

SKYLAB
EXPERIMENT BRIEFING

FOR TRAINING ONLY

F. T. S.
FUNCTIONAL TEST SET

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SKYLAB CREW PREFLIGHT TRAINING
FOR TRAINING PURPOSES ONLY

MARTIN MARIETTA

DENVER DIVISION

General

The Functional Test Set provides the capability for end-to-end checkout of experiment hardware, integrated system test support, malfunction isolation to black box level if the experiment hardware permits, and self checks (refer to figure 2-1).

Basic Test Capabilities

The basic test capabilities of the Functional Test Set are as follows:

- a. Provide DC power to the experiment hardware and for internal consumption of the Functional Test Set. The capability exists for switching and limiting power to the experiment hardware and a patching capability which permits circuit breaker matching to experiment hardware power requirements.
- b. Provide DC stimulus voltages to the experiment hardware.
- c. Provides AC stimulus to experiment hardware.
- d. Provides battery charging capability for charging experiment hardware nickel cadmium batteries.
- e. Provides current measuring capability for determining experiment hardware power profiles.
- f. Provides capability for making voltage, resistance, voltage ratio and resistance ratio measurements.
- g. Provides capability for making continuous and permanent strip chart recordings of analog and bi-level signals.
- h. Provides capability for observing, measuring and photographing waveforms for determining DC ripple, noise, transients, digital wavetrains, etc.

- i. Provides capability for making frequency measurements, time totalizations, frequency ratio measurements, period averages and time interval measurements.
- j. Provides the capability for permanently printing measurement data with time test code in numeric form.
- k. Provide common timing for time tagging test data.
- l. Provides the capability for logic recording of PCM, analog and/or digital data up to 6.0 KHz. Timing signals can be recorded and the capability exists for voice annotation.
- m. Provides digital voltmeter for accurately measuring voltage from 0-100 volts.
- n. Provides capability for synchronizing, simulating and word selection of PCM data as received from the experiment hardware or the Functional Test Set tape recorder.
- o. Provides the capability for passive and transient loading of the experiment hardware batteries.
- p. Provides the capability for measuring RF power output of the M509 Experiment transmitter.
- q. Provides the capability for measuring M509 Experiment receiver sensitivity, output data format and RF section operation.
- r. Provides the capability for determining the M509 Experiment transmitter output switch characteristics and encoder performance.
- s. Provides the capability for measuring the M509 Experiment transmitter output frequency.
- t. Provides the capability for displaying a "Go-No Go" for a particular test configuration and for controlling the measurement and stimulus switching for the various experiment hardware tests.

- u. Provides a flexible interfacing of test equipment and power to the experiment hardware and Functional Test Set associated test instruments by patch and jack panels.
- v. Provides interfacing cable sets for interfacing the GSE with the experiment hardware.
- w. Provides a hand control position calibrator for calibrating the M509 Experiment rotational hand controller.

In addition to the above capabilities, the functional test set serial number 2 provides the following:

- a. Provides interfacing cables for interfacing the GSE with the input and output of the Earth Resources Experiment Package C&D Panel.
- b. Provides capability for installation checkout of the Earth Resources Experiment Package.
- c. Provides a quick-look data station for the Earth Resources Experiment Package.

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RACK 84024830100			SN1 -009	SN2 -019	SN3 -010	Ref No.
a.	Tape Recorder Rack	01000-009	X	X	X	1
b.	Rack Instrument	01100-009	X	X	X	
c.	Rack Cable Storage	01200-009	X	X	X	
d.	Digital Rack	03000-009	X	X	X	3
e.	Stimulus Rack	04000-009	X	X	X	4
f.	Pulse Code Modulation Rack	05000-010 05000-009	X	X	X	5
g.	Battery Charger Rack	06000-009	X	X	X	6
h.	Power Supply Rack	07000-009	X	X	X	7
i.	Auxiliary Test Rack	08000-009	X	X	0	8
j.	Strip Chart Recorder Rack	09000-009	X	X	X	9
k.	F.T.S. Interface Rack	97000-009	0	X	0	12
l.	Signal Conditioning Unit	99000-009	0	X	0	13
m.	Position Calibrator Hand Controller	32100-				
n.	Test Transmitter	09600-009	X	X	X	
o.	Ancillary Equipment		X	X	X	
p.	Ampex FR1928 Tape Recorder		0	X	0	

Chassis within the racks are identified by A1, A2, etc. immediately following the rack designator. Example: 3A1.

Change 1-August 30, 1971

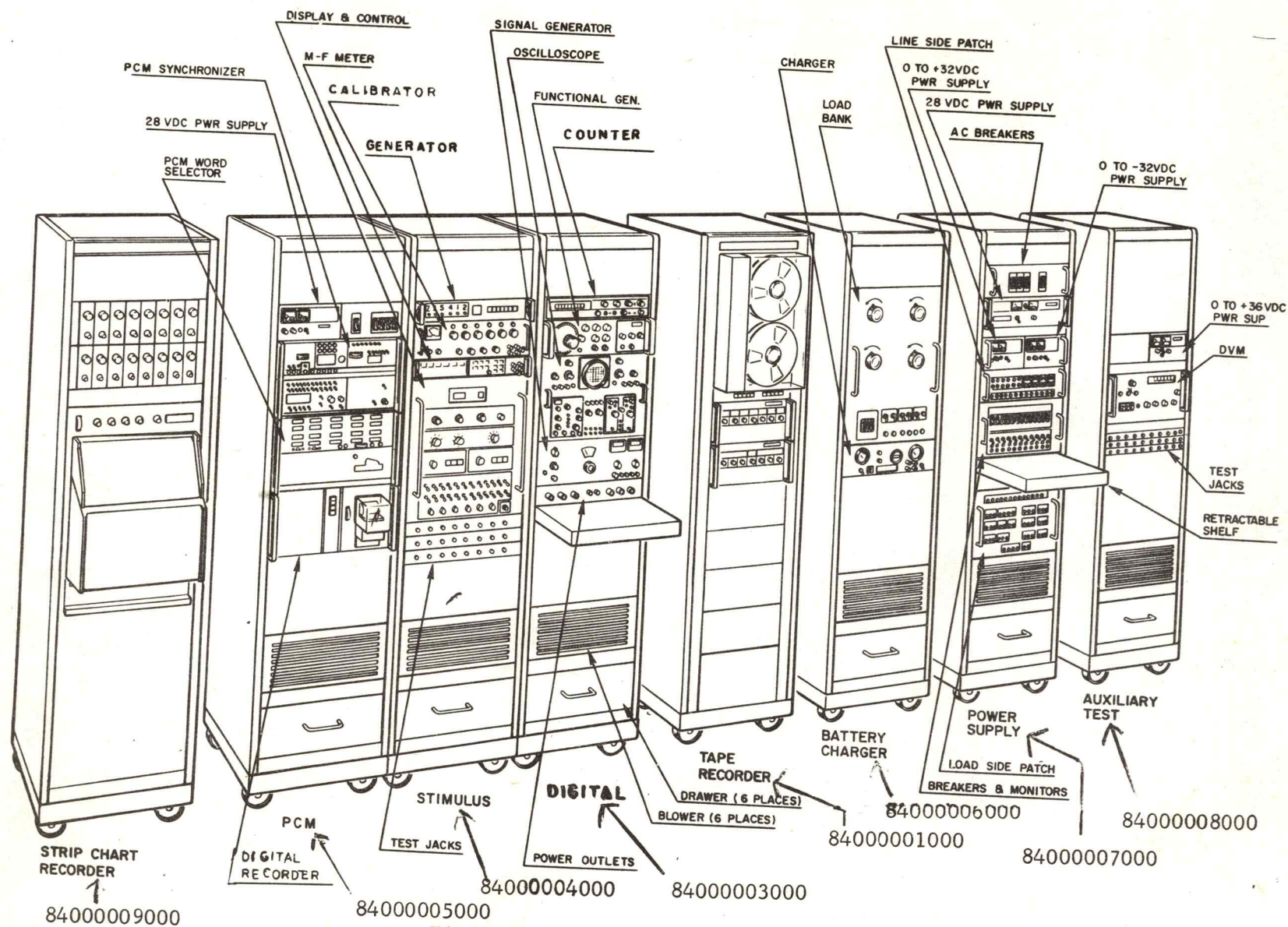


Figure 1-1 Functional Test Set
(Sheet 1 of 4)

