TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS

TEST SET,

RADIO

AN USM-306 V 1

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY

MAY 1971

WARNING

Be careful when working on the 155V 230V ac line connections and circuits. Serious injury or death may result from contact with these terminals, or between these terminals and earth ground.

DON'T TAKE CHANCES!
EXTREMELY DANGEROUS VOLTAGES
EXIST IN THE FOLLOWING UNIT OF
TEST SET AN/USM-306(V)1:

ANALYZER, SPECTRUM IP-1018U-2600 VOLTS

WARNING

Be careful when working on the 155V/230V ac line connections and circuits.
Serious injury or death may result from contact with these terminals, or between these terminals and earth ground.

DON'T TAKE CHANCES!
EXTREMELY DANGEROUS VOLTAGES
EXIST IN THE FOLLOWING UNIT OF
TEST SET AN/USM-3064V)I:
ANALYZER, SPECTRUM IP-1018/U-2600 VOLTS

Prevent personal injury when applying or removing steel strapping by wearing heavy gloves and protective eyewear. Do not handle packing cartons by the steel strapping.

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

TECHNICAL MANUAL
No. 11-662.-1748-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 17 *May 1971*

Operator and Organizational Maintenance Manual
Including Repair Parts and Special Tools Lists
TEST SET, RADIO AN/USM-306(V)1

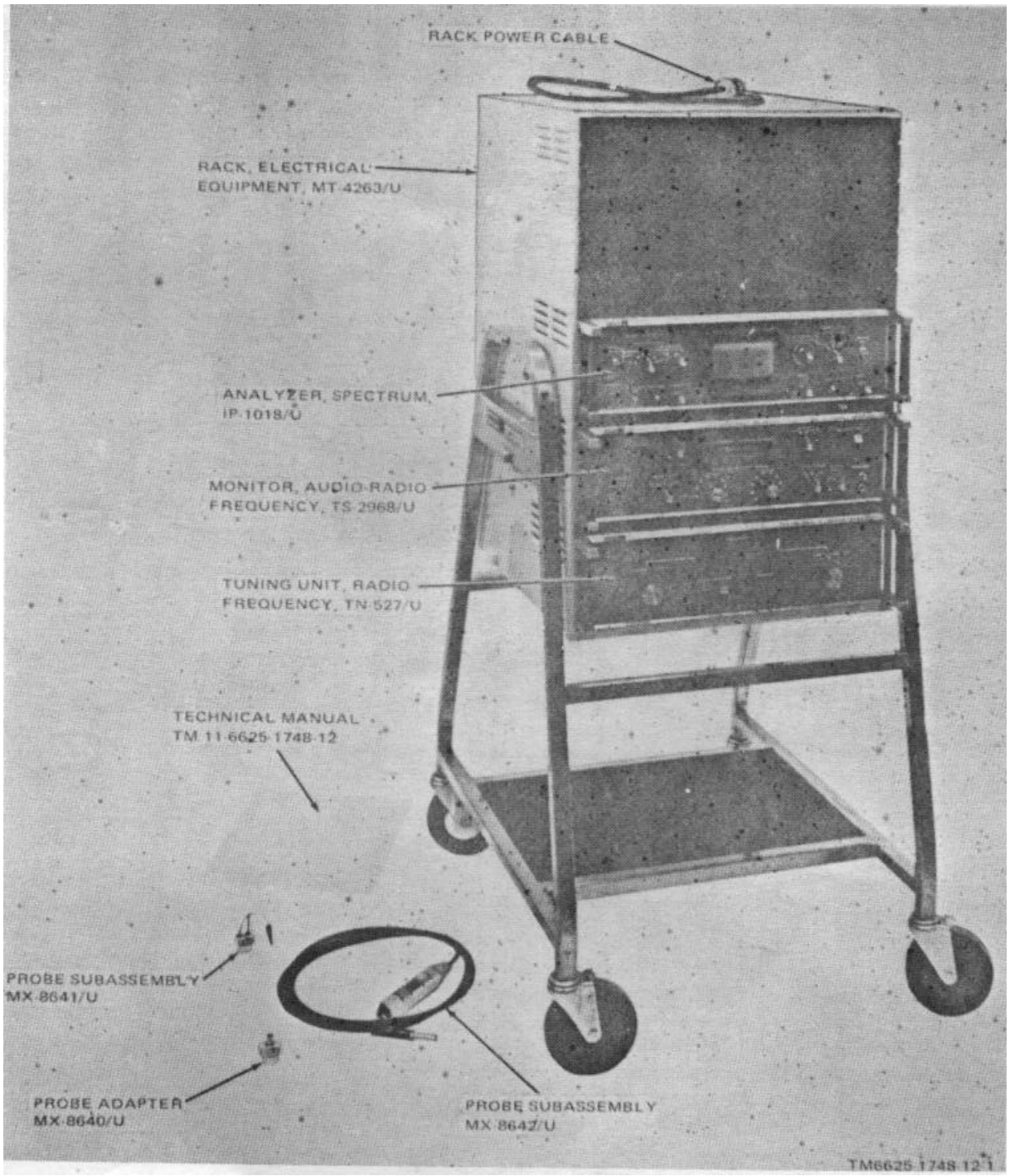


Figure 1-1. Test Set, Radio AN/USM-306(V)1.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope
This manual describes Test Set, Radio AN/USM-306(V)1 (fig. 1-1) which is a transmission measuring system, and provides instructions for installation, operation, and operator and organizational maintenance. It includes instructions for cleaning and inspection of equipment. and replacement of parts available to the operator and organizational repairman.

NOTE

Throughout this manual where reference is made to figures 1-2, 1-3, 1-4 and 1-5 the appropriate added figures 1-2.1, 1-3.1, 1-4.1 and 1-5.1 also apply. Figures 1-2 through 1-5 pertain to test units procured on Contract No. DAAB05-69-C-0767 whereas figures 1-2.1 through 1-5.1 pertain to test units procured on Contract No. DAAB07-78-C-3013 which include Serial Numbers (S/N) 1C through 53C.

1-2. Indexes of Publications
a. DA Pam 310-4. Refer to 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's) pertaining to the equipment. DA Pam 310-7 lists all authorized Department of the Army modification work orders, identifying the type, model, series and Federal stock number of the item to be modified; number, date and classification of the MWO; category of maintenance authorized to perform the modification, and man-hours required to apply the modification to each item.

1-3. Forms and Records
a. Records of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions given in TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/ARF 71-13/MCO P4030.29A, and DLAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (S 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

d. Reporting of Equipment Manual Improvements. 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 Blank Forms) and forward direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth. N.J. 07703.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use
The Test Set, Radio AN/USM-306(V)1, is a transmission measuring system. It combines the functions of a radio frequency tuning unit, audioradio frequency monitor, and a spectrum analyzer unit. It provides a visual display, calibrated both in amplitude and frequency, of the signals present. A bandwidth of 120 kHz, 12 kHz, or 3.6 kHz may be selected for display. Signal frequency and amplitude may be measured from 1 kHz to 33.5 MHz and -109 to + 22 db respectively.

