 59 | 43 | Send "C" | |
| | | | C | C | 60 | 43 | Send "C" | |
| | | | D | D | 61 | 20 | Page 2 Select "OFF" | |
| | | | E | E | 62 | 08 | Set Loop Counter = 8 | |
| | | 3 | F | F | 63 | 01 | Turn "ON" Alarm | "L" 8 → |
| ADDITIONAL REMARKS | | | | | | | PROGRAM LOCATION | |
| | | | | | | | DTM S/N | |
| | | | | | | | CELL | |
| | | | | | | | RAM | |
| | | | | | | | PROM | |
| PROGRAM WRITTEN BY: | | | | | | DATE | | |
| | | | | | | June, 1977 | | |
| COMPANY NAME: | | | | | | TEL. NO. | | |
| Atlantic Research Corporation | | | | | | | | |
| ADDRESS: | | | | | | | | |
| 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | | | | | | |

FORM NO. TP-139-3-77

INTERSHAKE II PROGRAM

| | |
|--|----------------------------|
| TITLE: CRT DEMONSTRATION PROGRAM (Continued) | FILE NO. 7 SHEET 2 OF 2 |
|--|----------------------------|

DESCRIPTION:

OBJECTIVE:

| ADDRESS PAGE (CIRCLE ONE) | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|------------------------------|-------|------|----------|--|----------------|--|
| | STEP | DATA | FUNCTION | | | |
| 3 2 1 0 C 8 4 0 | 0 | 0 20 | 81 | Time Delay 200 ms | | CODE |
| | 1 | 1 01 | 71 | Turn "OFF" Alarm | | SPEED |
| | 2 | 2 01 | 81 | Time Delay 100 ms | | ASYNC / SYNC |
| | 3 | 3 3F | 41 | Preset Jump | | SYN CHARACTER |
| | 4 | 4 00 | 43 | Loop Jump 8 Times "L" 8 | → | STOP BIT 1.0 , 1.5 , 2.0 |
| | 5 | 5 00 | 00 | Halt | | INFO BITS 5 , 6 , 7 , 8 |
| | 6 | 6 70 | 94 | Blink "OFF" | | PARITY NONE , ODD , EVEN |
| | 7 | 7 03 | 40 | Jump To Restart Demo (Page 0 - Step 4) | → | CONTROL EIA / OFF |
| | 8 | 8 | | | | ON-LINE TD/RD , TD , RD |
| | 9 | 9 | | | | OFF-LINE TERM / MODEM |
| | A | 10 | | | | MON SIGS / NORMAL |
| | B | 11 | | | | PATCH CORDS |
| | C | 12 | | | | CONTROL EIA (V. 24) |
| | D | 13 | | | | COUNTER ZONE |
| | E | 14 | | | | INTERRUPTS |
| | F | 15 | | | | FLAGS |
| D 9 5 1 | 0 | 16 | | | | LATCH |
| | 1 | 17 | | | | |
| | 2 | 18 | | | | |
| | 3 | 19 | | | | |
| | 4 | 20 | | | | |
| | 5 | 21 | | | | |
| | 6 | 22 | | | | |
| | 7 | 23 | | | | |
| | 8 | 24 | | | | |
| | 9 | 25 | | | | |
| | A | 26 | | | | |
| | B | 27 | | | | |
| | C | 28 | | | | |
| | D | 29 | | | | |
| | E | 30 | | | | |
| | F | 31 | | | | |

CONTINUE ON OTHER SIDE

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CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|--|---|---|---|-------|------|----------|-------------------------------|------------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | | | | | | |
| E | A | 6 | 2 | 0 | 32 | | | | |
| | | | | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| ADDITIONAL REMARKS | | | | | | | | PROGRAM LOCATION | |
| | | | | | | | | DTM 5/N | |
| | | | | | | | | CELL | |
| | | | | | | | | RAM | |
| | | | | | | | | PROM | |
| PROGRAM WRITTEN BY: | | | | | | | DATE <i>June, 1977</i> | | |
| COMPANY NAME: <i>Atlantic Research Corporation</i> | | | | | | | TEL. NO. | | |
| ADDRESS: <i>5390 Cherokee Avenue, Alexandria, Virginia 22314</i> | | | | | | | | | |

FORM NO. TP-139-3-77

INTERSHAKE II PROGRAM

| TITLE: BASIC MONITOR - SYNCHRONOUS MODE | | | | | | | FILE NO. A-1 | |
|--|---|-------|------|----------|-------------------------------|----------------|--|--|
| DESCRIPTION: | | | | | | | SHEET / OF / | |
| USE WITH AN INTERVIEW TO DISPLAY ALL TRANSMITTED DATA. RECEIVED DATA DISPLAYED IN REVERSE VIDEO. INTERSHAKE II COMPLETELY PASSIVE. ALL SWITCHES AND SYNC CHARACTERS ARE SET TO MATCH SYSTEM TO BE MONITORED. | | | | | | | | |
| OBJECTIVE: NOTE: FOR ASYNC - MODE USE ONLY STEPS 03 AND 04, ALONG WITH RESETTING THE APPROPRIATE SWITCHES (# STOP BITS, # INFO BITS, ASYNC). | | | | | | | | |
| ADDRESS | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | |
| PAGE (CIRCLE ONE) | | STEP | DATA | FUNCTION | | | | |
| 3 | 2 | 1 | 0 | 0 | 0 | 10 | 95 | CODE EBCDIC SPEED SYSTEM SPECS ASYNC / (SYNC) SYN CHARACTER 32 STOP BIT 1.0 , 1.5 , 2.0 INFO BITS 5 , 6 , 7 , (8) PARITY (NONE) ODD , EVEN CONTROL EIA (OFF) ON-LINE (TD/RD) , TD , RD OFF-LINE TERM / MODEM MON SIGS (NORMAL) PATCH CORDS CONTROL EIA (V. 24) ALL THRU COUNTER ZONE NOT USED INTERRUPTS NOT USED FLAGS NONE LATCH |
| C | 8 | 4 | 0 | 0 | 1 | 32 | 90 | |
| | | | | 1 | 2 | FF | 57 | |
| | | | | 2 | 3 | 59 | 94 | |
| | | | | 3 | 4 | 00 | 00 | |
| | | | | 4 | 5 | | | |
| | | | | 5 | 6 | | | |
| | | | | 6 | 7 | | | |
| | | | | 7 | 8 | | | |
| | | | | 8 | 9 | | | |
| | | | | 9 | A | | | |
| | | | | A | B | | | |
| | | | | B | C | | | |
| | | | | C | D | | | |
| | | | | D | E | | | |
| | | | | E | F | | | |
| D | 9 | 5 | 1 | 0 | 16 | | | |
| | | | | 1 | 17 | | | |
| | | | | 2 | 18 | | | |
| | | | | 3 | 19 | | | |
| | | | | 4 | 20 | | | |
| | | | | 5 | 21 | | | |
| | | | | 6 | 22 | | | |
| | | | | 7 | 23 | | | |
| | | | | 8 | 24 | | | |
| | | | | 9 | 25 | | | |
| | | | | A | 26 | | | |
| | | | | B | 27 | | | |
| | | | | C | 28 | | | |
| | | | | D | 29 | | | |
| | | | | E | 30 | | | |
| | | | | F | 31 | | | |

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| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|--|---|---|---|-------|------|----------|-------------------------------|------------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | | | | | | |
| E | A | 6 | 2 | 0 | 32 | | | | |
| | | | | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| ADDITIONAL REMARKS | | | | | | | | PROGRAM LOCATION | |
| | | | | | | | | DTM S/N | |
| | | | | | | | | CELL | |
| | | | | | | | | RAM | |
| | | | | | | | | PROM | |
| PROGRAM WRITTEN BY: | | | | | | | DATE | | |
| | | | | | | | June, 1977 | | |
| COMPANY NAME: | | | | | | | TEL. NO. | | |
| Atlantic Research Corporation | | | | | | | | | |
| ADDRESS: | | | | | | | | | |
| 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | | | | | | | |

INTERSHAKE II PROGRAM

| TITLE: RECORD ALL POLLING SEQUENCE CHARACTERS ON BOTH RD AND TD LEADS | | | | | | | FILE NO. A-2 | |
|--|-------|------|----------|----------------------------------|--|--|--|--|
| | | | | | | | SHEET 1 OF 2 | |
| DESCRIPTION: RESULTS MEMORY WILL BE INITIALLY ZEROES, THEN ALL TD AND RD CHARACTERS AND EIA LINE STATUS WILL BE RECORDED (UNTIL RM OVERFLOWS). | | | | | | | | |
| OBJECTIVE: FUNCTION 12 WILL INDICATE TO THE OPERATOR THE DIRECTION OF THE DATA RECORDED. THIS PROGRAM DEMONSTRATES THE USE OF THE OVERFLOW INTERRUPT. | | | | | | | | |
| ADDRESS PAGE (CIRCLE ONE) | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | |
| | STEP | DATA | FUNCTION | | | | | |
| 3 2 1 0 | 0 | 00 | 98 | No-Op | | CODE | SYSTEM | |
| C 8 4 0 | 1 | 00 | 07 | Record Bit | ← | SPEED | SYSTEM | |
| | 2 | 01 | 41 | Preset Jump | ← | ASYNC / SYNC | | |
| | 3 | 82 | 47 | Jump RM Not Full | ← | SYN CHARACTER | | |
| | 4 | 01 | 97 | Interrupt On RM Full | | STOP BIT SYSTEM | 1.0 , 1.5 , 2.0 | |
| | 5 | 00 | 11 | Record Data Until TD ↔ RD Change | | INFO BITS SYSTEM | 5 , 6 , 7 , 8 | |
| | 6 | 00 | 12 | Record TD ↔ RD Status | | PARITY SYSTEM | NONE , ODD , EVEN | |
| | 7 | 05 | 40 | Recycle | | CONTROL EIA | <input checked="" type="radio"/> OFF | |
| | 8 | | | | | ON-LINE | <input checked="" type="radio"/> TD/RD TD , RD | |
| | 9 | | | | | OFF-LINE | | |
| | A | | | | | TERM / MODEM | | |
| | B | | | | | MON SIGS | <input checked="" type="radio"/> NORMAL | |
| | C | | | | | PATCH CORDS | | |
| | D | | | | | CONTROL EIA (V. 24) | | |
| | E | | | | | ALL THRU | | |
| | F | | | | | COUNTER ZONE | | |
| D 9 5 1 | 0 | 16 | 00 | 00 | Halt Or Note 2 | INTERRUPTS | MEMORY OVERFLOW | |
| | 1 | 17 | | | NOTES: 1. If The System Under Test Is | FLAGS | 0 | |
| | 2 | 18 | | | Synchronous, The "Get In Sync" | LATCH | | |
| | 3 | 19 | | | Functions Must Be Inserted After | | | |
| | 4 | 20 | | | Step 03. | | | |
| | 5 | 21 | | | | | | |
| | 6 | 22 | | | 2. Place 00-99 At MEM OVFL INT Step 63 | | | |
| | 7 | 23 | | | Of Last Page. | | | |
| | 8 | 24 | | | | | | |
| | 9 | 25 | | | 3. Restart With START Button. | | | |
| | A | 26 | | | | | | |
| | B | 27 | | | | | | |
| | C | 28 | | | | | | |
| | D | 29 | | | | | | |
| | E | 30 | | | | | | |
| | F | 31 | | | | | | |

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CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|-----------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | | | | | | |
| E | A | 6 | 2 | 0 | 32 | | | | |
| | | | | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| LAST PAGE | | | | F | 63 | 10 | 40 | Jump To Process | |

FRONT OF PAGE

| | |
|--------------------|------------------|
| ADDITIONAL REMARKS | PROGRAM LOCATION |
| | DTM S/N |
| | CELL |
| | RAM |
| | PROM |

| | |
|---|------------|
| PROGRAM WRITTEN BY: | DATE |
| COMPANY NAME: Atlantic Research Corporation | June, 1977 |
| ADDRESS: 5390 Cherokee Avenue, Alexandria, Virginia 22314 | TEL. NO. |

OM 842A

INTERSHAKE II PROGRAM

| TITLE: <i>RTS - CTS DELAY (IN MONITOR MODE)</i> | | | | | | | | | | FILE NO. <i>A-3</i> | | | | | | | | | | | | | | | |
|--|----------|----------|----------|-------|------|-----------|-------------------------------|--|--|---------------------|---|--|--|--|--------------------------------------|--|---------|----------|---|----------|-------------|---------------------|--------------|------------|-------|
| DESCRIPTION: <i>FOR SYNCHRONOUS IF USE STEPS 00, 01, 02. FOR USE WITH INTERVIEW IF USE STEP 03.</i> | | | | | | | | | | SHEET / OF / | | | | | | | | | | | | | | | |
| OBJECTIVE: | | | | | | | | | | | | | | | | | | | | | | | | | |
| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | | | | | | | | | | | | | | | |
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | CODE | SPEED | ASYNC / <input checked="" type="radio"/> SYNC | SYN CHARACTER | STOP BIT | INFO BITS | PARITY | CONTROL EIA | ON-LINE | OFF-LINE | TERM / MODEM | MON SIGS | PATCH CORDS | CONTROL EIA (V. 24) | COUNTER ZONE | INTERRUPTS | FLAGS |
| <i>C</i> | <i>8</i> | <i>4</i> | <i>0</i> | 0 | 0 | <i>10</i> | <i>95</i> | <i>Get In Sync</i> | | <i>EBCDIC</i> | - | <input checked="" type="radio"/> 1.0 , 1.5 , 2.0 | <i>5</i> , <i>6</i> , <i>7</i> , <input checked="" type="radio"/> <i>8</i> | <input checked="" type="radio"/> NONE <input type="radio"/> ODD , EVEN | <input checked="" type="radio"/> OFF | <input checked="" type="radio"/> TD/RD , TD , RD | | | <input checked="" type="radio"/> NORMAL | | | | | | |
| | | | | 1 | 1 | <i>32</i> | <i>90</i> | | | | | | | | | | | | | | | | | | |
| | | | | 2 | 2 | <i>FF</i> | <i>57</i> | | | | | | | | | | | | | | | | | | |
| | | | | 3 | 3 | <i>59</i> | <i>94</i> | <i>Reverse Video On RD</i> | | | | | | | | | | | | | | | | | |
| | | | | 4 | 4 | <i>02</i> | <i>98</i> | <i>Preset Jump No-Op (02-98)</i> | | | | | | | | | | | | | | | | | |
| | | | | 5 | 5 | <i>80</i> | <i>73</i> | <i>RTS (Wait For OFF) (Fun 73)</i> | | | | | | | | | | | | | | | | | |
| | | | | 6 | 6 | <i>00</i> | <i>86</i> | <i>Measure RTS - CTS Delay</i> | | | | | | | | | | | | | | | | | |
| | | | | 7 | 7 | <i>00</i> | <i>00</i> | <i>Halt - (Or Jump To Step 04 With Time Delay)</i> | | | | | | | | | | | | | | | | | |
| | | | | 8 | 8 | | | | | | | | | | | | | | | | | | | | |
| | | | | 9 | 9 | | | | | | | | | | | | | | | | | | | | |
| | | | | A | 10 | | | | | | | | | | | | | | | | | | | | |
| | | | | B | 11 | | | | | | | | | | | | | | | | | | | | |
| | | | | C | 12 | | | | | | | | | | | | | | | | | | | | |
| | | | | D | 13 | | | | | | | | | | | | | | | | | | | | |
| | | | | E | 14 | | | | | | | | | | | | | | | | | | | | |
| | | | | F | 15 | | | | | | | | | | | | | | | | | | | | |
| <i>D</i> | <i>9</i> | <i>5</i> | <i>1</i> | 0 | 16 | | | | | | | | | | | | | | | | | | | | |
| | | | | 1 | 17 | | | | | | | | | | | | | | | | | | | | |
| | | | | 2 | 18 | | | | | | | | | | | | | | | | | | | | |
| | | | | 3 | 19 | | | | | | | | | | | | | | | | | | | | |
| | | | | 4 | 20 | | | | | | | | | | | | | | | | | | | | |
| | | | | 5 | 21 | | | | | | | | | | | | | | | | | | | | |
| | | | | 6 | 22 | | | | | | | | | | | | | | | | | | | | |
| | | | | 7 | 23 | | | | | | | | | | | | | | | | | | | | |
| | | | | 8 | 24 | | | | | | | | | | | | | | | | | | | | |
| | | | | 9 | 25 | | | | | | | | | | | | | | | | | | | | |
| | | | | A | 26 | | | | | | | | | | | | | | | | | | | | |
| | | | | B | 27 | | | | | | | | | | | | | | | | | | | | |
| | | | | C | 28 | | | | | | | | | | | | | | | | | | | | |
| | | | | D | 29 | | | | | | | | | | | | | | | | | | | | |
| | | | | E | 30 | | | | | | | | | | | | | | | | | | | | |
| | | | | F | 31 | | | | | | | | | | | | | | | | | | | | |

CONTINUE ON OTHER SIDE

ATLANTIC RESEARCH CORP.
ALEXANDRIA, VA. 22314 (703) 354-3400

CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | | | ENTRY | | | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|----------------|---|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | |
| E | A | 6 | 2 | 1 | 33 | | | |
| | | | | 2 | 34 | | | |
| | | | | 3 | 35 | | | |
| | | | | 4 | 36 | | | |
| | | | | 5 | 37 | | | |
| | | | | 6 | 38 | | | |
| | | | | 7 | 39 | | | |
| | | | | 8 | 40 | | | |
| | | | | 9 | 41 | | | |
| | | | | A | 42 | | | |
| | | | | B | 43 | | | |
| | | | | C | 44 | | | |
| | | | | D | 45 | | | |
| | | | | E | 46 | | | |
| | | | | F | 47 | | | |
| F | B | 7 | 3 | 0 | 48 | | | |
| | | | | 1 | 49 | | | |
| | | | | 2 | 50 | | | |
| | | | | 3 | 51 | | | |
| | | | | 4 | 52 | | | |
| | | | | 5 | 53 | | | |
| | | | | 6 | 54 | | | |
| | | | | 7 | 55 | | | |
| | | | | 8 | 56 | | | |
| | | | | 9 | 57 | | | |
| | | | | A | 58 | | | |
| | | | | B | 59 | | | |
| | | | | C | 60 | | | |
| | | | | D | 61 | | | |
| | | | | E | 62 | | | |
| | | | | F | 63 | | | |

| | | | |
|--|--|------------------|--|
| ADDITIONAL REMARKS | | PROGRAM LOCATION | |
| | | DTM S/N | |
| | | CELL | |
| | | RAM | |
| | | PROM | |
| PROGRAM WRITTEN BY: | | DATE | |
| | | June, 1977 | |
| COMPANY NAME: | | TEL. NO. | |
| Atlantic Research Corporation | | | |
| ADDRESS: | | | |
| 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | |

FORM NO. TP-139-377

INTERSHAKE II PROGRAM

| | |
|---|--------------------------|
| TITLE: MEASURE EXCESSIVE RTS - CTS DELAY | FILE NO. A-4 SHEET OF |
| DESCRIPTION: "TEST" THE CONTROL LEAD AFTER AN INTERNALLY GENERATED DELAY. IF THE LEAD IS ALREADY "ON" RECYCLE THE TEST. IF THE LEAD IS OFF CONTINUE MEASURING TIME UNTIL THE LEAD DOES COME ON - AND THEN STOP THE TEST FREEZING THE TIME ON THE COUNTER DISPLAY. | |

OBJECTIVE:

| ADDRESS PAGE (CIRCLE ONE) | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|------------------------------|-------|------|----------|--|----------------|--|
| | STEP | DATA | FUNCTION | | | |
| 3 2 1 0 | 0 | 05 | 40 | Jump Start | → | CODE |
| C 8 4 0 | 1 | | | | | SPEED |
| | 2 | | | | | ASYNC / SYNC |
| | 3 | | | | | SYN CHARACTER |
| | 4 | | | | | STOP BIT 1.0, 1.5, 2.0 |
| 0 5 | 5 | 80 | 73 | Det RTS OFF Retest | ← | INFO BITS 3, 6, 7, 8 |
| | 6 | 80 | 72 | Det RTS ON | | PARITY NONE, ODD, EVEN |
| | 7 | 01 | 87 | Start Counter | | CONTROL EIA / OFF |
| | 8 | 40 | 72 | Det CTS ON | | ON-LINE TD/RD, TD, RD |
| | 9 | 02 | 87 | Stop Counter | | OFF-LINE TERM / MODEM |
| A | 10 | 10 | 41 | Preset Jump | | MON SIGS / NORMAL |
| B | 11 | | 88 | Jump Time Greater Than - - (Alarm) ms | → | PATCH CORDS |
| C | 12 | 00 | 87 | Clear Counter | | CONTROL EIA (V. 24) |
| D | 13 | 80 | 73 | Det RTS OFF | | THRU |
| E | 14 | 05 | 40 | Jump Retest | → | COUNTER ZONE |
| F | 15 | | | | | DURATION 8X |
| D 9 5 1 | 0 | 02 | 98 | No-Op (Alarm) | ← | INTERRUPTS |
| | 1 | 02 | 98 | No-Op | | FLAGS |
| | 2 | 01 | 70 | Turn ON Alarm | | LATCH |
| | 3 | 10 | 81 | Wait 100 ms | | |
| | 4 | 01 | 71 | Turn Alarm OFF | | |
| | 5 | 02 | 98 | No-Op | | |
| | 6 | 02 | 98 | No-Op | | |
| | 7 | 00 | 00 | Halt | | |
| | 8 | 05 | 40 | Jump Retest | → | |
| | 9 | | | | | |
| A | 26 | | | | | |
| B | 27 | | | | | |
| C | 28 | | | | | |
| D | 29 | | | | | |
| E | 30 | | | | | |
| F | 31 | | | | | |

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OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|--|---|---|---|-------|------|----------|-------------------------------|--|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| <p>ADDITIONAL REMARKS When Polling is at a SLOW Rate, the counter reading will be displayed long enough to see before starting a new Measurement. To FREEZE the duration readout on a Fast Poll cycle, insert a 1 sec delay before Step 14 (Before Recycling The Test). This will cause missing a Poll or two but the change in reading will be visually informative as it ranges around.</p> | | | | | | | | <p>PROGRAM LOCATION</p> <p>DTM S/N</p> <p>CELL</p> <p>RAM</p> <p>PROM</p> | |
| PROGRAM WRITTEN BY: | | | | | | | DATE | June 1977 | |
| COMPANY NAME: ATLANTIC RESEARCH CORPORATION | | | | | | | TEL. NO. | | |
| ADDRESS: | | | | | | | | | |

FORM NO. TP-139-3-77

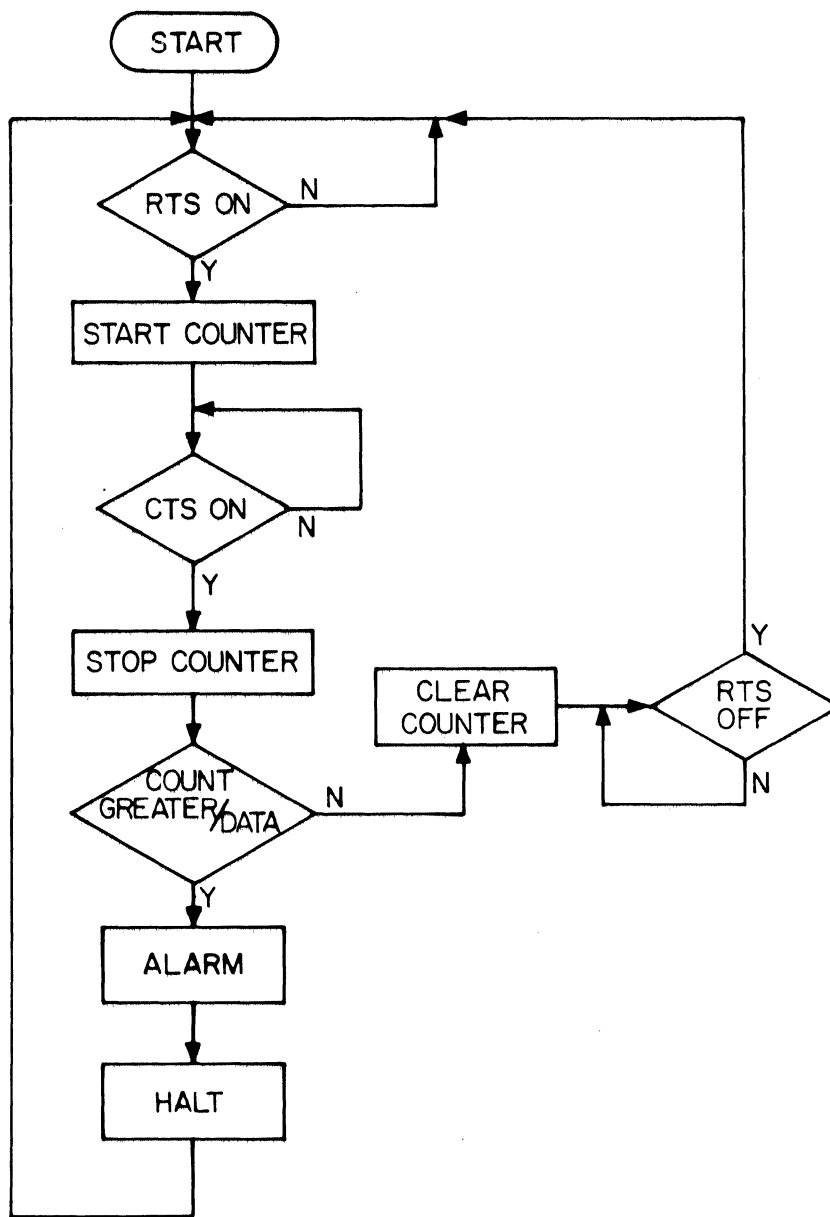
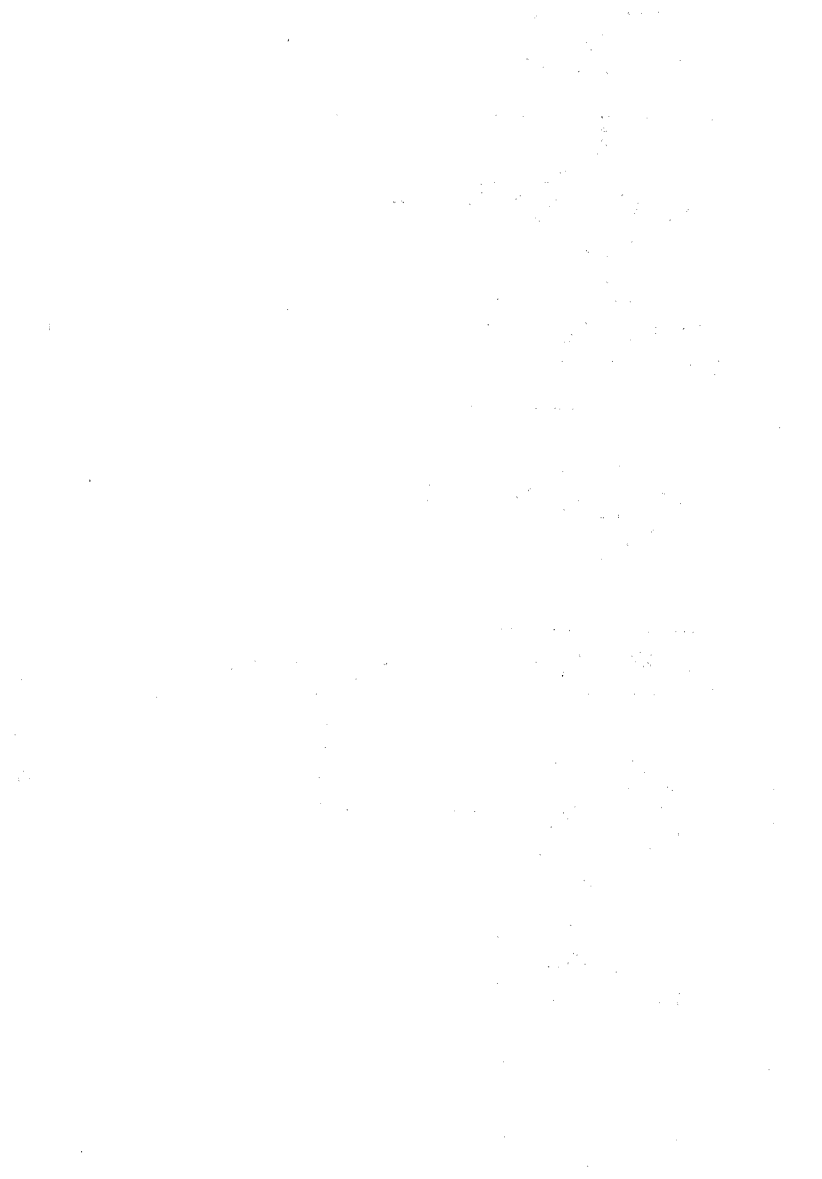


Figure E-2. Program Flow Diagram To Measure Excessive RTS-CTS Delay.



INTERSHAKE II PROGRAM

| TITLE: RECORD 8 RESPONSES FROM A SPECIFIC STATION ON A MULTI-DROP LINE. | | | | | | | FILE NO. A-5 | | |
|---|---|-------|------|----------|-------------------------------|------|---|---|--|
| DESCRIPTION: | | | | | | | SHEET OF | | |
| DISREGARD DATA TO/FROM OTHER TERMINALS. TRAP 3 CHARACTER ADDRESS OF POLL FOR SPECIFIC STATION AS IT IS GENERATED BY THE CPU. USE AUTO PANEL FUNCTIONS TO EXAMINE THE TD LEAD AND RECORD RESPONSE. | | | | | | | | | |
| OBJECTIVE: | | | | | | | | | |
| ADDRESS | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | |
| PAGE (CIRCLE ONE) | | STEP | DATA | FUNCTION | | | | | |
| 3 | 2 | 1 | 0 | 0 | 0 | 10 | 95 | | CODE EBCDIC |
| C | 8 | 4 | 0 | 1 | 1 | 32 | 90 | } | SPEED - |
| | | | | 2 | 2 | FF | 57 | | "Get In Sync" |
| | | | | 3 | 3 | 08 | 42 | | ASYNC / SYNC |
| | | | 0 | 4 | 4 | BD | 93 | | SYN CHARACTER 32 |
| | | | | 5 | 5 | C1 | 21 | | STOP BIT 1.0 , 1.5 , 2.0 |
| | | | | 6 | 6 | C2 | 22 | | INFO BITS 5 , 6 , 7 8 |
| | | | | 7 | 7 | C3 | 23 | | PARITY NONE ODD, EVEN |
| | | | | 8 | 8 | DF | 93 | | CONTROL EIA OFF |
| | | | | 9 | 9 | 05 | 32 | | ON-LINE FUN 93 TD/RD , TD , RD |
| | | | | A | 10 | 04 | 41 | | OFF-LINE TERM / MODEM |
| | | | | B | 11 | 00 | 43 | | MON SIGS NORMAL |
| | | | | C | 12 | 00 | 00 | | PATCH CORDS |
| | | | | D | 13 | | | | CONTROL EIA (V. 24) |
| | | | | E | 14 | | | | COUNTER ZONE |
| | | | | F | 15 | | | | INTERRUPTS |
| D | 9 | 5 | 1 | 0 | 16 | | | | FLAGS |
| | | | | 1 | 17 | | | | LATCH TD, RD, INT. CLOCK CONTROL EIA EIA |
| | | | | 2 | 18 | | | | |
| | | | | 3 | 19 | | | | |
| | | | | 4 | 20 | | | | |
| | | | | 5 | 21 | | | | |
| | | | | 6 | 22 | | | | |
| | | | | 7 | 23 | | | | |
| | | | | 8 | 24 | | | | |
| | | | | 9 | 25 | | | | |
| | | | | A | 26 | | | | |
| | | | | B | 27 | | | | |
| | | | | C | 28 | | | | |
| | | | | D | 29 | | | | |
| | | | | E | 30 | | | | |
| | | | | F | 31 | | | | |

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ALEXANDRIA, VA. 22314 (703) 354-3400

CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|----------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |

ADDITIONAL REMARKS
*Steps 00, 01, 02 Not Required For Async.
 Each Cycle Of Test Will Record 8 Characters In RM, Thus Storing 64 Characters
 In 8 Loops. It Is Advisable To Clear RM Before Running The Test.*

| |
|-------------------------|
| PROGRAM LOCATION |
| DTM S/N |
| CELL |
| RAM |
| PROM |

PROGRAM WRITTEN BY: _____ **DATE** June, 1977

COMPANY NAME: Atlantic Research Corporation **TEL. NO.** _____

ADDRESS: 5390 Cherokee Avenue, Alexandria, Virginia 22314

OM 842A

INTERSHAKE II PROGRAM

| TITLE: CAPTURE NAK'D DATA ONLY | | | | | | | FILE NO. A-6 | |
|--|---|-------|------|----------|-------------------------------|------|--|---|
| | | | | | | | SHEET OF | |
| DESCRIPTION: INTERSHAKE WILL RECORD THE APPROPRIATE PART OF A TRANSMISSION AND IF AN ACK IS RECEIVED, THE NEXT TRANSMISSION WILL WRITE OVER THE ACK, STARTING AGAIN AT PAGE 00/STEP 00. WHEN A NAK IS RECEIVED THE TEST STOPS AND HOLDS THE NAK'D DATA IN MEMORY FOR PLAYBACK. | | | | | | | | |
| OBJECTIVE: | | | | | | | | |
| ADDRESS | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | |
| PAGE (CIRCLE ONE) | | STEP | DATA | FUNCTION | | | | |
| 3 | 2 | 1 | 0 | | | | | |
| C | 8 | 4 | 0 | 0 | 00 | 41 | Preset Jump ≠ ACK | CODE - |
| | | | | 1 | 00 | 49 | Select RM, Page 00 /Step 00 | SPEED |
| | | | | 2 | STX | 20 | Trap STX TD Before Begin Recording | <input checked="" type="checkbox"/> ASYNC / SYNC |
| | | | | 3 | 00 | 11 | Record Until TD ← RD Change | SYN CHARACTER |
| | | | | 4 | NAK | 45 | Jump ≠ NAK (otherwise Restart) | STOP BIT 1.0, 1.5, 2.0 |
| | | | | 5 | 00 | 00 | Halt - NAK Detected | INFO BITS 5, 6, 7, 8 |
| | | | | 6 | | | | PARITY NONE, ODD, EVEN |
| | | | | 7 | | | | CONTROL EIA <input checked="" type="checkbox"/> OFF |
| | | | | 8 | | | | ON-LINE <input checked="" type="checkbox"/> TD/RD, TD, RD |
| | | | | A | | | NOTE: This Program Can Be Used In Synchronous Mode With The Additional Functions In "GET IN SYNC". SYNC Mode TD ← RD | OFF-LINE TERM / MODEM |
| | | | | B | | | Automatically Initiates A New SYN Search, | MON SIGS <input checked="" type="checkbox"/> NORMAL |
| | | | | C | | | | PATCH CORDS |
| | | | | D | | | | CONTROL EIA (V. 24) |
| | | | | E | | | | ALL THRU |
| | | | | F | | | | COUNTER ZONE |
| D | 9 | 5 | 1 | 0 | 16 | | | INTERRUPTS |
| | | | | 1 | 17 | | | FLAGS |
| | | | | 2 | 18 | | | LATCH |
| | | | | 3 | 19 | | | |
| | | | | 4 | 20 | | | |
| | | | | 5 | 21 | | | |
| | | | | 6 | 22 | | | |
| | | | | 7 | 23 | | | |
| | | | | 8 | 24 | | | |
| | | | | 9 | 25 | | | |
| | | | | A | 26 | | | |
| | | | | B | 27 | | | |
| | | | | C | 28 | | | |
| | | | | D | 29 | | | |
| | | | | E | 30 | | | |
| | | | | F | 31 | | | |

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OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|----------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |

ADDITIONAL REMARKS: FUNCTION 12 could be used to record whether NAK occurred on the TD (02) or RD (03) line. Insert FUNCTION 12 after FUNCTION 20 and again after FUNCTION 11. Display during RUN will Pause at STEP 02 FUNCTION 20 while looking for STX. Pause again at STEP 03. FUNCTION 11 while recording until TD ← RD change. Blink STEP 04 FUNCTION 45 and Stop on 00 after NAK is received.

