IBM

Field Engineering

Maintenance Manual

1620-1443 Attachment Feature and
1800-1443 Attachment Feature

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PREFACE

This manual contains information peculiar to the
1620 (Models 1 and 2) -1443 and 1800-1443 attach-
ment features. It is to be used with the IBM 1443,
1443NI Field Engineering Maintenance Manual,
Form 225-3032.

SAFETY PROCEDURES

Be careful when working around moving parts of the machine, or around parts that would be set into motion should the machine start unexpectedly.

Remember, although the cog-type timing belts look like large rubber bands, they have an internal cable construction that can cause injuries as severe as those caused by gears. Do not place your fingers near them when the guards are off and the power is on.

Even though the voltage on the 1443 is low, extreme caution should be exercised in the power-supply area. Each heat sink has an electrical potential. Do not short heat sinks together or to the machine frame.

Before attempting any repair or adjustment within the power supplies, remove the power plugs from the 1443 and 1620 (or 1443 and 1800) and wait at least one full minute after the power is off. Discharge any capacitors in the power supply you are working on before proceeding with your work.

INSTALLATION PROCEDURES

Installation procedures for attaching the 1443 to the adapter are given in the following logics:

1443 to 1620-1	ALD 19.00.05.1
	(1443 Adapter Logics)
1443 to 1620-2	ALD 10.02.00.1
	(1620 Logics)
1443 to 1800	ALD 18.00.05.0
	(1443 Adapter Logics)

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Buffer Service Techniques

Except for Continuously Transfer Storage, the following information is applicable only to the 1620-1443 Attachment Feature. See IBM 1800 Data Acquisition and Control System Field Engineering Maintenance Manual, Form 227-5956, for diagnostic aids applicable to the 1800-1443 Attachment.

Continuously Transfer Storage (1620, 1800)

To cause continuous buffer load cycles in the 1620:
1. Load 1620 storage with the character to be transferred (31 00014 00012 XX).
2. Float D 1B10G (20.10.03.1) to block BAR 197 from turning on the 1443 print latch and disconnecting the 1443.
3. Insert 39 00101 00900 or 38 00100 00900 into 1620 storage.
4. Press the release-start key.

The 1620 continuously transfers the entire contents of storage without a disconnect.

To cause continuous buffer load cycles in the 1800:
1. Float D 1B10G (20.10.03.1) to block BAR 197 from turning on the 1443 print latch and disconnecting the 1443.
2. Load the first six 1800 memory locations as follows:

Mem Loc	Data (Hex)	
0000	0801	XIO
0001	6000	LDX 0000
0002	0004 ⎫	X and Y = Area Code and Function.
0003	XYZZ ⎭	Z = Modifier
0004	0001 ⎱	WC
0005	AABB ⎰	Output Data

3. Turn the mode switch to RUN; press RESET, and START.

Continuously Transfer at a Selected Address (1620)

The 1620 and 1443 can be locked in a continuous transfer operation at any selected address.

For Numeric Transfer:
1. On 1620-1 systems, single-cycle through a transfer operation and stop at the desired address minus 1 and trigger 30 time. On 1620-2 systems, a character transfers each time the SCE button is pressed. Stop at the address desired minus 1. The BAR displays the next address in sequence to be written. It advances at CPC time. The 1620 must be stopped one address before the desired address.
2. Float D 1E36R (20.15.02.1) in the 1443 to prevent the BAR from advancing.
3. Float D 1C44B (20.15.08.1) in the 1443 to prevent resetting the buffer, and display the character being transferred.
4. a. In the 1620-1 turn on the CE bypass switch.
   b. In the 1620-2 ground 12A1E16C (12.15.07.1) and 12A1G18P (12.15.06.1).
   This action blocks MAR reset and MAR SA strobe.

5. Press the 1620 start key.
The character is now displayed in the buffer register; the BAR is locked in XX address; the 1620 is cycling. Scope the desired points.

For Alpha Transfer:
1. Do numeric transfer steps 1, 2, and 3.
2. a. In the 1620-1:
      E through H suffix. Float B 1B21D (01.55.03.1 block increment +2).
      C or D suffix. Float B 1B14H.
   b. In the 1620-2, this is the same as step 4 in numeric transfer.
3. Proceed with numeric step 5.
This procedure can be used in any combination desired. For example, if the 1443 is failing at one address with varied characters:
1. Lock the 1443 at the failing address by step 2.
2. Cycle the 1620 through locking-up at the address that contains a failing character by numeric step 4 or alpha step 2.

Display Buffer Register (1620)

The CE indicator box does not normally display the characters in the buffer register because the register is reset before clock stop time. Transferring the parity-check switch (CE switch 5) prevents resetting the buffer register when a parity check occurs. This displays the error on the CE indicator box. If CE switch 5 is not installed, float (insulate) D 1B28P.