1-5. Technical Characteristics
The technical characteristics of the Test Set, Radio AN/USM-306(V)1, are the individual characteristics of the units which comprise it.

a. Tuning Unit, Radio Frequency TN-527/U.

(1) *Electrical specifications.*

Output frequencies:

Coarse tuning	40.1 to 73.6 MHz
Accuracy	Clock accuracy
Stability	Clock stability
Fine tuning	18.775 to 18.895 MHz
Accuracy	±(10 Hz ± clock accuracy)
Stability	±(2 Hz/°C __clock stability)

Clock Accuracy:
(Referred to output freq. above) ..... ± (Setting accuracy ± stability)
Setting accuracy ..... ± 2 parts in 10^7
Clock stability:
Variation with temperature (+ 15° C to + 40° C) ..... ± 5 parts in 10^9/°C
Aging rate (per week after 30 days). ..... ± 1.5 parts in 10^7
Variation with line voltage (±10% ..... ±7.5 parts in 10^8
Warmup time:
Operational (with clock on standby 3 hr prior)..... 30 min
Clock ..... 3 hours
Standby condition .....Main switch OFF. Line cord plugged in 115V or 230V ac outlet.
Frequency readout:
Indicated Readout Frequency Range:
Locked mode ..... 0 to 33500 kHz
Minimum reading Increment ..... 10 Hz
Continuous mode ..... 0 to 33.5 MHz
Minimum reading Increment ..... 0.1 MHz
Temperature range ..... 15° C to 40° C
Output level (rear panel jacks):
Coarse tuning output.
TN-527/U ..... 125 mv rums ± 10 mv
(J7-40/72 MHz output) ..... @ 1.0 MHz
Variation over the frequency range ..... 40 mv maximum
Fine tuning output:
TN -527/U
(J8-18.8 MHz output) ..... 200 to 250 mv
Model 360B (J11-18.8 MHz output) ..... 90 mv rms ± 20 mv
Load impedance ..... 50 ohms
19.0 M Hz output:
TN-527/U (J6-19.0 MHz output) ..... 34 mv rms ± 3 mv
Load impedance ..... 50 ohms
input power:
Voltage ..... 115V or 230V ac ± 10%
Frequency ..... 47/63 Hz
Volt-amperes ..... 110 VA

(2) *Mechanical specifications.*

Dimensions:
Width ..... 19 inches
Height ..... 5 1/4 inches
Depth (behind panel) handles protrude 2 1/8 inches) ..... 17 inches
Weight ..... 30 pounds

b. Monitor, Audio-Radio Frequency TS-2968/1U. These characteristics apply only when the audioradio frequency monitor is used with Tuning Unit, Radio Frequency TN-527/U.

(1) *Electrical specifications.*

Frequency:
Range ..... 1 kHz to 33.5 MHz
Coarse tuning (Phase locked 100 kHz steps) ..... 0 to 33.5 MHz
Continuously tuned ..... 0 to 32 MHz
Accuracy of readout (referenced to tuned frequency ..... ± (a ± b ± c)
Typically ..... ± 60 Hz ± 1 count
(a) Filter center freq. tolerance ..... ± 50 Hz
(b) Counter uncertainty ..... ± 10 Hz = ± 1 count
(c) Clock accuracy ..... ± (d ± e)
(d) Setting accuracy ..... ± 10.40 + 2 parts in 10=) Hz
(e) Stability ..... ± (f ± g ± h)
(f) Variation with temperature (15°C to 40°C) ..... ± (0.25 + 1.25 parts in 10^7) Hz
(g) Variation with line voltage (± 10⁄) ..... ± (0.15 + 0.75 parts in 10%^{7}) Hz
(h) Aging (per week after 30 days) ..... ± (0.30 + 15 parts in 10^7) Hz
Stability (referenced to tuned frequency) ..... ± (x ± y)
(x) Fine tuning system stability (15° C to 40° C) ..... ± 50 Hz
(y) Clock stability ..... Section e
Level:
Measurement range .....-109 to + 22 dbm (-89 to +22 dbm full scale) (Effective on Contract No. DAAB05-69-C-0767) - 89 to + 22 dbm full scale. (Typically useable to -109 dbm in High Sensitivity Mode.) (Effective on Contract No. DAAB07-78-C-3013.)
Normal (low sensitivity) (1 kHz to 33.5 MHz) ..... -89 to +22 dbm
High sensitivity (60 kHz to 33.5 MHz) (20 db gain increase ..... -109 to + 2 dbm
Meter range (relative to input level indicator)
Normal scale ..... -25 db to + 2 db
Expanded scale ..... -2 db to +2 db 0.1 db per division)
Measurement accuracy at reference CA L freq. of 1 M Hz and 0 dbm ..... ± 0.2 db
Frequency response. fine tuning (entire range) ..... +0.1 db
Frequency response.

coarse tuning:
Normal sensitivity range:
1 kHz to 10 kHz ..... ± 0.7 db
10 kHz to 22 MHz. ..... ± 0.3 db
22 MHz to 32 MHz ..... ± 0.7 db
32 MHz to 33.5 MHz ..... ± 1.5 db
High sensitivity range:
60 kHz to 22 M Hz. ..... ± 0.3 db
22 MHz to 33.5 MHz ..... ± 1.7 db
Attenuator accuracy:
10 db per step attenuator:
1 kHz to 22 MHz ..... ± 0.2 db
1 kHz to 33.5 MHz ..... ± 0.3 db
1 db per step attenuator:
1 kHz to 33.5 MHz ..... ± 0.1 db
Input impedance:
Impedance ..... 75 ohms, unbalanced
Return loss:
Max. CW attenuator Position ..... 26 db minimum
Other attenuator Position ..... 30 db minimum
Connector type:
Normal ..... WE477B on panel
Optional ..... WE477B on rear of chassis
Other impedances ..... With probe accessories
Selectivity:
Wideband crystal filter:
3 db points ..... 3.1 ± 0.2 kHz
60 db points ..... 8.0 + (0.5-1.0) kHz
Narrow crystal filter:
3 db points ..... 250 ± 50 Hz
60 db points ..... 1000 ± 100 Hz
Spurious responses:
Image frequency rejection:
Tuned f 22 MHz (80 to 102 M Hz) ..... 70 db minimum
Tuned f 22 MHz (102 to 112 M Hz ..... 60 db minimum
I F rejection ..... 75 db minimum
Residual distortion attenuation (high sensitivity):
Input f 60 kHz ..... 55 db minimum
Input f 60 to 200 kHz ..... 65 db minimum
Input f 200 kHz to 1 MHz ..... 70 db minimum
Input f 1 MHz to 33.5 M Hz ..... 75 db minimum
Outputs:
Audio:
Detection:
Amplitude modulation ..... AM detector
Single sideband ..... Carrier reinsertion
Sensitivity:
Normal ..... Same as meter selectivity
Optional ..... Wide band. Independent of meter selectivity.
Output ..... Phones (600 ohms minimum impedance)
Connector ..... Dual telephone jack
Level recorder:
Output current ..... 0 to 200µa thru load impedance
Load impedance ..... 1200 ohms maximum
Connector ..... Single telephone jack
Analyzer. Spectrum IP-1018/U:
Frequency ..... 21.11 to 20.99 MHz
Impedance ..... 50 ohms
Connector ..... BNC female
Temperature range ..... 15° C to 40° C
Input power:
Voltage ..... 115V or 230 Vac ± 10%;
Frequency ..... 47 to 63 Hz
Volt-amperes ..... 25 VA

(2) *Mechanical Specifications:*

Dimensions:
Width ..... 19 inches
Height ..... 5 1/4 inches
Depth (behind panel) (handles protrude 2 1/8 inches) ..... 15 3/4 inches
Weight ..... 22 pounds

c. Analyzer, Spectrum IP-1018/U.