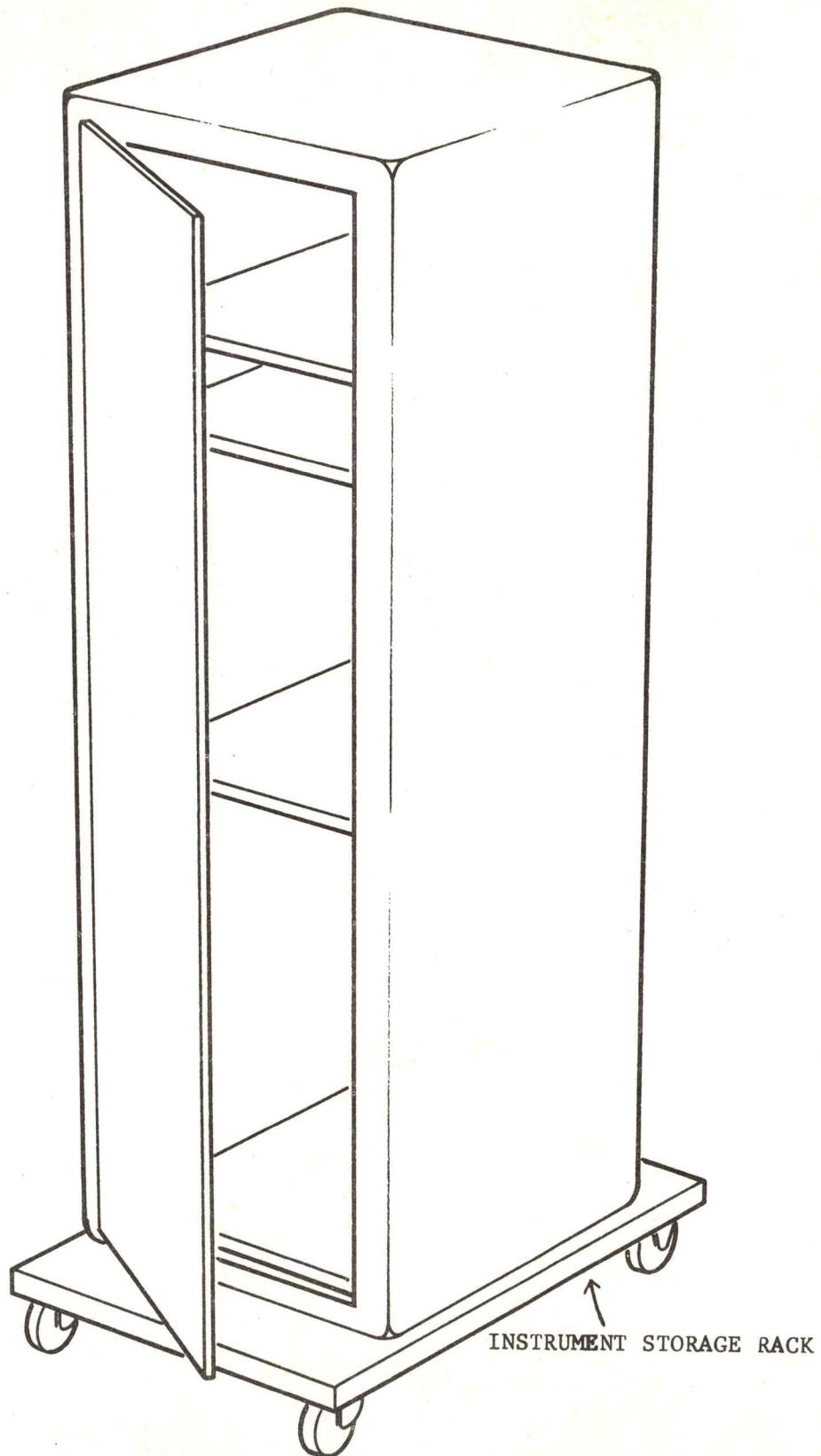


Figure 1-1 Functional Test Set
(Sheet 2 of 4)

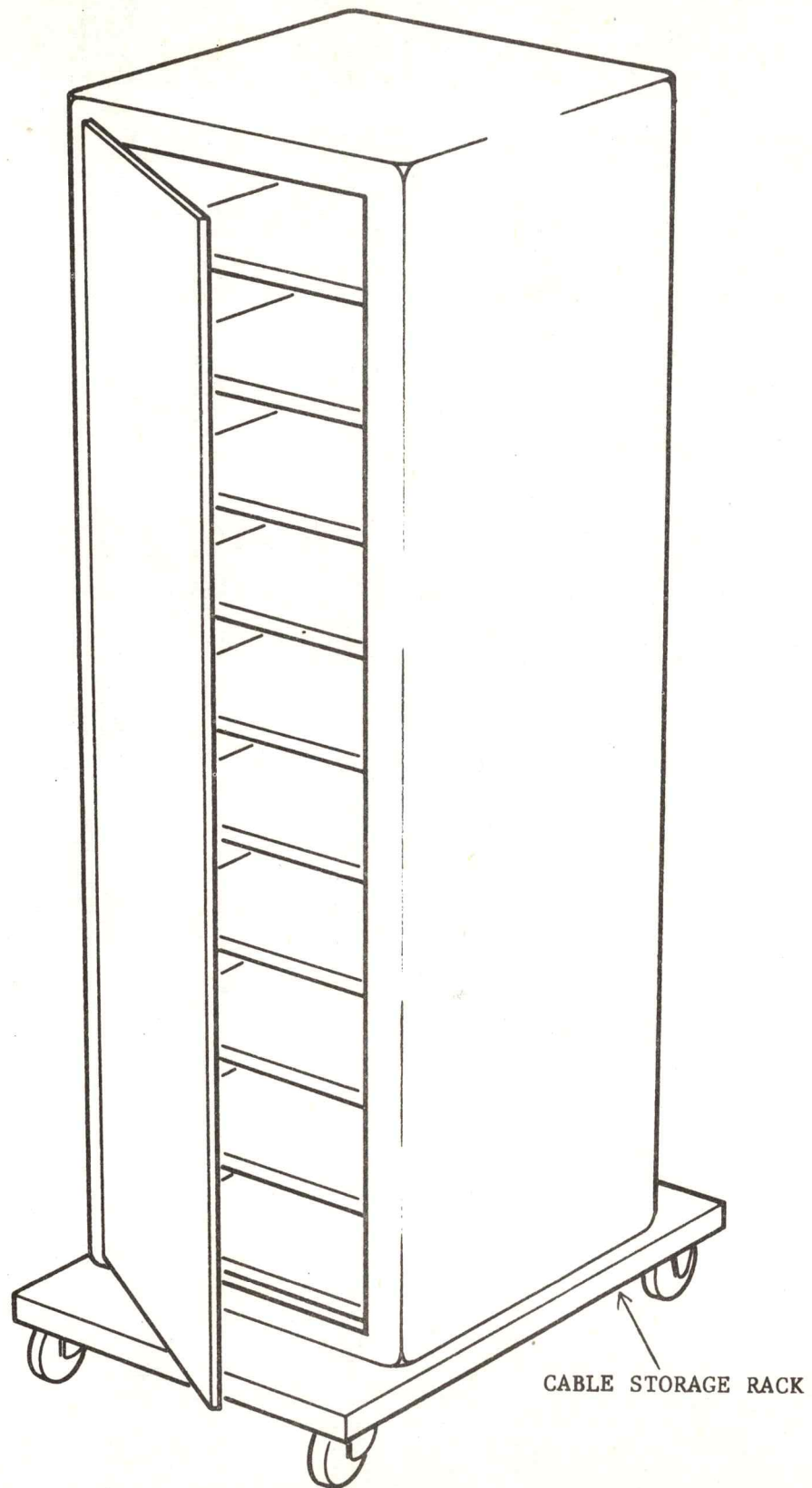


Figure 1-1 Functional Test Set
(Sheet 3 of 4)