PROGRAM WRITTEN BY: _____ DATE: June 1977

COMPANY NAME: ATLANTIC RESEARCH CORPORATION TEL. NO. _____

ADDRESS: _____

PROGRAM LOCATION: _____

DTM S/N: _____

CELL: _____

RAM: _____

PROM: _____

OM 842A

INTERSHAKE II PROGRAM

| | |
|--|--|
| TITLE: SELECTIVELY VERIFY A CHARACTER GROUP WITHIN A LONG BLOCK. | FILE NO. A-7 SHEET OF |
| DESCRIPTION: THE STX CHARACTER WILL BE LOGGED AND ALL OTHER CHARACTERS BETWEEN AND INCLUDING THE NTH AND (N + M)TH CHARACTERS. | |
| OBJECTIVE: | |

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|-------------------|---|---|---|-------|------|----------|--|--|--|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| C | 8 | 4 | 0 | 0 | 02 | 98 | Start With No-Op | CODE EBCDIC | |
| | | | | 1 | 32 | 90 | Enter Syn Character | SPEED EXT. | |
| | | | | 2 | 10 | 95 | Auto Sync | ASYNC <input checked="" type="radio"/> SYNC | |
| | | | | 3 | FF | 57 | Enter Fill Character | SYN CHARACTER 32 | |
| | | | | 4 | 59 | 94 | Rev Video On R.D. Data | STOP BIT 1.0 , 1.5 , 2.0 | |
| | | | | 5 | 02 | 20 | Trap STX Character | INFO BITS 5 , 6 , 7 , 8 | |
| | | | | 6 | #N | 31 | Record The Nth Character (Wait "N" Char) | PARITY <input checked="" type="radio"/> NONE <input type="radio"/> ODD , <input type="radio"/> EVEN | |
| | | | | 7 | #M | 32 | Record The Next M Characters | CONTROL EIA <input checked="" type="radio"/> OFF | |
| | | | | 8 | 00 | 00 | Halt (Or Recycle) | ON-LINE <input checked="" type="radio"/> TD/RD <input type="radio"/> TD , RD | |
| | | | | 9 | 05 | 40 | Jump To Retest | OFF-LINE TERM / MODEM | |
| | | | | A | | | NOTE: Remember To Use | MON SIGS <input checked="" type="radio"/> NORMAL | |
| | | | | B | | | a. Clear RM | PATCH CORDS | |
| | | | | C | | | b. Get In SYNC | CONTROL EIA (V. 24) | |
| | | | | D | | | When Necessary Or Helpful | COUNTER ZONE | |
| | | | | E | | | | INTERRUPTS | |
| | | | | F | | | | FLAGS | |
| D | 9 | 5 | 1 | 0 | | | | LATCH | |
| | | | | 1 | | | | | |
| | | | | 2 | | | | | |
| | | | | 3 | | | | | |
| | | | | 4 | | | | | |
| | | | | 5 | | | | | |
| | | | | 6 | | | | | |
| | | | | 7 | | | | | |
| | | | | 8 | | | | | |
| | | | | 9 | | | | | |
| | | | | A | | | | | |
| | | | | B | | | | | |
| | | | | C | | | | | |
| | | | | D | | | | | |
| | | | | E | | | | | |
| | | | | F | | | | | |

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OM 842A

| ADDRESS | | | | ENTRY | | | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) | |
|---|---|---|---|-------|------|----------|----------------|--------------------------------------|------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| ADDITIONAL REMARKS | | | | | | | | | PROGRAM LOCATION |
| | | | | | | | | | DTM S/N |
| | | | | | | | | | CELL |
| | | | | | | | | | RAM |
| | | | | | | | | | PROM |
| PROGRAM WRITTEN BY: | | | | | | | DATE | | June, 1977 |
| COMPANY NAME: Atlantic Research Corporation | | | | | | | TEL. NO. | | |
| ADDRESS: 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | | | | | | | |

FORM NO. TP-139-3-77

INTERSHAKE II PROGRAM

| TITLE: AUTOMATIC DETERMINATION OF SYNC CHARACTER | | | | | | | | | | FILE NO. A-8 | | | | | | | | | | | | | | | | | | |
|---|-------|---|---|-------------------------------|------|---|------|-------------------------------------|----------|--------------|-------|--------------|---------------|----------|-----------|--------|-------------------|---------|----------|----------|-------------|---------------------|--------------|------------|-------|-------|--|--|
| DESCRIPTION: | | | | | | | | | | SHEET OF | | | | | | | | | | | | | | | | | | |
| 1) TEST SEARCHES FOR SYN = 96, 16, 32 AND REPEATS 5 TIMES. 2) SHORT "BLIP" INDICATES ANOTHER SYN IS BEING TRIED. 3) SHORT "TONE BEEP" = SYN FOUND (HALT @ STEP 37). 4) LONG BEEP = SYN NOT FOUND (HALT @ STEP 37). | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBJECTIVE: 1) OPERATE PLAY & SYN IS SHOWN AS DATA FOR STEP 00 PAGE 0. (00 INDICATES SYNC NOT FOUND). | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ADDRESS PAGE (CIRCLE ONE) | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | | | | | | | | | | | | | | | | | | | | | |
| | 3 | 2 | 1 | | | 0 | STEP | DATA | FUNCTION | CODE | SPEED | ASYNC / SYNC | SYN CHARACTER | STOP BIT | INFO BITS | PARITY | CONTROL EIA / OFF | ON-LINE | OFF-LINE | MON SIGS | PATCH CORDS | CONTROL EIA (V. 24) | COUNTER ZONE | INTERRUPTS | FLAGS | LATCH | | |
| C | 8 | 4 | 0 | 0 | 0 | 00 | 07 | Clears First Step In RM | | | | | | | | | | | | | | | | | | | | |
| | | | | 1 | 1 | 00 | 49 | Select RM Page 0, Step 00 | | | | | | | | | | | | | | | | | | | | |
| | | | | 2 | 2 | 05 | 42 | Set Loop Count = 5 | | | | | | | | | | | | | | | | | | | | |
| | | | | 3 | 3 | 96 | 90 | Sync Character "96" | | | | ← | | | | | | | | | | | | | | | | |
| | | | | 4 | 4 | 10 | 95 | Auto Sync | | | | | | | | | | | | | | | | | | | | |
| | | | | 5 | 5 | 00 | 10 | Wait = TD / RD Change | | | | | | | | | | | | | | | | | | | | |
| | | | | 6 | 6 | 03 | 84 | 300 ms INT | | | | | | | | | | | | | | | | | | | | |
| | | | | 7 | 7 | 0C | 97 | Enable Timeout Int. | | | | | | | | | | | | | | | | | | | | |
| | | | | 8 | 8 | 08 | 41 | Wait for IN Sync | | | | ← | | | | | | | | | | | | | | | | |
| | | | | 9 | 9 | D3 | 47 | JUMP = Out-Of-Sync | | | | | | | | | | | | | | | | | | | | |
| | | | | A | 10 | 96 | 07 | Log SYN Character (Bit Switch = 96) | | | | | | | | | | | | | | | | | | | | |
| | | | | B | 11 | 1D | 40 | | | | | | | | | | | | | | | | | | | | | |
| | | | | C | 12 | 16 | 90 | | | | | | | | | | | | | | | | | | | | | |
| | | | | D | 13 | 10 | 95 | | | | | | | | | | | | | | | | | | | | | |
| | | | | E | 14 | 00 | 10 | | | | | | | | | | | | | | | | | | | | | |
| | | | | F | 15 | 03 | 84 | | | | | | | | | | | | | | | | | | | | | |
| D | 9 | 5 | 1 | 0 | 16 | 0C | 97 | Look For SYN = 16 | | | | | | | | | | | | | | | | | | | | |
| | | | | 1 | 17 | 11 | 41 | | | | | ← | | | | | | | | | | | | | | | | |
| | | | | 2 | 18 | D3 | 47 | | | | | | | | | | | | | | | | | | | | | |
| | | | | 3 | 19 | 16 | 07 | | | | | | | | | | | | | | | | | | | | | |
| | | | | 4 | 20 | 1D | 40 | | | | | | | | | | | | | | | | | | | | | |
| | | | | 5 | 21 | 32 | 90 | | | | | | | | | | | | | | | | | | | | | |
| | | | | 6 | 22 | 10 | 95 | | | | | | | | | | | | | | | | | | | | | |
| | | | | 7 | 23 | 00 | 10 | | | | | | | | | | | | | | | | | | | | | |
| | | | | 8 | 24 | 03 | 84 | Look For SYN = 32 | | | | | | | | | | | | | | | | | | | | |
| | | | | 9 | 25 | 0C | 97 | | | | | | | | | | | | | | | | | | | | | |
| | | | | A | 26 | 1A | 41 | | | | | ← | | | | | | | | | | | | | | | | |
| | | | | B | 27 | D3 | 47 | | | | | | | | | | | | | | | | | | | | | |
| | | | | C | 28 | 32 | 07 | | | | | | | | | | | | | | | | | | | | | |
| | | | | D | 29 | 05 | 42 | Short | | | | | | | | | | | | | | | | | | | | |
| | | | | E | 30 | 08 | 97 | Disable INT | | | | | | | | | | | | | | | | | | | | |
| | | | | F | 31 | 01 | 70 | ON | | | | | | | | | | | | | | | | | | | | |

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CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | | | | | | |
| E | A | 6 | 2 | 0 | 32 | 50 80 | Delay (50 ms ON) | | |
| | | | | 1 | 33 | 01 71 | OFF | | |
| | | | | 2 | 34 | 80 80 | Delay (80 ms OFF) | | |
| | | | | 3 | 35 | 1F 41 | Pre "ON" | → | |
| | | | | 4 | 36 | 00 43 | J Until L | | |
| | | | | 5 | 37 | 00 00 | Halt | | |
| | | | | 6 | 38 | 1D 40 | Hard Halt "BEEP" | → | |
| | | | | 2 7 | 39 | 08 97 | Disable INT SER INT | ← | |
| | | | | 8 | 40 | 01 70 | Turn ON Alarm | | |
| | | | | 9 | 41 | 50 80 | Delay | | |
| | | | | A | 42 | 01 71 | Turn OFF Alarm | | |
| | | | | B | 43 | 38 41 | Pre | | |
| | | | | C | 44 | 12 47 | JF1=0 SF1 | → | |
| | | | | D | 45 | 3A 41 | Pre | | |
| | | | | E | 46 | 22 47 | JF2=0 SF2 | → | |
| | | | | F | 47 | 3C 41 | Pre | | |
| F | B | 7 | 3 | 0 | 48 | 32 47 | JF3=0 SF3 | → | |
| | | | | 1 | 49 | 10 47 | SF1=0 | | |
| | | | | 2 | 50 | 20 47 | SF2=0 | | |
| | | | | 3 | 51 | 30 47 | SF3=0 | | |
| | | | | 4 | 52 | 03 41 | Pre | | |
| | | | | 5 | 53 | 00 43 | J Until L "96" | → | |
| | | | | 6 | 54 | 20 42 | Fails = LONG BEEP | | |
| | | | | 7 | 55 | 1F 40 | Go To ON | → | |
| | | | | 3 8 | 56 | 11 47 | SF1=1 SF1 | ← | |
| | | | | 9 | 57 | 03 40 | Go To "96" | → | |
| | | | | 3 A | 58 | 21 47 | SF2=1 SF2 | ← | |
| | | | | B | 59 | 0C 40 | Go To "16" | → | |
| | | | | 3 C | 60 | 31 47 | SF3=1 SF3 | ← | |
| | | | | D | 61 | 15 40 | Go To "32" | → | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |

NOTE #2 FROM LAST PAGE STEP 61

ADDITIONAL REMARKS

- 1) 32 = EBCDIC, 96 = ASCII EVEN PARITY, 16 = ASCII ODD PARITY.
- 2) STEP 61, P1 LOAD DATA 27, FUN 40 FOR INT.
- 3) INTERVIEW WILL AUTOMATICALLY START DISPLAYING DATA WHEN SYNC IS OBTAINED.

PROGRAM WRITTEN BY: _____ DATE _____

COMPANY NAME: _____ TEL. NO. _____

ADDRESS: _____

PROGRAM LOCATION

DTM S/N _____

CELL _____

RAM _____

PROM _____

FORM NO. TP-139-3-77

)

OM 842A

INTERSHAKE II PROGRAM

| TITLE: GENERATION OF LRC CHARACTERS | | | | | | | | | | FILE NO. B-1 | | |
|---|---|---|-------|------|----------|-------------------------------|----------------|--|--|--------------|--|-----------------------------|
| DESCRIPTION: LRC IS GENERALLY CALCULATED USING ASCII & ASYNC, BUT IS ALSO USED IN ASCII SYNC. VERY RARELY USED IN EBCDIC. | | | | | | | | | | SHEET OF | | |
| OBJECTIVE: | | | | | | | | | | | | |
| ADDRESS | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | | | |
| PAGE (CIRCLE ONE) | | | STEP | DATA | FUNCTION | | | | | | | |
| 3 | 2 | 1 | 0 | | | | | CODE ASCII SPEED ANY <input checked="" type="checkbox"/> ASYNC / SYNC SYN CHARACTER STOP BIT <input checked="" type="checkbox"/> 1.0, 1.5, 2.0 INFO BITS 5, 6, <input checked="" type="checkbox"/> 7, 8 PARITY NONE <input checked="" type="checkbox"/> ODD, EVEN CONTROL EIA / OFF ON-LINE TD/RD, TD, RD OFF-LINE <input checked="" type="checkbox"/> TERM / MODEM MON SIGS / NORMAL PATCH CORDS CONTROL EIA (V. 24) COUNTER ZONE INTERRUPTS FLAGS LATCH | | | | |
| C | 8 | 4 | 0 | 0 | 02 | 50 | | | | | | Send STX Character |
| | | | | 1 | 18 | 58 | | | | | | Start LRC (ODD) Calculation |
| | | | | 2 | 03 | 64 | | | | | | Send Test Message 3 Times |
| | | | | 3 | 03 | 50 | | | | | | Send ETX |
| | | | | 4 | 00 | 59 | | | | | | Send LRC Character (1 BYTE) |
| | | | | 5 | 00 | 00 | | | | | | Halt |
| | | | | 6 | | | | | | | | |
| | | | | 7 | | | | | | | | |
| | | | | 8 | | | | | | | | |
| | | | | 9 | | | | | | | | |
| | | | | A | | | | | | | | |
| | | | | B | | | | | | | | |
| | | | | C | | | | | | | | |
| | | | | D | | | | | | | | |
| | | | | E | | | | | | | | |
| | | | | F | | | | | | | | |
| D | 9 | 5 | 1 | 0 | | | | | | | | |
| | | | | 1 | | | | | | | | |
| | | | | 2 | | | | | | | | |
| | | | | 3 | | | | | | | | |
| | | | | 4 | | | | | | | | |
| | | | | 5 | | | | | | | | |
| | | | | 6 | | | | | | | | |
| | | | | 7 | | | | | | | | |
| | | | | 8 | | | | | | | | |
| | | | | 9 | | | | | | | | |
| | | | | A | | | | | | | | |
| | | | | B | | | | | | | | |
| | | | | C | | | | | | | | |
| | | | | D | | | | | | | | |
| | | | | E | | | | | | | | |
| | | | | F | | | | | | | | |

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OM 842A

| ADDRESS | | | | ENTRY | | | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|----------------|---|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | |
| E | A | 6 | 2 | 1 | 33 | | | |
| | | | | 2 | 34 | | | |
| | | | | 3 | 35 | | | |
| | | | | 4 | 36 | | | |
| | | | | 5 | 37 | | | |
| | | | | 6 | 38 | | | |
| | | | | 7 | 39 | | | |
| | | | | 8 | 40 | | | |
| | | | | 9 | 41 | | | |
| | | | | A | 42 | | | |
| | | | | B | 43 | | | |
| | | | | C | 44 | | | |
| | | | | D | 45 | | | |
| | | | | E | 46 | | | |
| | | | | F | 47 | | | |
| F | B | 7 | 3 | 0 | 48 | | | |
| | | | | 1 | 49 | | | |
| | | | | 2 | 50 | | | |
| | | | | 3 | 51 | | | |
| | | | | 4 | 52 | | | |
| | | | | 5 | 53 | | | |
| | | | | 6 | 54 | | | |
| | | | | 7 | 55 | | | |
| | | | | 8 | 56 | | | |
| | | | | 9 | 57 | | | |
| | | | | A | 58 | | | |
| | | | | B | 59 | | | |
| | | | | C | 60 | | | |
| | | | | D | 61 | | | |
| | | | | E | 62 | | | |
| | | | | F | 63 | | | |

ADDITIONAL REMARKS FOR CRC GENERATION ONLY STEP 01 WOULD CHANGE: (EXAMPLE DATA = 03).
 FUNCTION 59 WOULD AUTOMATICALLY SEND 2 CRC CHARACTERS INSTEAD OF THE ONE
 LRC BYTE.

| | |
|--|------------------------|
| PROGRAM WRITTEN BY: | DATE June, 1977 |
| COMPANY NAME: Atlantic Research Corporation | TEL. NO. |
| ADDRESS: 5390 Cherokee Avenue, Alexandria, Virginia 22314 | |

| |
|-------------------------|
| PROGRAM LOCATION |
| DTM S/N |
| CELL |
| RAM |
| PROM |

FORM NO. TP-139-3-77

INTERSHAKE II PROGRAM

TITLE: MEASURE OF TURN-AROUND TIME

DESCRIPTION: DTM-2 USED TO POLL A TERMINAL AND PROVIDE THE FOLLOWING INFORMATION (a) VERIFY THAT THE TERMINAL ACCEPTS THE PROPER POLL. (b) VERIFY THAT THE CORRECT RESPONSE IS SENT FROM THE TERMINAL. (c) MEASURE THE RESPONSE TIME (AS WITHIN THE CPU SOFTWARE CONSTRAINTS). (d) CONTINUE TEST TO SEND DATA FORWARD TO TERMINAL TO AUTHENTICATE TERMINAL OPERATION.