(1) *Electrical Specifications:*

Frequency coverage ..... Same as that of the companion AF-RF monitor.
Sweep width ..... 120 kHz. 12 kHz. and 3.6 kHz (fired, switch selected).
Dynamic range (display unit only):
Total ..... Same as that of the companion AF-RF monitor.
Linear ..... 60 db (Operates satisfactorily with signals present at the input which are 60 db above the baseline of the cathode ray tube display.)
Simultaneous display ..... 25 db
Frequency accuracy:
120 kHz sweep width (10 kHz/Div) ..... ± 1 kHz (visual limitation)
12 kHz (1 kHz/Div) and 3.6 kHz (0.3 kHz/Div) sweep widths ..... ± 200 Hz (dependent on accuracy of monitor's fine tuning oscillator).

Frequency resolution:
120 kHz sweep width ..... Resolves signals separated by 1500 Hz to 60 db down.

12 kHz and 3.6 kHz sweep widths ..... Resolves signals separated by 60 Hz to 40 db down.
Frequency stability:
(Display unit only over the operating temperature range):
120 kHz sweep width ..... ± 2500 Hz
12 kHz and 3.6 kHz sweep widths ..... ± 250 Hz
Tuning accuracy:
(With use of marker):
120 kHz sweep width ..... ± 1000 Hz
12 kHz and 3.6 kHz sweep widths ..... ± 35 Hz
Amplitude response:
Display unit only) flatness and level stability at 0 db ..... ± 0.5 db
Range ..... 25 db logarithmic (linear db scale) + 5 db to - 20 db referenced to monitor 0 db reading.
Linearity ..... ±10% of indicated level referenced to 0 db. 0 to - 20 db.
Residual responses (No signal input) ..... More than 25 db below full amplitude display.
Spurious and intermodulation product- ..... More than 50 db below largest level signal present at the input provided this signal is within the allowable dynamic range of the display unit.
IF Bandwidth (nominal):
120 kHz sweep width ..... 400 Hz at -3 db 2400 Hz at - 60 db.
12 kHz and 3.6 kHz sweep widths ..... 35 Hz at -3 db 180 Hz at -60 db.

Sweep rate (nominal)[2]	*Normal*	*Search*
120 kHz sweep width	3.5 second/ sweep	1 second/sweep
12 kHz and 3.6 kHz sweep widths	10 second/ sweep	3.5 second/ sweep

Attenuator range:
Input attenuator ..... 0 db to 40 db in 20 db steps
Vernier ..... + 5 db to -20 db continuously adjustable, noncalibrated.
Marker Amplitude ..... + 5 db to -20 db continuously adjustable, noncalibrated
Cathode ray tube:
Screen ..... Long persistence P7 phosphor (blue fluorescence, yellow persistence).
Size (nominal) ..... 3 x 5 inches
Input (nominal):
Impedance ..... 50 ohms
IF(21.11 to 20.99 MHz} 50/µa
Incremental oscillator (18.895 to 18.785 MHz) ..... 75 mv BNC female.
Temperature range:
operating ..... + 15° C to + 45° C
Storage ..... -20° C to +60° C
Input power:
Voltage ..... 115V or 230V ac ± 10%
Frequency ..... 47/63 Hz
Volt-amperes ..... 40 VA

(2) *Mechanical specifications:*

Dimensions:
Height ..... 5 1/4 inches
Width ..... 19 inches
Depth ..... 15 inches (from panel).
Weight ..... 23 1/2 pounds

NOTES

[1] Frequency accuracy stated above may be maintained by slight adjustment of horizontal position and sweep cal controls.
[2] Automatically selected by positioning of sweep rate switch.

d. Probe, Subassembly MX-8642/U.

(1) *Electrical specifications.,*

Frequency range ..... 1 kHz to 33.5 MHz
Frequency response:
10 kHz to 22 M Hz ..... ± 0.25 db
1 kHz to 33.5 MHz ..... ± 0.5 db
Circuit impedance ..... 50 ohms and 75 ohms
Probe input impedance:
bridging mode ..... >100.000 ohms in parallel with<10 pF
Bridging loss (50 or 75 Ω Systems ..... 0.05 db may.
Terminating mode:
Return loss (75 Ω systems)..... 30 db min.
VSWR (50 Ω systems) ..... 1.1 max.
Insertion loss ..... 0 ± 0.1 db
Maximum input level:
Signal ..... +2 dbm @ 50 or 75 ohms 0.35 volt rms
Dc voltage ..... 25 volts
Harmonic distortion:
Harmonics (0 dbm input level) ..... >50 db down
Temperature range ..... + < 15 °C to + 40° C
Operating power ..... - 16 volts @ 65 ma

(2) *Mechanical specifications:*

Width-Probe body ..... 1 inch
Height-Probe body ..... 1 5/16 inch
Length- Probe body ..... 6 inches
Weight-Probe body and connecting cable ..... 16 oz
Cable length ..... 8 feet

e. Connector Heads.

Adapter. Probe. MX-8640 U ..... BNC type receptacles (mates with BNC plug such as UG -88/U. or equivalent).
Length ..... 1 inch
Weight ..... 2 oz

Probe. Subassembly, M X -
8641 U .....Pin tip and ground clip lead
Length .....2 1/4 inches
Weight .....2 oz

f. Cabinet (Mechanical Specifications).

Height .....54 1/4 inches
Width .....23 inches
Depth .....34 inches
Weight .....125 pounds

1-6. Deleted.

