TM 11-6625-1746-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL

TEST SET, RADAR ALTIMETER SYSTEM AN/APM-323

HEADQUARTERS, DEPARMENT OF THE ARMY

OCTOBER 1970

WARNING

115 VOLTS AC

is used in the operation of this equipment.

Be careful not to contact high-voltage connections when installing or operating this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions.

TECHNICAL MANUAL
No. 11-6625-1746-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 19 October 1970

OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL

FOR

TEST SET, RADAR ALTIMETER SYSTEM AN/APM-323

LIST OF ILLUSTRATIONS

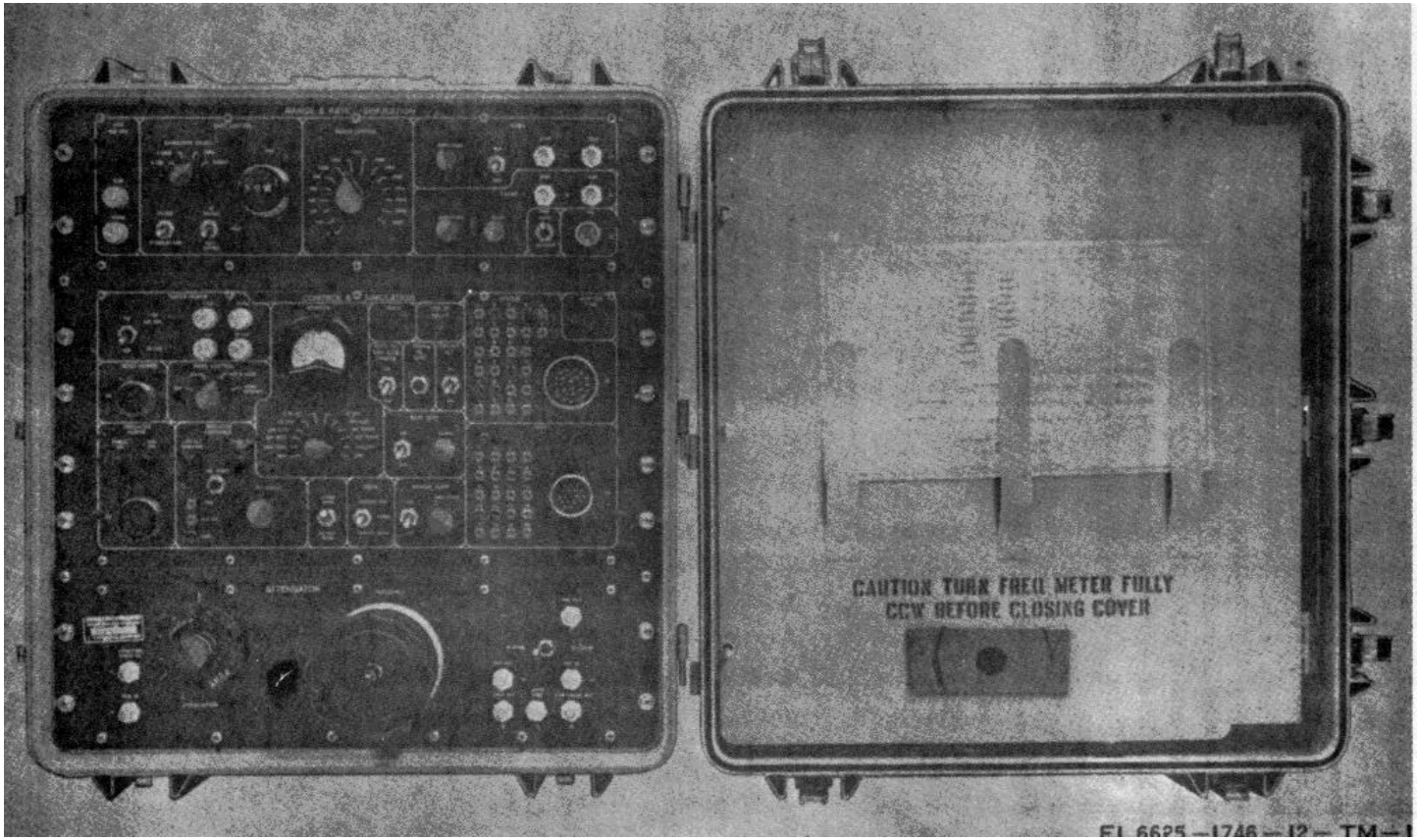

Figure 1-1. Test Set, Radar Altimeter System AN/APM-323 (less cable assemblies iv and accessories).

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual describes Test Set, Radar Altimeter System AN/APM-323 (system test set) (fig. 1-1 and 1-2) and covers its installation, operation, and organizational maintenance. Included are instructions for operation under usual and unusual conditions, cleaning, inspection, troubleshooting, and replacement of items available to the operator and organizational repairman.

NOTE

Appendix B is current as of 30 July 1970.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO) pertaining to the equipment.

1-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory

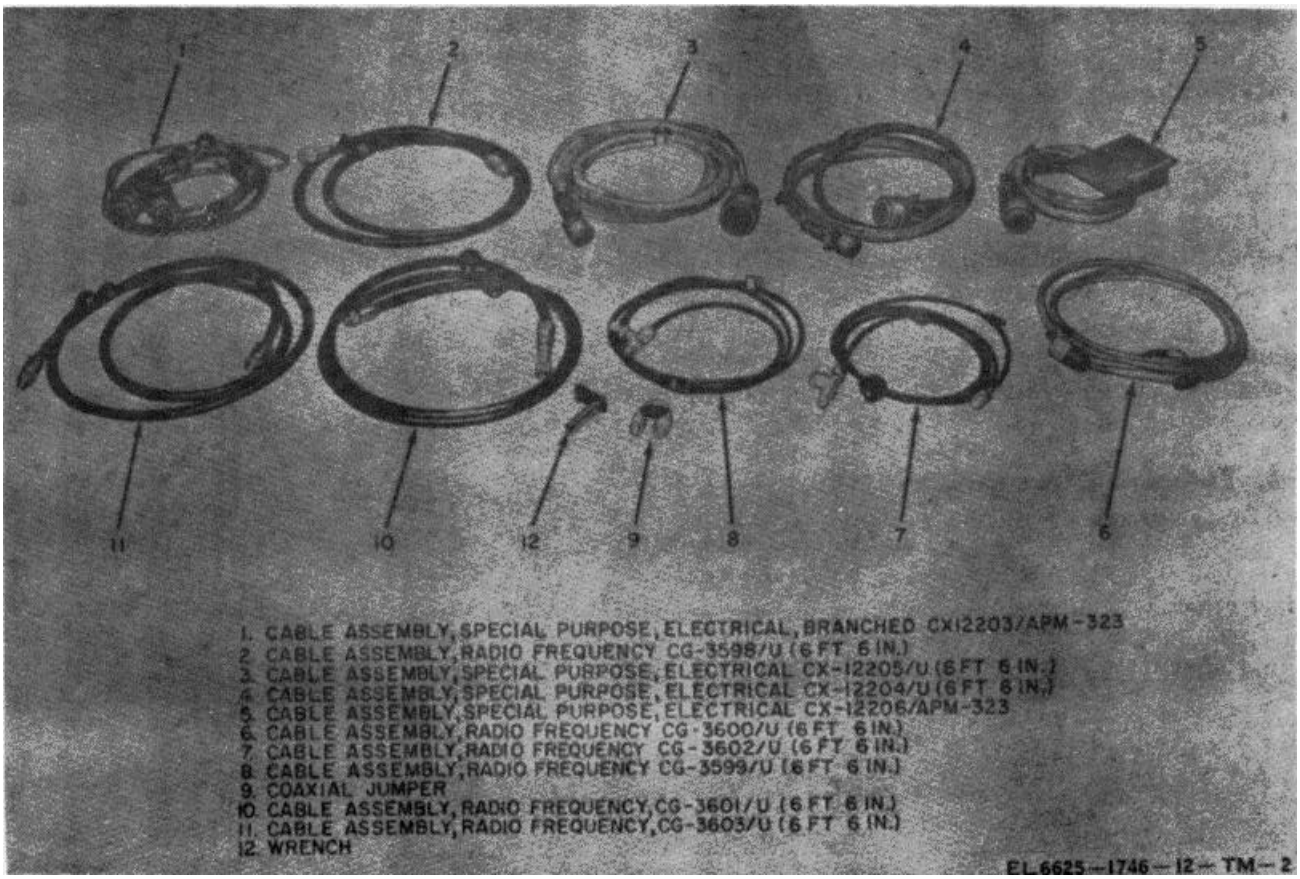

Figure 1-2. Test Set, Radar Altimeter System AN/APM-323, cable assemblies and accessories.

Equipment. Use equipment forms and records in accordance with instructions given in TM 38750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army NAVSUP PUB 378 (Navy) AFR 71-4 (Air Force) and MCO P4030.29 (Marine Corps).

c. Discrepancy in Shipment Report (DISREP) (SF361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF361) as prescribed in AR 5548 (Army) NAVSUP PUB 459 (Navy) AFM 75-34 (Air Force) and MCO P4610.19 (Marine Corps).

d. Reporting of Equipment Publication Improvements. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL ME-NMP-EM, Fort Monmouth, N.J. 07703.

e. Administrative Storage. For procedures, forms and records, and inspections required during administrative storage of this equipment refer to TM 740-90-1. Historical records required by TM 38-750 will be maintained.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

a. Purpose. The system test set simulates operation- of an altimeter system with target signals of preselected altitude ranges, or with ranges varying at rates of up to 2, 000 feet per second. Simulated altitude signals are also provided for height indicator testing.

b. Use. The system test set is used for bench tests of Altimeter Set, Electronic AN/APN-171A (V)1 (altimeter set). It provides simulated signal inputs and circuit test points for functional tests of Receiver-Transmitter RT-804A/APN-171(V) (receiver-transmitter) and Height Indicator (height indicator) ID-1345A/APN-171 (V). Tests may be made of the height indicator (A, fig. 1-3), the receiver-transmitter with the height indicator (B, fig. 1-3), or the receiver-transmitter without the height indicator (C, fig. 1-3).

1-5. Technical Characteristics

Voltage requirements --- 115 ñ11 volts, 400 :ñ20 hz, 1.5 ampere max; 27 ±2 volts dc, 0.5 ampere max.