FILE NO. B-2
SHEET OF

OBJECTIVE:

| ADDRESS PAGE (CIRCLE ONE) | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|------------------------------|-------|------|----------|-------------------------------|----------------|---|
| | STEP | DATA | FUNCTION | | | |
| C 8 4 0 | 0 | 0 | CR 50 | Send Poll Character 1 | | CODE OPTIONAL |
| | 1 | 1 | LF 50 | Send Poll Character 2 | | SPEED OPTIONAL |
| | 2 | 2 | H 50 | Send Poll Character 3 | | <input checked="" type="radio"/> ASYNC / SYNC |
| | 3 | 3 | E 50 | Send Poll Character 4 | | SYN CHARACTER |
| | 4 | 4 | L 50 | Send Poll Character 5 | | STOP BIT 1.0 , 1.5 , 2.0 |
| | 5 | 5 | L 50 | Send Poll Character 6 | | INFO BITS 5 , 6 , 7 , 8 |
| | 6 | 6 | 0 50 | Send Poll Character 7 | | PARITY NONE , ODD , EVEN |
| | 7 | 7 | CR 50 | Send Poll Character 8 | | <input checked="" type="radio"/> CONTROL EIA OFF |
| | 8 | 8 | LF 50 | Send Poll Character 9 | | ON-LINE TD/RD , TD , RD |
| | 9 | 9 | 01 87 | Start Time Duration | | OFF-LINE <input checked="" type="radio"/> TERM MODEM |
| | A | 10 | H 21 | Trap 1st Response Character | | MON SIGS <input checked="" type="radio"/> NORMAL |
| | B | 11 | I 23 | Trap 2nd Response Character | | PATCH CORDS |
| | C | 12 | 02 87 | Stop Timer | | CONTROL EIA (V. 24) |
| | D | 13 | 02 80 | Wait 2ms Turnaround | | COUNTER ZONE |
| | E | 14 | STX 50 | Send STX Character | | DURATION (8X) |
| | F | 15 | 08 61 | Send FOX Message 8 Times | | INTERRUPTS |
| D 9 5 1 | 0 | 16 | EOT 50 | Send EOT | | FLAGS |
| | 1 | 17 | 00 00 | Halt | | LATCH |
| | 2 | 18 | | | | |
| | 3 | 19 | | | | |
| | 4 | 20 | | | | |
| | 5 | 21 | | | | |
| | 6 | 22 | | | | |
| | 7 | 23 | | | | |
| | 8 | 24 | | | | |
| | 9 | 25 | | | | |
| | A | 26 | | | | |
| | B | 27 | | | | |
| | C | 28 | | | | |
| | D | 29 | | | | |
| | E | 30 | | | | |
| | F | 31 | | | | |

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OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|----------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | | | | | | |
| E | A | 6 | 2 | 0 | 32 | | | | |
| | | | | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |

ADDITIONAL REMARKS

(a) TIMER WILL READ OUT TURNAROUND DELAY IN THE RANGE MANUALLY SELECTED BETWEEN 0.01 - 9.99 MS, AND 001 - 999 SEC.

(b) TURNAROUND TIME (STEP 13) SELECTABLE FROM 1 MS TO 9.9 SEC BY USING FUN 81 OR 82.

(c) STEP 15 GENERATES 64 CHARACTERS X 8 REPEATS = 512 CHARACTER BLOCK.

PROGRAM WRITTEN BY: _____ DATE: June, 1977

COMPANY NAME: Atlantic Research Corporation TEL. NO. _____

ADDRESS: 5390 Cherokee Avenue, Alexandria, Virginia 22314

PROGRAM LOCATION

DTM S/N _____

CELL _____

RAM _____

PROM _____

OM 842A

INTERSHAKE II PROGRAM

| TITLE: CRC LOOPBACK ERROR TEST | | | | | | | | | | FILE NO. B-3 | | |
|--------------------------------|---|---|---|-------|------|----------|--|------|---|--------------|--|--|
| DESCRIPTION: SYNC/MODE - | | | | | | | | | | SHEET OF | | |
| OBJECTIVE: | | | | | | | | | | | | |
| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | | |
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | | | | |
| 3 | 2 | 1 | 0 | | | | | | | | | |
| C | 8 | 4 | 0 | 0 | 0 | 02 98 | No-Op | | | | | |
| | | | | 1 | 1 | 02 98 | No-Op | | | | | |
| | | | | 2 | 2 | 06 96 | Select 4096 Bit Delay | | | | | |
| | | | | 3 | 3 | FF 57 | Select Fill Character | | | | | |
| | | | | 4 | 4 | 10 95 | Auto Sync | | | | | |
| | | | | 5 | 5 | 32 90 | Sync Character | | | | | |
| | | | | 6 | 6 | 02 98 | No-Op | | | | | |
| | | | | 7 | 7 | 02 98 | No-Op | | | | | |
| | | | | 0 | 8 | 32 50 | Send Sync (Next) | ← | | | | |
| | | | | 9 | 9 | 32 50 | Send Sync | | | | | |
| | | | | A | 10 | 32 50 | Send Sync | | | | | |
| | | | | B | 11 | 32 50 | Send Sync | | | | | |
| | | | | C | 12 | 02 50 | Send "STX" | | | | | |
| | | | | D | 13 | 00 58 | Start Transmit BCC | | | | | |
| | | | | E | 14 | 04 63 | Send Test Message 4 Times | | | | | |
| | | | | F | 15 | 03 50 | Send "ETX" | | | | | |
| D | 9 | 5 | 1 | 0 | 16 | 30 59 | Send BCC | | | | | |
| | | | | 1 | 17 | 02 16 | Wait For "STX" As Input Character | | | | | |
| | | | | 2 | 18 | 00 38 | Start BCC - Normal EBCDIC | | | | | |
| | | | | 3 | 19 | 03 16 | Wait For "ETX" As Input Character | | | | | |
| | | | | 4 | 20 | 19 41 | Preset | | | | | |
| | | | | 5 | 21 | 00 39 | Test Received BCC Jump If (Error) | → | | | | |
| | | | | 6 | 22 | 08 40 | Continued With Next Xmission (Next) | → | | | | |
| | | | | 7 | 23 | | | | | | | |
| | | | | 8 | 24 | | | | | | | |
| | | | | 1 | 9 | 01 70 | Turn "ON" Alarm - Error Signal (Error) | ← | | | | |
| | | | | A | 26 | 01 82 | Time Delay 100 ms | | | | | |
| | | | | B | 27 | 01 71 | Turn "OFF" Alarm | | | | | |
| | | | | C | 28 | 08 40 | Jump To Step 8 - Continue (Next) | → | | | | |
| | | | | D | 29 | | | | | | | |
| | | | | E | 30 | | | | | | | |
| | | | | F | 31 | | | | | | | |

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CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | | | ENTRY | | | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) | |
|--|---|---|---|-------|------|----------|----------------|--------------------------------------|-------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | FUNCTION DESCRIPTION/COMMENTS |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| ADDITIONAL REMARKS | | | | | | | | | PROGRAM LOCATION |
| | | | | | | | | | DTM S/N |
| | | | | | | | | | CELL |
| | | | | | | | | | RAM |
| | | | | | | | | | PROM |
| PROGRAM WRITTEN BY: | | | | | | DATE | | | June, 1977 |
| COMPANY NAME: | | | | | | TEL. NO. | | | |
| Atlantic Research Corporation | | | | | | | | | |
| ADDRESS: | | | | | | | | | |
| 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | | | | | | | |

FORM NO. TP-139-3-77

INTERSHAKE II PROGRAM

| | |
|--|--|
| TITLE: MEASURE NUMBER OF SUCCESSFUL TERMINAL RESPONSES WITHOUT A PARITY ERROR | FILE NO. B-4 SHEET OF |
| DESCRIPTION: (a) - CONTINUOUSLY POLL (b) - COUNT NUMBER OF POLLS (c) - STOP POLLING WHEN A PARITY ERROR OCCURS (d) - READ OUT NUMBER OF SUCCESSFUL POLLS. | |
| OBJECTIVE: | |

| ADDRESS PAGE (CIRCLE ONE) 3 2 1 0 | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|---|-------|------|----------|-------------------------------|----------------|--|
| | STEP | DATA | FUNCTION | | | |
| C 8 4 0 0 | 0 | 00 | 87 | Clear Event Counter | | CODE ASCII |
| 0 1 | 1 | "A" | 50 | Send Poll Character 1 Cycle | ← | SPEED ANY |
| | 2 | "B" | 50 | | | ASYNC / SYNC |
| | 3 | "C" | 50 | | | SYN CHARACTER --- |
| | 4 | "D" | 50 | | | STOP BIT 1.0, 1.5, 2.0 |
| | 5 | 1st | 21 | Trap 1st Response Character | | INFO BITS 5, 6, 7, 8 |
| | 6 | 2nd | 22 | 2 | | PARITY NONE, ODD, EVEN |
| | 7 | 3rd | 22 | 3 | | CONTROL EIA OFF |
| | 8 | 4th | 23 | 4 (LAST) | | ON-LINE TD/RD, TD, RD |
| | 9 | 14 | 80 | 14 ms Delay | | OFF-LINE TERM / MODEM |
| A | 10 | 10 | 41 | Preset | | MON SIGS NORMAL |
| B | 11 | 09 | 97 | Interrupt On Parity ERR | → | PATCH CORDS |
| C | 12 | 03 | 87 | Increment Event Count | | CONTROL EIA (V. 24) |
| D | 13 | 01 | 40 | Keep Cycling (Cycle) | → | AS REQUIRED |
| E | 14 | | | | | COUNTER ZONE EVENT COUNT (8x) |
| F | 15 | | | | | INTERRUPTS |
| D 9 5 1 0 | 16 | 00 | 00 | Error - Halt (Error) | ← | FLAGS |
| | 17 | | | | | LATCH |
| | 18 | | | | | |
| | 19 | | | | | |
| | 20 | | | | | |
| | 21 | | | | | |
| | 22 | | | | | |
| | 23 | | | | | |
| | 24 | | | | | |
| | 25 | | | | | |
| A | 26 | | | | | |
| B | 27 | | | | | |
| C | 28 | | | | | |
| D | 29 | | | | | |
| E | 30 | | | | | |
| F | 31 | | | | | |

CONTINUE ON OTHER SIDE

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ALEXANDRIA, VA. 22314 (703) 354-3400

CONTINUE ON OTHER SIDE

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|--|---|---|---|-------|------|----------|-------------------------------|------------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| ADDITIONAL REMARKS | | | | | | | | PROGRAM LOCATION | |
| | | | | | | | | DTM S/N | |
| | | | | | | | | CELL | |
| | | | | | | | | RAM | |
| | | | | | | | | PROM | |
| PROGRAM WRITTEN BY: | | | | | | | DATE | | |
| | | | | | | | June, 1977 | | |
| COMPANY NAME: | | | | | | | TEL. NO. | | |
| Atlantic Research Corporation | | | | | | | | | |
| ADDRESS: | | | | | | | | | |
| 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | | | | | | | |

OM 842A

INTERSHAKE II PROGRAM

| TITLE: SEND SDLC WITH CRC | | | | | | | | | | FILE NO. 8-5 | | |
|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-------|------|----------|---------------------------------------|------|--|--------------|--|--|
| DESCRIPTION: | | | | | | | | | | | | |
| OBJECTIVE: | | | | | | | | | | | | |
| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | | |
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | | | | |
| 3 | 2 | 1 | 0 | | | | | | CODE OPTIONAL SPEED OPTIONAL ASYNC <input checked="" type="radio"/> SYNC SYN CHARACTER 7E STOP BIT 1.0 , 1.5 , 2.0 INFO BITS 5 , 6 , 7 <input checked="" type="radio"/> 8 PARITY NONE , ODD , EVEN CONTROL EIA <input checked="" type="radio"/> OFF ON-LINE TD/RD , TD , RD OFF-LINE TERM / MODEM MON SIGS <input checked="" type="radio"/> NORMAL PATCH CORDS NONE CONTROL EIA (V. 24) AS REQUIRED COUNTER ZONE --- INTERRUPTS NONE FLAGS NONE LATCH FUN. 90 , 96 | | | |
| <input checked="" type="radio"/> C | <input checked="" type="radio"/> 8 | <input checked="" type="radio"/> 4 | <input checked="" type="radio"/> 0 | 0 | 0 | 7E 57 | Select Fill Character | | | | | |
| | | | | 1 | 1 | 16 83 | Wait 16 Bit Times Restart | ← | | | | |
| | | | | 2 | 2 | 7E 50 | Send Last Fill | | | | | |
| | | | | 3 | 3 | 16 58 | Start CRC Inverted | | | | | |
| | | | | 4 | 4 | "X" 50 | Send First Character | | | | | |
| | | | | 5 | 5 | 10 96 | Select SDLC Mode Zero Insertion | | | | | |
| | | | | 6 | 6 | "X" 50 | Send Second Character | | | | | |
| | | | | 7 | 7 | 03 63 | Send Test Message 3 Times | | | | | |
| | | | | 8 | 8 | "X" 50 | Send Character | | | | | |
| | | | | 9 | 9 | "X" 50 | Send Another Character | | | | | |
| | | | | A | 10 | 00 59 | Send CRC Characters | | | | | |
| | | | | B | 11 | 50 96 | Delete Zero Insertion | | | | | |
| | | | | C | 12 | 40 83 | Idle Fill (Variable Length) | | | | | |
| | | | | D | 13 | 01 40 | Restart /Or Next Message | → | | | | |
| | | | | E | 14 | | | | | | | |
| | | | | F | 15 | | | | | | | |
| <input checked="" type="radio"/> D | <input checked="" type="radio"/> 9 | <input checked="" type="radio"/> 5 | <input checked="" type="radio"/> 1 | 0 | 16 | | | | | | | |
| | | | | 1 | 17 | NOTE: | One FILL Character Will Automatically | | | | | |
| | | | | 2 | 18 | | Be Sent After The CRC. | | | | | |
| | | | | 3 | 19 | | | | | | | |
| | | | | 4 | 20 | | | | | | | |
| | | | | 5 | 21 | | | | | | | |
| | | | | 6 | 22 | | | | | | | |
| | | | | 7 | 23 | | | | | | | |
| | | | | 8 | 24 | | | | | | | |
| | | | | 9 | 25 | | | | | | | |
| | | | | A | 26 | | | | | | | |
| | | | | B | 27 | | | | | | | |
| | | | | C | 28 | | | | | | | |
| | | | | D | 29 | | | | | | | |
| | | | | E | 30 | | | | | | | |
| | | | | F | 31 | | | | | | | |

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CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | | | ENTRY | | | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) | |
|---|---|---|---|-------|------|----------|----------------|--------------------------------------|------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | | | | |
| ADDITIONAL REMARKS | | | | | | | | | PROGRAM LOCATION |
| | | | | | | | | | DTM S/N |
| | | | | | | | | | CELL |
| | | | | | | | | | RAM |
| | | | | | | | | | PROM |
| PROGRAM WRITTEN BY: | | | | | | | DATE | | June, 1977 |
| COMPANY NAME: Atlantic Research Corporation | | | | | | | TEL. NO. | | |
| ADDRESS: 5390 Cherokee Avenue, Alexandria, Virginia 22314 | | | | | | | | | |

FORM NO. TP-139-3-77

OM 842A

INTERSHAKE II PROGRAM

| TITLE: RECEIVE SDLC WITH CRC | | | | | | | | | | FILE NO. B-6 | | |
|--|---|-------|------|----------|-------------------------------|----|----|-------------------------------|---|--------------|---|-------------------------------|
| DESCRIPTION: CHECKS CRC CHARACTERS AND INCREMENT COUNTER TO INDICATE ERROR RECEIVED. ALL RECEIVED MESSAGES ARE STORED IN RESULTS MEMORY. | | | | | | | | | | SHEET OF | | |
| OBJECTIVE: ASSUMES MIN-16 BITS (CONTROL + ADDRESS) | | | | | | | | | | | | |
| ADDRESS | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | | | | | JUMP | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | |
| PAGE (CIRCLE ONE) | | STEP | DATA | FUNCTION | | | | | | ← | | |
| 3 | 2 | 1 | (0) | | | | | | | → | | |
| C | 8 | 4 | 0 | 0 | 0 | 7E | 90 | Enter SYNC Character | | | | CODE OPTIONAL |
| | | | | 1 | 1 | 10 | 95 | Auto SYNC | | | | SPEED OPTIONAL |
| | | | | 2 | 2 | 10 | 96 | Enter SDLC (Zero-Delete Mode) | | | | ASYNCR / SYNC |
| | | | | 3 | 3 | 02 | 98 | No-Op | | | | SYN CHARACTER 7E |
| | | | | 4 | 4 | 02 | 98 | No-Op | | | | STOP BIT 1.0, 1.5, 2.0 |
| | | | 0 | 5 | 5 | 00 | 85 | Advance Base Count 10X | ← | | | INFO BITS 5, 6, 7, 8 |
| | | | | 6 | 6 | 01 | 35 | Log Received Data | | | | PARITY NONE ODD, EVEN |
| | | | 0 | 7 | 7 | 00 | 47 | Set Flag 0 = 0 | ← | | | CONTROL EIA OFF |
| | | | | 8 | 8 | 06 | 38 | Start Normal CRC | | | | ON-LINE TD/RD, TD, RD |
| | | | | 9 | 9 | 0E | 97 | Enable Frame Detect Interrupt | | | | OFF-LINE TERM / MODEM |
| | | | | A | 10 | 00 | 00 | Wait For Interrupt | | | | MON SIGS (NORMAL) |
| | | | 0 | B | 11 | 08 | 97 | Disable Frame Interrupt | ← | I | | PATCH CORDS |
| | | | | C | 12 | 26 | 41 | Preset Jump | | | | CONTROL EIA (V. 24) |
| | | | | D | 13 | 02 | 47 | Jump Flag 0 = 0 | → | A | | AS REQUIRED |
| | | | | E | 14 | 16 | 38 | Invert CRC To CRC Generator | | | | COUNTER ZONE |
| | | | | F | 15 | 01 | 14 | Wait 1 Character | | | | EVENTS (8X) |
| D | 9 | 5 | 1 | 0 | 16 | 13 | 41 | Preset Jump | | | | INTERRUPTS FRAME DETECT |
| | | | | 1 | 17 | E3 | 47 | Jump If Frame Detect | → | | | FLAGS 0, 1, 2 |
| | | | | 2 | 18 | 11 | 47 | Set Flag 1 = 1 If Data | | | | LATCH |
| | | | 1 | 3 | 19 | 01 | 14 | Wait 1 Character | ← | | | |
| | | | | 4 | 20 | 17 | 41 | Preset Jump | | | | |
| | | | | 5 | 21 | E3 | 47 | Jump If Frame Detect | → | | | |
| | | | | 6 | 22 | 21 | 47 | Set Flag 2 = 1 If Data | | | | |
| | | | 1 | 7 | 23 | 1A | 41 | Preset Jump | ← | | | |
| | | | | 8 | 24 | F2 | 47 | Jump No SDLC BCC Error | | | | |
| | | | | 9 | 25 | 03 | 87 | Increment Error Count | | | | |
| | | | 1 | A | 26 | 06 | 38 | Start Norm CRC | ← | | | |
| | | | | B | 27 | 05 | 41 | Preset Jump | | | | |
| | | | | C | 28 | 22 | 47 | Jump Flag 2 = 0 | → | | | |
| | | | | D | 29 | 31 | 41 | Preset Jump | | | | |
| | | | | E | 30 | 13 | 47 | Jump Flag 1 = 1 (Both = 0) | → | D | | |
| | | | | F | 31 | 20 | 47 | Set Flags 2 To 0 | | | | |