Single-Cycle Buffer Load (1620)

See Single Cycle Procedures.

Stop During Buffer Load (1620)

The disk stop switch (CE switch 10 on a 1620-2) can be used to stop the 1620-2 if one of the following conditions arises during a print buffer load cycle (11.40.08.1):
1. MBR (even VRC).
2. MBR (odd VRC).
3. MAR check stop.
4. I/O read check.
5. I/O write check.
6. Optional. A -S signal can be wired to B 1B26R to stop the print buffer load cycle.

Fuses (1620, 1800)

If fuse 4 in the lower power-sequence panel is blown, check for a blown fuse in one of the mini-watt power supplies (fuses 15, 16, and 17).

Hammer Flight Time (1620, 1800)

Before adjusting hammer flight time (registration), thoroughly clean the pole faces with a piece of card stock to ensure that the faces are free from oil. Any oily film on the pole faces can cause poor registration.

If difficulty is encountered in moving a hammer assembly to adjust flight time, carefully insert a card or thin shim between that coil and the coils on each side of it. Heat and time tend to cause adjacent coils to adhere to each other.

Line Printing, Repetitive (1620, 1800)

To adjust, scope, or check the 1443 mechanics without using the processing unit:
1. Load the 1443 buffer.
2. Turn on the buffer print switch (CE switch 4) located on the E-gate. This turns on the print control latch (20.06.00.1). Note: If this switch is not on the 1443, ground D 1E20L.
3. Press the start key. The printer takes repetitive print cycles and prints the buffer contents. Using this procedure the CE can adjust hammers, adjust solar cells, or diagnose troubles while the customer uses the processing unit.

Single Cycle Procedures (1620)

Buffer Load

To single-cycle a buffer load operation, transfer CE switch 9 on the 1620-2. No switch is needed on the 1620-1. One character transfers to the 1443 buffer for each operation of the SCE (Single Cycle Execute) button on the 1620 console.

Print Character Counter

The PCC (Print Character Counter) is not used during 1620-1443 transfer operations. To single-cycle the PCC under control of the 1620 processing unit SCE key:
1. Enter a 1443 print instruction into the 1620.
2. Jumper from D 1A28R (20.07.01.1) to D 1C34H (20.15.01.1) in the 1443.
3. Press the 1620 SCE key and observe the stepping of the PCC on the CE indicator box.

Transfer and Display

To single-cycle the 1620-1443 transfer operation and display the character in the buffer register:
1. Enter a 1443 print instruction into the 1620.
2. Place a card extender in the 1443 at D 1C44 (20.15.01.1).
3. Float pin B of the extender.
4. Jumper pin B of the extender to D 1C38J (20.15.00.1). This controls the buffer register reset from the clock control trigger. The buffer register is normally reset at the end of the clock cycle (CPC time).
5. Single-cycle the 1620 with the SCE key. Stop the 1620-1 with the sync trigger on to observe the digit being transferred. On the CE indicator box, the 1443 buffer displays the character that is in the MBR and MDR (alpha) or in the MDR (numeric) for the 1620-1. For the 1620-2 the 1443 buffer displays the alpha or numeric character in the MBR.

The CE indicator box displays the contents of BAR. This display is the next sequential address to be written. The BAR advances at CPC time.

Solar Cells (1620, 1800)

When replacing solar cells or solar cell lamps, it is not necessary to remove the plastic mounting block from the main assembly. For replacement, loosen the solar cell or lamp locking screws only.

Timing Pulses (1620)

On intermittent troubles that are difficult to analyze, do not disregard the possibility of incorrect levels or poorly shaped timing pulses from the clock.

Many timing and signal pulses on the lines between the 1620 and the 1443 are not clean square waves as might be expected. If you suspect trouble, square up the pulse as much as possible by card substitution. If the trouble still exists, ignore the timing pulse or signal line and pursue other possibilities. Figure 2-1 shows a typical waveform on the line between a 1620-1 and the 1443. Figure 2-2 shows a typical waveform on the line between a 1620-2 and a 1443.