1-7. Description of Major Units

a. Tuning Unit, Radio Frequency TN-527/U fig. 1-2). The radio frequency tuning unit is an ac operated device required to operate the Audio-Radio Frequency Monitor TS-2968/U and Specifictrum Analyzer IP-1018/U. It provides both signal and power connections for these units. The audio-radio frequency monitor unit can be tuned from 1 kHz to 33.5 MHz in a continuous or locked tuning mode. The tuned frequency is referenced against a 100-kHz signal derived from the 1.0-MHz clock oscillator through a decade divider. Visible and audible indications of frequency locking at each 100-kHz point are provided. The fine tuning control provides continuous incremental tuning between the 100-kHz lock points with approximately 8-kHz overlap at each end of the tuning range. It provides a fixed frequency, 19.0 MHz, coarse tuning, 40.1-73.6 MHz, and fine tuning 18.785-18.885 MHz signals to the monitor. These signals are used as local oscillator frequencies by the monitor. The 18.785-18.885 MHz signals are also furnished to the IP-1018/U spectrum analyzer to provide a visual frequency-reference MARKER.

b. Audio-Radio Frequency Monitor TS-2968/U (Level Meter). The audio-radio frequency monitor provides for signal level measurements in two ranges: normal sensitivity, -89 to +22 db from 1 kHz to 33.5 MHz, and high sensitivity, -109 to +2 db from 60 kHz to 33.5 MHz. An audio detector in the Monitor provides a means for listening to audiofrequency amplitude modulation components of the RF signal under test. Both double-sideband transmitted-carrier and single-sideband suppressed-carrier types of amplitude modulation can be detected. It receives the 19.0 MHz, the 40.1 to 73.6 MHz, and the 18,785 to 18,885 MHz signals from the tuning unit, and uses these signals as local oscillator frequencies to select the frequency to be measured. The monitor also provides a 21.0 to 21.1 MHz IF signal to the IP-1018/U spectrum analyzer unit.

c. Spectrum Analyzer 1018/U ((fig. 1-4). The spectrum analyzer provides a visual display of the signal present in either a 120-kHz, a 12-kHz, or a 3.6-kHz band of the frequency spectrum. These signals are presented on the CRT display calibrated for both signal amplitude and frequency with respect to the audio-radio frequency monitor tuning unit. Signals differing by 60 Hz may be separated to 40 db down. There is a rapid sweep for search mode operation. slower rates for signal resolution, and a single sweep mode for trace photography.

1-8. Description of Minor Assemblies

a. Rack, Electrical Equipment MT-4263/U. The equipment console (fig. 1-1 consists of a steel cabinet, open at the front, with an access door at the rear. Inside the cabinet are slide rails for mounting the modular units of the Test Set, Radio AN/USM-306(V)1. and two ac power receptacles. The rails permit sliding the modular units out of the cabinet for inspection or maintenance. The sides of the cabinet are vented and a small fan is mounted on the access door to insure proper air circulation. The cabinet is suspended on a cart made of chrome-plated steel tubing equipped with four swivel-type casters and soft rubber tires. "he two front casters have foot operated brakes. The cabinet can be tilted up and down through a series of locked positions.

b. Probe. The MX-8642/U active, unbalanced probe subassembly (fig. 1-5), is used to measure low-level signals in the frequency range of 1 kHz to 33.5 MHz. A 0-db insertion loss is obtained when utilized either for bridging or terminating a 50-ohm line. The two switches on the small, hand-held probe provide for selection of either the BRIDGING or TERMINATING functions at either 50-ohm or 75-ohm impedance.

c. Connector. The connector heads for the probe snap-fit in place. This allows for quick change of heads for different test applications.

(1) *Probe Adaptor MX-8640/U.* This head is for BNC receptacles. It mates with BNC plugs such as UH-88/U, or equivalent (fig. 1-5).

(2) *Probe Subassembly MX-8641/U.* This head has a pin tip and a ground clip lead. It is useful for general test applications (fig. 1-5).

1-9. Additional Equipment Required

No other equipment is required to operate the Test Set, Radio AN/USM-306(V) 1.

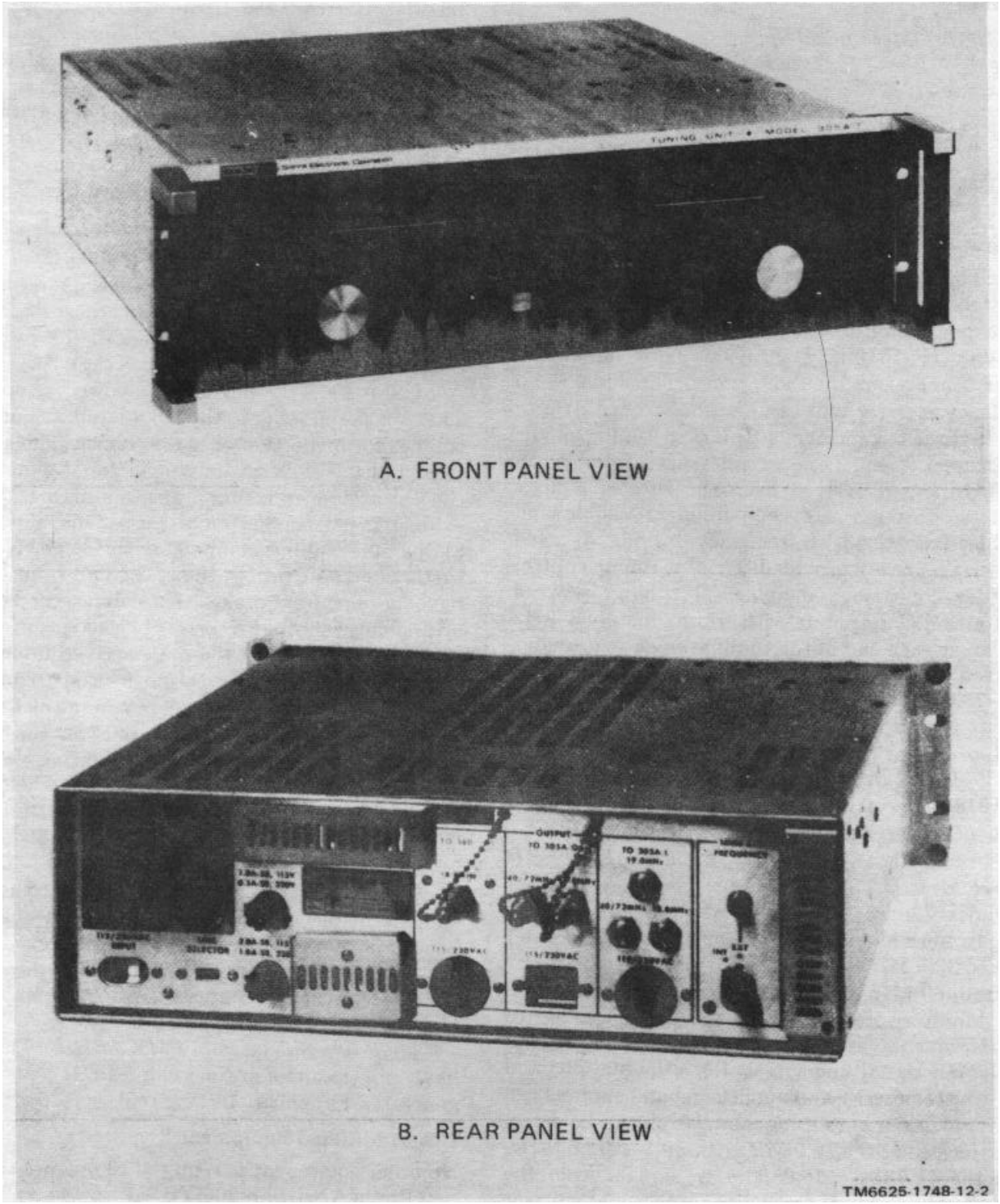


Figure 1-2. TN-527/U radio frequency tuning unit. (Contract No. DAAB05-69-C0767.