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CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP | ADDITIONAL INFORMATION (WRITE IN) | | | |
|-------------------|---|-------|------|----------|-------------------------------|------|-----------------------------------|--|-----|--|
| PAGE (CIRCLE ONE) | | STEP | DATA | FUNCTION | | | | | | |
| E | A | 6 | 2 | 0 | 32 | 00 | 47 | Set Flag 0 To 0 | | |
| | | | | 1 | 33 | 01 | 42 | Start Loop = 1 (Wait For 2nd Data Char.) | | |
| | | | | 2 | 34 | 2D | 40 | | | |
| | | | | 3 | 35 | | | | | |
| | | | | 4 | 36 | | | | | |
| | | | | 5 | 37 | | | | | |
| | | | | 2 | 6 | 02 | 42 | Loop = 2 (Wait For 16 Bits Data) | ← A | |
| | | | | 2 | 7 | 01 | 14 | Wait 1 Character | ← | |
| | | | | 8 | 40 | 2D | 41 | | | |
| | | | | 9 | 41 | E2 | 47 | Jump If Not Frame (If Data) | | |
| | A | | | | 42 | 0E | 97 | Enable Interrupt | | |
| | B | | | | 43 | 00 | 00 | Wait For (Leading 7E) | | |
| | C | | | | 44 | | | | | |
| | | | | 2 | D | 27 | 41 | End Of Loop | ← | |
| | | | | | E | 00 | 43 | | | |
| | | | | | F | 02 | 98 | - 16 Bits - Non 7E Received | | |
| F | B | 7 | 3 | 0 | 48 | 01 | 47 | Set Flag 0 = 1 | | |
| | | | | 1 | 49 | 10 | 47 | Set Flag 1 To 0 | ← D | |
| | | | | 2 | 50 | 20 | 47 | Set Flag 2 To 0 | | |
| | | | | 3 | 51 | 01 | 14 | Wait 1 Character Time | | |
| | | | | 4 | 52 | 03 | 98 | Initialize CRC Generator | | |
| | | | | 5 | 53 | 0E | 97 | Enable Frame Detect | | |
| | | | | 6 | 54 | 00 | 00 | Wait For Trailing 7E | | |
| | | | | 7 | 55 | | | | | |
| | | | | 8 | 56 | | | | | |
| | | | | 9 | 57 | | | | | |
| | A | | | | 58 | | | | | |
| | B | | | | 59 | | | | | |
| | C | | | | 60 | | | | | |
| | | | | LAST | D | 0B | 40 | Go Progress Interrupt | → I | |
| | | | | PAGE | E | | | | | |
| | | | | | F | | | | | |

ADDITIONAL REMARKS

| |
|-------------------------|
| PROGRAM LOCATION |
| DTM S/N |
| CELL |
| RAM |
| PROM |

| | |
|--|-------------------------|
| PROGRAM WRITTEN BY: P.G. SCHIRMER | DATE: 2/16/77 |
| COMPANY NAME: Atlantic Research Corporation | TEL. NO.: 354-3400 X719 |
| ADDRESS: 5390 Cherokee Ave., Alexandria, Va. 22314 | |

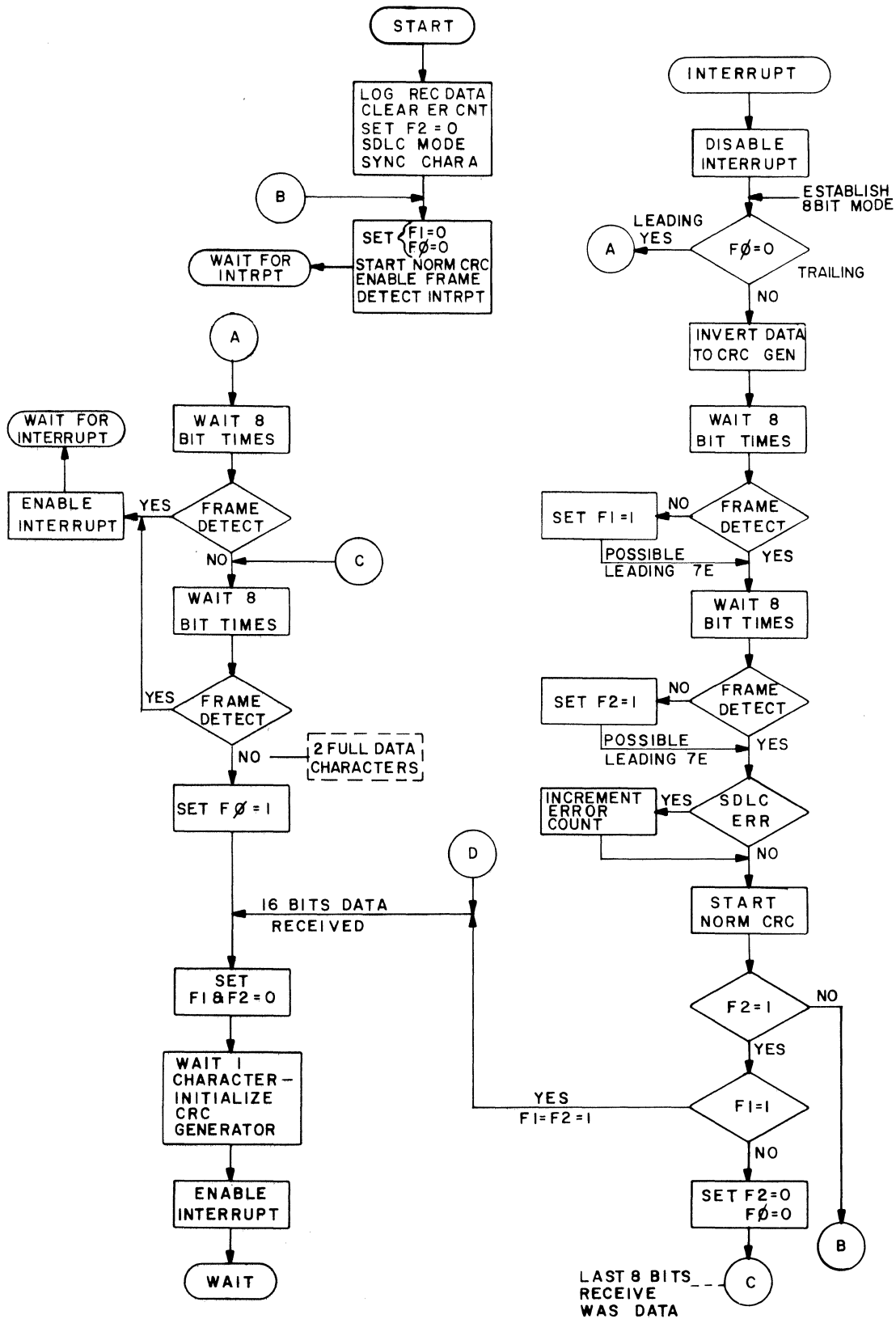


Figure E-4. Program Flow Diagram for Receive SDLC with CRC (File B-6) Test Program.

OM 842A

OM 842A

INTERSHAKE II PROGRAM

| TITLE: OUTPUT RESULTS MEMORY (RM) | | | | | | | | | | FILE NO. B-7 | |
|--|-------|------|----------|--|----------------|--|--|--|--|--------------|--|
| DESCRIPTION: (A) - OUTPUT FORMATS 2 BYTES AS STATION & TIME (B) - OPERATES WITH OTHER TERMINAL - PRINTER/CRT | | | | | | | | | | SHEET 1 OF 1 | |
| OBJECTIVE: (A) - HALTS WHEN ENTIRE RM IS DUMPED TO EXT DEVICE EG MODEL 33 TTY. | | | | | | | | | | | |
| ADDRESS PAGE (CIRCLE ONE) | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) | | | | | |
| | STEP | DATA | FUNCTION | | | | | | | | |
| 3 2 1 0 C 8 4 0 | 0 | 0 | FF 57 | Fill Character PAD For Hex In SYNC | | CODE ASCII | | | | | |
| | 1 | 1 | 02 98 | | | SPEED AS REQUIRED | | | | | |
| | 2 | 2 | 01 97 | INT MEM OVFL | | ASYNC / SYNC | | | | | |
| | 3 | 3 | 00 49 | Start Output @ Page 00 | | SYN CHARACTER | | | | | |
| | 4 | 4 | 01 94 | Clear ON "NEXT SCREEN" | ← | STOP BIT 1.0, 1.5, 2.0 | | | | | |
| | 5 | 5 | 02 80 | 2 ms | | INFO BITS 5, 6, 7, 8 | | | | | |
| | 6 | 6 | 00 94 | Clear OFF | | PARITY NONE, ODD, EVEN | | | | | |
| | 7 | 7 | 02 98 | | | CONTROL EIA / OFF | | | | | |
| | 8 | 8 | 10 80 | Nominal 10 ms Delay | | ON-LINE TD/RD, TD, RD | | | | | |
| | 0 9 | 9 | 2A 50 | DOT "Next Data" (4B) | ← | OFF-LINE TERM / MODEM | | | | | |
| | A | 10 | 53 50 | S (E2) | | MON SIGS / NORMAL | | | | | |
| | B | 11 | 54 50 | T (E3) | | PATCH CORDS | | | | | |
| | C | 12 | 4E 50 | N (D5) | | CONTROL EIA (V. 24) AS REQUIRED | | | | | |
| | D | 13 | 20 50 | SP (40) | | COUNTER ZONE | | | | | |
| | E | 14 | 02 98 | REV ON No-Op | | INTERRUPTS | | | | | |
| | F | 15 | 10 68 | Hex ASCII Translate (32) | | 97 | | | | | |
| D 9 5 1 | 0 | 16 | 00 52 | Send Station RM BYTE (As 3 Characters per STEP 15) | | FLAGS | | | | | |
| | 1 | 17 | 00 68 | Hex OFF | | LATCH | | | | | |
| | 2 | 18 | 02 98 | No-Op | | 68 | | | | | |
| | 3 | 19 | 3D 50 | = (7E) | | | | | | | |
| | 4 | 20 | 10 68 | Hex ASCII (32) | | | | | | | |
| | 5 | 21 | 00 52 | Send Time RM BYTE | | | | | | | |
| | 6 | 22 | 00 68 | Hex OFF | | | | | | | |
| | 7 | 23 | 4D 50 | m (D4) | | | | | | | |
| | 8 | 24 | 53 50 | s (A2) | | | | | | | |
| | 9 | 25 | 02 42 | Loop For # Spaces To Format Columns | | | | | | | |
| | 1 A | 26 | 20 50 | SP "SPACES" (40) | ← | | | | | | |
| | B | 27 | 1A 41 | Preset Jump For Repeated "SP" | | | | | | | |
| | C | 28 | 00 43 | Jump until "L" "SP" Characters | → | | | | | | |
| | D | 29 | 09 40 | Jump "NEXT DATA" | → | | | | | | |
| | E | 30 | | | | | | | | | |
| | F | 31 | | | | | | | | | |

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CONTINUE ON OTHER SIDE

OM 842A

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | ADDITIONAL INFORMATION (WRITE IN) |
|--|---|---|---|-------|------|------------------------|-------------------------------|------------------------|--------------------------------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | | |
| E | A | 6 | 2 | 1 | 33 | | | | |
| | | | | 2 | 34 | | | | |
| | | | | 3 | 35 | | | | |
| | | | | 4 | 36 | | | | |
| | | | | 5 | 37 | | | | |
| | | | | 6 | 38 | | | | |
| | | | | 7 | 39 | | | | |
| | | | | 8 | 40 | | | | |
| | | | | 9 | 41 | | | | |
| | | | | A | 42 | | | | |
| | | | | B | 43 | | | | |
| | | | | C | 44 | | | | |
| | | | | D | 45 | | | | |
| | | | | E | 46 | | | | |
| | | | | F | 47 | | | | |
| F | B | 7 | 3 | 0 | 48 | | | | |
| | | | | 1 | 49 | | | | |
| | | | | 2 | 50 | | | | |
| | | | | 3 | 51 | | | | |
| | | | | 4 | 52 | | | | |
| | | | | 5 | 53 | | | | |
| | | | | 6 | 54 | | | | |
| | | | | 7 | 55 | | | | |
| | | | | 8 | 56 | | | | |
| | | | | 9 | 57 | | | | |
| | | | | A | 58 | | | | |
| | | | | B | 59 | | | | |
| | | | | C | 60 | | | | |
| | | | | D | 61 | | | | |
| | | | | E | 62 | | | | |
| | | | | F | 63 | 00 | 00 | Memory Overflow - Halt | |
| ADDITIONAL REMARKS | | | | | | | | PROGRAM LOCATION | |
| | | | | | | | | DTM S/N | |
| | | | | | | | | CELL | |
| | | | | | | | | RAM | |
| | | | | | | | | PROM | |
| PROGRAM WRITTEN BY: J. L. WALLACE | | | | | | DATE 01-14-77 | | | |
| COMPANY NAME: Atlantic Research Corporation | | | | | | TEL. NO. 354-3400 X636 | | | |
| ADDRESS: 5390 Cherokee Ave., Alexandria, Va. 22314 | | | | | | | | | |

FORM NO. TP-139-3-77

OM 842A

APPENDIX F

STORED TEST PROGRAM FORMS

(To be used when specifying custom-programmed tests for PROM entry)



CODE _____ PROM 842

E F

STORED TEST CELL _____*

| TEST STEP | PROM ADDR. | | | | DATA | HEX | FUNCTION | OPERATION |
|-----------|------------|---|---|----|------|-----|----------|-----------|
| | 0 | 1 | 2 | 3 | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | 40 | | | | |
| | | | | 41 | | | | |
| | | | | 42 | | | | |
| | | | | 43 | | | | |
| | | | | 44 | | | | |
| | | | | 45 | | | | |
| | | | | 46 | | | | |
| | | | | 47 | | | | |
| | | | | 48 | | | | |
| | | | | 49 | | | | |
| | | | | 4A | | | | |
| | | | | 4B | | | | |
| | | | | 4C | | | | |
| | | | | 4D | | | | |
| | | | | 4E | | | | |
| | | | | 4F | | | | |
| | | | | 50 | | | | |
| | | | | 51 | | | | |
| | | | | 52 | | | | |
| | | | | 53 | | | | |
| | | | | 54 | | | | |
| | | | | 55 | | | | |
| | | | | 56 | | | | |
| | | | | 57 | | | | |
| | | | | 58 | | | | |
| | | | | 59 | | | | |
| | | | | 5A | | | | |
| | | | | 5B | | | | |
| | | | | 5C | | | | |
| | | | | 5D | | | | |
| | | | | 5E | | | | |
| | | | | 5F | | | | |

*CELL A: 000-07F CELL B: 080-0FF CELL C: 100-17F CELL D: 180-1FF
 CELL E: 200-27F CELL F: 280-2FF CELL G: 300-37F CELL H: 380-3FF



CODE _____ PROM 842

E F

STORED TEST CELL _____*

| TEST STEP | PROM ADDR. | | | | DATA | HEX | FUNCTION | OPERATION |
|-----------|------------|---|---|----|------|-----|----------|-----------|
| | 0 | 1 | 2 | 3 | | | | |
| | | | | 60 | | | | |
| | | | | 61 | | | | |
| | | | | 62 | | | | |
| | | | | 63 | | | | |
| | | | | 64 | | | | |
| | | | | 65 | | | | |
| | | | | 66 | | | | |
| | | | | 67 | | | | |
| | | | | 68 | | | | |
| | | | | 69 | | | | |
| | | | | 6A | | | | |
| | | | | 6B | | | | |
| | | | | 6C | | | | |
| | | | | 6D | | | | |
| | | | | 6E | | | | |
| | | | | 6F | | | | |
| | | | | 70 | | | | |
| | | | | 71 | | | | |
| | | | | 72 | | | | |
| | | | | 73 | | | | |
| | | | | 74 | | | | |
| | | | | 75 | | | | |
| | | | | 76 | | | | |
| | | | | 77 | | | | |
| | | | | 78 | | | | |
| | | | | 79 | | | | |
| | | | | 7A | | | | |
| | | | | 7B | | | | |
| | | | | 7C | | | | |
| | | | | 7D | | | | |
| | | | | 7E | | | | |
| | | | | 7F | | | | |

*CELL A: 000-07F CELL B: 080-0FF CELL C: 100-17F CELL D: 180-1FF
 CELL E: 200-27F CELL F: 280-2FF CELL G: 300-37F CELL H: 380-3FF



CODE _____ PROM 842

E F

STORED TEST CELL _____*

| TEST STEP | PROM ADDR. | | | | DATA | HEX | FUNCTION | OPERATION |
|-----------|------------|---|---|----|------|-----|----------|-----------|
| | 0 | 1 | 2 | 3 | | | | |
| | | | | 80 | | | | |
| | | | | 81 | | | | |
| | | | | 82 | | | | |
| | | | | 83 | | | | |
| | | | | 84 | | | | |
| | | | | 85 | | | | |
| | | | | 86 | | | | |
| | | | | 87 | | | | |
| | | | | 88 | | | | |
| | | | | 89 | | | | |
| | | | | 8A | | | | |
| | | | | 8B | | | | |
| | | | | 8C | | | | |
| | | | | 8D | | | | |
| | | | | 8E | | | | |
| | | | | 8F | | | | |
| | | | | 90 | | | | |
| | | | | 91 | | | | |
| | | | | 92 | | | | |
| | | | | 93 | | | | |
| | | | | 94 | | | | |
| | | | | 95 | | | | |
| | | | | 96 | | | | |
| | | | | 97 | | | | |
| | | | | 98 | | | | |
| | | | | 99 | | | | |
| | | | | 9A | | | | |
| | | | | 9B | | | | |
| | | | | 9C | | | | |
| | | | | 9D | | | | |
| | | | | 9E | | | | |
| | | | | 9F | | | | |

*CELL A: 000-07F CELL B: 080-0FF CELL C: 100-17F CELL D: 180-1FF
 CELL E: 200-27F CELL F: 280-2FF CELL G: 300-37F CELL H: 380-3FF

OM 842A

APPENDIX G

PROGRAM FORMS

(To be used by test personnel when developing in-house test programs)

Order Form No. TP-139-3-77

**INSTRUCTION IN THE USE OF
INTERSHAKE II PROGRAM FORM
NO. TP-139-3-77**

TITLE: Provide key words which best describe the action and/or purpose of the program.

FILE NO.: Enter a numbering system as desired for record keeping purposes. Programs and technical notes published by Atlantic Research will indicate AR XXX.

SHEET____ OF____: Indicates sheet number and total number of sheets used to complete the program. There will be a maximum of two sheets required for a program which is to be contained in a 128-step cell or a maximum of four sheets for a program contained in a 256-step cell.

DESCRIPTION: Describe the program application, how it is applied in a data communications system, specifically what equipment is involved, what the program will do or is expected to do and techniques used.

OBJECTIVE: Provide the results which one should expect to achieve; e.g., how the terminal responds to the test, what the INTERVIEW CRT display will show, etc.