Typebar Damage (1620, 1800)

When servicing a machine after typebar damage has occurred, it may prove valuable to operate the machine with all segments removed from the typebar. Timings can be checked without causing further typebar damage.
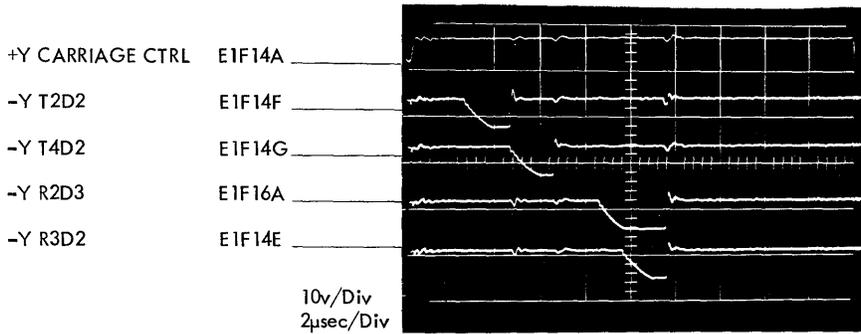

+Y CARRIAGE CTRL	E1F14A
-Y T2D2	E1F14F
-Y T4D2	E1F14G
-Y R2D3	E1F16A
-Y R3D2	E1F14E

10v/Div
2µsec/Div

Figure 2-1. Typical Carriage-Control Signals (1620-1 to 1443)

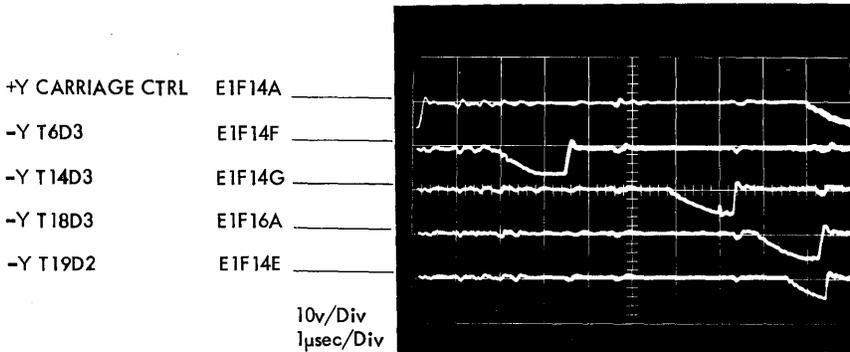| +Y CARRIAGE CTRL | E1F14A |
-Y T6D3	E1F14F
-Y T14D3	E1F14G
-Y T18D3	E1F16A
-Y T19D2	E1F14E

10v/Div
1µsec/Div

Figure 2-2. Typical Carriage-Control Signals (1620-2 to 1443)

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Tools and Test Equipment

The following items are shipped with each machine:

Description	P/N
Status Indicator Box	727007
Overlay, Buffered Printer	726590
Allen Wrench (not required on some machines)	452220

The status indicator box is a CE aid useful in diagnosing troubles. The overlay modifies the nomenclature of the status indicator box for use on a buffered printer. The special allen wrench is used with the 2-56 ribbon-shield setscrews.

The following office tools are used for maintaining each machine:

Description	P/N
* Tach-Generator (used with 1443)	450976
* Tach-Generator Coupling	451921
Pin Removal Soldering Iron	451111
Extender, Card (2)	451075
SMS Card Puller (Double)	461110
Weston 901 Meter (dc)	460879
Truarc Pliers	460966
Lamp Insertion - Extraction Tool	461163
Potentiometer Adj. Tool	461228

*See Maintenance Features in the 1443, 1443N1 FE Maintenance Manual, Form 225-3032.

The tach-generator converts mechanical motion of a shaft into an electrical output that can be scoped. The tach-gen coupling adapts the tach-gen to the 1443 shafts.

The pin removal soldering iron is used when replacing damaged pins in the SMS card sockets.

The card extenders are for CE use when testing, and the double card puller is used for pulling double SMS cards out of the panels.

The Weston 901 meter is used to measure power-supply voltages.

The potentiometer adjusting tool is used when adjusting single shots, etc.

CE Switches

Mainline Switch

This switch is located on the lower power-sequence box. It provides 208/230 volt ac to the 1443 from the line cord. Because power is not sequenced down when this switch is turned off, it must be used to turn off the 1443 only in emergencies.

The mainline switch does not disconnect the 24 volts ac from the 1620 or the 1800; it does not disconnect the 12 volts dc from the 1620 if marginal switch 2 is on.

Mainline Breaker Switch

The mainline breaker switch provides power to:
1. The restore motor.
2. The platen motor.
3. The carriage motor.
4. The typebar motor.
5. The ribbon motors.
6. The -7 volt dc power supply primary.
This switch is located on the upper power-sequence (distribution) box.

CE Switch 2, Marginal Check (Not on 1443-1800)

This switch is located on the lower power-sequence box. It switches the E-gate +12 volt dc line from the +12 volt power supply to the 1620 marginal check (+12M) bus. DO NOT turn on CE switch 2 with 1620 power off. Lack of either +12 volt dc or +12M can cause damage to SMS cards in the 1443.

CE Switch 3 (Local/Off/Normal)

This is a three-position switch located on the lower power-sequence box.