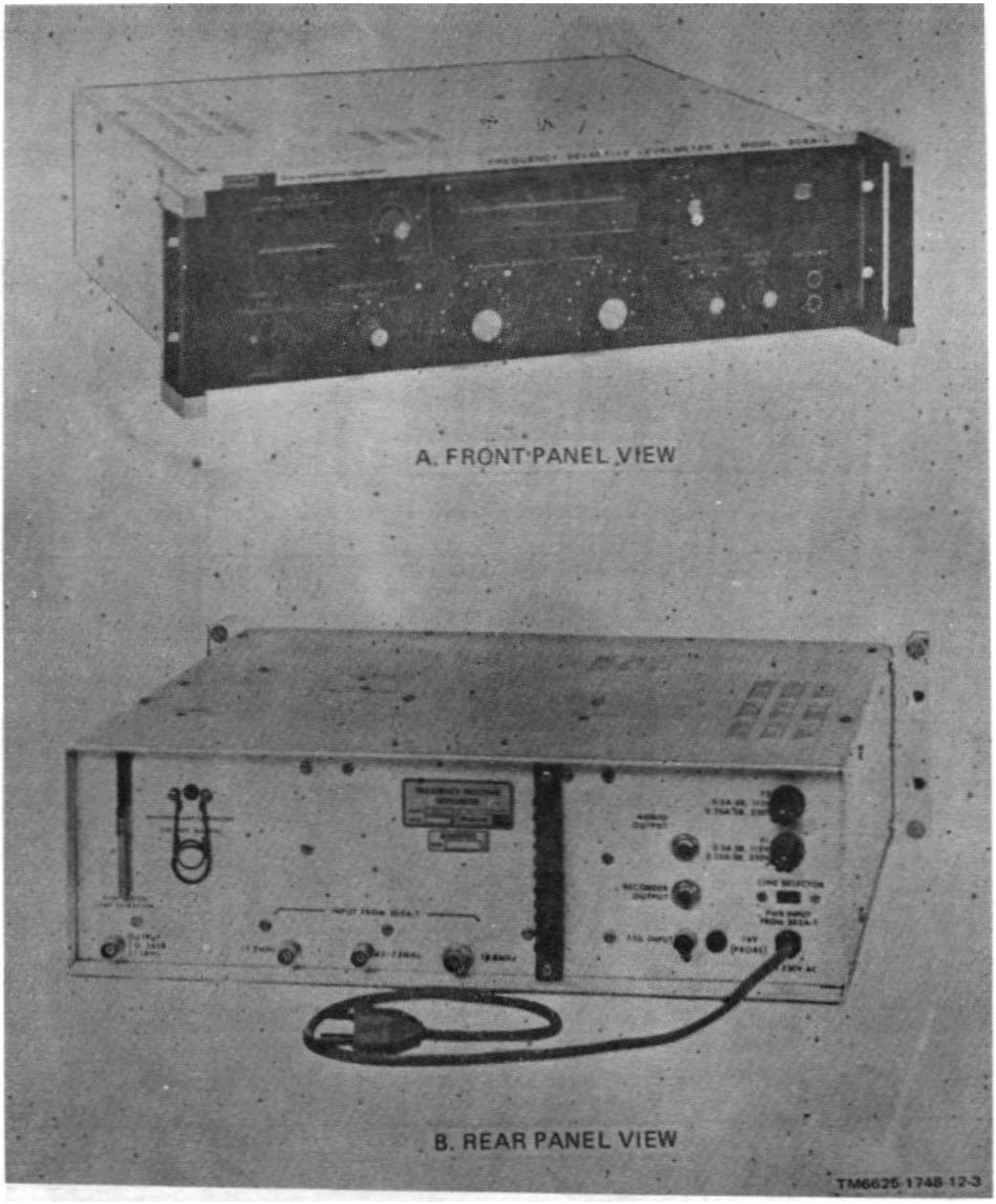


Figure 1-3. TS-2968/U audio-radio frequency monitor.