Signal outputs:

- T-zero pulse (variable) ---------- 0 to +5 volts minimum, 0 to 550-nanosecond delay, 15-nanosecond risetime.
- Range simulation pulse ---------- +5 volts minimum, 100-nanosecond risetime, 450-nanoseconds width.
- Rate-of-change pulse:
  - Fixed rate ---------- 0 to 2, 000 feet per second
  - Variable rates ---------- 0 to 100 and 0 to 1, 000 feet per second.
  - Video pulse (variable) --- 0 to ± 5 volts
- Oscilloscope sync pulses:
  - Video ---------- 5-volt amplitude, 10-nanoseconds risetime.
  - T-zero ---------- 5-volt amplitude, 10-nanosecond risetime.
  - Manual slew stimulus ---- 2 to -14 ñ1 volts dc.
  - Preset altitude ---------- +6.00 ±0.03 volts.
  - Indicator altitude signal ---------- 0 to -40.00 ±0.01 volts.
  - Search delay stimulus Open, ground, or +15 volts dc.
- Accuracy of Output Signals:
  - Range ---------- ñ1 percent
  - Rate, fixed ---------- ñ5 percent
  - Variable ---------- ñ3 percent

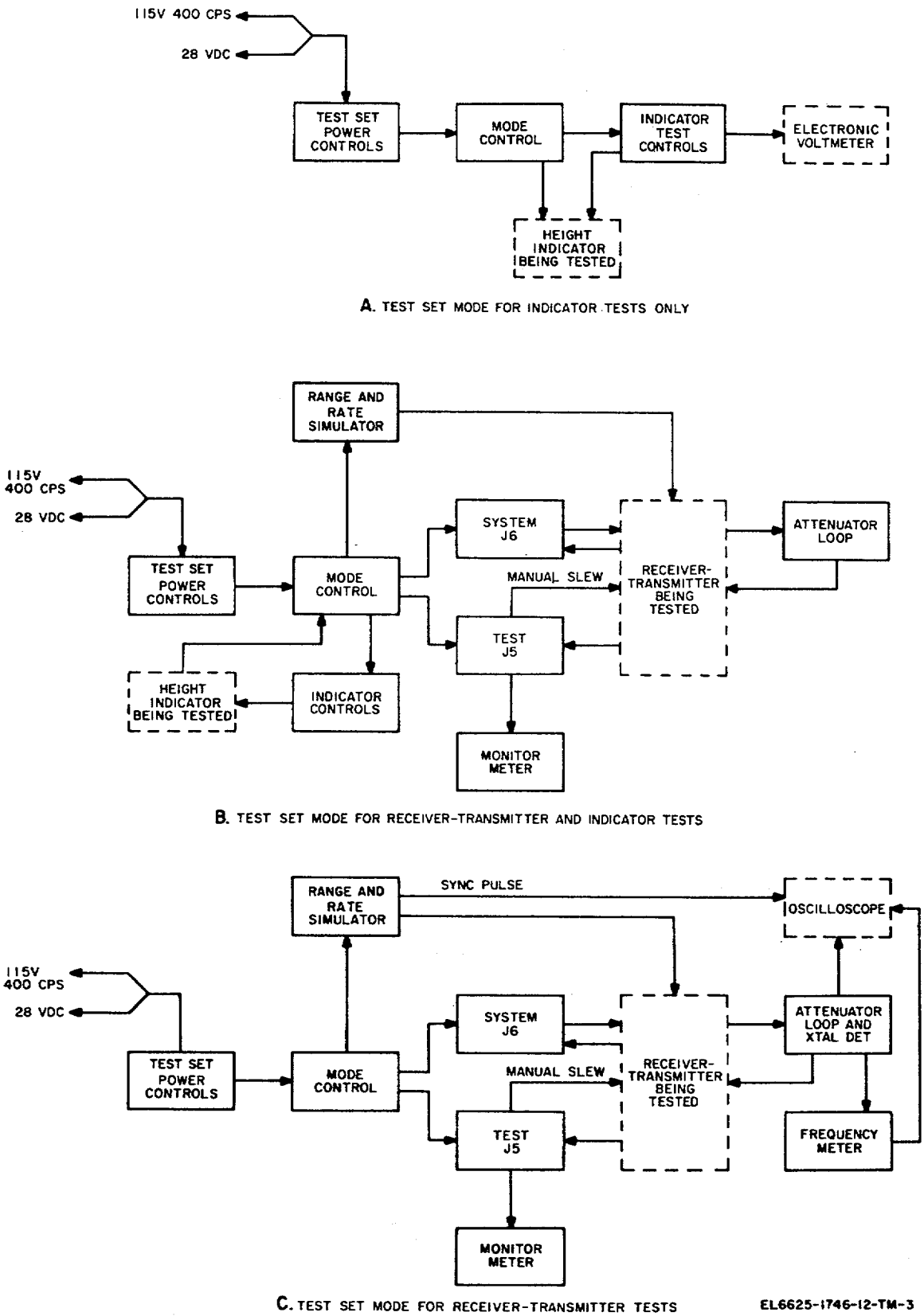

Figure 1-3. Test Set, Radar Altimeter System AN/APM-2S3, block diagram for typical operation.

1-6. Items Comprising an Operable Equipment

Federal stock No.	Item	Quantity	Dimensions			
			Height	Depth	Width	Weight
6625-491-0580	Test Set, Radar Altimeter System AN/APM-323					95
6625-484-5859	Case, Test Set CY-6789/APM.	1	22	14	23.5	
6625-437-7293	Panel, Range-Rate Simulation SM-566/APM-323.	1	5	5	19	
6625-463-4708	Panel, Control-Simulation C-8396/APM-323.	1	8.75	5	19	
6625-437-7311	Panel, Attenuator CN-1313/APM-323.	1	5	6	19	
	Cable Assembly Coaxial Jumper CG-3636.	1				

Federal stock No.	Item	Quantity	Dimensions	
	Cable Assembly, Special Purpose, Electrical, Branched CX-12203/APM-323.	1	6 feet	6 inches long
	Cable Assembly, Radio Frequency CG-3598/U.	1	6 feet	6 inches long
5995-477-3882	Cable Assembly, Special Purpose, Electrical CX-12205/U. 1 6 feet 6 inches long			
5995-477-3883	Cable Assembly, Special Purpose, Electrical CX-12204/U. 1 6 feet 6 inches long			
5995-477-3881	Cable Assembly, Special Purpose, Electrical CX-12206/APM-323.	1		
	Cable Assembly, Radio Frequency CG-3600/U.	1	6 feet	6 inches long
	Cable Assembly, Radio Frequency CG-3602/U.	1	6 feet	6 inches long
	Cable Assembly, Radio Frequency CG-3599/U.	1	6 feet	6 inches long
	Cable Assembly, Radio Frequency CG-3601/U.	1	6 feet	6 inches long
	Cable Assembly, Radio Frequency CG-3603/U.	1	6 feet	6 inches long

1-7. Description

The system test set consists of three signal simulation and control panels mounted in a portable case. The panels are assembled into the case with gaskets along all mounting surfaces to provide protection against moisture, dust, and shock. The gaskets are conductive and maintain a radio frequency shield bond. When closed, the case gaskets provide additional seal.

a. Panel, Range-Rate Simulation SM-566/ APM-323 (fig. 1-4). This panel contains the simulation signal generating circuits that produce altitude range signals, video and T-zero signals, and rate-of-altitude-change signals. The panel controls are divided into five groups according to circuit function. The signal generator circuits are contained on five printed circuit cards mounted in a shielded compartment at the rear of the panel.

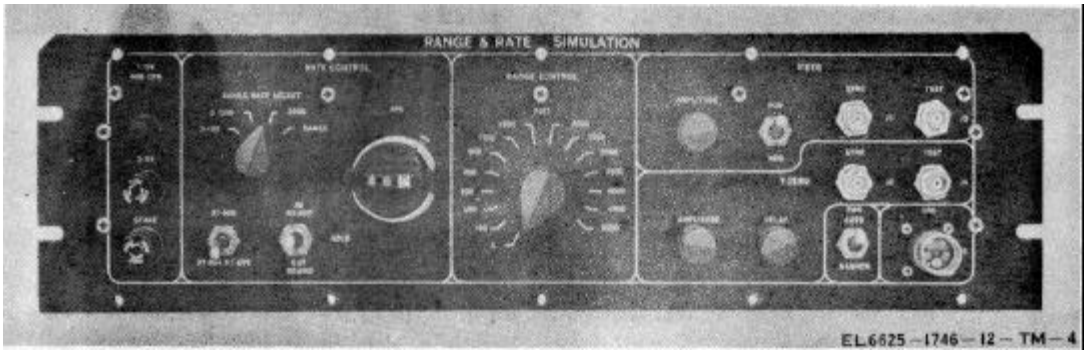

Figure 1-4. Panel, Range-Rate Simulation SM-566/APM-323.

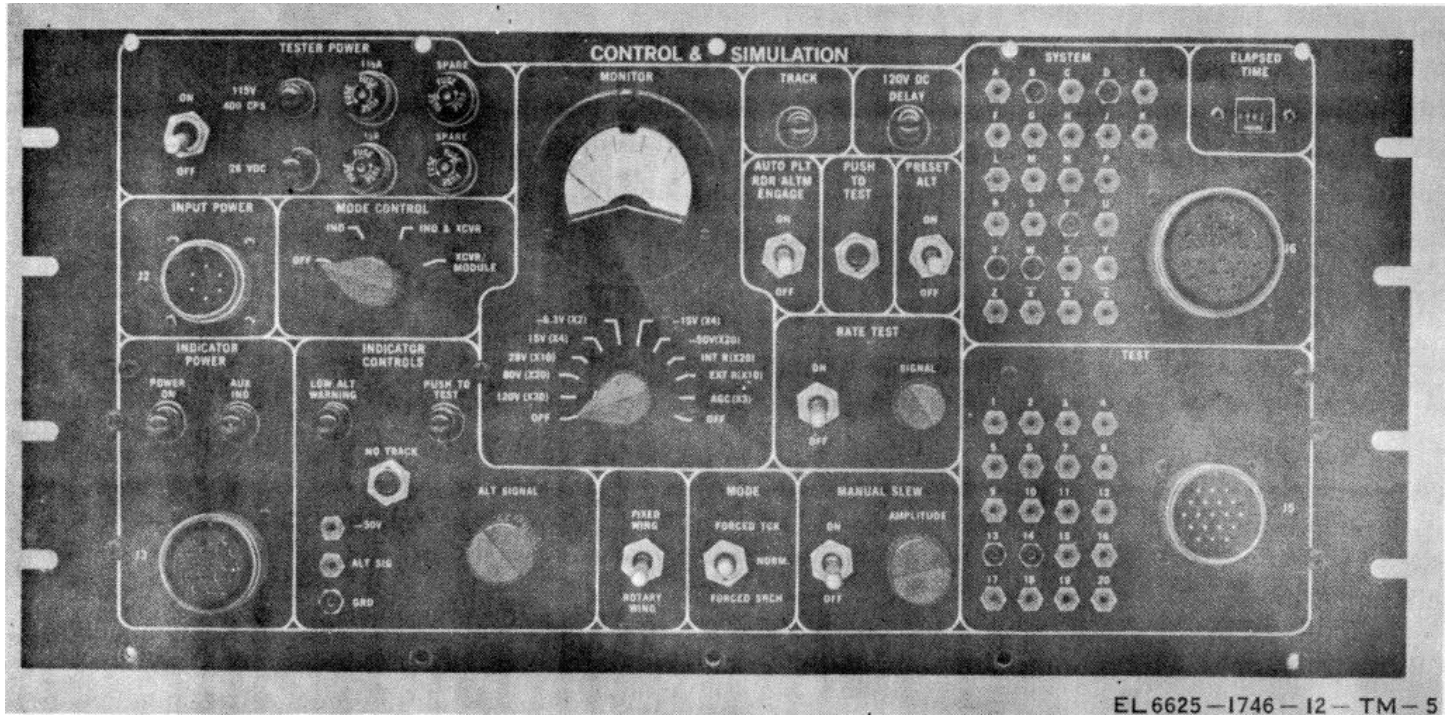

Figure 1-5. Panel, Control-Simulation C-8396/APM-323.