ADDRESS: Circle the appropriate PAGE number (0, 1, 2, or 3) on all sheets used in order that the proper program step sequence, 00 through 63, is identified; i.e., step 00 through 63 for page "0", step 64 through 127 for page "1", step 128 through 191 for page "2" and step 192 through 255 for page "3".


Circling the appropriate page is also used to identify the "left" (high order digit) character in the "ADDRESS" column. The sole purpose of this "ADDRESS" column is to provide the address HEX equivalent for the Binary entry of a Function 40 or 41 "jump to" program step. The "jump to" instructions of Functions 40 and 41 require that the sequence number of the address (program step) to be "jumped to" be identified in its "DATA" entry.

The "ADDRESS" column provides a convenient direct conversion of a program step to the address HEX equivalent. For example:

Program step number 58, i.e., step 58 of page "0" is shown as ADDRESS "3A"
Program step number 108, i.e., step 44 of page "1" is shown as ADDRESS "6C"
Program step number 142, i.e., step 14 of page "2" is shown as ADDRESS "8E"
Program step number 244, i.e., step 52 of page "3" is shown as ADDRESS "F4"

ENTRY: Enter the "FUNCTION" and its "DATA" for each "STEP" in the program sequence.

FUNCTION DESCRIPTION/COMMENTS: Enter the description of each Function as given in the Function List. Add any additional description and/or comment which will clarify the intent or purpose.

JUMP: Draw an arrow in the "JUMP" column indicating, the STEP "jumped from" and and STEP "jumped to"  as caused by a jump instruction. To facilitate the aforementioned, it is helpful to circle the addresses of subroutine "starting points" which are used as "jump to" DATA for Functions 40 or 41 elsewhere in the program.

APPLICABLE INFORMATION: Indicate the information necessary for set-up and operation of INTERSHAKE in the specific program application. Note that the specific "CODE" is written in. Then after "CODE", the information indicated for "SPEED" down through "COUNTER ZONE POSITIONS" provides all information required for the INTERSHAKE face panel set-up. The order of set-up of controls conveniently follows down the left side of INTERSHAKE and then from the top center down. The remaining "INTERRUPTS", "FLAGS" and "LATCH" relate to Functions which may influence all steps and should therefore be given special consideration.

CODE: Provide the applicable language code.

SPEED: Provide the baud rate applicable to the program.

ASYN/SYN: Circle the applicable mode.

SYN CHARACTERS: Provide the appropriate SYN characters if operation is in the synchronous mode. Write in one or two SYN characters as appropriate to indicate the internal selection. It is suggested that the SYN character be indicated in HEX, e.g., 32, 32 for two SYN characters for EBCDIC.

STOP BIT: Circle the appropriate Stop Bit setting if operation is in the Asynchronous mode.

INFO BITS, PARITY, CONTROL EIA/OFF, ON-LINE, OFF-LINE, MON SIGS/NORMAL: Circle the proper setting for the program application.

PATCH CORDS: Describe pin jack connections, if used. For example, a pin jack connection might be shown as "RI to DETECT IN" or perhaps "CHAR SYNC TX to Counter +."

CONTROL EIA (V.24) POSITIONS: Indicate CONTROL EIA (V.24) switch positions, ON, THRU, and OFF (7X).

COUNTER ZONE POSITIONS: Indicate position of both rotary switches.

INTERRUPTS: List the Interrupt Functions used, with the address of their location.

FLAGS: List the Flags used and their purpose, e.g., Flag 0 = ACK, Flag 1 = NAK, Flag 2 = Loop Status, etc.

LATCH: List the Latch Functions used, with the address location of latch ON and OFF.

ADDITIONAL INFORMATION: Provide additional information pertinent to program operation.

ADDITIONAL REMARKS: Provide additional remarks which might be helpful to another user of the program.

DTM S/N; CELL; RAM; PROM: These block spaces are provided as a convenience to a user who wishes to describe the physical location of the program; e.g., the program could be located in:

- DTM S/N "214", CELL "C", of "Stored Test" PROM "MXXX"
- DTM S/N "B244", CELL "E", in non-volatile RAM
- CELL "G" of "Stored Test" PROM "MXXX" S/N "(user choice)" which might be signed out to Mr. John Doe or kept on the shelf for ready use.

PROGRAM WRITTEN BY: The last block of spaces is provided for convenience to a user for in-house record keeping, or for external use in interchange of INTERSHAKE programming information with others.

It is the firm desire of Atlantic Research Corporation, Teleproducts Division, that there be an active interchange of INTERSHAKE programming information between customer and factory and between customer and customer.

Atlantic Research would be pleased to include your program contribution in our compilation of INTERSHAKE Application Programs. Your program will in turn be distributed to other users and in turn other user contributions would be sent to you.

For the purpose of interchange as described above, please provide complete information at the bottom of the reverse side of the form including the CONTRIBUTOR'S NAME, DATE, COMPANY, TELEPHONE NO. and ADDRESS and send us a copy of your program at the following address:

Atlantic Research Corporation
5390 Cherokee Avenue
Alexandria, Virginia 22314

Attention: Teleproducts Marketing

Where company policy prohibits source identification, Atlantic Research will, upon request, withhold this information. In such case, the information distributed would contain the source industry only, e.g., terminal vendor, communications service, hardware development, etc.

INTERSHAKE II PROGRAM

| | |
|--------------|------------------|
| TITLE: | FILE NO. |
| DESCRIPTION: | SHEET OF |
| | PROGRAM LOCATION |
| | DTM S/N |
| | CELL |
| | RAM |
| PROM | |

OBJECTIVE:

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → | APPLICABLE INFORMATION (WRITE IN OR CIRCLE) |
|-------------------|---|---|---|-------|------|----------|-------------------------------|-----------------------------|--|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | | |
| C | 8 | 4 | 0 | 0 | 0 | | | CODE | |
| | | | | 1 | 1 | | | SPEED | |
| | | | | 2 | 2 | | | ASYNC / SYNC | |
| | | | | 3 | 3 | | | SYN CHARACTER | |
| | | | | 4 | 4 | | | STOP BIT 1.0 , 1.5 , 2.0 | |
| | | | | 5 | 5 | | | INFO BITS 5 , 6 , 7 , 8 | |
| | | | | 6 | 6 | | | PARITY NONE , ODD , EVEN | |
| | | | | 7 | 7 | | | CONTROL EIA / OFF | |
| | | | | 8 | 8 | | | ON-LINE TD/RD , TD , RD | |
| | | | | 9 | 9 | | | OFF-LINE TERM / MODEM | |
| | | | | A | 10 | | | MON SIGS / NORMAL | |
| | | | | B | 11 | | | PATCH CORDS | |
| | | | | C | 12 | | | CONTROL EIA (V. 24) | |
| | | | | D | 13 | | | COUNTER ZONE | |
| | | | | E | 14 | | | INTERRUPTS | |
| | | | | F | 15 | | | FLAGS | |
| D | 9 | 5 | 1 | 0 | 16 | | | LATCH | |
| | | | | 1 | 17 | | | | |
| | | | | 2 | 18 | | | | |
| | | | | 3 | 19 | | | | |
| | | | | 4 | 20 | | | | |
| | | | | 5 | 21 | | | | |
| | | | | 6 | 22 | | | | |
| | | | | 7 | 23 | | | | |
| | | | | 8 | 24 | | | | |
| | | | | 9 | 25 | | | | |
| | | | | A | 26 | | | | |
| | | | | B | 27 | | | | |
| | | | | C | 28 | | | | |
| | | | | D | 29 | | | | |
| | | | | E | 30 | | | | |
| | | | | F | 31 | | | | |

CONTINUE ON OTHER SIDE

CONTINUE ON OTHER SIDE

| ADDRESS | | | | ENTRY | | | FUNCTION DESCRIPTION/COMMENTS | JUMP ← → |
|-------------------|---|---|---|-------|------|----------|-------------------------------|----------------|
| PAGE (CIRCLE ONE) | | | | STEP | DATA | FUNCTION | | |
| 3 | 2 | 1 | 0 | 0 | 32 | | | |
| E | A | 6 | 2 | 1 | 33 | | | |
| | | | | 2 | 34 | | | |
| | | | | 3 | 35 | | | |
| | | | | 4 | 36 | | | |
| | | | | 5 | 37 | | | |
| | | | | 6 | 38 | | | |
| | | | | 7 | 39 | | | |
| | | | | 8 | 40 | | | |
| | | | | 9 | 41 | | | |
| | | | | A | 42 | | | |
| | | | | B | 43 | | | |
| | | | | C | 44 | | | |
| | | | | D | 45 | | | |
| | | | | E | 46 | | | |
| | | | | F | 47 | | | |
| F | B | 7 | 3 | 0 | 48 | | | |
| | | | | 1 | 49 | | | |
| | | | | 2 | 50 | | | |
| | | | | 3 | 51 | | | |
| | | | | 4 | 52 | | | |
| | | | | 5 | 53 | | | |
| | | | | 6 | 54 | | | |
| | | | | 7 | 55 | | | |
| | | | | 8 | 56 | | | |
| | | | | 9 | 57 | | | |
| | | | | A | 58 | | | |
| | | | | B | 59 | | | |
| | | | | C | 60 | | | |
| | | | | D | 61 | | | |
| | | | | E | 62 | | | |
| | | | | F | 63 | | | |

FILE NO. _____

SHEET OF _____

PROGRAM LOCATION _____

DTM S/N _____

CELL _____

RAM _____

PROM _____

ADDITIONAL INFORMATION (WRITE IN)

ADDITIONAL REMARKS

PROGRAM WRITTEN BY: _____ DATE _____

COMPANY NAME: _____ TEL. NO. _____

ADDRESS: _____

OM 842A

APPENDIX H

FUNCTIONS 60-67 MESSAGE CONTENTS (PROM G)

FUNCTIONS 60 THROUGH 67 MESSAGES

THE MESSAGES ARE STORED IN PROM (#842G). FUNCTIONS 60 THROUGH 67 ARE LISTED IN THE FOLLOWING PARAGRAPHS FOR PART #842G-001A. BOTH CHARACTERS AND HEXADECIMAL EQUIVALENTS ARE SHOWN.

- NOTE
- 1). WHEN CODES DO NOT USE EIGHT BITS, THE UNUSED BITS MAY BE "STUFFED" WITH EITHER "1" OR "0". THE HEXADECIMAL EQUIVALENTS SHOWN IN THE FOLLOWING PARAGRAPHS INCLUDE SUCH "STUFFED" BITS.
 - 2). EACH MESSAGE OF 80 OR 127 CHARACTERS IN LENGTH IS DESIGNED TO BE READABLE AND CONTAINS THE SAME WORD STRUCTURE IN ALL CODES.
 - 3). BRACKETS [] SIGNIFY THE CHARACTER WILL NOT (NORMALLY) BE DISPLAYED OR PRINTED AS A SYMBOL.
 - 4). SOME EBCDIC CRT DISPLAYS WILL PRESENT NL, CR, LF, AS SYMBOLS (CHARACTERS OR PUNCTUATION). REFER TO THE SPECIFIC TERMINAL'S CODE SET WHEN THESE ARE ENCOUNTERED.

75

0111
0101

[] DENOTES NON PRINT CHAR/CONTROL

FUNCTION 60 - 72 PRINT CHARACTER FOX MESSAGE (ASCII) (74 CHARACTERS TOTAL)

| | | | | | | | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|----|------|----|------|----|------|----|------|----|---|
| [CR] | [LF] | T | h | e | (SP) | Q | u | i | c | k | (SP) | B | r | o | w | | |
| 0D | 0A | 54 | 68 | 65 | 20 | 51 | 75 | 69 | 63 | 6B | 20 | 42 | 72 | 6F | 77 | | |
| | | n | (SP) | F | o | x | (SP) | J | u | m | p | s | (SP) | 0 | v | e | r |
| | 6E | 20 | 46 | 6F | 78 | 20 | 4A | 75 | 6D | 70 | 73 | 20 | 4F | 76 | 65 | 72 | |
| (SP) | T | h | e | (SP) | L | a | z | y | (SP) | D | o | g | ' | s | (SP) | | |
| 20 | 54 | 68 | 65 | 20 | 4C | 61 | 7A | 79 | 20 | 44 | 6F | 67 | 27 | 73 | 20 | | |
| B | a | c | k | . | (SP) | (SP) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | |
| 42 | 61 | 63 | 6B | 2E | 20 | 20 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | | |
| φ | (SP) | (SP) | T | E | S | T | I | N | G | | | | | | | | |
| 30 | 20 | 20 | 54 | 45 | 53 | 54 | 49 | 4E | 47 | | | | | | | | |

FUNCTION 61 - 80 PRINT CHARACTER MESSAGE (ASCII) (82 CHARACTER TOTAL)

| | | | | | | | | | | | | | | | |
|------|------|----|----|------|------|----|------|------|------|----|----|------|----|----|------|
| [CR] | [LF] | I | N | T | E | R | S | H | A | K | E | (SP) | A | n | a |
| 0D | 0A | 49 | 4E | 54 | 45 | 52 | 53 | 48 | 41 | 4B | 45 | 20 | 41 | 6E | 61 |
| 1 | y | z | e | s | (SP) | A | n | d | (SP) | F | i | n | d | s | (SP) |
| 6C | 79 | 7A | 65 | 73 | 20 | 41 | 6E | 64 | 20 | 46 | 69 | 6E | 64 | 73 | 20 |
| Y | o | u | r | (SP) | D | a | t | a | (SP) | C | o | m | m | u | n |
| 59 | 6F | 75 | 72 | 20 | 44 | 61 | 74 | 61 | 20 | 43 | 6F | 6D | 6D | 75 | 6E |
| i | c | a | t | i | o | n | s | (SP) | P | r | o | b | l | e | m |
| 69 | 63 | 61 | 74 | 69 | 6F | 6E | 73 | 20 | 50 | 72 | 6F | 62 | 6C | 65 | 6D |
| s | (SP) | F | a | s | t | ! | (SP) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 73 | 20 | 46 | 61 | 73 | 74 | 21 | 20 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| 9 | φ | | | | | | | | | | | | | | |
| 39 | 30 | | | | | | | | | | | | | | |

OM 842A

FUNCTION 62 - 122 PRINT CHARACTER MESSAGE (ASCII) (124 CHARACTERS TOTAL)

| | | | | | | | | | | | | | | | |
|------|------|------|------|----|----|------|----|------|----|------|------|------|------|----|------|
| [CR] | [LF] | I | N | T | E | R | S | H | A | K | E | (SP) | a | n | d |
| 0D | 0A | 49 | 4E | 54 | 45 | 52 | 53 | 48 | 41 | 4B | 45 | 20 | 61 | 6E | 64 |
| (SP) | I | N | T | E | R | V | I | E | W | (SP) | J | o | i | n | (SP) |
| 20 | 49 | 4E | 54 | 45 | 52 | 56 | 49 | 45 | 57 | 20 | 4A | 6F | 69 | 6E | 20 |
| T | o | g | e | t | h | e | r | (SP) | T | o | (SP) | Q | u | i | c |
| 54 | 6F | 67 | 65 | 74 | 68 | 65 | 72 | 20 | 54 | 6F | 20 | 51 | 75 | 69 | 63 |
| k | l | y | (SP) | S | i | m | u | l | a | t | e | (SP) | A | n | d |
| 6B | 6C | 79 | 20 | 53 | 69 | 6D | 75 | 6C | 61 | 74 | 65 | 20 | 41 | 6E | 64 |
| (SP) | A | n | a | l | y | z | e | (SP) | Y | o | u | r | (SP) | D | a |
| 20 | 41 | 6E | 61 | 6C | 79 | 7A | 65 | 20 | 59 | 6F | 75 | 72 | 20 | 44 | 61 |
| t | a | (SP) | C | o | m | m | u | n | i | c | a | t | i | o | n |
| 74 | 61 | 20 | 43 | 6F | 6D | 6D | 75 | 6E | 69 | 63 | 61 | 74 | 69 | 6F | 6E |
| s | (SP) | P | r | o | b | l | e | m | s | ! | (SP) | 1 | 2 | 3 | 4 |
| 73 | 20 | 50 | 72 | 6F | 62 | 6C | 65 | 6D | 73 | 21 | 20 | 31 | 32 | 33 | 34 |
| 5 | 6 | 7 | 8 | 9 | φ | (SP) | # | & | @ | / | - | | | | |
| 35 | 36 | 37 | 38 | 39 | 30 | 20 | 23 | 26 | 40 | 2F | 2D | | | | |

FUNCTION 63 - 80 PRINT CHARACTER MESSAGE (EBCDIC) (82 CHARACTERS TOTAL)

| | | | | | | | | | | | | | | | |
|------|------|----|----|------|------|----|------|------|------|----|----|------|----|----|------|
| [CR] | [LF] | I | N | T | E | R | S | H | A | K | E | (SP) | A | n | a |
| 0D | 25 | C9 | D5 | E3 | C5 | D9 | E2 | C8 | C1 | D2 | C5 | 40 | C1 | 95 | 81 |
| l | y | z | e | s | (SP) | A | n | d | (SP) | F | i | n | d | s | (SP) |
| 93 | A8 | A9 | 85 | A2 | 40 | C1 | 95 | 84 | 40 | C6 | 89 | 95 | 84 | A2 | 40 |
| Y | o | u | r | (SP) | D | a | t | a | (SP) | C | o | m | m | u | n |
| E8 | 96 | A4 | 99 | 40 | C4 | 81 | A3 | 81 | 40 | C3 | 96 | 94 | 94 | A4 | 95 |
| i | c | a | t | i | o | n | s | (SP) | P | r | o | b | l | e | m |
| 89 | 83 | 81 | A3 | 89 | 96 | 95 | A2 | 40 | D7 | 99 | 96 | 82 | 93 | 85 | 94 |
| s | (SP) | F | a | s | t | ! | (SP) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| A2 | 40 | C6 | 81 | A2 | A3 | 5A | 40 | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 |
| 9 | φ | | | | | | | | | | | | | | |
| F9 | F0 | | | | | | | | | | | | | | |