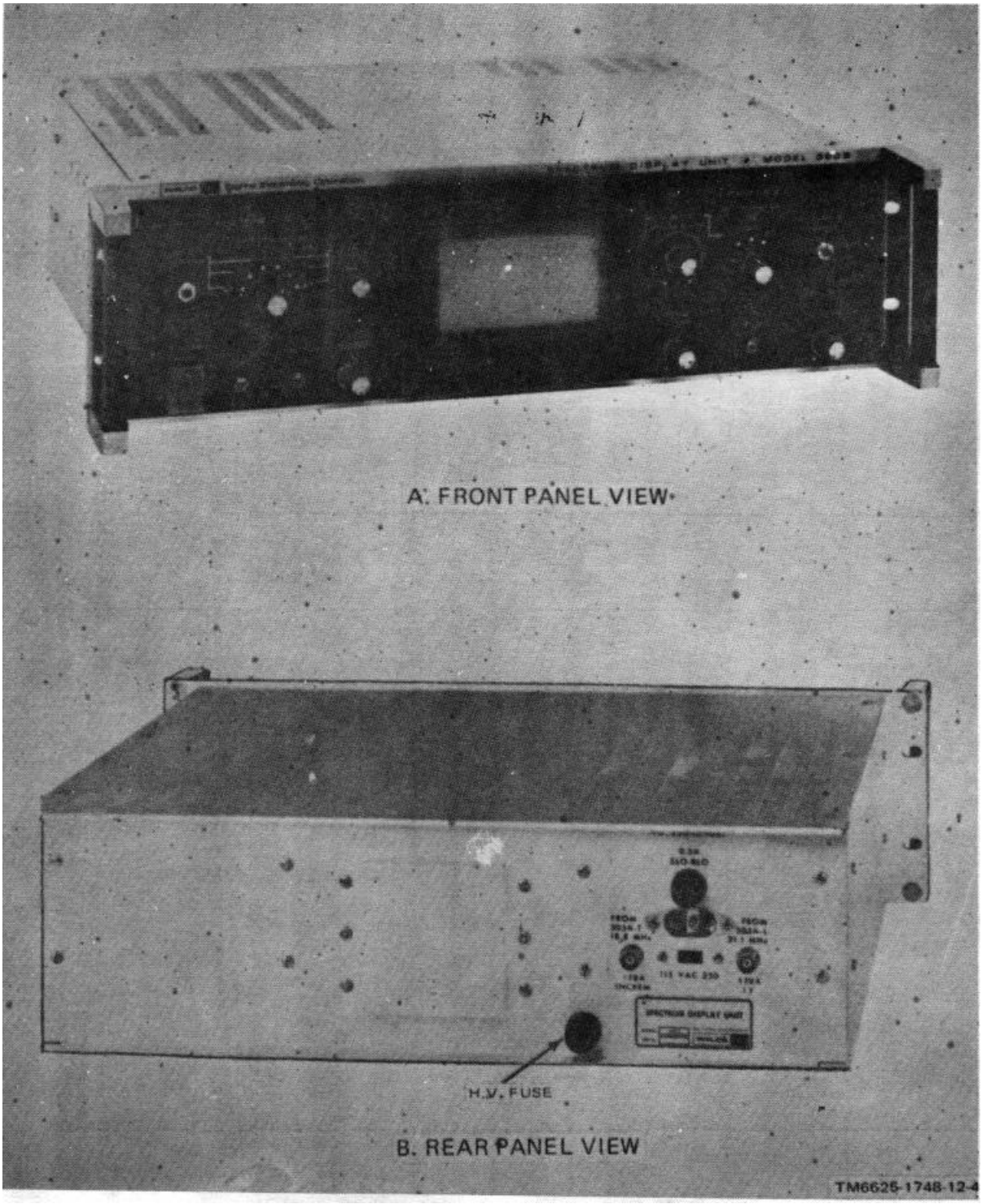


Figure 1-4. IP-1018/U spectrum analyzer.

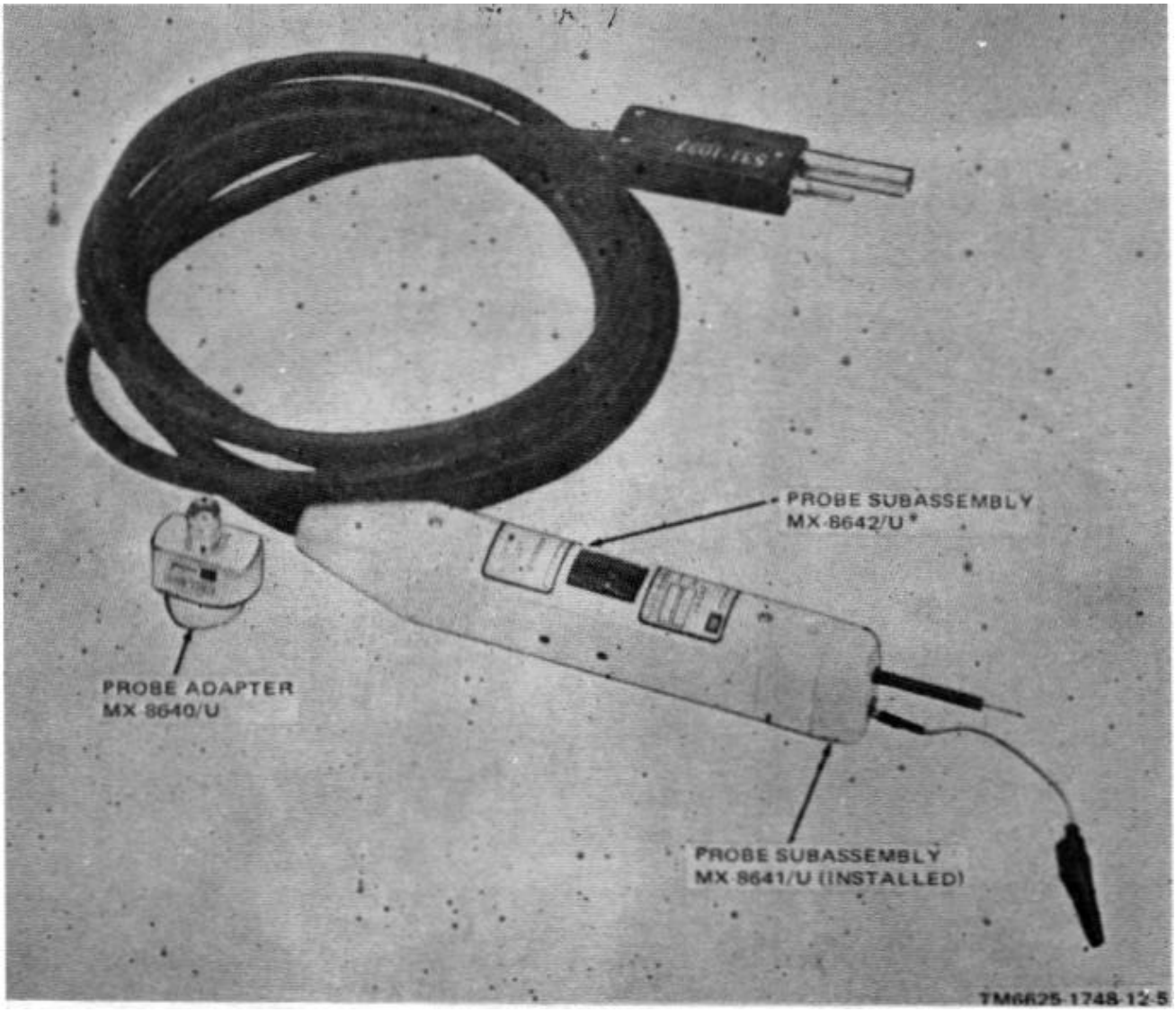


Figure 1-5. Probe and cable assembly and connector heads.

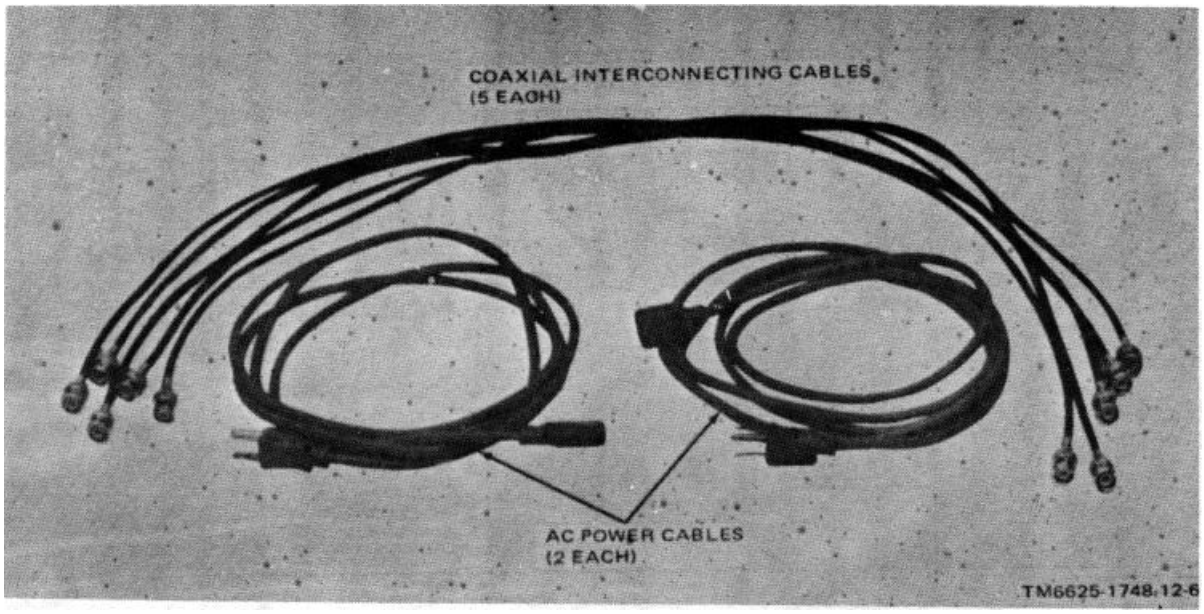


Figure 1-6. Coaxial interconnecting cables and power cables.