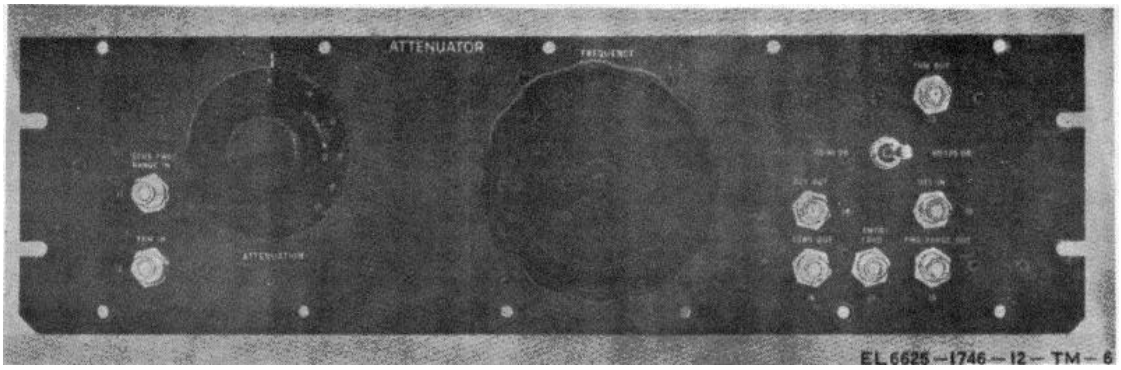

Figure 1-6. Panel, Attenuator CN-1313/APM-323.

b. Panel, Control Simulation C-8396/APM323 (fig. 1-5). This panel contains power, signal, and function control circuits. It also contains a monitor meter with a selector switch that provides circuit voltage and signal output checks of the receiver-transmitter unit being tested. The SYSTEM and TEST sections of the panel contain tip jacks that correspond to connector pins of SYSTEM connector J6 and TEST connector J5. Two printed circuit cards in the panel chassis contain the voltage divider networks, the manual slew driver transistor, and the meter multiplier resistors. The 115-volt, 400-Hertz (Hz) circuit is protected by a 1 1/2-ampere fuse. A 3/8-ampere fuse protects the 28-volt direct current (dc) input. Power is connected into the system test set through Cable Assembly, Special Purpose, Electrical, Branched CX-12203/APM323 and INPUT POWER connector J2.

c. Panel, Attenuator CN-1313/APM-323 (fig. 1-6). This panel contains a frequency control, a variable attenuator, a crystal detector, a fixed attenuator, and interconnecting cables required to complete the radar altimeter attenuation loops. A delay cable, used in the 85to 135-decibel (db) attenuator loop, is wound in back of the panel. This line adds approximately 45 db of attenuation and also introduces 125 feet of radar delay. A coaxial switch and output jacks on the panel permit selection of the desired attenuation or frequency measuring function.

d. Case, Test Set CY-6789/APM (fig. 1-1). The test set case provides a protective cover for transport or storage when closed, and an operational bench mounting when open. The test set case opens in two sections: one section contains mounting positions for the system test set panels, and the other section provides storage positions for the test cables and accessories. The cable compartment has a hinged lid with push-type fasteners. Seven latches secure the test set case in the closed position. Both sections have mounting rails on one end that provide a bench mounting base.

e. Cables (fig. 1-2).

Item	Function
Cable Assembly, Radio Frequency CG-3598/U.	Transmitter power calibration (signal generator to power meter).
Cable Assembly, Radio Frequency CG-3599/U.	Video cables (have 91-ohm loads).
Cable Assembly, Radio Frequency CG-3600/U.	Calibration cable (cal connector J5 to test connector of receiver-transmitter being tested).
Cable Assembly, Radio Frequency CG-3601/U.	Transmitter rf attenuation cable (has 20-db fixed attenuator).
Cable Assembly, Radio Frequency CG-3602/U.	Oscilloscope cable (has 51-ohm load).
Cable Assembly, Radio Frequency CG-3603/U.	Receiver rf attenuation cable.
Cable Assembly, Radio Frequency CG-3636/U.	Coaxial jumper cable (attenuator connector J5 to connector J8).
Cable Assembly, Special Purpose, Electrical, Branched CX-12203/APM-323.	System test set power input.
Cable Assembly, Special Purpose, Electrical CX-12204/U.	Height indicator test.
Cable Assembly, Special Purpose, Electrical CX-12205/U.	System power and signal cable (system connector J6 to receiver-transmitter being tested or to associated module test set).
Cable Assembly, Special Purpose, Electrical CX-12206/APM-323.	System test cable (to receiver-transmitter being tested or associated module test set).

1-8. Additional Equipment Required

Equipment	Purpose	Technical manual
Oscilloscope AN/USM-281.	Making waveform and delay time measurements.	TM 9-6625-2362-12.
Time Base Plug-in PL1213 (used with oscilloscope).	Extending range cf oscilloscope time base to 50 nanosec/cm.	
Dual Channel Vertical Amplifier HP-1802E (used with oscilloscope).	Extending frequency response and reducing risetime of oscilloscope.	
Differential Voltmeter ME-202/U.	Monitoring signal input levels and measuring outputs.	TM 11-6625-537-15.
Multimeter AN/USM-223.	Used while making circuit continuity checks.	TM 11-5527.

CHAPTER 2
OPERATION

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Packaging Data

a. The system test set is packaged in a standard regular service carton. A typical packaging arrangement is shown in figure 2-1.

b. When the system test set is packaged for shipment, the dimensions are 30 inches by 30 inches by 20 inches, the volume is 10.53 cubic feet, and the weight is 95 pounds.

2-2. Unpacking Instructions

Cut the metal strap and open the carton from the top. Remove the cushioning material and lift the equipment from the carton. Save the cushioning material and carton for repacking.

2-3. Checking Unpacked Equipment

a. Inspect the equipment for damage that may occur during shipment. If the equipment is damaged, fill out and forward DD Form 6 (para 1-3b).

b. Check to see that the equipment is complete as listed on the packing slip. If the packing slip is not available, check the equipment against the equipment listed in paragraph 1-6. Report all discrepancies in accordance with TM 38-750. The equipment should l)e)placed in service even if a minor assembly or part, that does not affect proper functioning, is missing.

NOTE

Current MWO's applicable to the equipment are listed in DA Pam 310-7.

c. Check to see whether the equipment has been modified. If the equipment has been modified, the MWO number appears on the front panel near the nomenclature plate. Also, check to see whether all MWO's, current at the time the equipment is placed in use, have been applied.

2-4. Installation Instructions

a. The system test set is normally used mounted in its test set case. In some instances, it may be more convenient to remove the panels from the test set case and rack mount them with auxiliary test equipment in a complete test station.

b. When the system test set is used mounted in its test set case, remove the cover and place the system test set on a suitable bench, or solid, flat surface. Place the cover in a position convenient for access to the test cables stored In the cable compartment. All cables shall be kept in the cable compartment, except when actually being used.

c. Mount the panels on a rack as follows:

(1) Remove the screws that hold the front panels and the holddown straps to the test set case, and remove the front panels. Retain the straps and the mounting screws.

(2) Install the front panels on a rack, in their original positions relative to each other, Secure the front panels to the rack.

(3) Retain the test set case to use for storage or reshipment.

NOTE

Delay line DL1, in the test set case, shall be connected to the attenuator panel, or a second delay line shall be fabricated to supply the 45-db attenuation and 125 radar feet of delay when the system test set is rack-mounted.

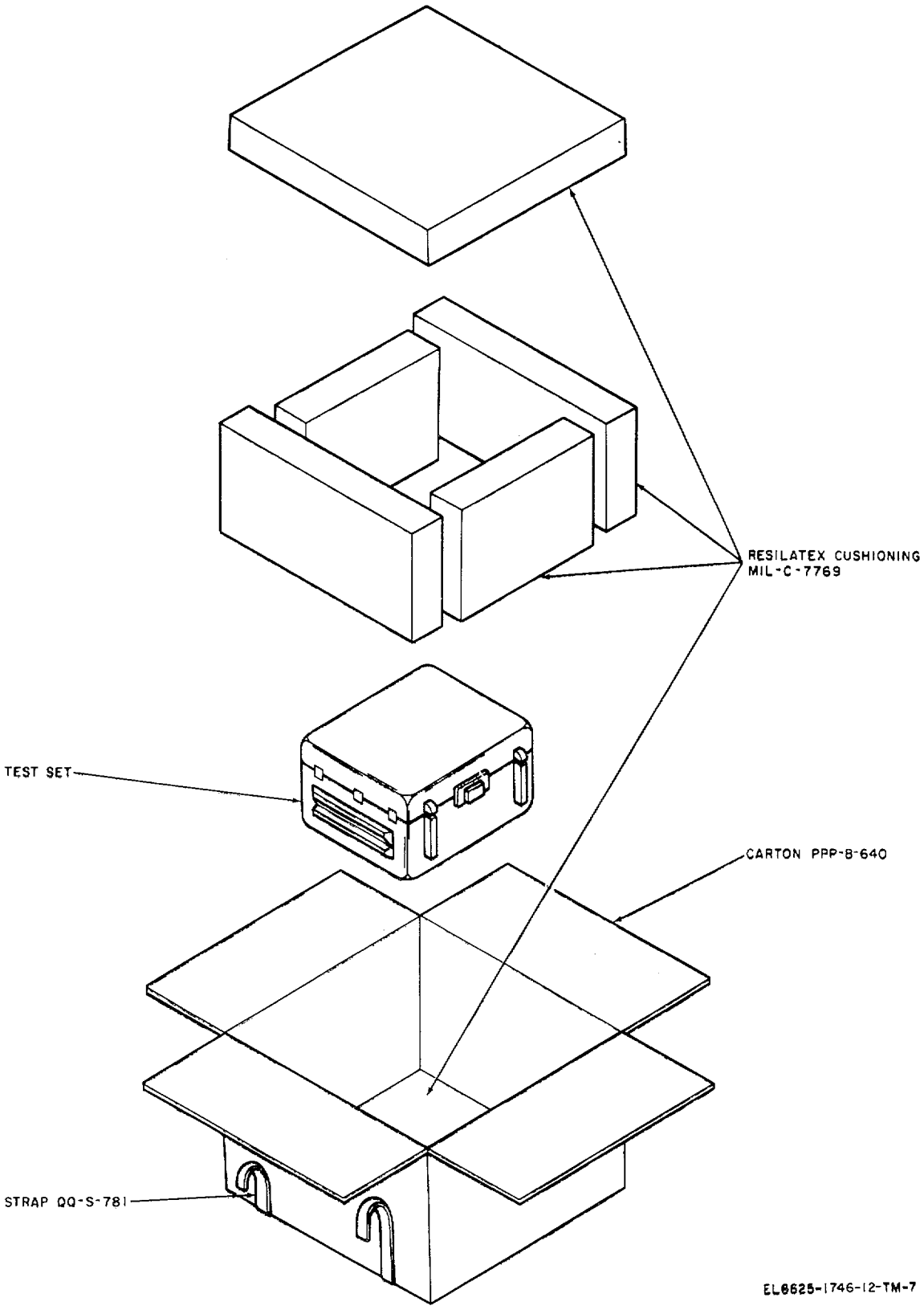

Figure 2-1. Test Set, Radar Altimeter System AN/APM-323, typical packaging.

Section II. OPERATOR'S CONTROLS AND INDICATORS

2-5. Damage from Improper Settings

No damage will occur to the system test set from improper switch settings.