Change 1 August 30, 1971

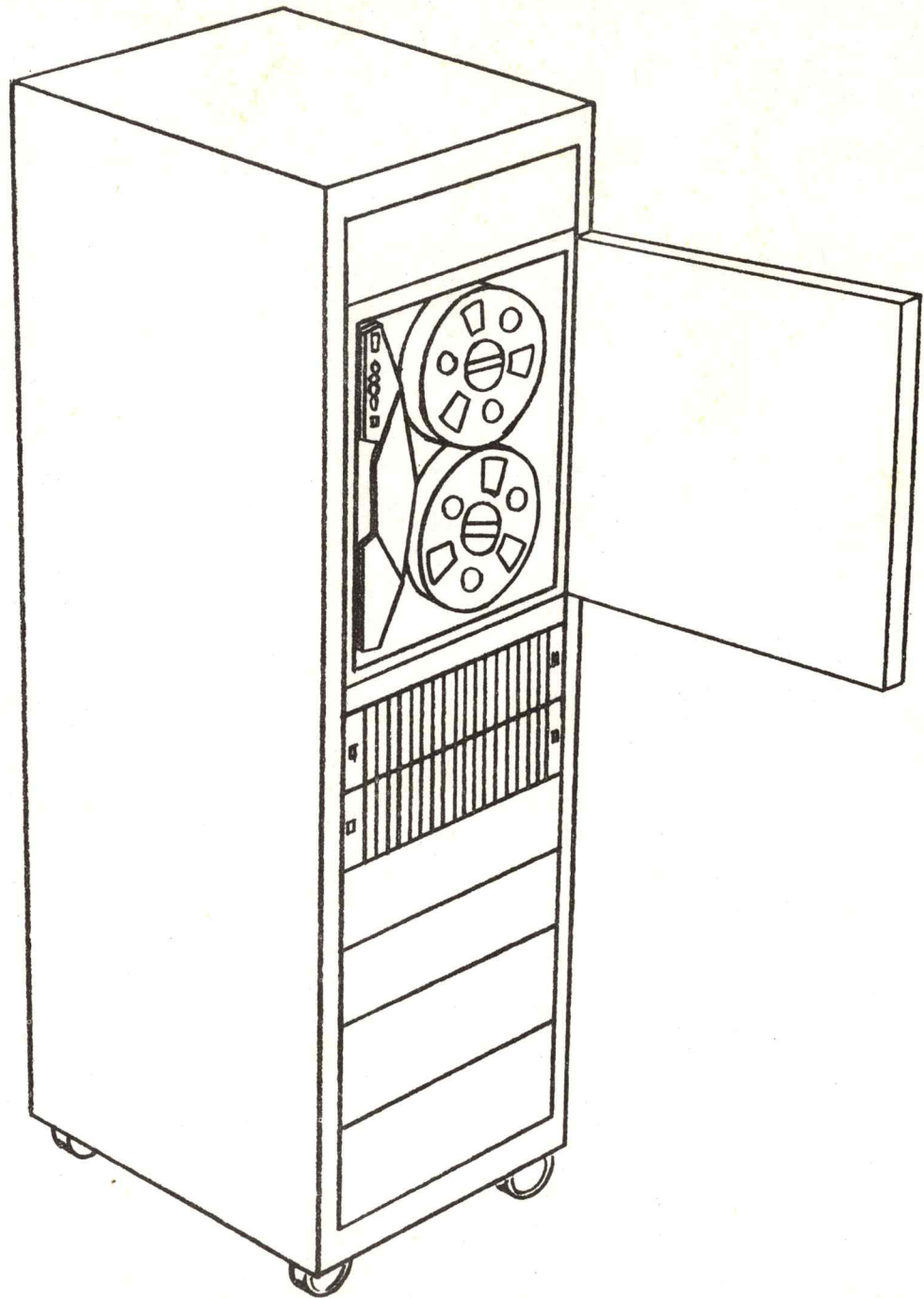


Figure 1-2 Tape Recorder Rack

Change 1-August 30, 1971

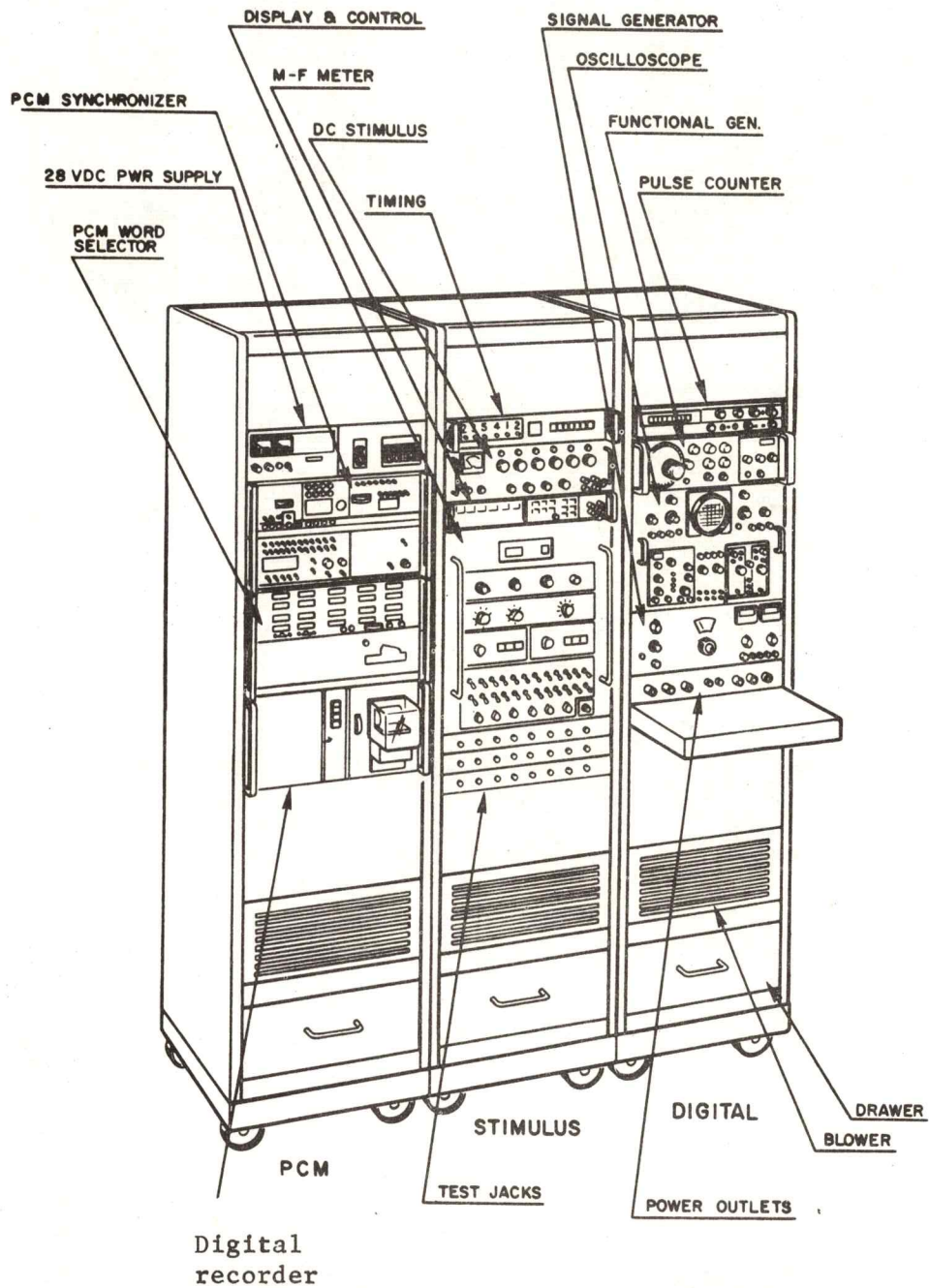


Figure 1-3 Checkout Group (Serial Number 1 & 3)