Local. In the local position this switch supplies 24 volt ac to pick the 1443 start relay (R18). It is used when servicing the 1443 off-line. The 1620 (or 1800) must have ac power on to supply 24 volt ac to the 1443.

Off. The off position of this switch allows sequencing power off without turning off the 1620 (or 1800).

Normal. This is the normal operation position of this switch. It allows the 1620 (or 1800) to pick the start relay (R18) from a normal power-on condition.

CE Switch 4 (Buffer Print)

This switch (located on the E-gate) causes continuous print cycles by:

1. Turning on or holding on the 1443 print latch.
2. Inhibiting print checks.
3. Stopping the 1620 clock during the I-cycle of a code 34, control operation, when the printer is selected (sel 9).

Repetitive line-print cycles begin when the start key is pressed, and continue until the stop key is pressed. The data to be printed must be loaded in the buffer before the repetitive print is started.

CE Switch 5 (Parity Check)

This switch is located on the E-gate. On the 1443-1800 attachment, it stops the 1443 immediately upon detecting an error during buffer loading or printing. The parity error stops the 1443 clock.

When a parity error occurs during buffer loading, the 1443 attachment in the 1800 takes no more cycle steals. The cycle steal requests are blocked by the printer-not-ready signal. (Printer-Not-Ready is activated by Print Check.)

When a parity error occurs during printing, the 1800 is not affected. However, the 1443 device status word in the 1800 will show the error. Carriage and Printer Busy (brought up by the print latch), Printer Not Ready, and Printer Error (brought up by the 1443 Print Check Line) turn on their corresponding bits in the 1443 device status word.

On a 1443-1620 system, activating this switch causes the system to stop immediately when a parity error is detected. The system stops whether the error occurs during buffer loading or line printing. The parity error stops the 1443 clock; the 1620 is stopped by blocking Printer Clock Response. The 1620 must be manually reset and restarted after a stop of this kind. Pressing either the 1620 manual reset key or the 1443 manual reset key turns off the parity-check latch.

When the system stops because of a parity check during buffer loading, the data being transferred is displayed on both the 1443 CE indicator box and the 1620 console. When the error occurs during printing, the error information in the buffer register is displayed on the CE indicator box only.

The input power to the 1443 is 208/230 volts, single phase. This voltage drives the motors and supplies the SMS power supplies.

The SMS power supplies supply the following voltages: +12, -12, -6, -7, and -20. Line levels for the 1443 are:

Level	Maximum Positive	Maximum Negative
Y	-0.01 to -0.65	-5.81 to -8.81
S	-0.05 to -0.45	-6.87 to -12.48 (SDTRL)
S	-0.35 to -0.20	-5.56 to -12.48 (CTRL)

Some Y levels are clamped to -6V maximum.

Adjust the miniwatt power supplies as shown in Figure 4-1. The miniwatt power supplies (+12, -12, and -6 volts) are located in the E-gate. The -20 volt power supply is located behind the lower power sequence box. The -7 volt power supply is located on the rear wall of the SMS cabinet.

POWER SUPPLY ADJUSTMENT				
Voltage	Pot Location	*Measure Between	1620 Reference Logics	1800 Reference Logics
-12	E1C31	TS 2-4 & DC GND	19.00.40.1	18.00.40.1
+12	E1A37	TS 2-1 & DC GND	19.00.40.1	18.00.40.1
- 6	E1B29	TS 2-3 & DC GND	19.00.40.1	18.00.10.1
-20	No Adj	TS 3-1 & TS 3-2	19.00.10.1	18.00.10.1
- 7	No Adj	TB 11-3 & TB 11-4	20.00.09.0	20.00.09.0

*Use Weston 901 Meter P/N 460879
Branch Office Tool.