2-6. Panel, Control-Simulation C-8396/APM-323 (fig. 2-2)

Control, indicator, or connector	Function
TESTER POWER panel section:	
ON-OFF switch	Controls 115-volt 400-Hz and 28-volt dc power to system test set.
115V 400 PS indicator	Indicates 115-volt 400-Hz power is on when illuminated.
28 VDC indicator	Indicates 28-volt dc power is on when illuminated.
1-1/2A fuse	Protects 115-volt power circuit.
1/2A fuse	Protects 28-volt de circuit.
INPUT POWER connector J2	Receptacle for power cable CX-12203/APM-323.
MODE CONTROL switch	Controls power input to height indicator or receiver-transmitter being tested.
INDICATOR POWER panel section:	
POWER ON indicator	Illuminates when power is applied to height indicator (MODE CONTROL switch at IND or IND & XCVR).
AUX IND indicator	Illuminates when power is turned on by on-off switch of the height indicator being tested.
Connector J3	Receptacle for height indicator power and signal cable CX-12204/U.
INDICATOR CONTROLS panel section:	
LOW ALT WARNING indicator	Indicates that low altitude warning circuit of height indicator being tested is functioning when illuminated.
PUSH TO TEST indicator	Indicates functioning of PUSH-to-TEST switch, of height indicator being tested, when illuminated.
NO TRACK push switch	Checks no-track flag operation of height indicator being tested.
ALT SIGNAL control	Adjusts simulated altitude signal levels for height indicator scale checks.
ALT SIG tip jack	Provides monitor point for altitude signal voltage.
-50V tip jack	Monitor point for -50-volt reference voltage to height indicator being tested.
GRD tip jack	Ground jack for ALT SIG and -50V jacks.
FIXED WING-ROTARY WING switch	Energizes relay A4K4 in Receiver-Transmitter RT-804A/APN-171 (V) when required in tests.
MODE Forced Tck-Norm-Forced Srch switch	Selects forced track or forced search modes of operation when required in tests.
MONITOR meter and selector switch:	Checks dc voltages of receiver-transmitter power supply, range signal output, and age output.
INT R(X20)	Meter indicates internal range output.
EXT R(X10)	Meter indicates external range voltage output.
AGC(X3)	Meter indicates age voltage output of range computer.
-50V(X20) to the 120V (X30)	Power supply voltages are indicated on meter. **NOTE** Symbols X3 through X30 indicate multiplication actor for meter scale indications to obtain actual voltage.
TRACK indicator	Glows when range computer is in track mode, and is extinguished in no-track or search mode.
120V DC DELAY indicator	Glows when power supply thermal delay relay closes +120-volt delayed output circuit for transmitter modulator.
AUTO PLT RDR ALTM ENGAGE SWITCH	Programs push-to-test circuits for different input.
PUSH TO TEST switch	Performs push-to-test function in place of height indicator push-to-test switch.

Control, indicator, or connector	Function
PRESET ALT switch	Applies preset altitude signal to check altitude error amplifier operation.
RATE TEST panel section:	
ON-OFF switch	Closes test circuit to range computer rate amplifier.
SIGNAL control	Provides test signal input to range computer rate. amplifier.
MANUAL SLEW panel section:	
ON-OFF switch	Closes circuit to range computer manual slew input.
AMPLITUDE control	Applies manual slew input voltage to drive altimeter range integrator to simulated altitude output voltages.
SYSTEM panel section:	
Connector J6	Provides test and power input connections to receiver-transmitter power and signal connector J1, or to Test Set, Radar Altimeter System AN/APM-322 (module test set) connector.
Tip jacks A through C	Test points for corresponding pins of connector J6.
TEST panel section:	
Connector J5	Provides test inputs to test connector J8 of receiver-transmitter, or to test connector on module test set.
Tip jacks 1 through 20	Test points for corresponding pins of connector JS.
ELAPSED TIME indicator	Operates when TESTER POWER ON-OFF switch is at ON, Registers total operating hours,

2-7. Panel, on Range-Rate Simulation SM-566/APM323

Control, indicator, or connector	Function
115V 400 CPS indicator -	Indicates that 115-volt 400-Hz power is supplied to range-rate simulation panel.
3/8A fuse	Protects 115-volt 400-Hz power circuit from overloads.
RATE CONTROL panel section:	
RANGE/RATE SELECT switch.	At RANGE position, connects range generator to system test set signal output circuits; at 2000 position, connects rate generator 2,000-foot-per-second signal output to system test set signal output circuits; at 0-100 and 0-1000 positions, rate signal output can be varied by adjusting FPS dial.
FPS dial	Controls variable rate output signals with ranges of 0 to 100, or 0 to 1,000 feet per second.
RT-805/RT-804/RT-829 switch.	Selects system test set circults for 0- to 1,000- or 0- to 5,000-foot receiver-transmitter.
IN BOUND-HOLD-OUT BOUND switch.	Controls rate generator output. At HOLD position, rate signal is stopped. At OUT BOUND position, rate signal varies in direction of increased time delays, corresponding to altitude increase. At IN BOUND position, rate signal is reversed, decreasing time delay and altitude.
RANGE CONTROL switch	Controls pulse time delay of range generator to correspond with desired range signal output.
VIDEO panel section:	Provides video signals to module test set.
POS-NEG switch	Controls video output signal polarity.
AMPLITUDE control	Adjusts video output signal level.
SYNC connector J1	Connects video synchronizing pulse to an external oscilloscope.
TEST connector J3	Connects video output signal to module test set.
T-ZERO panel section:	
AMPLITUDE control	Adjusts amplitude of T-zero pulse.
DELAY control	Adjusts delay of T-zero pulse.
TEST connector J4	Connects T-zero output signal to module test set.
SYNC connector J2	Provides T-zero sync pulse for external synchronizing oscilloscope horizontal input.
PWC Auto-Narrow switch	Switches receiver-transmitter to narrow pulse operation for range checks.
CAL connector J5	Provides connection of T-zero and T, and pulse width control to receiver-transmitter being tested.

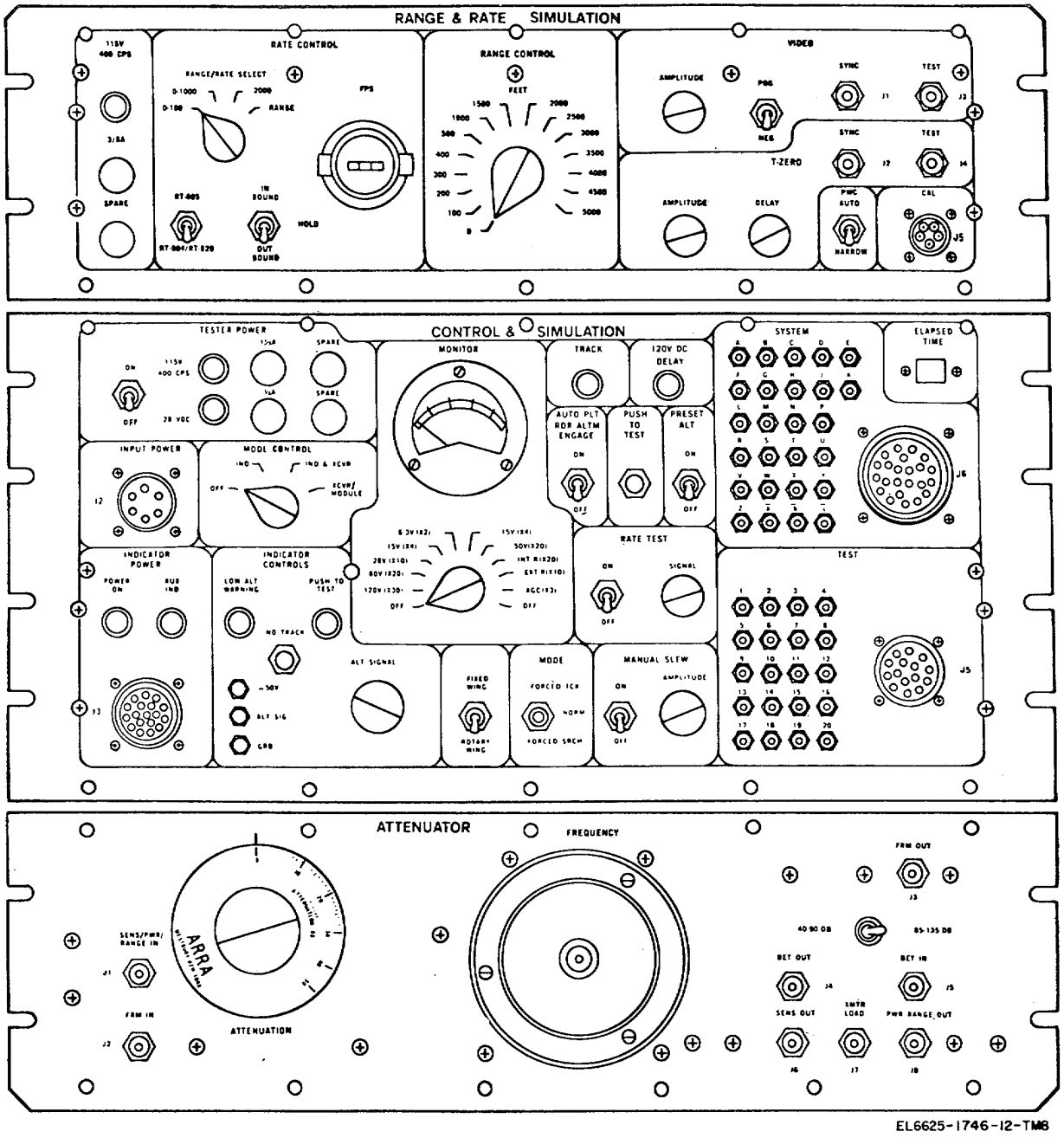

Figure 2-2. Test Set, Radar Altimeter System AN/APM-323, operator's controls and indicators.

2-8. Panel, Attenuator CN-1313/APM-323

Control, indicator, or connector	Function
ATTENUATION control	Variable 0- to 50-db attenuation loop adjustment.
40-90 DB-85-135 DB switch	Coaxial attenuation loop selector. At 40-90 DB position, 0- to 50-db attenuation control is in series with 20-db fixed attenuator, and with an

Control, indicator, or connector	Function
	other 20-db fixed attenuator that is part of external attenuator cable loops. In 85-135 DB position, a 45.7-db delay cable is added in the loop to increase total attenuation.
FREQUENCY control	Used in measuring transmitter frequency.
SENS/PWR/RANGE IN connector J1	Input connection for attenuation loop cables.
SENS OUT connector J6	Output connection for attenuation loop cables and delay cable in sensitivity test setup, with 40-90 DB-85-135 DB switch set to 85-135 DB.
PWR RANGE OUT connector J8	Output connection for attenuation loop cables in transmitter power check with 40-90 DB-85-135 DB switch set to 40-90 DB.
FRM IN connector J2	Connects coaxial cable to frequency meter input through 20-db attenuator.
FRM OUT connector J3	Connects coaxial cable to frequency meter output.
DET OUT connector J4	Connects coaxial cable to crystal detector output for transmitter RF power checks.
DET IN connector J5	Connects coaxial cable to crystal detector input for transmitter RF power checks.
XMTR LOAD connector J7	Provides a 50-ohm dummy load when connected to transmitter antenna connector.

Section III. OPERATION UNDER USUAL CONDITIONS

2-9. Preliminary Procedures

Prepare the system test set for altimeter set tests. Interconnect the system test set special purpose electrical and radiofrequency cable assemblies according to figure 2-3; observe the following general procedures.

a. Cable Assembly, Special Purpose, Electrical, Branched CX-12203/APM-323. With the system test set TESTER POWER ON-OFF switch set to OFF and the 115-volt 400-Hz and 28-volt dc power sources turned off, connect Cable Assembly, Special Purpose, Electrical, Branched CX-12203 (power cable) to INPUT POWER connector J2. Connect the alternating current (ac) plug connector to the 115-volt 400-Hz power source. Connect the four-pin plug to the 28-volt dc power source.

b. Cable, Assembly, Special Purpose, Electrical CX-12205/U. Connect Cable Assembly Special Purpose, Electrical CX-12205/U (system cable) to SYSTEM connector J6. Connect plug connector P2 to power and signal input connector J1 on the front of the receiver-transmitter to be tested.

c. Cable Assembly, Special Purpose, Electrical CX-12206/APM-323. When tests require use of Cable Assembly, Special Purpose, Electrical CX-12206/APM-323 (test cable), remove the cover from the receiver-transmitter being tested, then, connect plug connector P2 to test connector J8 on the receiver-transmitter and connect plug connector P1 to system test set TEST connector J5.

d Attenuation Loop Cables.. The attenuation loop consists of Cable Assemblies CG-3601/U (transmitter cable) and CG-3603/U (receiver cable), the zero calibration cable, the jumper cable, and circuits in the attenuator panel. Connect these cables as described in (1) through (8) below.