Change 3-October 22, 1971

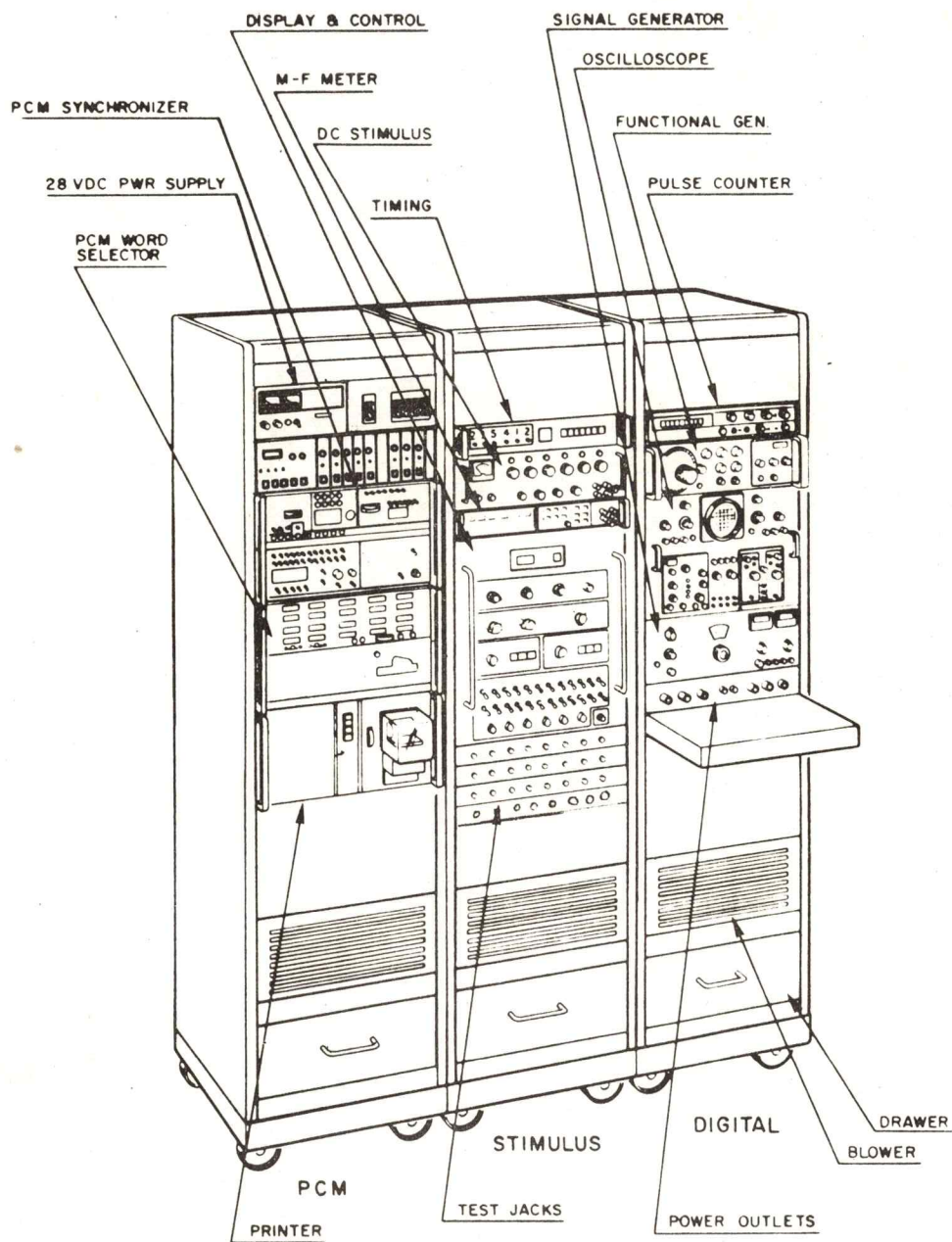


Figure 1-3a Checkout Group
(Serial Number 2 only)