OM 842A

FUNCTION 64 - 122 PRINT CHARACTER MESSAGE (EBCDIC) (125 CHARACTERS TOTAL)

| | | | | | | | | | | | | | | | |
|------|------|------|------|------|----|----|------|----|------|----|------|------|------|------|----|
| [NL] | [CR] | [LF] | I | N | T | E | R | S | H | A | K | E | (SP) | a | n |
| 15 | 0D | 25 | C9 | D5 | E3 | C5 | D9 | E2 | C8 | C1 | D2 | C5 | 40 | 81 | 95 |
| d | (SP) | I | N | T | E | R | V | I | E | W | (SP) | J | o | i | n |
| 84 | 40 | C9 | D5 | E3 | C5 | D9 | E5 | C9 | C5 | E6 | 40 | D1 | 96 | 89 | 95 |
| (SP) | T | o | g | e | t | h | e | r | (SP) | T | o | (SP) | Q | u | i |
| 40 | E3 | 96 | 87 | 85 | A3 | 88 | 85 | 99 | 40 | E3 | 96 | 40 | D8 | A4 | 89 |
| c | k | l | y | (SP) | S | i | m | u | l | a | t | e | (SP) | A | n |
| 83 | 92 | 93 | A8 | 40 | E2 | 89 | 94 | A4 | 93 | 81 | A3 | 85 | 40 | C1 | 95 |
| d | (SP) | A | n | a | l | y | z | e | (SP) | Y | o | u | r | (SP) | D |
| 84 | 40 | C1 | 95 | 81 | 93 | A8 | A9 | 85 | 40 | E8 | 96 | A4 | 99 | 40 | C4 |
| a | t | a | (SP) | C | o | m | m | u | n | i | c | a | t | i | o |
| 81 | A3 | 81 | 40 | C3 | 96 | 94 | 94 | A4 | 95 | 89 | 83 | 81 | A3 | 89 | 96 |
| n | s | (SP) | P | r | o | b | l | e | m | s | ! | (SP) | 1 | 2 | 3 |
| 95 | A2 | 40 | D7 | 99 | 96 | 82 | 93 | 85 | 94 | A2 | 5A | 40 | F1 | F2 | F3 |
| 4 | 5 | 6 | 7 | 8 | 9 | φ | (SP) | # | & | @ | / | - | | | |
| F4 | F5 | F6 | F7 | F8 | F9 | F0 | 40 | 7B | 50 | 7C | 61 | 60 | | | |

FUNCTION 65 - 122 PRINT CHARACTER MESSAGE (EBCD) (127 CHARACTERS TOTAL)

| | | | | | | | | | | | | | | | |
|------|------|------|----|----|----|----|------|------|------|------|------|------|------|------|------|
| [UC] | I | N | T | E | R | S | H | A | K | E | (SP) | A | N | D | (SP) |
| 1C | 67 | 29 | 32 | 6B | 25 | 52 | 07 | 23 | 51 | 6B | 40 | 23 | 29 | 0B | 40 |
| I | N | T | E | R | V | I | E | W | (SP) | J | O | I | N | (SP) | T |
| 67 | 29 | 32 | 6B | 25 | 2A | 67 | 6B | 1A | 40 | 61 | 19 | 67 | 29 | 40 | 32 |
| O | G | E | T | H | E | R | (SP) | T | O | (SP) | Q | U | I | C | K |
| 19 | 3B | 6B | 32 | 07 | 6B | 25 | 40 | 32 | 19 | 40 | 45 | 4A | 67 | 73 | 51 |
| L | Y | (SP) | S | I | M | U | L | A | T | E | (SP) | A | N | D | (SP) |
| 31 | 46 | 40 | 52 | 67 | 49 | 4A | 31 | 23 | 32 | 6B | 40 | 23 | 29 | 0B | 40 |
| A | N | A | L | Y | Z | E | (SP) | Y | O | U | R | (SP) | [LC] | d | a |
| 23 | 29 | 23 | 31 | 46 | 26 | 6B | 40 | 46 | 19 | 4A | 25 | 40 | 1F | 0B | 23 |
| t | a | (SP) | c | o | m | m | u | n | i | c | a | t | i | o | n |
| 32 | 23 | 40 | 73 | 19 | 49 | 49 | 4A | 29 | 67 | 73 | 23 | 32 | 67 | 19 | 29 |
| s | (SP) | p | r | o | b | l | e | m | s | [UC] | ! | (SP) | [LC] | 1 | 2 |
| 52 | 40 | 79 | 25 | 19 | 13 | 31 | 6B | 49 | 52 | 1C | 75 | 40 | 1F | 20 | 10 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | φ | (SP) | # | & | @ | / | - | [NL] | |
| 30 | 08 | 68 | 58 | 38 | 04 | 64 | 54 | 40 | 34 | 43 | 02 | 62 | 01 | 6D | |

OM 842A

FUNCTION 66 - 122 PRINT CHARACTER MESSAGE (SELECTRIC) (127 CHARACTERS TOTAL)

| | | | | | | | | | | | | | | | | |
|------|----|------|------|----|----|----|------|------|----|------|------|------|------|------|------|------|
| [UC] | I | N | T | E | R | S | H | A | K | E | (SP) | A | N | D | (SP) | |
| 1C | 19 | 52 | 02 | 4A | 29 | 25 | 26 | 79 | 1A | 4A | 40 | 79 | 52 | 2A | 40 | |
| | I | N | T | E | R | V | I | E | W | (SP) | J | O | I | N | (SP) | T |
| | 19 | 52 | 02 | 4A | 29 | 31 | 19 | 4A | 75 | 40 | 43 | 45 | 19 | 52 | 40 | 02 |
| | O | G | E | T | H | E | R | (SP) | T | O | (SP) | Q | U | I | C | K |
| | 45 | 23 | 4A | 02 | 26 | 4A | 29 | 40 | 02 | 45 | 40 | 5B | 32 | 19 | 7A | 1A |
| | L | Y | (SP) | S | I | M | U | L | A | T | E | (SP) | A | N | D | (SP) |
| | 46 | 67 | 40 | 25 | 19 | 61 | 32 | 46 | 79 | 02 | 4A | 40 | 79 | 52 | 2A | 40 |
| | A | N | A | L | Y | Z | E | (SP) | Y | O | U | R | (SP) | [LC] | d | a |
| | 79 | 52 | 79 | 46 | 67 | 54 | 4A | 40 | 67 | 45 | 32 | 29 | 40 | 1F | 2A | 79 |
| | t | a | (SP) | c | o | m | m | u | n | i | c | a | t | i | o | n |
| | 02 | 79 | 40 | 7A | 45 | 61 | 61 | 32 | 52 | 19 | 7A | 79 | 02 | 19 | 45 | 52 |
| | s | (SP) | p | r | o | b | l | e | m | s | ! | (SP) | 1 | 2 | 3 | 4 |
| | 25 | 40 | 0B | 29 | 45 | 76 | 46 | 4A | 61 | 25 | 01 | 40 | 20 | 10 | 70 | 04 |
| | 5 | 6 | 7 | 8 | 9 | φ | (SP) | [UC] | # | & | @ | [LC] | / | - | [NL] | |
| | 08 | 58 | 68 | 38 | 34 | 64 | 40 | 1C | 70 | 68 | 10 | 1F | 07 | 37 | 6D | |

FUNCTION 67 - 72 PRINT CHARACTER FOX MESSAGE (BAUDOT) (77 CHARACTERS TOTAL)

| | | | | | | | | | | | | | | | | |
|--------|------|--------|------|----|----|------|--------|--------|------|------|------|------|------|----|--------|----|
| [CR] | [LF] | [LTRS] | T | H | E | (SP) | Q | U | I | C | K | (SP) | B | R | O | |
| 08 | 02 | 1F | 10 | 14 | 01 | 04 | 17 | 07 | 06 | 0E | 0F | 04 | 19 | 0A | 18 | |
| | W | N | (SP) | F | O | X | (SP) | J | U | M | P | S | (SP) | O | V | E |
| | 13 | 0C | 04 | 0D | 18 | 1D | 04 | 0B | 07 | 1C | 16 | 05 | 04 | 18 | 1E | 01 |
| | R | (SP) | T | H | E | (SP) | L | A | Z | Y | (SP) | D | O | G | [FIGS] | ' |
| | 0A | 04 | 10 | 14 | 01 | 04 | 12 | 03 | 11 | 15 | 04 | 09 | 18 | 1A | 1B | 0B |
| [LTRS] | S | (SP) | B | A | C | K | [FIGS] | . | (SP) | (SP) | 1 | 2 | 3 | 4 | 5 | |
| 1F | 05 | 04 | 19 | 03 | 0E | 0F | 1B | 1C | 04 | 04 | 17 | 13 | 01 | 04 | 10 | |
| | 6 | 7 | 8 | 9 | φ | (SP) | (SP) | [LTRS] | T | E | S | T | I | N | G | |
| | 15 | 07 | 1A | 18 | 16 | 04 | 04 | 1F | 10 | 01 | 05 | 10 | 06 | 0C | 1A | |

NOTE: THE 72- AND 80-CHARACTER MESSAGES HAVE 72 OR 80 PRINT CHARACTERS.
 THE 122-CHARACTER MESSAGES HAVE ABOUT 127 TOTAL CHARACTERS.

OM 842A

APPENDIX I

FUNCTION 68 CODE TRANSLATIONS

EBCDIC TO ASCII

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|--------|-----------|------------|--------|
| 00 | 00 | NUL | 30 | - | - |
| 01 | 01 | SOH | 31 | - | - |
| 02 | 02 | STX | 32 | 16 | SYN |
| 03 | 03 | ETX | 33 | - | - |
| 04 | - | - | 34 | - | - |
| 05 | 09 | HT | 35 | - | - |
| 06 | - | - | 36 | - | - |
| 07 | 7F | DEL | 37 | 04 | EOT |
| 08 | - | - | 38 | - | - |
| 09 | - | - | 39 | - | - |
| 0A | - | - | 3A | - | - |
| 0B | 0B | VT | 3B | - | - |
| 0C | 0C | FF | 3C | 14 | DC4 |
| 0D | 0D | CR | 3D | 15 | NAK |
| 0E | 0E | S0 | 3E | - | - |
| 0F | 0F | S1 | 3F | 1A | SUB |
| 10 | 10 | DLE | 40 | 20 | SP |
| 11 | 11 | DC1 | 41 | - | - |
| 12 | 12 | DC2 | 42 | - | - |
| 13 | 13 | DC3 | 43 | - | - |
| 14 | - | - | 44 | - | - |
| 15 | 0D | NL | 45 | - | - |
| 16 | 08 | BS | 46 | - | - |
| 17 | - | - | 47 | - | - |
| 18 | 18 | CAN | 48 | - | - |
| 19 | 19 | EM | 49 | - | - |
| 1A | - | - | 4A | - | - |
| 1B | - | - | 4B | 2E | . |
| 1C | 1C | IFS | 4C | 3C | < |
| 1D | 1D | IGS | 4D | 28 | (|
| 1E | 1E | IRS | 4E | 2B | + |
| 1F | 1F | IUS | 4F | - | - |
| 20 | - | - | 50 | 26 | & |
| 21 | - | - | 51 | - | - |
| 22 | - | - | 52 | - | - |
| 23 | - | - | 53 | - | - |
| 24 | - | - | 54 | - | - |
| 25 | 0A | LF | 55 | - | - |
| 26 | 17 | ETB | 56 | - | - |
| 27 | 1B | ESC | 57 | - | - |
| 28 | - | - | 58 | - | - |
| 29 | - | - | 59 | - | - |
| 2A | - | - | 5A | 21 | ! |
| 2B | - | - | 5B | 24 | \$ |
| 2C | - | - | 5C | 2A | * |
| 2D | 05 | ENQ | 5D | 29 |) |
| 2E | 06 | ACK | 5E | 3B | ; |
| 2F | 07 | BEL | 5F | - | - |

EBCDIC TO ASCII

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|--------|-----------|------------|--------|
| 60 | 2D | - | 90 | - | - |
| 61 | 2F | / | 91 | 6A | j |
| 62 | - | - | 92 | 6B | k |
| 63 | - | - | 93 | 6C | l |
| 64 | - | - | 94 | 6D | m |
| 65 | - | - | 95 | 6E | n |
| 66 | - | - | 96 | 6F | o |
| 67 | - | - | 97 | 70 | p |
| 68 | - | - | 98 | 71 | q |
| 69 | - | - | 99 | 72 | r |
| 6A | 7C | : | 9A | - | - |
| 6B | 2C | , | 9B | - | - |
| 6C | 25 | % | 9C | - | - |
| 6D | 5F | - | 9D | - | - |
| 6E | 3E | > | 9E | - | - |
| 6F | 3F | ? | 9F | - | - |
| 70 | - | - | A0 | - | - |
| 71 | - | - | A1 | 7E | ~ |
| 72 | - | - | A2 | 73 | s |
| 73 | - | - | A3 | 74 | t |
| 74 | - | - | A4 | 75 | u |
| 75 | - | - | A5 | 76 | v |
| 76 | - | - | A6 | 77 | w |
| 77 | - | - | A7 | 78 | x |
| 78 | - | - | A8 | 79 | y |
| 79 | 5C | \ | A9 | 7A | z |
| 7A | 3A | : | AA | - | - |
| 7B | 23 | # | AB | - | - |
| 7C | 40 | @ | AC | - | - |
| 7D | 27 | ' | AD | - | - |
| 7E | 3D | = | AE | - | - |
| 7F | 22 | " | AF | - | - |
| 80 | - | - | B0 | - | - |
| 81 | 61 | a | B1 | - | - |
| 82 | 62 | b | B2 | - | - |
| 83 | 63 | c | B3 | - | - |
| 84 | 64 | d | B4 | - | - |
| 85 | 65 | e | B5 | - | - |
| 86 | 66 | f | B6 | - | - |
| 87 | 67 | g | B7 | - | - |
| 88 | 68 | h | B8 | - | - |
| 89 | 69 | i | B9 | - | - |
| 8A | - | - | BA | - | - |
| 8B | - | - | BB | - | - |
| 8C | - | - | BC | - | - |
| 8D | - | - | BD | - | - |
| 8E | - | - | BE | - | - |
| 8F | - | - | BF | - | - |

EBCDIC TO ASCII

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|--------|-----------|------------|--------|
| C0 | 7B | { | E0 | 5C | \ |
| C1 | 41 | A | E1 | - | - |
| C2 | 42 | B | E2 | 53 | S |
| C3 | 43 | C | E3 | 54 | T |
| C4 | 44 | D | E4 | 55 | U |
| C5 | 45 | E | E5 | 56 | V |
| C6 | 46 | F | E6 | 57 | W |
| C7 | 47 | G | E7 | 58 | X |
| C8 | 48 | H | E8 | 59 | Y |
| C9 | 49 | I | E9 | 5A | Z |
| CA | - | - | EA | - | - |
| CB | - | - | EB | - | - |
| CC | - | - | EC | - | - |
| CD | - | - | ED | - | - |
| CE | - | - | EE | - | - |
| CF | - | - | EF | - | - |
| D0 | 7D | } | F0 | 30 | 0 |
| D1 | 4A | J | F1 | 31 | 1 |
| D2 | 4B | K | F2 | 32 | 2 |
| D3 | 4C | L | F3 | 33 | 3 |
| D4 | 4D | M | F4 | 34 | 4 |
| D5 | 4E | N | F5 | 35 | 5 |
| D6 | 4F | O | F6 | 36 | 6 |
| D7 | 50 | P | F7 | 37 | 7 |
| D8 | 51 | Q | F8 | 38 | 8 |
| D9 | 52 | R | F9 | 39 | 9 |
| DA | - | - | FA | - | - |
| DB | - | - | FB | - | - |
| DC | - | - | FC | - | - |
| DD | - | - | FD | - | - |
| DE | - | - | FE | - | - |
| DF | - | - | FF | - | - |

ASCII TO EBCDIC

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|--------|-----------|------------|--------|
| 00 80 | 00 | NUL | 30 B0 | F0 | 0 |
| 01 81 | 01 | SOH | 31 B1 | F1 | 1 |
| 02 82 | 02 | STX | 32 B2 | F2 | 2 |
| 03 83 | 03 | ETX | 33 B3 | F3 | 3 |
| 04 84 | 37 | EOT | 34 B4 | F4 | 4 |
| 05 85 | 2D | ENQ | 35 B5 | F5 | 5 |
| 06 86 | 2E | ACK | 36 B6 | F6 | 6 |
| 07 87 | 2F | BEL | 37 B7 | F7 | 7 |
| 08 88 | 16 | BS | 38 B8 | F8 | 8 |
| 09 89 | 05 | HT | 39 B9 | F9 | 9 |
| 0A 8A | 25 | LF | 3A BA | 7A | : |
| 0B 8B | 0B | VT | 3B BB | 5E | ; |
| 0C 8C | 0C | FF | 3C BC | 4C | < |
| 0D 8D | 0D | CR | 3D BD | 7E | = |
| 0E 8E | 0E | SO | 3E BE | 6E | > |
| 0F 8F | 0F | SI | 3F BF | 6F | ? |
| 10 90 | 10 | DLE | 40 C0 | 7C | @ |
| 11 91 | 11 | DC1 | 41 C1 | C1 | A |
| 12 92 | 12 | DC2 | 42 C2 | C2 | B |
| 13 93 | 13 | DC3 | 43 C3 | C3 | C |
| 14 94 | 3C | DC4 | 44 C4 | C4 | D |
| 15 95 | 3D | NAK | 45 C5 | C5 | E |
| 16 96 | 32 | SYN | 46 C6 | C6 | F |
| 17 97 | 26 | ETB | 47 C7 | C7 | G |
| 18 98 | 18 | CAN | 48 C8 | C8 | H |
| 19 99 | 19 | EM | 49 C9 | C9 | I |
| 1A 9A | 3F | SUB | 4A CA | D1 | J |
| 1B 9B | 27 | ESC | 4B CB | D2 | K |
| 1C 9C | 1C | FS | 4C CC | D3 | L |
| 1D 9D | 1D | GS | 4D CD | D4 | M |
| 1E 9E | 1E | RS | 4E CE | D5 | N |
| 1F 9F | 1F | US | 4F CF | D6 | O |
| 20 A0 | 40 | SP | 50 D0 | D7 | P |
| 21 A1 | 5A | ! | 51 D1 | D8 | Q |
| 22 A2 | 7F | " | 52 D2 | D9 | R |
| 23 A3 | 7B | # | 53 D3 | E2 | S |
| 24 A4 | 5B | \$ | 54 D4 | E3 | T |
| 25 A5 | 6C | % | 55 D5 | E4 | U |
| 26 A6 | 50 | & | 56 D6 | E5 | V |
| 27 A7 | 7D | ' | 57 D7 | E6 | W |
| 28 A8 | 4D | (| 58 D8 | E7 | X |
| 29 A9 | 5D |) | 59 D9 | E8 | Y |
| 2A AA | 5C | * | 5A DA | E9 | Z |
| 2B AB | 4E | + | 5B DB | - | - |
| 2C AC | 6B | , | 5C DC | E0 | \ |
| 2D AD | 60 | - | 5D DD | - | - |
| 2E AE | 4B | . | 5E DE | 5F |] |
| 2F AF | 61 | / | 5F DF | 6D | - |