CAUTION

Do not disconnect the transmitter cable from transmitter connector J2 while power is applied to the receiver-transmitter. If the attenuator cables are to be disconnected, set the MODE CONTROL switch to OFF, or disconnect the shorting plug or cable from transmitter connector J4 to deactivate the transmitter. Failure to observe this procedure may damage the transmitter module.

(1) The transmitter cable contains a 20-db fixed attenuator. Connect the attenuator end (plug connector P1) of the cable to transmitter connector J2 on the front of the receiver-transmitter. Connect cable plug connector P2 to attenuator panel FRM IN connector J2 for

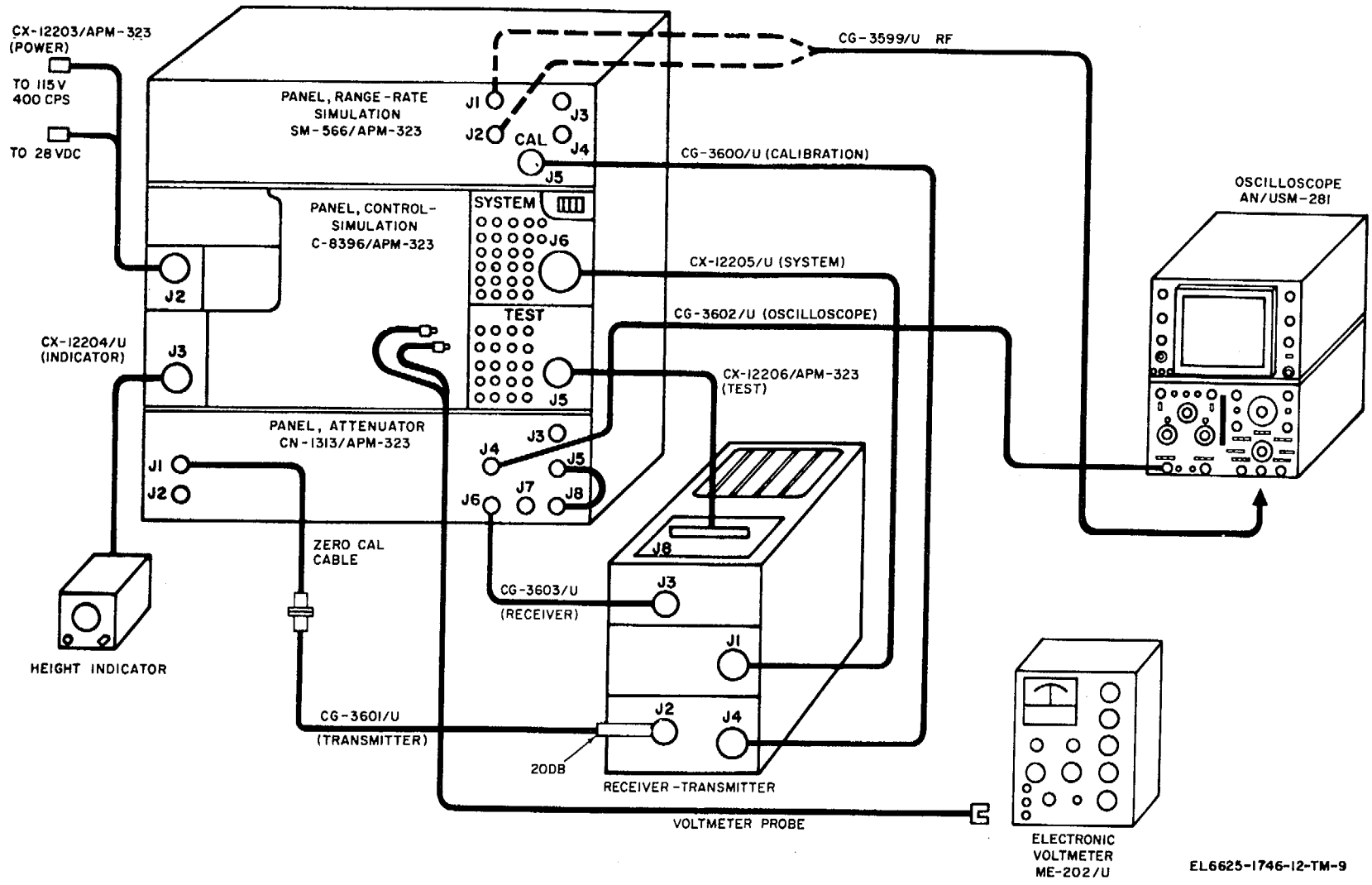

Figure 2-3. Test Set, Radar Altimeter System AN/APM-S23 and Receiver-Transmitter RT-804A/APN-171(V), test connections.

transmitter frequency measurements, or to SENS/ PWR/RANGE IN connector J1 for all other tests.

(2) The receiver cable connects receiver connector J3 and SENS OUT connector J6 for sensitivity, or other tests requiring more than 90-db attenuation. For tests requiring less than 85-db attenuation, connect the receiver cable to PWR RANGE OUT connector J8.

(3) The jumper cable is used to connect connector J8 to DET IN connector J5 when waveforms are to be displayed on Oscilloscope AN/ USM-281 (oscilloscope). Cable Assembly, Radio Frequency CG-3602, /U (oscilloscope cable) then connects to DET OUT connector J4.

(4) The oscilloscope cable has a T-connector with a 51-ohm load installed. Connect the T-Connector end to oscilloscope A or B input and connect the other end to the test signal source, as specified in the AN/APN-171A(V) 1 test procedures.

(5) Cable Assembly, Radio Frequency CG3599/U (radio frequency cable) has a T-connector with a 91-ohm load installed. Connect the T-Connector to the oscilloscope external sync or trigger circuits, or to other terminations specified when a 91-ohm load is required.

(6) Cable Assembly, Radio Frequency CG 3600/U (calibration cable) is used when the transmitter is triggered from the simulated range or rate signals. To connect the calibration cable, remove the shorting plug from transmitter connector J4. Connect cable plug connector P1 to connector J4 and connect plug connector P2 to CAL connector J5.

(7) Cable Assembly, Special Purpose, Electrical CX-12204/U (indicator cable), used when a height indicator is tested, connects the height indicator and INDICATOR POWER connector J3.

(8) Connect the zero calibration cable in series with the transmitter cable or the receiver cable (fig. 2-3). The zero calibration cable simulates the travel time, in radar feet, from the transmitter to the ground and back to the receiver, when the aircraft is on the ground. A different cable is made specially for each type aircraft for use in bench testing the AN/APN-171A (V) 1. Instructions for making this cable are contained in TM 11-5841-272-35. The zero calibration cable shall be used for all zero altitude tests, zero voltage adjustment, and range output voltage indications.

2-10. Turn-On Procedures

a. Initial Control Settings. Set the panel controls to the initial settings listed below:

Panel	Switch or control	Initial position
CONTROL-SIMULATION	TESTER POWER ON-OFF	ON.
	MODE CONTROL	OFF.
	FIXED WING-ROTARY WING	ROTARY WING.
	MODE	NORM.
	MANUAL SLEW ON-OFF	OFF.
	MANUAL SLEW AMPLITUDE	Fully ccw.
	AUTO PLT RDR ALTM ENGAGE	OFF.
	PRESET ALT	OFF.
	ALT SIGNAL	Fully ccw.
	RATE TEST ON/OFF	OFF.
	RATE TEST SIGNAL MONITOR	Fully ccw.
		-50V(X20).
RANGE and RATE SIMULATION	RANGE/RATE SELECT	RANGE.
	RANGE CONTROL	0.
	RT-805/RT-804/RT-829	RT-804/RT-829.
	IN BOUND-HOLD-OUT BOUND	HOLD.
	VIDEO POS-NEG	POS.
	PWC AUTO-NARROW	AUTO.
ATTENUATOR	40-90 DB-85-135 DB	Either position.
	ATTENUATION	50.

b. Applying Power. Apply power to the units being tested as follows:

(1) If only a height indicator is being tested, set the' MODE CONTROL switch to IND, then, turn the altimeter set indicator PUSH TO TEST knob clockwise to energize the height indicator.

(2) If both a height indicator and a receiver-transmitter are being tested, set the MODE CONTROL switch to IND & XCVR; then, turn the

altimeter set indicator PUSH TO TEST knob clockwise. This action energizes the height indicator and the receiver-transmitter.

(3) If a receiver-transmitter is being tested without a height indicator, or if the system test set is used in conjunction with Test Set, Radar Altimeter Module AN/APM-322, set the MODE CONTROL switch to XCVR/ MODULE.

(4) When power is applied to the receiver-transmitter, observe the MONITOR meter; it should stabilize at -50 ± 2 volts dc in less than 1 minute. Do not attempt to continue tests with the -50-volt output not within tolerance.

(5) After approximately 2 minutes, the 120V DC DELAY indicator should light.

(6) Turn on the oscilloscope and Differential Voltmeter ME-202/U. Allow 2 or 3 minutes of additional warmup time for all circuits to stabilize before proceeding with tests. Verify that the system test set ELAPSED TIME indicator is operating.

c. Standard Signal Level. Adjust the video and T-zero signal outputs of the range-rate simulation panel to standard levels before performing any range computer tests. Use the oscilloscope to calibrate the levels.

(1) Use T-Connector Adapters UG-274/U to connect the video and T-zero signal cables to VIDEO SYNC connector J1 and T-ZERO SYNC connector J2. Connect the oscilloscope A input to the T-connector at connector J1, and the B input to the T-connector at connector J2.

(2) Set the VIDEO POS-NEG switch to NEG, and the RATE CONTROL RANGE/RATE SELECT switch to 2000.

(3) Set the oscilloscope horizontal time base to 0.1 μsec/cm, and B inputs for 0.5 volts/cm.

(4) Adjust the VIDEO AMPLITUDE control for -0.75 ± 0.25-volt peak amplitude on the A input channel. Pulse risetime shall be less than 30 nanoseconds between the 10and 90-percent points.

(5) Adjust the T-ZERO AMPLITUDE control for +0.50 ± 0.25-volt peak on the B input channel.

(6) Mark the settings of the AMPLITUDE controls to enable ready adjustment of the standard signal levels during tests.

2-11. Typical Operating Procedure

a. Receiver-Transmitter Voltage Checks. With the receiver-transmitter connected as shown in figure 2-3, set the MONITOR meter switch to each of the voltage test positions, from -50V (X20) to 120V(X30). Use the scale multiplication factor indicated for each position to convert the meter indication to actual voltage. This is a quick operational check that shows that these power supply voltages are present in the receiver-transmitter.

b. Track Acquisition. When the receiver transmitter is properly connected and operating, it locks onto the transmitted signal. When this action occurs, the TRACK indicator lights. The track signal relay in the receiver-transmitter shall also be operating. Check this condition by measuring the voltage between TEST tip jacks 17 (+) and 13 (-) with Multimeter AN/USM223 (multimeter). A 24- to 32-volt dc reading indicates that the relay is operating. When the TRACK indicator is extinguished, the receivertransmitter is not tracking and zero volt shall be indicated on the multimeter.

c. Range Tests. For range output tests, remove the shorting plug from receiver-transmitter connector J4 and connect the calibration cable between connector J4 and range-rate simulation panel CAL connector J5. Connect Differential Voltmeter ME-202/U to SYSTEM tip jacks E (-) and T (+) to read the external range voltage output. Use the range simulation controls as follows:

(1) With the RATE CONTROL RANGE/ RATE SELECT switch at RANGE, the RANGE CONTROL switch at 0, and the VIDEO POSNEG switch at POS, use the T-ZERO DELAY control to obtain true zero setting, when specified in the particular test procedure given in TM 11-5841-272-35.