Figure 4-1. Power Supply Adjustment

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Figures 5-1 through 5-5 show the locations of units and components in the 1443.
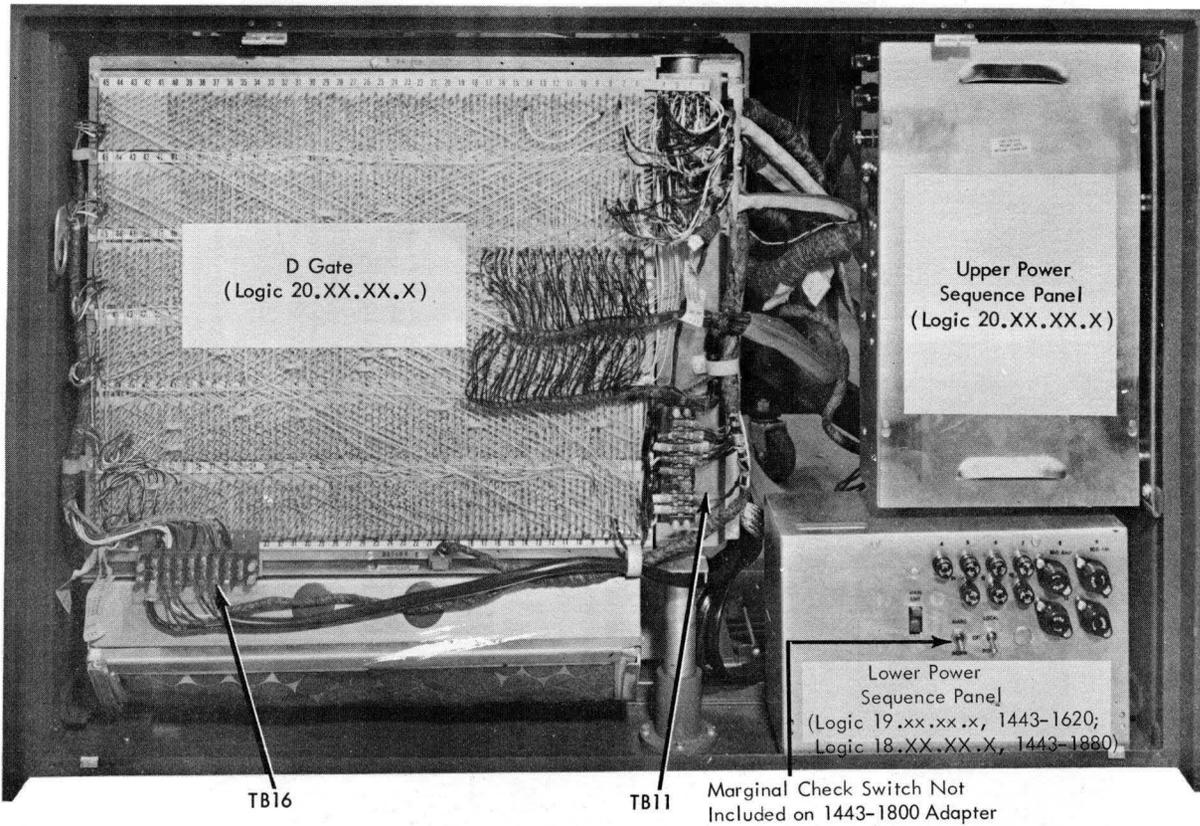

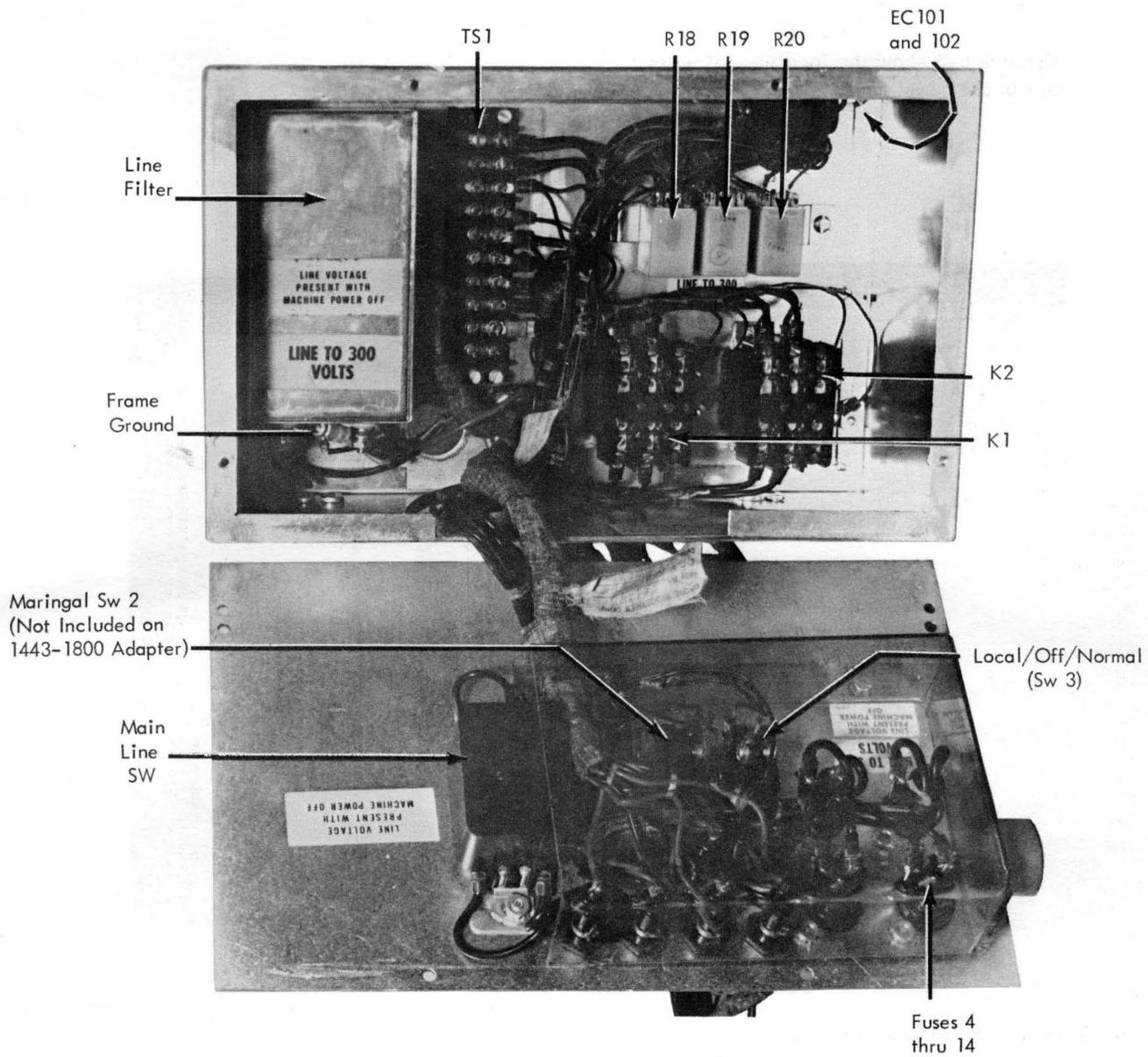Figure 5-1. D-Gate, Upper and Lower Power-Sequence Panels