CHAPTER 2

INSTALLATION

WARNING

Prevent personal injury when applying or removing steel strapping by wearing heavy gloves and protective eyewear. Do not handle packing cartons by the steel strapping.

2-1. Unpacking

a. Packaging Data. When packed for shipment, the units of Test Set, Radio AN/USM-306(V)1 are placed in four double-walled (corrugated fiber shipping cartons. A typical shipping carton and its contents for the Rack, Electrical Equipment MT-4263 U is shown in figure 2-1(1). A typical shipping carton and its contents for anyone of the three chassis is shown in figure 2-1 (2). The dimensions, volume, weight and contents of the shipping cartons are-

Box No.	Contents	Dimensions (in.)	Volume (cu. ft)	Weight (lb)
1 of 4	Analyzer, Spectrum IP 1018/U, with plug-in power cable 2 ea- coaxial cables.	24.5 x 23.5 x 11	3.7	42
2 of 4	Monitor, Audio Radio Fre(quency T.S 2968/U 3 ea- coaxial cables.	24.5 x 23.5 x 11	3.7	42
3 of 4	Tuning Unit, Radio Frequency TN-527/U, with plug-ill power cable.	24.5 x 23.5 x 11	3.7	42
4 of 4	Rack, Electrical Equipment MT-4263/U Probe Subassembly MX-8642 U. Adapter Probe MX-8640/U. Probe Subassembly MX-8641 U. Set of running spares. Instruction manual(s). Package of mounting screws.	32 x 34 x 55	34.6	145

b. Removing Contents.

(1) Stand box number 4 of 4 (fig. 2-1(1), in an upright position. Cut and remove steel straps. Lift carton straight up off of the equipment.

CAUTION

Do not discard any of the filler and cushioning materials until all of the accessories listed in a above, have been located and identified.

(2) Remove top fillers.

(3) Cut tape and remove corrugated fiber board wrapper from around the cabinet.

(4) Lift rack out of pan and place on floor.

(5) Unpack all accessories. Check the accessories against the list in a above, to ascertain that nothing is missing.

(6) Check running spares against list given in paragraph 1-6b.

(7) Carefully cut the tapes and remove the contents of boxes 1 of 4, 2 of 4, and 3 of 4. Verify that all of the components listed in a above, have been received.

2-2. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1-3).

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against appendix B. Report all discrepancies in accordance with TM 38-750. Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, the MWO number will appear on the front panel near the nomenclature plate. If modified, see that any operational instruction changes resulting from the modification have been entered in the equipment manual.

NOTE

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

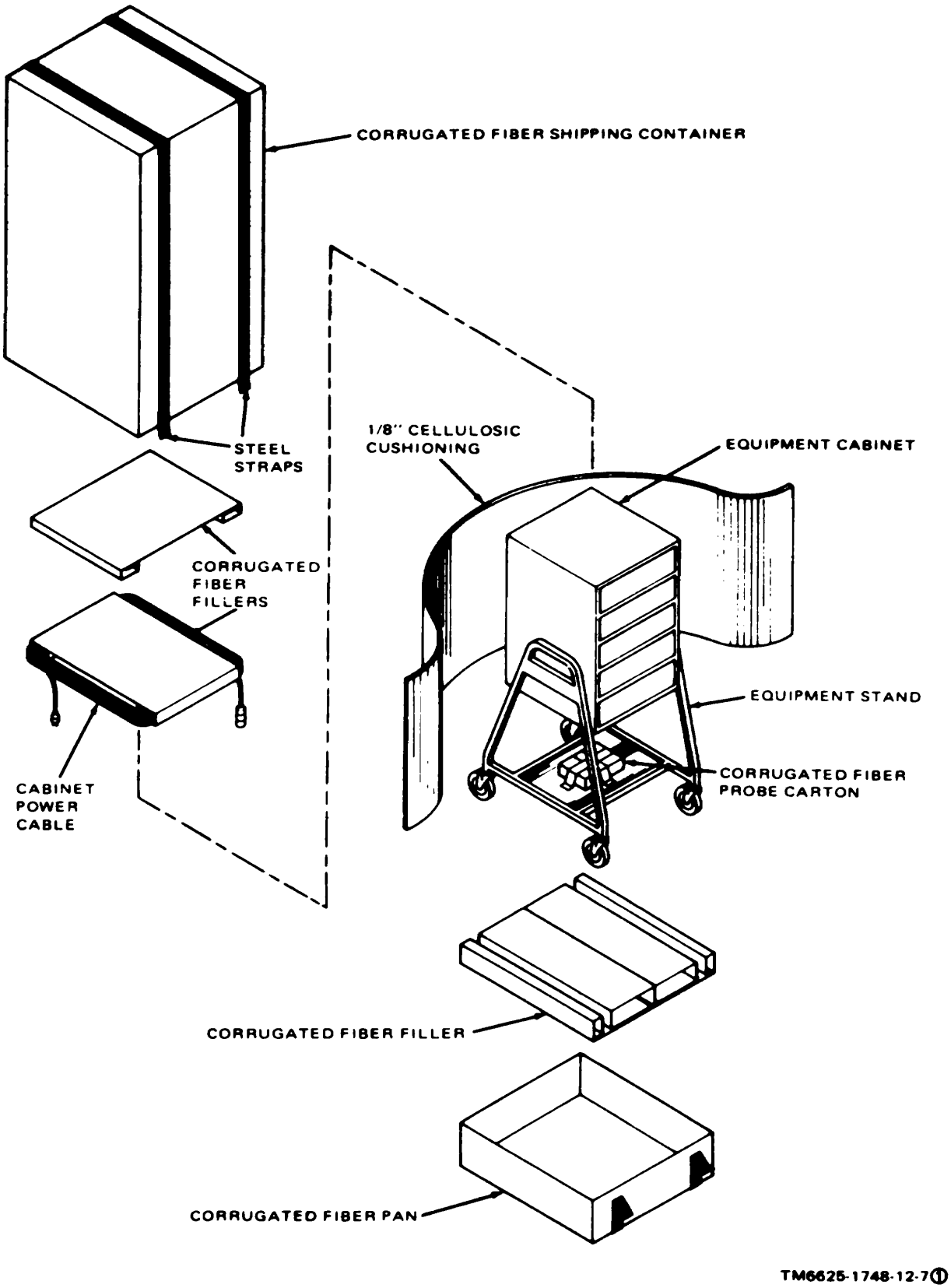


Figure 2-1. (1) Packaging of Test Set, Radio AN/USM-306(V)1 (part 1 of 2).