(2) Set the RANGE CONTROL switch to the corresponding range settings and read the output voltage.

(3) To use the altitude rate-of-change simulation circuits, set the RATE CONTROL RANGE/ RATE SELECT switch to the required setting: 2000 for a fixed rate, or 0-100 or 0-1000 for a variable rate. When a variable rate is used, set the RATE CONTROL FPS dial to the rate in feet per second. Set the MONITOR switch to INT R (X20). Set the RATE CONTROL IN BOUNDHOLD-OUT BOUND switch to OUT BOUND until the required range voltage is reached; then, set the switch to IN BOUND to drive the range voltage to zero. The TRACK indicator remains lighted if the AN/APM-171A(V)1 remains in track with the rate-of-change input.

d. Manual Slew. With the MONITOR switch at INT R(X20), set the MODE switch to FORCED TCK and the MANUAL SLEW ON-OFF switch to ON. Use the MANUAL SLEW AMPLITUDE control to manually drive the internal range voltage to the desired level directed in TM 11-5841-272-35.

e. Forced Search. The FORCED SRCH position of the MODE switch interrupts the track mode and activates the search generator. Operation of the search generator can be observed with the MONITOR switch set to INT R(X20). The internal range voltage cycles from zero to maximum at the search generator cycling rate (about 2 Hz per second). Returning the MODE switch to NORM allows the AN/APM-171A(V)1 to find and lock onto the target pulse.

f. Push-to-Test. The PUSH TO TEST switch is used when a receiver-transmitter is being tested without a height indicator. Pressing the PUSH TO TEST switch activates the self-test circuits. The normal self-test external range voltage, 800 ± 120 millivolts, shall be present at SYSTEM tip jacks E (-) and T (+).

g. Sensitivity Checks. This check is made with the receiver-transmitter in track. Attenuation is then added in the loop until the target signal is too weak to hold in track. The TRACK indicator extinguishes when track is broken. The total loop attenuation required to break track (in db) is taken as the sensitivity parameter for the receiver-transmitter. To measure sensitivity, the receiver cable connects to attenuator panel SENS OUT connector J6, and the attenuator panel 4090 DB-85-135 DB switch is set to 85-135 DB.

h. Power Measurements. Peak power of the transmitter pulse output is also measured by the attenuation required to reduce the pulse peak to zero-dbm level. A signal generator is calibrated for zero-dbm power output at 4,300 MHz. This signal is displayed on the oscilloscope and adjusted to a convenient, repeatable level. The oscilloscope input is then connected into the attenuation loop, and attenuation is added to reduce the transmitter pulse output to the same level as the zero-dbm pulse. The attenuation required is taken as the peak power level parameter for the transmitter. For power measurements, the transmitter cable connects to SENS/PWR/RANGE IN connector J1, and the jumper cable connects PWR RANGE OUT connector J8 and DET IN connector J5. Connect the oscilloscope input to DET OUT connector J4 and set the attenuator panel 40-90 DB-85-135 DB switch to 40-90 DB. Measure the low-altitude narrow pulse with the PWC AUTO-NARROW switch at NARROW. Measure the high-altitude wide pulse by inserting a simulated range signal, 2,000 to 3,000 foot, with the PWC AUTO-NARROW switch at AUTO.

i. Frequency Measurements. To measure transmitter frequency, connect the transmitter cable to FRM IN connector J2. Connect the oscilloscope to FRM OUT connector J3. Set the FREQUENCY control to 4, 300 megacycles. Set the oscilloscope horizontal time base to 0.1 /Asec/cm, and vertical amplitude to 20 mv/cm. Allow a 5 to 10-minute warmup time for the transmitter. Adjust the FREQUENCY control for a maximum pulse amplitude on the oscilloscope. The dial indication is the transmitter frequency, within ±5 MHz.

j. Attenuation Loop Indications. The calibration chart supplied with the system test set lists the actual attenuation in db for the system test set cables and the attenuator panel circuits. Total loop attenuation is the sum of the panel and cable attenuation values, plus the setting of the variable attenuator dial.

k. Zero Altitude Tests. When receiver-transmitter tests specify zero altitude, observe the following:

(1) The zero calibration cable shall be used and the receiver-transmitter zero level adjusted, as directed in TM 11-5841-272-35.

(2) The attenuation loop shall be connected between attenuator panel SENS/PWR/RANGE IN connector J1 and PWR RANGE OUT connector J8, and the 40-90 DB-85-135 DB switch shall be set to 40-90 DB. If attenuation greater than 90 db is required, add a 20or 40-db fixed attenuator in series with transmitter cable. The 85-135 DB switch position should not be used since it adds 125 radar feet of delay. If fixed attenuators are not available, use the range simulator circuits. With the RATE CONTROL RANGE/ RATE SELECT switch set to RANGE and the RANGE CONTROL switch to 0, use the T-ZERO DELAY control to return the AN/APN-171A (V) 1 output to zero altitude.

l. Height Indicator Tests. Perform the procedures given below for the height indicator tests.

(1) Connect the ME-202/U to the INDICATOR CONTROLS ALT SIG (-) and GRD (+) jacks. Adjust the INDICATOR CONTROLS ALT SIGNAL control to obtain the altitude range

voltage specified in the height indicator test procedures (TM 11-5841-272-35).

(2) When the height indicator INDICATOR CONTROLS PUSH TO TEST switch is operated, the INDICATOR CONTROLS PUSH TO TEST indicator shall light.

(3) When the height indicator low altitude warning index is set below the height indicator pointer position, the INDICATOR CONTROLS LOW ALT WARNING
indicator light shall light.

(4) Pressing the INDICATOR CONTROLS NO TRACK switch should actuate the no track mask in the height indicator.

2-12. Turn-Off Procedures

a. Turn-Off Procedure for Standby Condition. Set the control-simulation panel MODE CONTROL switch to OFF. This action turns off power to the external test circuits, but maintains operational readiness.

b. Turn-Off Procedure for Shutdown Status. Set the MODE CONTROL switch to OFF. Set the TESTER POWER ON-OFF switch to OFF. Disconnect all cables from the system test set receptacle connectors. Turn the FREQUENCY control fully counterclockwise. Close the cover and secure the latches.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-13. Operation at Low Temperatures

a. The system test set is designed to operate in surrounding temperatures as low as +32° F. Operation at temperatures as low as +20° F. are possible without damage. Operation at lower temperatures is not recommended.

b. For temperatures below +32° F. allow at least 5 minutes of additional time for warmup of the system test set.

2-14. Operation in Desert Climates

a. The system test set case is designed with a dust protective seal to eliminate entrance of dust.

b. Since the system test -set is not absolutely dust proof when used under prolonged and extreme dust conditions, periodically check the components for excessive dust. Refer to paragraph 3-9 for cleaning instructions.

c. Install polyethylene or other protective cover when the system test set is not in use.

d. The system test set is designed to operate in surrounding temperatures up to +131° F. Operation at higher temperatures is not recommended.

e. Shield the system test set from direct sun rays to prevent a temperature rise above the high temperature limits.

2-15. Operation under Tropical Conditions

Check the system test set components daily for the collection of excess moisture. Refer to paragraph 3-9 for cleaning instructions.

CHAPTER 3
ORGANIZATIONAL MAINTENANCE

Section I. GENERAL

3-1. Scope of Organizational Maintenance

The organizational maintenance duties assigned to the operator of the system test set are listed in paragraphs 3-5 through 3-8, together with references to the paragraphs covering specific maintenance functions.

3-2. Test Equipment, Tools, and Materials Required

a. Test Equipment. The following test equipment is required:

(1) Differential Voltmeter ME-202/U.
(2) Multimeter AN/USM-223.
(3) Oscilloscope AN/USM-281.

b. Tools. The tools required for maintenance are contained in Tool Kit, Electronic Equipment TK-105/G.

c. Materials. Trichloroethane is required for cleaning.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-3. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, reduce downtime, and assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 3-5, 3-6, and 3-7 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Maintenance Checks and Services. The preventive maintenance checks and services charts (para 3-5 through 3-8) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining serviceability, the charts indicate what to check and what the normal indications are. The *References* column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by performing the corrective action indicated, a higher category of maintenance or repair is required. Records and reports of these checks and services shall be made in accordance with requirements set forth in TM 38-750.

3-4. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of the system test set are required daily, in accordance with paragraph 3-5; weekly, in accordance with paragraph 3-6; monthly, in accordance with paragraph 3-7; and quarterly, in accordance with paragraph 3-8.

3-5. Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedures	References
1	Cleanliness	Check exterior of equipment for cleanliness. Exterior surfaces should be free of dust, dirt, grease, and fungus.	Para 3-9
2	Controls	Check rotary and toggle switches for proper action. Check control knobs for binding.	Para 3-14

Sequence No.	Item to be inspected	Procedures	References
3	Cables	Check power cord and interconnection cables for cuts, cracks, and breaks.	Para 3-14

3-6. Weekly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedures	References
1	Case and exposed metal surfaces.	Inspect for corrosion and moisture. Clean and/or touch up.	Para 3-9 and 3-11
2	Latches and slip hinges	Check for smoothness of operation _	Fig. 1-1
3	Switches, knobs, connectors,	Check for security and operation fuses, and panel lamp.	Fig. 2-2, para 3-14 and 3-16
4	MONITOR meter	Check for damage and clean meter glass.	Fig. 2-2, para 3-9

3-7. Monthly Preventive Maintenance Checks and Services Chart

Perform the maintenance functions indicated, in the following monthly preventive maintenance checks and services chart once each month. Periodic daily (para 3-5) and weekly (para 3-6) services constitute a part of the monthly checks. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval shall be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition shall have monthly preventive maintenance checks and services. Equipment in limited storage (required service before operation) does not require monthly preventive maintenance.

Sequence No.	Item to be inspected	Procedures	References
1	Cables	Check for cuts, cracks, or breaks	Para 3-14
2	Control knobs	Check tightness of control knobs. Check for chipped or broken knobs.	Para 3-14
3	Toggle and rotary switches	Check tightness of mounting hardware and action of switches.	Para 3-14
4	Connectors	Check for evidence of broken, bent, or corroded terminals.	Para 3-14
5	Indicator lights	Check indicator lights for tightness and signs of blackening.	Para 3-16
6	Modifications	Check DA Pam 310-7 to determine if new applicable MWO have been published. All urgent MWO shall be applied immediately. All normal MWO shall be scheduled.	DA Pam 310-7

3-8. Quarterly Preventive Maintenance Checks and Services Chart

Quarterly preventive maintenance checks and services of the system test set are required. Periodic daily, weekly, and monthly services constitute a part of the quarterly preventive maintenance checks and services and shall be performed concurrently. All deficiencies or shortcomings shall be recorded in accordance with the requirements of TM 38-750. Perform all the checks and services listed in the following quarterly preventive maintenance checks and services chart in the sequence listed. Adjustment of the maintenance interval shall be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition shall have quarterly preventive maintenance checks and services. Equipment in limited storage (requires service before operation) does not require quarterly preventive maintenance.