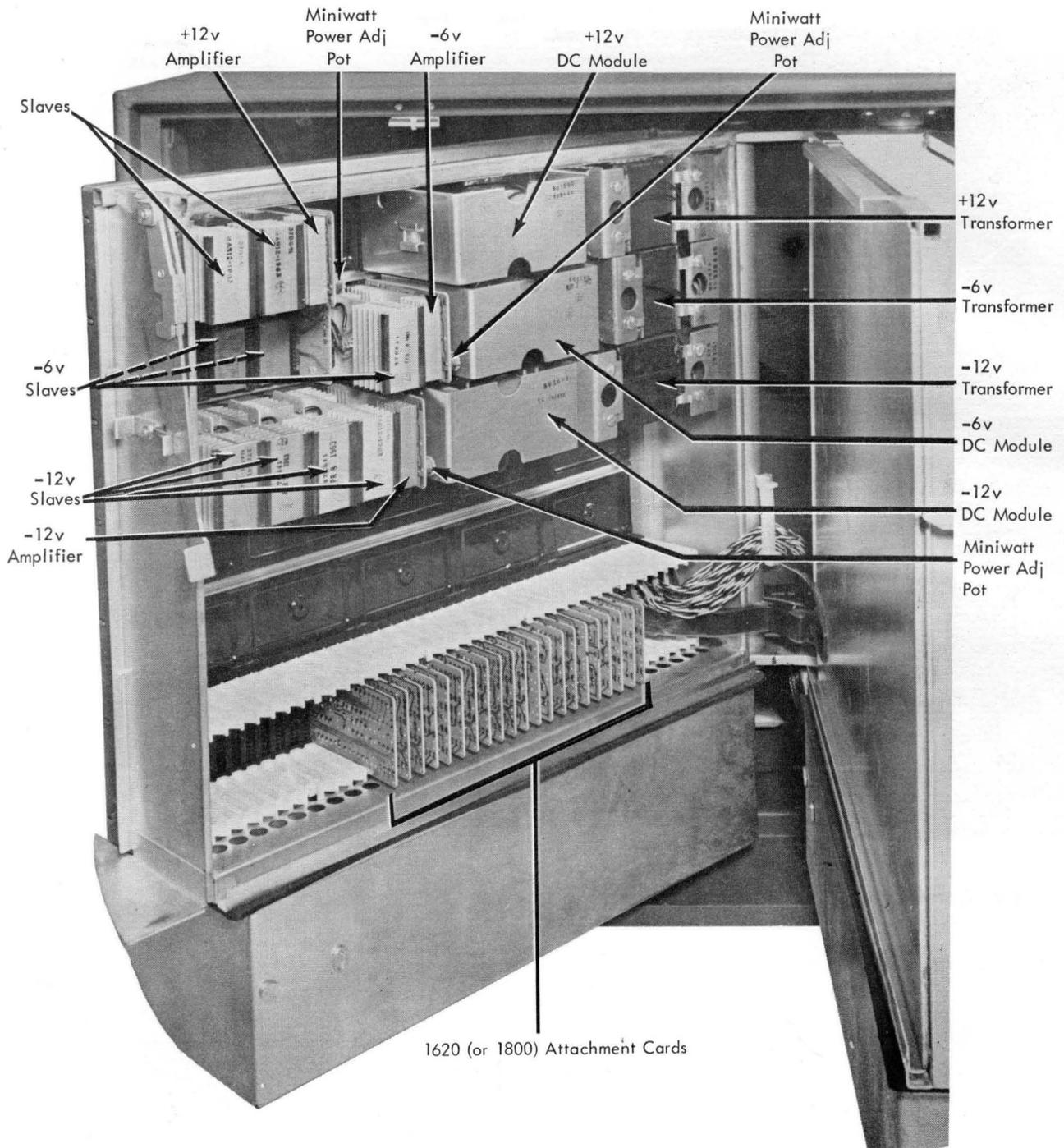Figure 5-2. Lower Power-Sequence Panel, Internal View