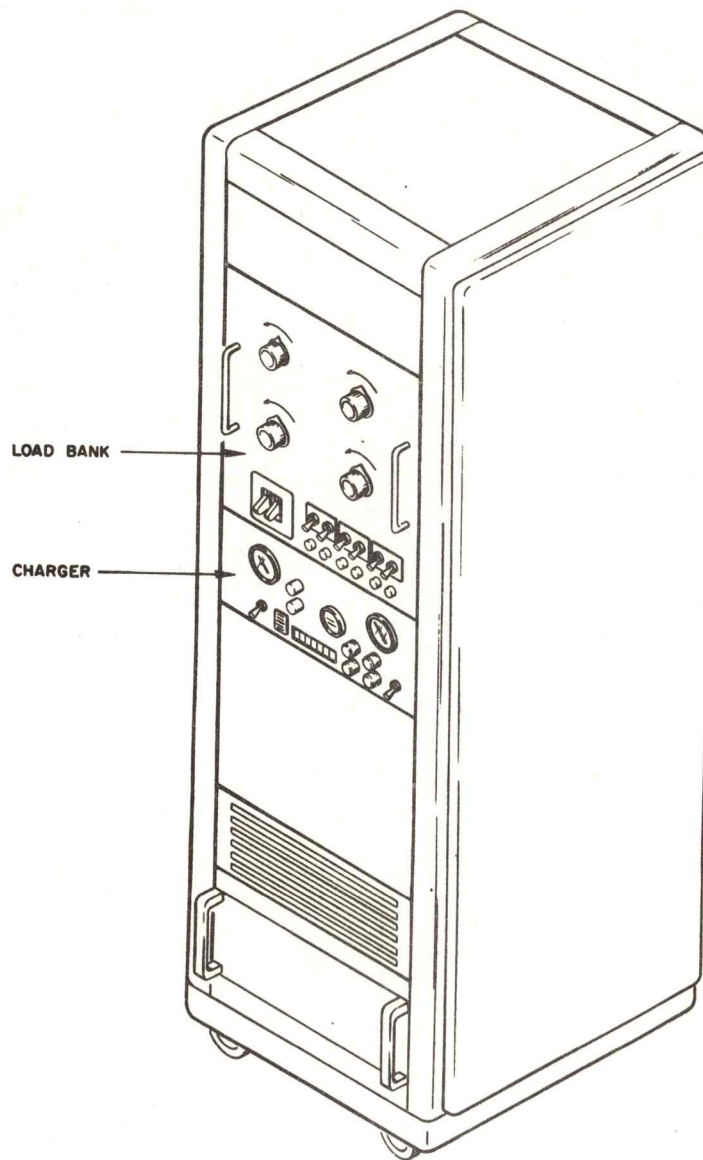


Figure 1-4 Battery Charger Rack

Change 1-August 30, 1971

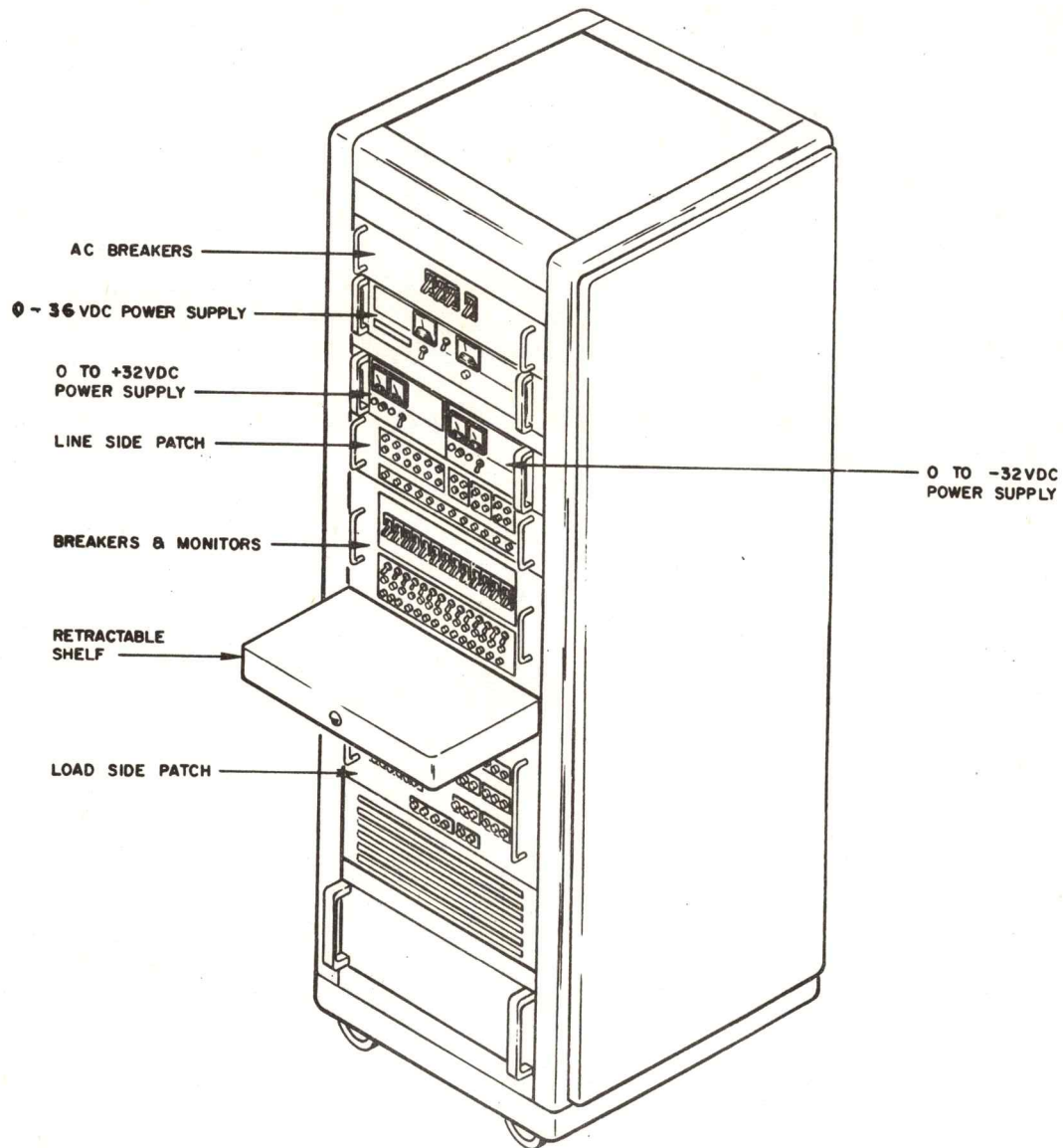


Figure 1-5 Power Supply Rack

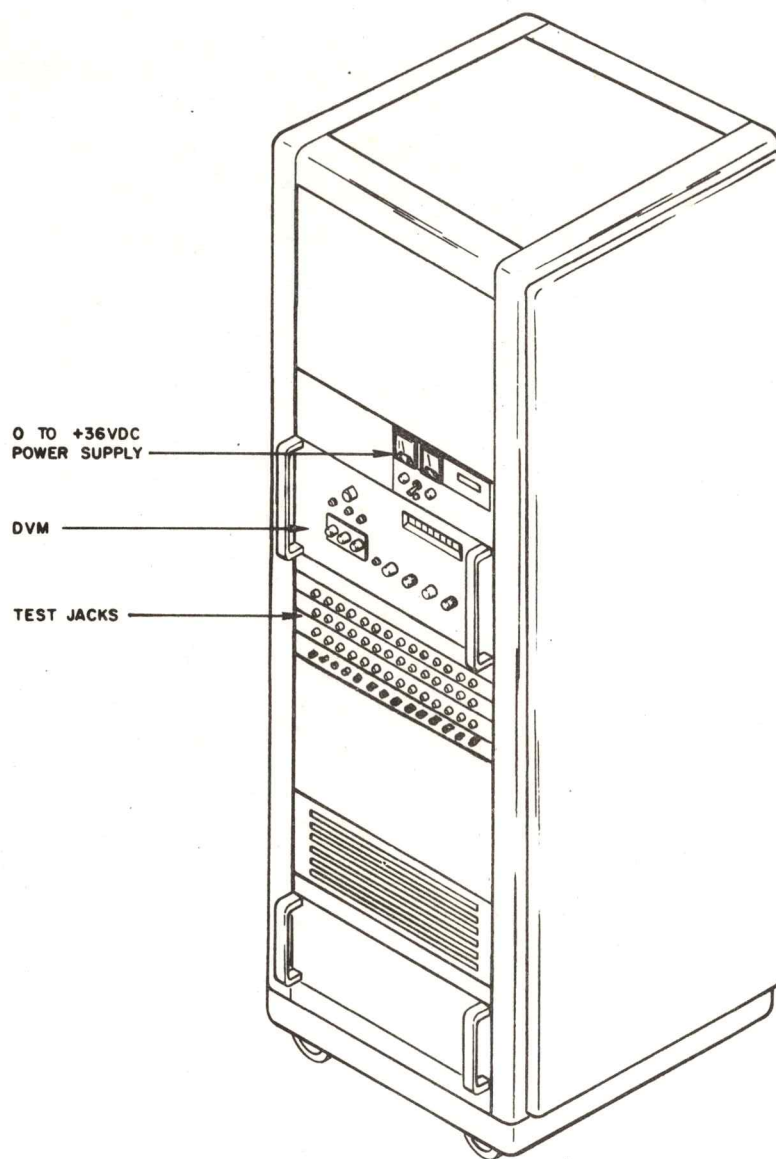


Figure 1-6 Auxiliary Test Rack