Sequence No.	Item to be inspected	Procedures	References
1	Publications	Check to see that all publications are complete, serviceable, and current.	DA Pam 310-4
2	Modifications	Check DA Pam 310-7 to determine whether new applicable MWO have been published. All urgent MWO shall be applied immediately. All normal MWO shall be scheduled.	TM 38-750 and DA Pam 310-7
3	Spare parts	Check all spare parts for general condition and method of storage. No overstock should be evident, and all shortages shall be on valid requisitions.	Para 1-6
4	Indicator controls and lights	With the system test set connected to the 115- and 28-volt power sources (fig. 2-3), connect a jumper wire between pins E and S of INDICATOR POWER connector J3. Connect a second jumper wire between pin A and pins N and P. Set the control-simulation panel TESTER POWER ON-OFF switch to ON and MODE CONTROL switch to IND. The INDICATOR POWER POWER ON, INDICATOR POWER AUX IND, and INDICATOR CONTROLS LOW ALT WARNING indicators shall light. Press the INDICATOR CONTROLS NO TRACK switch. The voltage indication shall disappear and INDICATOR CONTROLS LOW ALT WARNING indicator shall extinguish. Press the INDICATOR CONTROLS PUSH TO TEST indicator. The PUSH TO TEST indicator shall light. Connect a jumper between connector J3 pins H and E. Set the MODE CONTROL switch to IND & XCVR. The TRACK and INDICATOR CONTROLS LOW ALT WARNING indicators shall light. Remove the jumpers.	Para 3-13, item 1
5	Altitude signal output	Connect the ME-202/U between INDICATOR CONTROLS ALT SIG (-) and GRD (+) jacks. Turn the INDICATOR CONTROLS ALT SIGNAL control from counterclockwise to fully clockwise. Voltage shall vary from 0.0 +0.2 volt dc to 40.0 ±0.8 volts dc.	Para 3-13, item 2
6	Manual slew circuit	Connect the ME-202/U to TEST tip jack 6 and SYSTEM tip jack T (signal ground). Set the MANUAL SLEW ON-OFF switch to ON. Turn the MANUAL SLEW AMPLITUDE control fully counterclockwise; then, fully clockwise. Voltage shall vary from -2 to - 15 volts de.	Para 3-13, item 3
7	MONITOR meter	Connect a jumper wire between TEST tip jack 10 and INDICATOR CONTROLS -50V tip jack.	Para 3-13, item 4

Sequence No.	Item to be inspected	Procedures	References
		Connect a second jumper between TEST tip jack 13 and SYSTEM tip jack T (signal ground). Connect the ME-202/U to TEST tip jacks 10 (-) and 14 (+). Set the MONITOR switch to -50V(X20). Voltage indication on MONITOR meter shall be within ± 2 volts of ME-202/U indication.	
8	RANGE & RATE SIMULATION panel.	Set controls to following positions: ***Control*** ***Position*** MODE CONTROL XCVR/MODULE TESTER POWER ON-OFF. ON RATE CONTROL RANGE/RATE SELECT. RANGE VIDEO POS-NEG POS RANGE CONTROL 0 Oscilloscope horizontal. 10 to 200 nanosec/cm, as required. Oscilloscope vertical. 2 volts/cm	
	a. T-zero signal	Connect VIDEO SYNC connector J1 to oscilloscope external trigger input, and connect T-ZERO TEST connector J4 to channel A input, using the radio frequency cable. Connect T-ZERO SYNC connector J2 to channel B. Vary the T-ZERO AMPLITUDE control through its range. Amplitude of T-zero pulse shall vary from 0 to a minimum of +5 volts. With amplitude set to +5 volts, T-zero pulse shall be at least 20 nanoseconds in width, with 15 nanoseconds maximum risetime, when measured with +5-volt amplitude. Set T-ZERO DELAY control fully counterclockwise, and note position of corresponding points of pulse on channel A with respect to pulse on channel B of oscilloscope; this shall be 180 nanoseconds minimum (220 nanoseconds nominal). Set T-ZERO DELAY control fully clockwise, and note position of pulse on channel A with respect to pulse on channel B of oscilloscope; this shall be 550 nanoseconds minimum to right (delayed) of T-zero pulse. Set T-ZERO AMPLITUDE control fully clockwise, then counterclockwise; pulse on oscilloscope shall vary from 5 to 0 volts. Return T-ZERO AMPLITUDE control to midposition. If results are not correct, check for presence of a pulse at T-ZERO SYNC connector J2.	Para 3-13, item 5

Sequence No.	Item to be inspected	Procedures	References
	b. Video pulse (positive)	Connect oscilloscope trigger input to T-ZERO SYNC connector J2. Connect channel A to VIDEO TEST connector J3. Set VIDEO AMPLITUDE control fully clockwise. Video pulse shall have 15- to 35-nanosecond risetime and 20-nanosecond minimum width. Amplitude shall be at least + 5 volts.	Para 3-13, item 5
	c. Video pulse (negative)	Set VIDEO POS-NEG switch to NEG. Pulse amplitude shall be at least -5 volts, with width and risetime as in sequence number 8b. Return switch to POS.	Para 3-13, item 5
	d. Video sync pulse	Observe video sync pulse on oscilloscope channel B. Pulse width shall be approximately 50 nanoseconds with 10-kHz pulse repetition frequency.	Para 3-13, item 5
	e. Range signal	With other switch positions remaining the same, set RANGE CONTROL switch to each of its positions: from 100 to 5000. Pulse shall increase in delay for each step.	Para 3-13, item 5
	f. Rate signal	With other switch positions remaining the same, set RATE CONTROL RANGE/RATE SELECT switch to 0-1000, and RATE CONTROLS FPS dial to 500. Set RATE CONTROLS IN BOUND-HOLD-OUT BOUND switch to OUT BOUND. Pulses shall travel to the right on oscilloscope. At IN BOUND, pulses shall return to the left.	Para 3-13, item 5
	g. TX pulse	Connect calibration cable to CAL connector J5. Connect oscilloscope A input to pin 4 of cable plug with an X1 probe and ground probe to shield of pin 4. The T, pulse amplitude shall be at least +5 volts, width shall be at least 400 nanoseconds, e and risetime shall be less than 100 nanoseconds.	Para 3-13, item 5
9	AUTO-NARROW PWC SWITCH.	Set PWC AUTO-NARROW switch to NARROW. Continuity shall exist between pin 1 of CAL connector J5 and ground. With switch at AUTO, no continuity shall exist.	Para 3-13, item 6

3-9. Cleaning

Inspect the exteriors of the equipment. The exterior surfaces should be free of dust, dirt, tease, and fungus. If necessary, clean equipment as follows:

a. Remove dust and loose dirt with a clean, soft cloth.

WARNING

The fumes of trichlorothane are toxic. Provide thorough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable, but exposure of fumes to an open flame converts fumes to highly toxic, dangerous gases.

b. Remove grease, fungus, and ground-in dirt from the cases with trichloroethane.

c. Remove dust and dirt from plugs and jacks with a brush.

d. Clean the front panels, meters, and control

knobs with a soft, clean cloth. If dirt is difficult to remove, dampen the cloth with water. Mild soap may be used for more effective cleaning.

3-10. Lubrication

There are no lubrication requirements for the system test set.

3-11. Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of enamel on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB 746-10.

Section III. TROUBLESHOOTING

3-12. General

The troubleshooting chart is based on the checks contained in the quarterly preventive maintenance checks and services chart (para 3-8). To troubleshoot the equipment, perform all the checks given in paragraph 3-8. Proceed through the checks until an abnormal condition or result is observed. When an abnormal condition or result is observed, refer to the troubleshooting chart for symptoms and corrective action. If the corrective measures listed in the troubleshooting chart do not result in correction of the trouble, higher category maintenance is required.

3-13. Troubleshooting Chart

Sequence No.	Item to be inspected	Procedures	References
1	Indicator lights do not light	a. Burned out lamp ---------- b. Faulty switch or monitor circuits.	a. Install new lamps (para 3-16). b. Return system test set to higher category maintenance.
2	Altitude signal out of limits	Faulty control circuits, or defective -50 volt power supply.	Return system test set to higher category maintenance.
3	Manual slew voltage not oh	Faulty circuit card	Return system test set to higher cate-tained. gory maintenance.
4	Incorrect voltage indication	Faulty meter, or meter resistor card	Return system test set to higher category maintenance.
5	Pulses not obtained	Faulty circuit cards in range-rate simulator.	Return system test set to higher category maintenance.
6	No continuity	Faulty switch	Return system test set to higher category maintenance.

3-14. Repairs

a. Connector Contacts.

(1) Reposition the connector contacts that are bent to provide good contact for the mating contacts.

(2) Straighten the cable connector contacts that do not align properly with the mating connector contacts.

b. Control Knobs.

(1) Reposition knobs that have become loose on the control shaft and tighten the setscrew.

(2) Install a new setscrew, of the correct size, in knobs where a setscrew may have fallen out,

(3) Replace missing or broken knobs. Replace knobs if threads are stripped.

c. Cables. Cables repair is limited to repair of damaged insulation and straightening of connector pins. Repair breaks in insulation by first covering them with rubber tape, and then with friction tape. Replace cables with broken wires or connector pins.

3-15. Removal

Removal from the system test set of components other than control knobs, lamps, and fuses is not authorized at the organizational category of maintenance.

3-16. Replacement

a. Panel Lamp.

(1) Use Panel Lamp MS25252NE2D, a complete lamp and lens unit, for replacement.

(2) Unscrew the faulty lamp and replace it with a new lamp.

b. Fuse.

(1) Press in on the fuseholder cap and rotate it counterclockwise to unlock it.

(2) Pull the fuseholder cap and fuse out of the fuseholder.

(3) Remove the defective fuse from the fuseholder cap.

(4) Replace the defective fuse with a new one with the same rating.

(5) Insert the fuse and fuseholder cap in the fuseholder. Push in on the fuseholder cap and rotate it clockwise to lock it.

3-17. Adjustments

No adjustments to components of the system test set are required at the organizational category of maintenance.

3-18. Fuses

Unit	Panel designation or circuit	Fuse	Fuse rating		Figure No.
			Amp	Volts	
CONTROL and SIMULATION panel.	115V 400 CPS 1 $^{1}/_{2}$ A	MS90078-25-1	1 $^{1}/_{2}$	115	2-2
CONTROL and SIMULATION panel.	28 VDC 1/2 A	MS90078-22-1	1/2	115	2-2
RANGE and RATE SIMULATION panel.	115V 400 CPS 3/8A	MS90078-21-1	1/2	115	2-2

CHAPTER 4

SHIPMENT AND LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

4-1. Disassembly of Equipment

a. If the system test set is rack-mounted, remove the unit from the rack and mount it in the test set case.

b. Stow all cables and accessories under the lid of the system test set cover (fig. 1-1 and 1-2).

c. Align the hinge pins on the cover with the hinges on the test set case. Slide the hinge pins into the hinges until they are completely seated. Check to see that the cover sealing surfaces match when the cover is closed.

d. Close the case cover and secure the latches.

4-2. Storage

The test set case on the system test set provides adequate protection for normal storage conditions. Install the test set case cover and secure the latch fasteners. Use ordinary care in handling the system test set to avoid damage. No special procedures are required for storage.

4-3. Repackaging of Equipment

Repackaging of equipment for shipment or limited storage normally is performed at a packaging facility, or by a repackaging team. If emergency packaging is required, select the materials from those listed in SB 38-100. Package the equipment in accordance with the original packaging, in so far as possible, with the available materials (para 2-1).

Section II. DEMOLITION TO PREVENT ENEMY USE

4-4. Authority for Demolition

Demolition of the equipment will be accomplished only upon the order of the commander. Use the destruction procedures outlined in paragraph 4-5 to prevent further use of the equipment.

4-5. Methods of Destruction

The tactical situation and time available will determine the method to be used when destruction of equipment is ordered. In most cases, it is preferable to completely demolish some portions of the equipment rather than to partially destroy all the equipment components.

a. Smash. Smash the system test set components; use sledges, axes, hammers, crowbars, or any other heavy tools available.

b. Cut. Cut the cable assemblies and equipment internal wiring; use axes, handaxes, machetes, and similar tools.

c. Burn. Burn as much of the equipment as is flammable; use gasoline, oil, flamethrowers, and similar flammables. Burn the technical manual first. Pour gasoline on the cut cables and internal wiring and ignite it.