Figure 5-3. E-Gate, Card Side
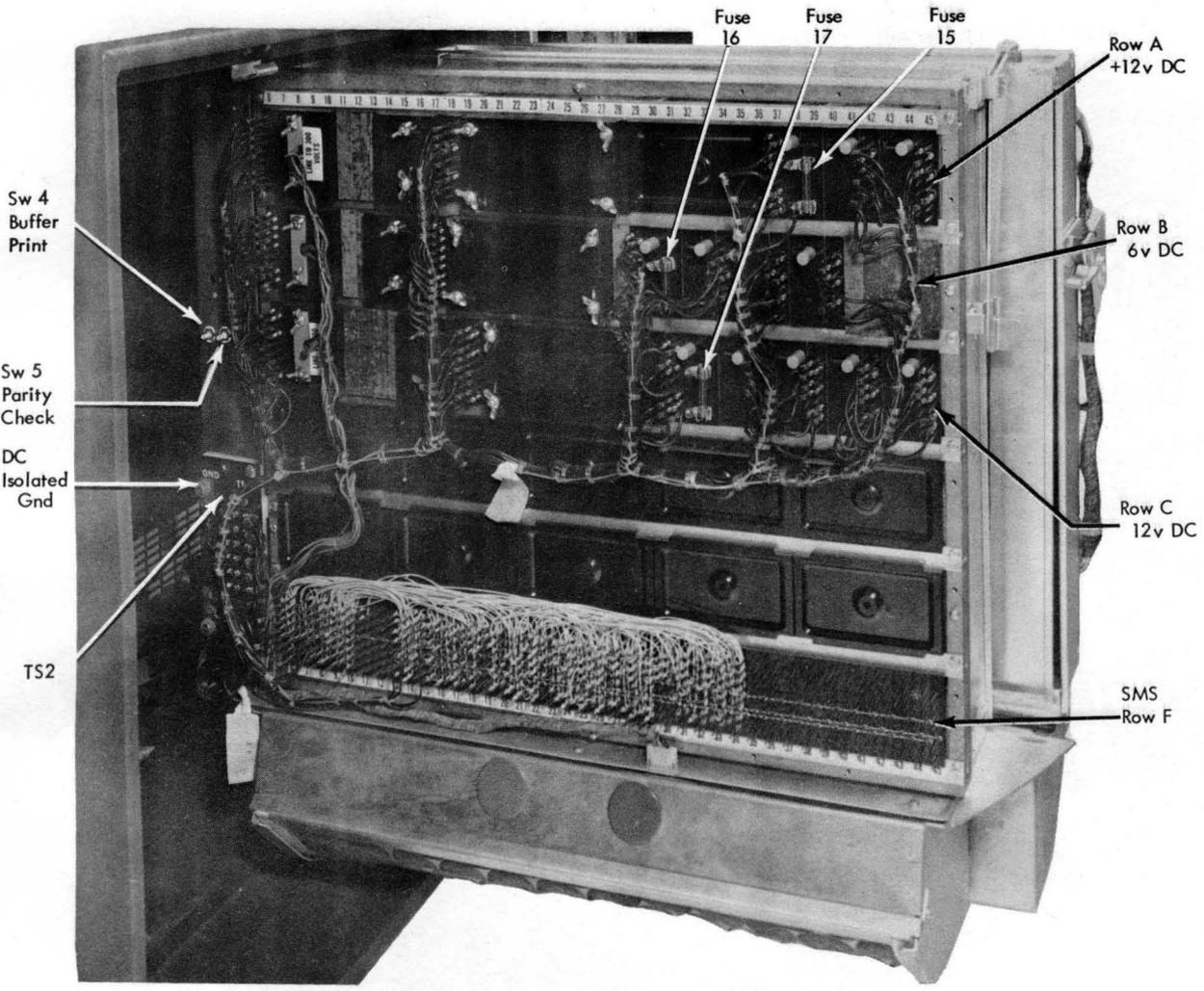
Labels (left side, top to bottom):
+12v Amplifier
Miniwatt Power Adj Pot
−6v Amplifier
+12v DC Module
Miniwatt Power Adj Pot