ASCII TO EBCDIC

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|--------|-----------|------------|--------|
| 60 E0 | — | — | 70 F0 | 97 | p |
| 61 E1 | 81 | a | 71 F1 | 98 | q |
| 62 E2 | 82 | b | 72 F2 | 99 | r |
| 63 E3 | 83 | c | 73 F3 | A2 | s |
| 64 E4 | 84 | d | 74 F4 | A3 | t |
| 65 E5 | 85 | e | 75 F5 | A4 | u |
| 66 E6 | 86 | f | 76 F6 | A5 | v |
| 67 E7 | 87 | g | 77 F7 | A6 | w |
| 68 E8 | 88 | h | 78 F8 | A7 | x |
| 69 E9 | 89 | i | 79 F9 | A8 | y |
| 6A EA | 91 | j | 7A FA | A9 | z |
| 6B EB | 92 | k | 7B FB | C0 | { |
| 6C EC | 93 | l | 7C FC | 6A | : |
| 6D ED | 94 | m | 7D FD | D0 | } |
| 6E EE | 95 | n | 7E FE | A1 | ~ |
| 6F EF | 96 | o | 7F FF | 07 | DEL |

EBCD TO ASCII

| HEX INPUT | HEX OUTPUT | UPPER CASE SYMBOL | HEX INPUT | HEX OUTPUT | UPPER CASE SYMBOL |
|-----------|------------|-------------------|-----------|------------|-------------------|
| 00 | 20 | SP | 30 | 3B | ; |
| 01 | 5F | - | 31 | 4C | L |
| 02 | - | ¢ | 32 | 54 | T |
| 03 | 2B | + | 33 | 43 | C |
| 04 | 2A | * | 34 | 22 | " |
| 05 | 51 | Q | 35 | 21 | ! |
| 06 | 59 | Y | 36 | - | - |
| 07 | 48 | H | 37 | 5E |] |
| 08 | 3A | : | 38 | 3E | > |
| 09 | 4D | M | 39 | 50 | P |
| 0A | 55 | U | 3A | 58 | X |
| 0B | 44 | D | 3B | 47 | G |
| 0C | 12 | PN(DC2) | 3C | 04 | EOT |
| 0D | - | - | 3D | 16 | IDL(SYN) |
| 0E | - | - | 3E | 01 | PRE(SOH) |
| 0F | 14 | PF(DC4) | 3F | 7F | DEL |
| 10 | 3C | < | 40 | 20 | SP |
| 11 | 4B | K | 41 | 5F | - |
| 12 | 53 | S | 42 | 40 | @ |
| 13 | 42 | B | 43 | 26 | & |
| 14 | 29 |) | 44 | 38 | 8 |
| 15 | - | - | 45 | 71 | q |
| 16 | - | - | 46 | 79 | y |
| 17 | - | - | 47 | 68 | h |
| 18 | 27 | / | 48 | 34 | 4 |
| 19 | 4F | O | 49 | 6D | m |
| 1A | 57 | W | 4A | 75 | u |
| 1B | 46 | F | 4B | 64 | d |
| 1C | 5E | UC(Λ) | 4C | 12 | PN(DC2) |
| 1D | 08 | BS | 4D | - | - |
| 1E | - | - | 4E | - | - |
| 1F | 5C | LC(\\) | 4F | 14 | PF(DC4) |
| 20 | 3D | = | 50 | 32 | 2 |
| 21 | 4A | J | 51 | 6B | k |
| 22 | 3F | ? | 52 | 73 | s |
| 23 | 41 | A | 53 | 62 | b |
| 24 | 28 | (| 54 | 30 | φ |
| 25 | 52 | R | 55 | - | - |
| 26 | 5A | Z | 56 | - | - |
| 27 | 49 | I | 57 | - | - |
| 28 | 25 | % | 58 | 36 | 6 |
| 29 | 4E | N | 59 | 6F | o |
| 2A | 56 | V | 5A | 77 | w |
| 2B | 45 | E | 5B | 66 | f |
| 2C | 1E | RS(DC3) | 5C | 5E | UC(Λ) |
| 2D | 0D | NL(CR) | 5D | 08 | BS |
| 2E | 0A | LF | 5E | - | - |
| 2F | 09 | HT | 5F | 5C | LC(\\) |

EBCD TO ASCII

| HEX INPUT | HEX OUTPUT | LOWER CASE SYMBOL | HEX INPUT | HEX OUTPUT | LOWER CASE SYMBOL |
|-----------|------------|-------------------|-----------|------------|-------------------|
| 60 | 31 | l | 70 | 33 | 3 |
| 61 | 6A | j | 71 | 6C | l |
| 62 | 2F | / | 72 | 74 | t |
| 63 | 61 | a | 73 | 63 | c |
| 64 | 39 | q | 74 | 23 | # |
| 65 | 72 | r | 75 | 24 | \$ |
| 66 | 7A | z | 76 | 2C | , |
| 67 | 69 | i | 77 | 2E | . |
| 68 | 35 | 5 | 78 | 37 | > |
| 69 | 6E | n | 79 | 70 | p |
| 6A | 76 | v | 7A | 78 | x |
| 6B | 65 | e | 7B | 67 | g |
| 6C | 1E | RS(DC3) | 7C | 04 | EOT |
| 6D | 0D | NL(CR) | 7D | 16 | IDL(SYN) |
| 6E | 0A | LF | 7E | 01 | PRE(SOH) |
| 6F | 09 | HT | 7F | 7F | DEL |

ASCII TO EBCD

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|-----------|-----------|------------|--------|
| 00 80 | — | — | 30 B0 | 54 | 0 |
| 01 81 | 3E | SOH(PRE) | 31 B1 | 20 | 1 |
| 02 82 | — | — | 32 B2 | 10 | 2 |
| 03 83 | — | — | 33 B3 | 30 | 3 |
| 04 84 | 7C | EOT | 34 B4 | 08 | 4 |
| 05 85 | — | — | 35 B5 | 68 | 5 |
| 06 86 | — | — | 36 B6 | 58 | 6 |
| 07 87 | — | — | 37 B7 | 38 | 7 |
| 08 88 | 5D | BS | 38 B8 | 04 | 8 |
| 09 89 | 2F | HT | 39 B9 | 64 | 9 |
| 0A 8A | 6E | LF | 3A BA | 08 | : |
| 0B 8B | — | — | 3B BB | 30 | ; |
| 0C 8C | — | — | 3C BC | 10 | < |
| 0D 8D | 6D | CR(NL) | 3D BD | 20 | = |
| 0E 8E | — | — | 3E BE | 38 | > |
| 0F 8F | — | — | 3F BF | 62 | ? |
| 10 90 | — | — | 40 C0 | 02 | @ |
| 11 91 | — | — | 41 C1 | 23 | A |
| 12 92 | 4C | DC2(PN) | 42 C2 | 13 | B |
| 13 93 | 2C | DC3(RS) | 43 C3 | 73 | C |
| 14 94 | 4F | DC4(PF) | 44 C4 | 08 | D |
| 15 95 | — | — | 45 C5 | 6B | E |
| 16 96 | 3D | SYN(IDLE) | 46 C6 | 5B | F |
| 17 97 | — | — | 47 C7 | 3B | G |
| 18 98 | — | — | 48 C8 | 07 | H |
| 19 99 | — | — | 49 C9 | 67 | I |
| 1A 9A | — | — | 4A CA | 61 | J |
| 1B 9B | — | — | 4B CB | 51 | K |
| 1C 9C | — | — | 4C CC | 31 | L |
| 1D 9D | — | — | 4D CD | 49 | M |
| 1E 9E | — | — | 4E CE | 29 | N |
| 1F 9F | — | — | 4F CF | 19 | O |
| 20 A0 | 40 | SP | 50 D0 | 79 | P |
| 21 A1 | 75 | ! | 51 D1 | 45 | Q |
| 22 A2 | 34 | " | 52 D2 | 25 | R |
| 23 A3 | 34 | # | 53 D3 | 52 | S |
| 24 A4 | 75 | \$ | 54 D4 | 32 | T |
| 25 A5 | 68 | % | 55 D5 | 4A | U |
| 26 A6 | 43 | & | 56 D6 | 2A | V |
| 27 A7 | 58 | / | 57 D7 | 1A | W |
| 28 A8 | 64 | (| 58 D8 | 7A | X |
| 29 A9 | 54 |) | 59 D9 | 46 | Y |
| 2A AA | 04 | * | 5A DA | 26 | Z |
| 2B AB | 43 | + | 5B DB | — | — |
| 2C AC | 76 | , | 5C DC | 1F | \(LC) |
| 2D AD | 01 | — | 5D DD | — | — |
| 2E AE | 37 | . | 5E DE | 1C | ^(UC) |
| 2F AF | 62 | / | 5F DF | 01 | — |

ASCII TO EBCD

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|--------|-----------|------------|--------|
| 60 E0 | — | — | 70 F0 | 79 | p |
| 61 E1 | 23 | a | 71 F1 | 45 | q |
| 62 E2 | 13 | b | 72 F2 | 25 | r |
| 63 E3 | 73 | c | 73 F3 | 52 | s |
| 64 E4 | 0B | d | 74 F4 | 32 | t |
| 65 E5 | 6B | e | 75 F5 | 4A | u |
| 66 E6 | 5B | f | 76 F6 | 2A | v |
| 67 E7 | 3B | g | 77 F7 | 1A | w |
| 68 E8 | 07 | h | 78 F8 | 7A | x |
| 69 E9 | 67 | i | 79 F9 | 46 | y |
| 6A EA | 61 | j | 7A FA | 26 | z |
| 6B EB | 51 | k | 7B FB | — | — |
| 6C EC | 31 | l | 7C FC | — | — |
| 6D ED | 49 | m | 7D FD | — | — |
| 6E EE | 29 | n | 7E FE | — | — |
| 6F EF | 19 | o | 7F FF | 7F | DEL |

SELECTRIC TO ASCII

| HEX INPUT | HEX OUTPUT | UPPER CASE SYMBOL | HEX INPUT | HEX OUTPUT | LOWER CASE SYMBOL |
|-----------|------------|-------------------|-----------|------------|-------------------|
| 00 | 20 | SP | 30 | 23 | # |
| 01 | - | - | 31 | 56 | V |
| 02 | 54 | T | 32 | 55 | U |
| 03 | 4A | J | 33 | 46 | F |
| 04 | 24 | \$ | 34 | 28 | (|
| 05 | 4F | O | 35 | 57 | W |
| 06 | 4C | L | 36 | 42 | B |
| 07 | 3F | ? | 37 | 5F | - |
| 08 | 25 | % | 38 | 2A | * |
| 09 | 22 | " | 39 | 41 | A |
| 0A | 45 | E | 3A | 43 | C |
| 0B | 50 | P | 3B | 2C | , |
| 0C | 12 | PN(DC2) | 3C | 04 | EOT |
| 0D | - | - | 3D | 16 | IL(SYN) |
| 0E | - | - | 3E | 01 | PRE(SOH) |
| 0F | 14 | PF(DC4) | 3F | 7F | DEL |
| 10 | 40 | @ | 40 | 20 | SP |
| 11 | 2E | . | 41 | 21 | ! |
| 12 | 4E | N | 42 | 74 | t |
| 13 | 2B | + | 43 | 6A | j |
| 14 | 5A | Z | 44 | 34 | 4 |
| 15 | - | - | 45 | 6F | o |
| 16 | - | - | 46 | 6C | l |
| 17 | - | - | 47 | 2F | / |
| 18 | - | - | 48 | 35 | 5 |
| 19 | 49 | I | 49 | 27 | ' |
| 1A | 4B | K | 4A | 65 | e |
| 1B | 51 | Q | 4B | 70 | p |
| 1C | 5E | UC(Λ) | 4C | 12 | PN(DC2) |
| 1D | 08 | BS | 4D | - | - |
| 1E | - | - | 4E | - | - |
| 1F | 5C | LC(\) | 4F | 14 | PF(DC4) |
| 20 | - | - | 50 | 32 | 2 |
| 21 | 4D | M | 51 | 2E | . |
| 22 | 58 | X | 52 | 6E | n |
| 23 | 47 | G | 53 | 3D | = |
| 24 | 29 |) | 54 | 7A | z |
| 25 | 53 | S | 55 | - | - |
| 26 | 48 | H | 56 | - | - |
| 27 | 59 | Y | 57 | - | - |
| 28 | 26 | & | 58 | 36 | 6 |
| 29 | 52 | R | 59 | 69 | i |
| 2A | 44 | D | 5A | 6B | k |
| 2B | 3A | : | 5B | 71 | q |
| 2C | 1E | RS(DC3) | 5C | 5E | UC(Λ) |
| 2D | 0D | NL(CR) | 5D | 08 | BS |
| 2E | 0A | LF | 5E | - | - |
| 2F | 09 | HT | 5F | 5C | LC(\) |

SELECTRIC TO ASCII

| HEX INPUT | HEX OUTPUT | UPPER CASE SYMBOL | HEX INPUT | HEX OUTPUT | LOWER CASE SYMBOL |
|-----------|------------|-------------------|-----------|------------|-------------------|
| 60 | 31 | 1 OR] (1) | 70 | 33 | 3 |
| 61 | 6D | m | 71 | 76 | v |
| 62 | 78 | x | 72 | 75 | u |
| 63 | 67 | g | 73 | 66 | f |
| 64 | 30 | φ | 74 | 39 | 9 |
| 65 | 73 | s | 75 | 77 | w |
| 66 | 68 | h | 76 | 62 | b |
| 67 | 79 | y | 77 | 2D | — |
| 68 | 37 | 7 | 78 | 38 | 8 |
| 69 | 72 | r | 79 | 61 | a |
| 6A | 64 | d | 7A | 63 | c |
| 6B | 3B | ; | 7B | 2C | , |
| 6C | 1E | RS(DC3) | 7C | 04 | EOT |
| 6D | 0D | NL(CR) | 7D | 16 | IL(SYN) |
| 6E | 0A | LF | 7E | 01 | PRE(SOH) |
| 6F | 09 | HT | 7F | 7F | DEL |

ASCII TO SELECTRIC

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|-----------|-----------|------------|--------|
| 00 80 | — | — | 30 B0 | 64 | 0 |
| 01 81 | 3E | SOH(PRE) | 31 B1 | 20 | 1 |
| 02 82 | — | — | 32 B2 | 10 | 2 |
| 03 83 | — | — | 33 B3 | 70 | 3 |
| 04 84 | 7C | EOT | 34 B4 | 04 | 4 |
| 05 85 | — | — | 35 B5 | 08 | 5 |
| 06 86 | — | — | 36 B6 | 58 | 6 |
| 07 87 | — | — | 37 B7 | 68 | 7 |
| 08 88 | 5D | BS | 38 B8 | 38 | 8 |
| 09 89 | 2F | HT | 39 B9 | 34 | 9 |
| 0A 8A | 6E | LF | 3A BA | 6B | : |
| 0B 8B | — | — | 3B BB | 6B | ; |
| 0C 8C | — | — | 3C BC | — | — |
| 0D 8D | 6D | CR(NL) | 3D BD | 13 | = |
| 0E 8E | — | — | 3E BE | — | — |
| 0F 8F | — | — | 3F BF | 07 | ? |
| 10 90 | — | — | 40 C0 | 10 | @ |
| 11 91 | — | — | 41 C1 | 79 | A |
| 12 92 | 4C | DC2(PN) | 42 C2 | 76 | B |
| 13 93 | 2C | DC3(RS) | 43 C3 | 7A | C |
| 14 94 | 4F | DC4(PF) | 44 C4 | 2A | D |
| 15 95 | — | — | 45 C5 | 4A | E |
| 16 96 | 3D | SYN(IDLE) | 46 C6 | 73 | F |
| 17 97 | — | — | 47 C7 | 23 | G |
| 18 98 | — | — | 48 C8 | 26 | H |
| 19 99 | — | — | 49 C9 | 19 | I |
| 1A 9A | — | — | 4A CA | 43 | J |
| 1B 9B | — | — | 4B CB | 1A | K |
| 1C 9C | — | — | 4C CC | 46 | L |
| 1D 9D | — | — | 4D CD | 61 | M |
| 1E 9E | — | — | 4E CE | 52 | N |
| 1F 9F | — | — | 4F CF | 45 | O |
| 20 A0 | 40 | SP | 50 D0 | 0B | P |
| 21 A1 | 01 | ! | 51 D1 | 5B | Q |
| 22 A2 | 49 | " | 52 D2 | 29 | R |
| 23 A3 | 70 | # | 53 D3 | 25 | S |
| 24 A4 | 04 | \$ | 54 D4 | 02 | T |
| 25 A5 | 08 | % | 55 D5 | 32 | U |
| 26 A6 | 68 | & | 56 D6 | 31 | V |
| 27 A7 | — | — | 57 D7 | 75 | W |
| 28 A8 | 34 | (| 58 D8 | 62 | X |
| 29 A9 | 64 |) | 59 D9 | 67 | Y |
| 2A AA | 38 | * | 5A DA | 54 | Z |
| 2B AB | 13 | + | 5B DB | — | — |
| 2C AC | 3B | , | 5C DC | 1F | \(LC) |
| 2D AD | 37 | — | 5D DD | — | — |
| 2E AE | 51 | . | 5E DE | 1C | Δ (UC) |
| 2F AF | 07 | / | 5F DF | 37 | — |

ASCII TO SELECTRIC

| HEX INPUT | HEX OUTPUT | SYMBOL | HEX INPUT | HEX OUTPUT | SYMBOL |
|-----------|------------|--------|-----------|------------|--------|
| 60 E0 | — | — | 70 F0 | 0B | p |
| 61 E1 | 79 | a | 71 F1 | 5B | q |
| 62 E2 | 76 | b | 72 F2 | 29 | r |
| 63 E3 | 7A | c | 73 F3 | 25 | s |
| 64 E4 | 2A | d | 74 F4 | 02 | t |
| 65 E5 | 4A | e | 75 F5 | 32 | u |
| 66 E6 | 73 | f | 76 F6 | 31 | v |
| 67 E7 | 23 | g | 77 F7 | 75 | w |
| 68 E8 | 26 | h | 78 F8 | 62 | x |
| 69 E9 | 19 | i | 79 F9 | 67 | y |
| 6A EA | 43 | j | 7A FA | 54 | z |
| 6B EB | 1A | k | 7B FB | — | — |
| 6C EC | 46 | l | 7C FC | — | — |
| 6D ED | 61 | m | 7D FD | — | — |
| 6E EE | 52 | n | 7E FE | — | — |
| 6F EF | 45 | o | 7F FF | 7F | DEL |