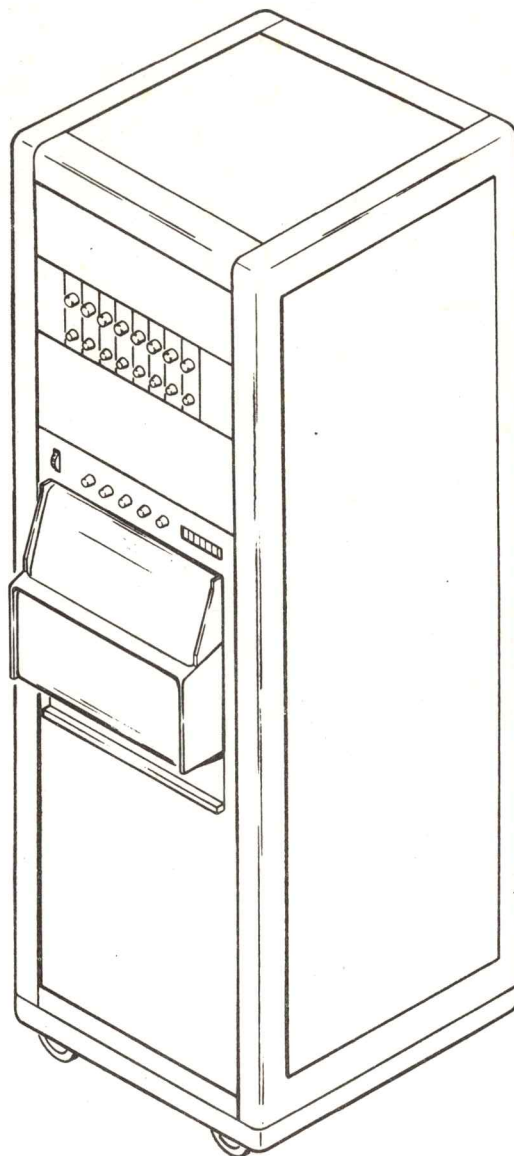


Figure 1-7 Strip Chart Recorder

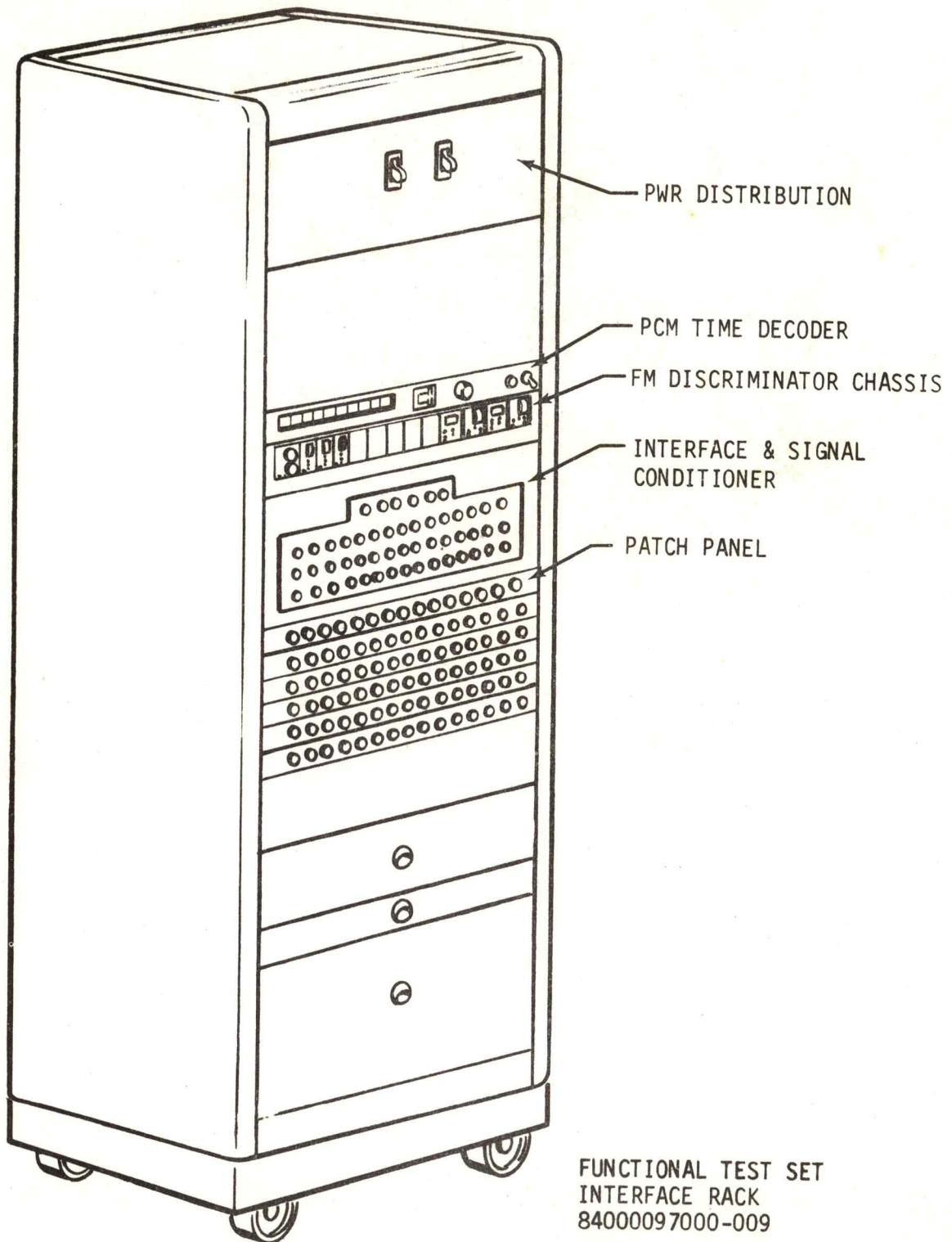


Figure 1-1 Functional Test Set (sheet 4 of 4)

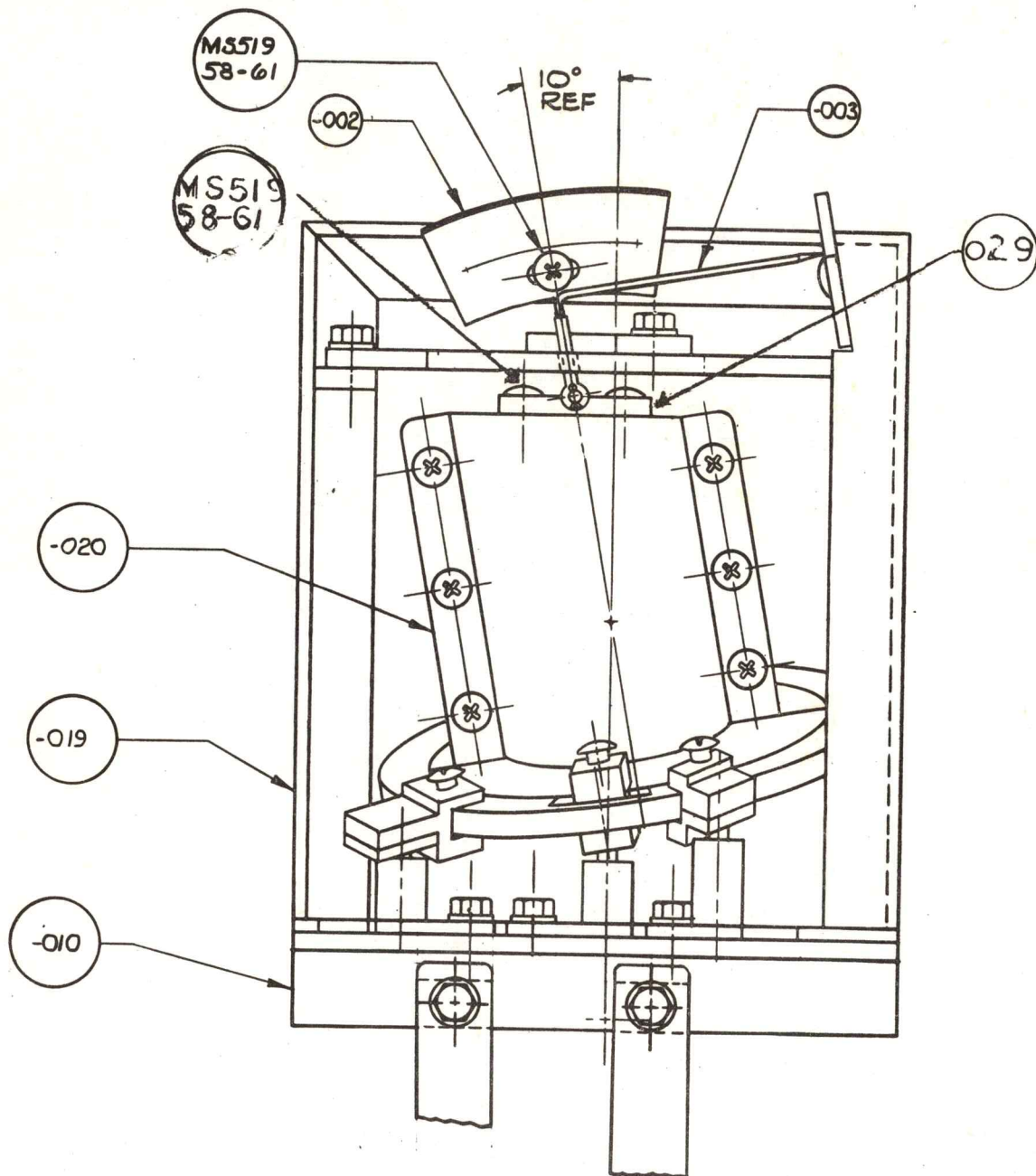
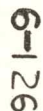