Slaves
−6v Slaves
−12v Slaves
−12v Amplifier

Labels (right side, top to bottom):
+12v Transformer
−6v Transformer
−12v Transformer
−6v DC Module
−12v DC Module
Miniwatt Power Adj Pot

1620 (or 1800) Attachment Cards

Figure 5-4. E-Gate, Wiring Side
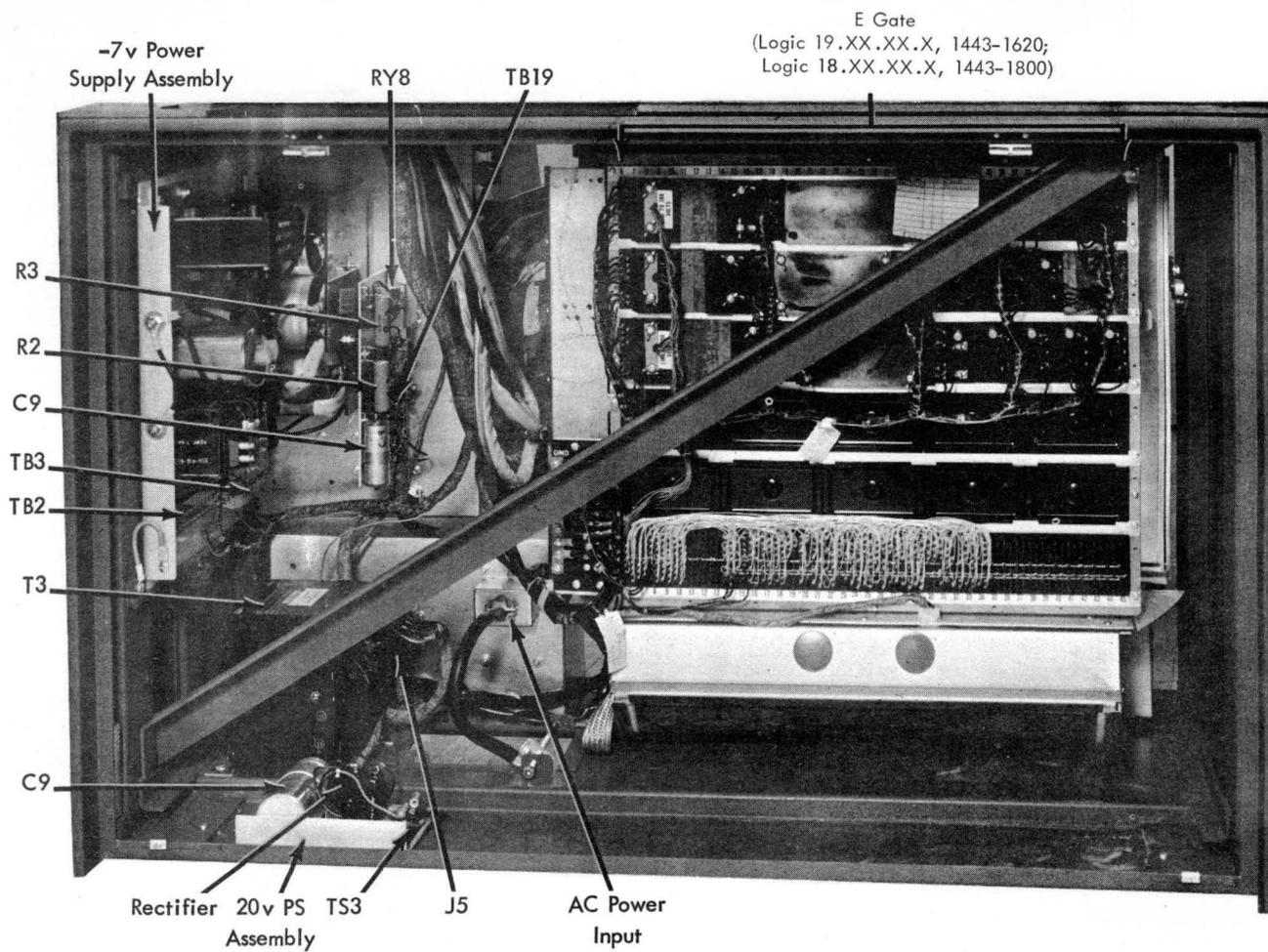
Figure 5-5. –20v Power Supply, –7v Power Supply, and Wiring Side of E-Gate

225-3306-1