WARNING

Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.

d. Explode. Use explosives to complete demolition or to cause maximum damage, before burning, when time does not permit complete demolition by other means. Powder charges, fragmentation grenades, or incendiary grenades may be used. Incendiary grenades usually are most effective.

e. Dispose. Bury or scatter destroyed parts or throw them into nearby waterways. This is particularly important if a number of parts have not been completely destroyed.

4-6. Report of Destruction

Destruction of equipment shall be reported through command channels.

APPENDIX A

REFERENCES

The following publications contain information applicable to the operation and maintenance of the system test set.

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U.S. Army Equipment Index of Modification Work Orders.
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies, and Equipment Used by the Army.
TB 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 9-6625-2362-12	Operator's Manual: Oscilloscope AN/USM-281.
TM 38-750	Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 11-5841-272-35	DS, GS, and Depot Maintenance Manual: Altimeter Set, Electronic AN/APN-171A (V) 1.
TM 11-6625-537-15	Operator, Organizational, Field and Depot Maintenance Manual: Differential Voltmeter ME-202/U.

APPENDIX B

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature for the AN/APM-323. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

b. Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc. This is accomplished with external test equipment and does not include operation of the equipment and operator type tests using internal meters of indicating devices.

c. Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

d. Adjust. To rectify to the extent necessary to bring into proper operating range.

e. Align. To adjust two or more components or assemblies of an electrical or mechanical system so that their functions are properly synchronized. This does not include setting the frequency control knob of radio receivers or transmitters to the desired frequency.

f. Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

g. Install. To set up for use in an operational environment such as an encampment, site, or vehicle.

h. Replace. To replace unserviceable items with serviceable like items.

i. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

j. Overhaul. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

k. Rebuild. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

l. Symbols. The uppercase letter placed in the appropriate column indicates the lowest level at

which that particular maintenance function is to be performed.

B-3. Explanation of Format

a. Column 1, Group Number. Not applicable.

b. Column 2, Functional Group. Column 2 lists the noun names of components, assemblies, subassemblies and modules on which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories. The codes used represent the various maintenance categories as follows:

Code	***Maintenance category***
C	Operator/Crew
O	Organizational Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

d. Column 4, Tools and Test Equipment. Column 4 specifies, by code, those tools and test equipment required to perform the designated function. The numbers appearing in this column refer to specific tools and test equipment which are identified in table I.

e. Column 5, Remarks. Self-explanatory.

B-4. Explanation of Format of Table I, Tool and Test Equipment Requirements

The columns in table I, Tool and Test Equipment Requirements are as follows:

a. Tools and Equipment. The numbers in this column coincide with the numbers used in the tools and equipment column of the Maintenance Allocation Chart. The numbers indicate the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. Federal Stock Number. This column lists the Federal stock number of the specific tool or test equipment.

e. Tool Number. Not used.

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
1	TEST SET, RADAR ALTIMETER SYSTEM AN/APM-323	O	O	O			H D	H	H	D	D		1, 4, 5 1 thru 8, 10 3, 11 thru 25 7 1 thru 35	Visual; fuses, knobs, cables Voltage, continuity, waveforms 1A1 and 1A2 panels (Note 1) 1A3 panel (Note 1) Panels
1A1	RANGE AND RATE SIMULATION PANEL SM-566/APM-323	O	H				H			H	D		3, 4, 5, 6, 10 2, 3, 6, 7, 10 7 1 thru 10, 26, 27, 28	Visual
1A1A1	COUNTER CIRCUIT CARD ASSEMBLY		H						H	D			5, 10 7 5, 10, 26, 27, 28	Logic check Card
1A1A2	MEMORY AND RANGE GATING CARD ASSEMBLY		H						H	D			5, 10 7 5, 10, 26, 27, 28	Card
1A1A3	DIODE MATRIX CIRCUIT CARD ASSEMBLY		H						H	D			4 7 26, 27, 28	Card
1A1A4	RATE TARGET GENERATOR CIRCUIT CARD ASSEMBLY		H	H	H				H	D			2, 3, 6, 10 2, 4 7 5, 10, 26, 27, 28	Card
1A1A5	RANGE INTEGRATOR CIRCUIT CARD ASSEMBLY		H		H		H		H	D			2, 3, 6, 10 7 4, 5, 6, 7, 26, 27, 28	Card
1A1A6	POWER SUPPLY ASSEMBLY		H		H				H				2, 7 **7**	**Black box**

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	AN/APM-323 (continued)													
1A1A7	POWER SUPPLY, DUAL OUTPUT, ASSEMBLY		H		H								2, 7	
									H				7	Black box
1A1Y1	OSCILLATOR ASSEMBLY (5 MHZ)		H										3, 7	
									H				7	Assembly
1A1Y2	OSCILLATOR ASSEMBLY (10 KHZ)		H										3, 7	
									H				7	Assembly
1A2	CONTROL AND SIMULATION PANEL C-8396/APM-323	O												Visual
			O										1, 5	
								H					1, 2, 5, 8	Power supply & voltmeter (Note 1)
										H			7	Replace defective assembly
											D		1 thru 10, 26, 27, 28	
1A2Al1	MANUAL SLEW CIRCUIT CARD ASSEMBLY		H										2	
										H			7	Card
											D		1, 2, 4, 5, 7	
1A2A2	METER RESISTOR CIRCUIT CARD ASSEMBLY		H										9	
										H		7		Card
											H		7, 9	
1A2A3	POWER SUPPLY SUBASSEMBLY	H	H		H								2, 4, 7	
							H						2, 7	
								H					7	Black box
1A2M2	MONITOR VOLTMETER		H										2, 8	
							H						2, 8	
													7	

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY NONMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	AN/APM-323 (continued)													
1A3	ATTENUATOR PANEL CN-1313/APM-323	O	H				D		H	D	D		4 3, 11 thru 25, 30 thru 34 7 3, 11 thru 25, 30 thru 34	Visual (Note 1)
1W1	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL BRANCHED CX-12203/APM-323	O	H							H			4, 7	
1W2, 3	CABLE ASSEMBLY, RADIO FREQUENIY CG-3599/U	O	H						O				4	
1W4	CABLE ASSEMBLY, RADIO FREQUENCY CG-3598/U	O	H						O	H			4, 7	
1W5	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-12204/APM-323	O	H						O	H			4, 7	
1W6	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-12205/APM-323	O	H						O	H			4, 7	
1W7	CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-12206/APM-323	O	H						O	H			4, 7	
1W8	CABLE ASSEMBLY, RADIO FREQUENCY CG-3600/U	O	H						O	H			4, 7	
1W9	CABLE ASSEMBLY, RADIO FREQUENCY CG-3601/U	O	H						O				4, 7	
1W10	CABLE ASSEMBLY, RADIO FREQUENCY CG-3602/U	O	H						O	H			4, 7	
1W11	CABLE ASSEMBLY, RADIO FREQUENCY CG-3603/U	O							O	D			4, 7, 11 4, 7, 11	

SECTION II. MAINTENANCE ALLOCATION CHART

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY NOMENCLATURE	(3) MAINTENANCE FUNCTIONS											(4) TOOLS AND EQUIPMENT	(5) REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	AN/APM-323 (continued)													
1W12	COAXIAL JUMPER CG-3636/U	O	H										4	
1U3	WRENCH	O												
	Note 1: Every 12 months, or after repairs.													

TABLE I. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL AND TEST EQUIPMENT REQUIREMENTS				
TOOLS AND EQUIPMENT	**MAINTENANCE CATEGORY**	**NOMENCLATURE**	**FEDERAL STOCK NUMBER**	**TOOL NUMBER**
		AN/APM-323 (continued)		
1	O, H, D	VOLTMETER, ELECTRONIC ME-202/U	6625-050-8686	
2	H, D	VOLTMETER, DIGITAL AN/GSM-64	6625-870-2264	
3	H, D	COUNTER, FREQUENCY AN/USM-207	6625-911-6368	
4	O, H, D	MULTIMETER AN/USM-223	6625-999-7465	
5	O, H, D	OSCILLOSCOPE AN/USM-281	6625-053-3112	
6	H, D	GENERATOR, SIGNAL SG-321/U	6625-880-5791	
7	H, D	TOOL KIT, ELECTRONIC REPAIRMAN TK-100/G	5180-605-0079	
8	H, D	METER TESTER TS-656/U	6625-348-0666	
9	H, D	RESISTANCE BRIDGE ZM-4/U	6625-166-0398	
10	H, D	ELECTRONIC TIME INTERVAL METER 796, ELDORADO ELECTRONICS		
11	D	MEASURING SET, SWR AN/USM-37A	6625-814-8357	
12	D	COMPARATOR, FREQUENCY CM-77/USM	6625-788-3780	
13	D	ATTENUATOR, CALIBRATOR BA-5, WEINSCHEL ENGINEERING CO.		
14	D	BARRETER MOUNT 926, WEINSCHEL ENGINEERING CO.		
15	D	DIRECTIONAL COUPLER 3004-20 or 3044-20, NARDA MICROWAVE CO.		
16	D	FIXED ATTENUATOR 210-20, WEINSCHEL ENGINEERING CO.		
17	D	ADAPTER 78800, 78825, 79825, 79850, AMPHENO-BEBG		
18	D	POWER SUPPLY MODULATOR MO-3, WEINSCHEL ENGINEERING CO.		
19	D	RADIO FREQUENCY AMPLIFIER 493, HEWLETT-PACKARD CO. 6625-615-6602 I		
20	D	RADIO FREQUENCY SOURCE MS-10, WEINSCHEL ENGINEERING CO.		
21	D	RADIO FREQUENCY TUNER DS109, WEINSCHEL ENGINEERING CO.		

TOOL AND TEST EQUIPMENT REQUIREMENTS				
TOOLS AND EQUIPMENT	**MAINTENANCE CATEGORY**	**NOMENCLATURE**	**FEDERAL STOCK NUMBER**	**TOOL NUMBER**
		AN/APM-323 (continued)		
22	D	VARIABLE ATTENUATOR 794, NARDA MICROWAVE CORP. b		
23	D	ISOLATOR 1212, PRD ELECTRONICS, INC.		
24	D	BARRETER 943, WEINSCHEL ENGINEERING CO.		
25	D	TERMINATION 535MN, WEINSCHEL ENGINEERING CO.		
26	D	CARD TEST STATION UG1984-F200, HONEYWELL INC.		
27	D	VOLTMETER, DIGITAL X-1, NON LINER SYSTEMS INC.		
28	D	AC/DC OHMS CONVERTER 1109, NON LINER SYSTEMS INC.		
29	D	CONNECTOR UG-21E/U		
30	D	COXIAL LEAD RG-214/U		
31	D	ADAPTER UG-57B/U		
32	D	ADAPTER UG-29A/U		
33	D	ADAPTER UG-27C/U		
34	D	ADAPTER CABLES BNC-C-30, POMONA Co.		
35	D	WATTMETER AN/URM-98	6625-566-4990	

GLOSSARY

The unusual terms used in this manual are explained below.

A

AGC-Automatic gain control.

D

DBM-Power level references to 1 milliwatt.

T

T_x -Transmitted range (simulated) pulse.
T-ZERO-Time zero of pulse transmission.
T-ZERO SYNC PULSE-Oscilloscope synchronizing pulse.

V

VIDEO SYCN PULSE-Oscilloscope synchronizing pulse for range and power measurements.

By Order of the Secretary of the Army:

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