Figure 1-8 Hand Controller Position Calibrator

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Change 1-August 30, 1971



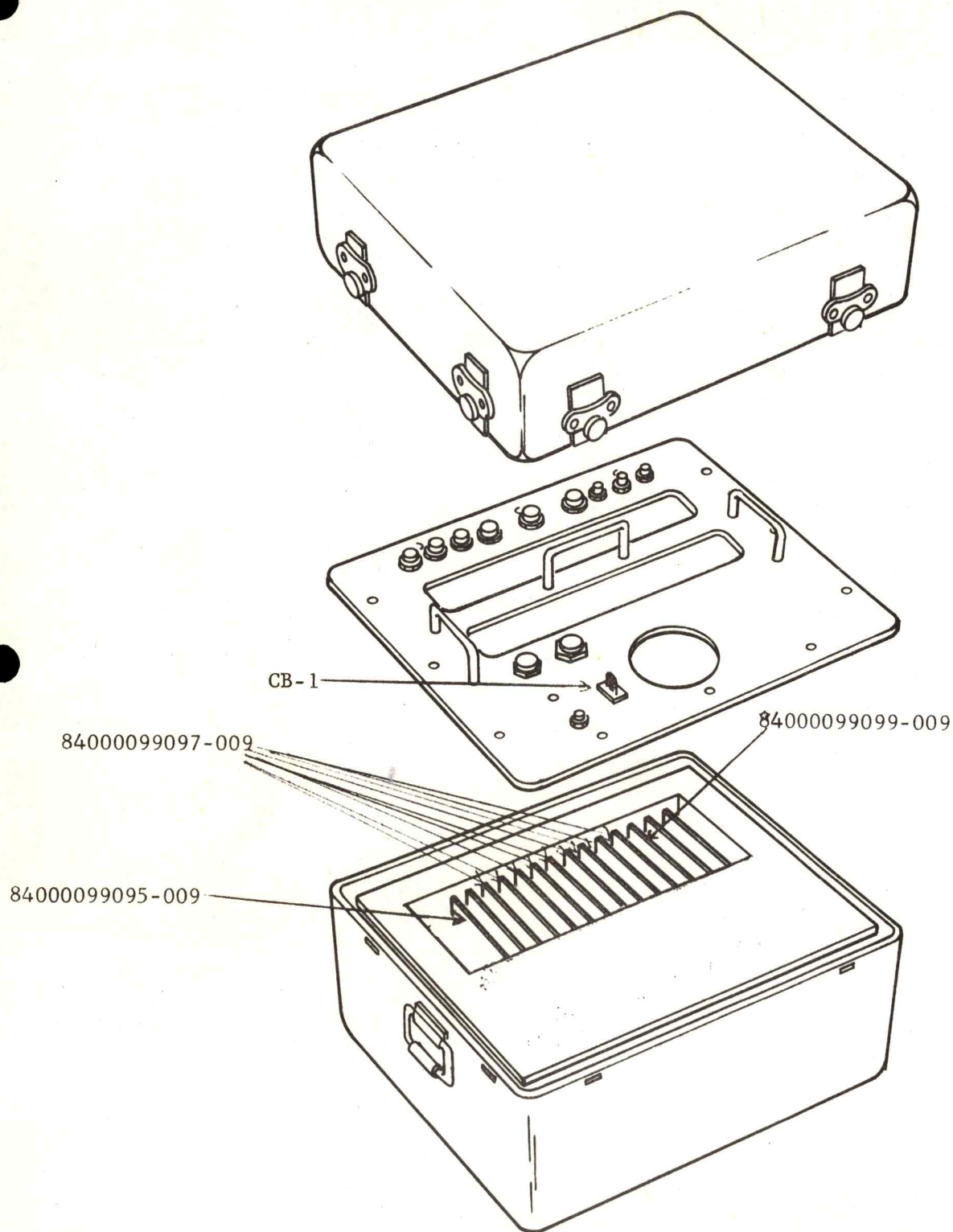


Figure 6-42 Signal Conditioning Unit (sheet 1 of 4)

Change 3, October 22, 1971

Table 5-3 Functional Test Set Controls (Sheet 1 of 5)

Control	Location	Reference Designation	Functional Description
AC Circuit Breaker (STIM)	Power Supply Panel 84000005028	5A2 CB3	Applies AC line voltage to: 1. Time Code Generator 2. Voltage/Current Calibrator 3. Digital Multi-Function Meter 4. Strip Chart Recorder 5. Tape Recorder 6. Display and Control Chassis - To PS1 (+5 VDC) and PS2 (+15 VDC) power supplies.
AC Circuit Breaker (PCM)	Power Supply Panel 84000005028	5A2 CB4	Applies AC line voltage to: 1. 5A2 Power Supply 2. PCM Bit Synchronizer/Simulator 3. PCM Word Selector 4. Digital Recorder 5. 84000009000 Rack for powering 2nd strip chart recorder if connected.
AC Circuit Breaker (RF)	Power Supply Panel 84000005028	5A2 CB2	Applies AC line voltage to: 1. Remote Power Monitor 2. Counter/Timer 3. Function Generator 4. Oscilloscope 5. HF Signal Generator
AC Circuit Breaker (BLO)	Power Supply Panel 84000005028	5A2 CB1	Applies AC line voltage to: 1. Blowers in 84000003000, 84000004000, and 84000005000 Rack.
DC Circuit Breaker (DC Pwr) (28 VDC)	Power Supply Panel 84000005028	5A2 CB5	Applies DC power to the Display and Control Chassis 84000004000 Rack
AC Power "ON-OFF" Switch	Power Supply Panel (MP-5-LM-E-28) 84000005028		Applies AC line voltage to 0-28 VDC Power Supply, LM-E-28-Y

Table 5-3 Functional Test Set Controls (Sheet 2 of 5)

Control	Location	Reference Designation	Functional Description
AC Circuit Breaker (Pos 28 VDC)	AC Breaker Panel 84000007100	7A1 CB1	Applies AC line voltage to the positive 28 VDC power supply LK-351-FM-0V
AC Circuit Breaker (Pos 0-32 VDC)	AC Breaker Panel 84000007100	7A1 CB2	Applies AC line voltage to the positive 0-32 VDC power supply, LM-EE-0-32-Y
AC Circuit Breaker (Neg 0-32 VDC)	AC Breaker Panel 84000007100	7A1 CB3	Applies AC line voltage to the negative 0-32 VDC power supply, LM-EE-0-32-Y
AC Circuit Breaker (Blower)	AC Breaker Panel 84000007100	7A1 CB4	Applies AC line voltage to the 84000001000 Rack Blower.
DC Circuit Breaker (17A)	Breaker and Monitor Panel, 84000007300	7A5 CB1	Applies DC power to experiments as patched.
DC Circuit Breaker (13A)	Breaker and Monitor Panel, 84000007300	7A5 CB2	Applies DC power to experiments as patched.
DC Circuit Breaker (10A)	Breaker and Monitor Panel, 84000007300	7A5 CB3	Applies DC power to experiments as patched.
DC Circuit Breaker (7A)	Breaker and Monitor Panel, 84000007300	7A5 CB4	Applies DC power to experiments as patched.
DC Circuit Breaker (5A)	Breaker and Monitor Panel, 84000007300	7A5 CB5	Applies DC power to experiments as patched.
DC Circuit Breaker (3A)	Breaker and Monitor Panel, 84000007300	7A5 CB6	Applies DC power to experiments as patched.
DC Circuit Breaker (2A)	Breaker and Monitor Panel, 84000007300	7A5 CB7	Applies DC power to experiments as patched.

Table 5-3 Functional Test Set Controls (Sheet 3 of 5)

Control	Location	Reference Designation	Functional Description
DC Circuit Breaker (2A)	Breaker and Monitor Panel, 84000007300	7A5 CB8	Applies DC power to experiments as patched.
DC Circuit Breaker (1A)	Breaker and Monitor Panel, 84000007300	7A5 CB9	Applies DC power to experiments as patched.
DC Circuit Breaker (0.7A)	Breaker and Monitor Panel, 84000007300	7A5 CB10	Applies DC power to experiments as patched.
DC Circuit Breaker (0.5A)	Breaker and Monitor Panel, 84000007300	7A5 CB11	Applies DC power to experiments as patched.
DC Circuit Breaker (0.3A)	Breaker and Monitor Panel, 84000007300	7A5 CB12	Applies DC power to experiments as patched.
DC Circuit Breaker (0.1A)	Breaker and Monitor Panel, 84000007300	7A5 CB13	Applies DC power to experiments as patched.
DC Circuit Breaker (0.08A)	Breaker and Monitor Panel, 84000007300	7A5 CB14	Applies DC power to experiments as patched.
DC Circuit Breaker (0.08A)	Breaker and Monitor Panel, 84000007300	7A5 CB15	Applies DC power to experiments as patched.
Current Monitor Switches (S1 thru S15)	Breaker and Monitor Panel, 84000007300	7A5 (S1-S15)	Permits current monitoring of appropriate experiment DC power lines as patched. One to one relationship between current monitor switches and circuit breakers (i.e., CB1 and S1, CB2 and S2, etc.). Switches are momentary switches.

Table 5-3 Functional Test Set Controls (Sheet 4 of 5)

<u>Control</u>	<u>Location</u>	<u>Reference Designation</u>	<u>Functional Description</u>
AC Circuit Breaker (15A)	Power Distribution Panel, 84000008028	8 CB1	Applies AC line voltage to the power supply, LK-343A-FM, the digital voltmeter, HP-2401C-W/M131, 84000008000 rack blower, 8J4, 8J5, 8J6, 8J7, 8J8 and 8J29.
Multi-Purpose Controls	Display and Control Panel, 84000004100	4A4 S1-S24	Allows control of signals as patched by 1244 hole patch-board.
Test Set Configuration Thumbwheel Switches	Display and Control Panel, 84000004100	4A4 S25	Is used to set test configuration which must be compatible with patchboard patched for a given test before stimulus can be applied to experiment hardware.
Recorder Channel Selection Switch (Rotary)	Display and Control Panel, 84000004100	4A4 S26	Selects "Groups of Four" Strip Chart Recorder channels for input to the Digital Recorder.
Printer Input Switch (Rotary)	Display and Control Panel, 84000004100	4A4 S27	Selects input data sources for digital recorder. Heading information, Multi-Meter, Counter, or Strip Chart Recorder.
Print Rate Switch	Display and Control Panel, 84000004100	4A4 S28	Selects the rate at which the Digital Recorder will print.
Manual Print Switch	Display and Control Panel, 84000004100	4A4 S29	With S-28 in the MANUAL POSITION, allows one printout for each depression.
Measurement Selection Switches	Display and Control Panel, 84000004100	4A4 S30 and S31	Selects one of 100 possible measurements of internal or external signals as patched in 1244 hole patchboard.

Table 5-3 Functional Test Set Controls (Sheet 5 of 5)

Control	Location	Reference Designation	Functional Description
Measurement Reference Switch	Display and Control Panel, 84000004100	4A4 S32	Allows selection of 11 signals to the Multi-Function Meter as patched by 1244 hole patchboard.
AC Stimulus	Display and Control Panel, 84000004100	4A4 S33	Applies AC stimulus to experiments as patched in 1244 hole patchboard.
DC Stimulus	Display and Control Panel, 84000004100	4A4 S37	Applies DC stimulus to experiments as patched in 1244 hole patchboard.
AC Circuit Breaker (5A) ¹	AC Power Distribution	12A1 CB1	Applies AC Line Voltage to signal conditioning unit 84000099000
AC Circuit Breaker (1A) ¹	AC Power Distribution	12A1 CB2	Applies AC Line Voltage to FM Discriminator's and the interface and signal conditioner chassis.
AC Circuit Breaker (1A) ¹	Signal Conditioning Unit	13 CB1	Applies AC Line Voltage to Signal conditioning unit.
¹ Applicable only to Functional Test Set 84024830100-019, Serial Number 2			

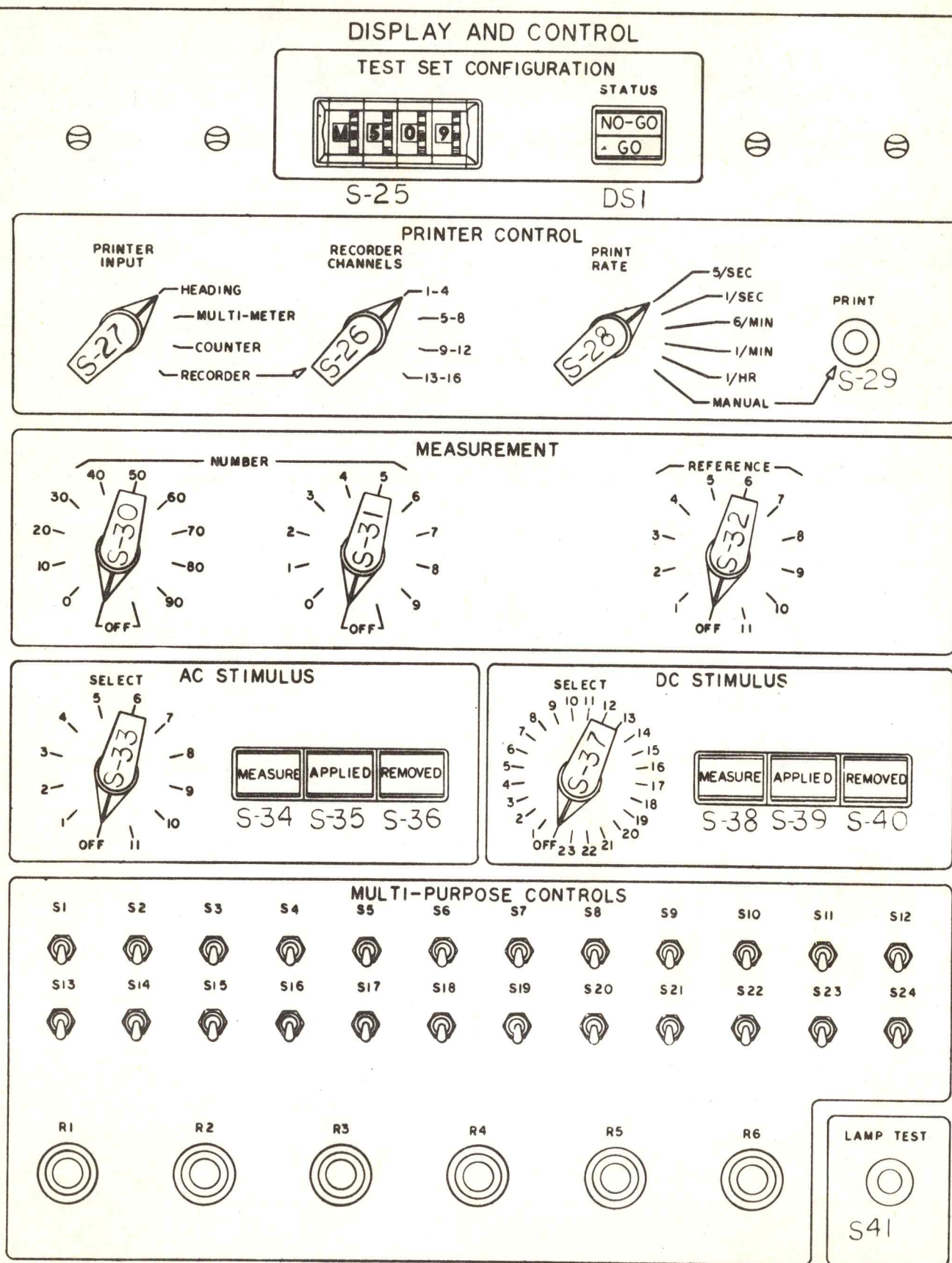


Figure 2-3 Display and Control Panel