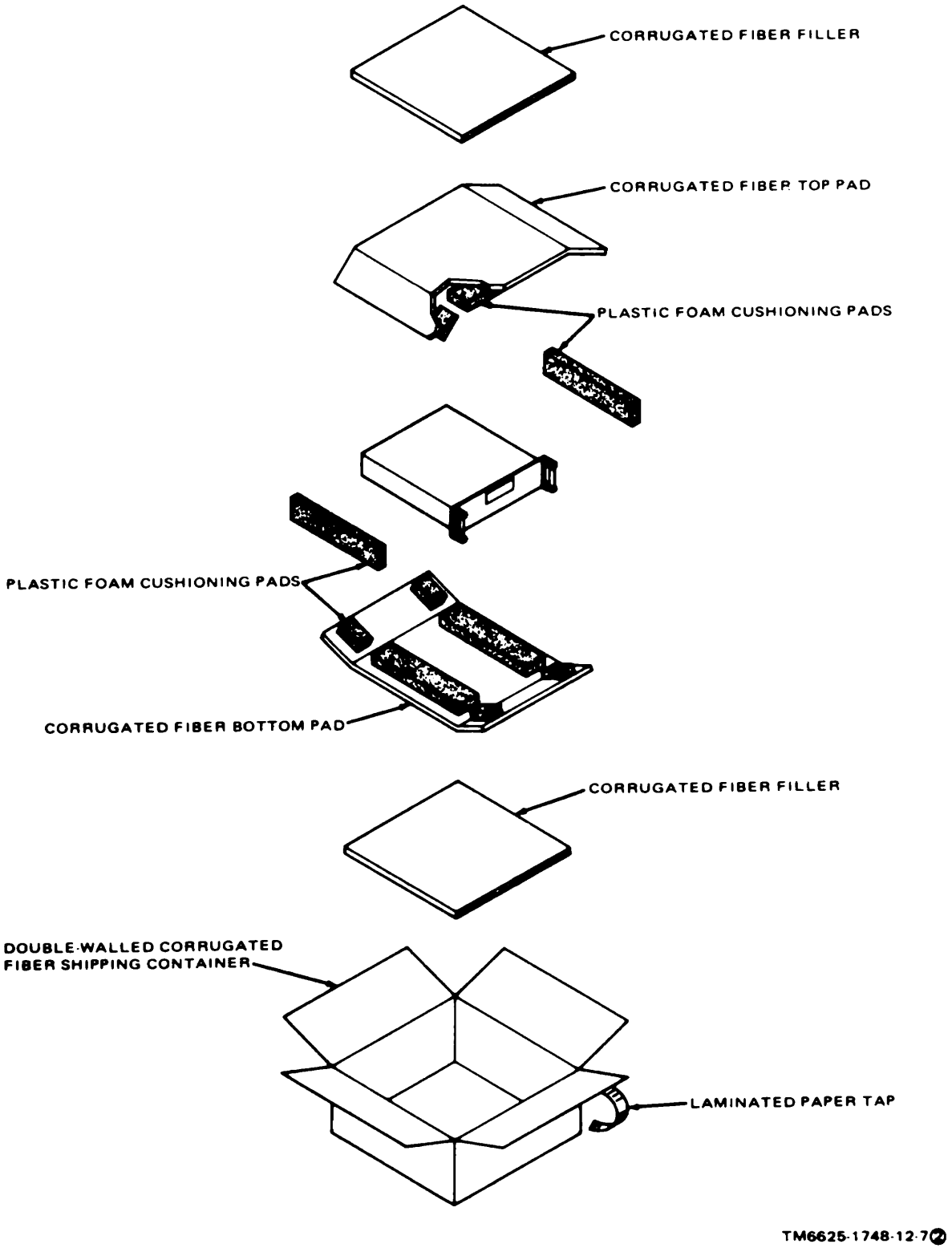


Figure 2-1. (2) Packaging of Test Set, Radio AN/USM-306(V)1 (part 2 of 2).

2-3. Tools and Test Equipment Required for Installation

No special tools or test equipment are required for the installation of the Test Set AN/USM-306(V)1.

2-4. Installation of Fuses

Be sure the proper fuses are inserted in the fuse holders on the rear of each of the three units. Table 2-1 lists the ratings and location of fuses.

CAUTION

Use only the correct value fuse for the line voltage available. Overfusing can result in damage to equipment.

2-5. Installation and Connections

*a. Install*ation. Install the RF tuning unit AF-RF monitor, and spectrum analyzer in the cabinet. Place the tuning unit in the bottom position, next install the monitor, and lastly install the spectrum analyzer (fig. 1-1).

*b. Conn*ections. Access to the rear of the units is through the rear of the cabinet. Make the power and signal connections according to the cabling diagram (fig. 2-2). Table 2-2 lists the cables by point of origin and destination, and length. All power and unit interconnecting cables are supplied with the equipment (fig. 1-6).

Table 2-1. Fuse Requirements, Test Set AN/USM-306(V)1

Unit model	Fuse reference	Amps	Line voltage	Circuit	Figure No.
TN-527/U radio frequency tuning unit	F1	1.0 Slow-Blow	115	Ac input	1-2
		0.5 Slow-Blow	230	Ac input	1-2
	F2	2.0 Slow-Blow	115	AC input	1-2
		1.0 Slow-Blow	230	Ac input	1-2
TS-2968/U Audio-radio frequency, monitor	F1	0.5 Slow-Blow	115	AC input	1-3
		0.25 Slow-Blow	230	AC input	1-3
	F2	0.5 Slow-Blow	115	Power supply	1-3
		- - -	DELETED	- - -	
IP-1018/U spectrum analyzer	F1	0.5 Slow-Blow	115	AC input	1-4
		0.25 Slow-Blow	230	AC input	1-4
	Figure 1-4	0.75 Fast-Blow		High voltage power supply.	1-4

2-6. Initial Adjustments

a. Set the LINE SELECTOR switch on the rear of each unit of the Test Set, Radio AN/USM/306(V)1, to the 115 VAC or 230 VAC position as required by the line voltage available. No other adjustment is necessary as the test set has been aligned at the factory. Insure that the correct fuses are installed prior to connecting the equipment to the ac power source (para 2-5b).

b. As a complete check of the equipment before releasing it for routine operation perform the starting procedure (para 3-4). If the equipment is inoperative or malfunctioning and cannot be corrected by maintenance procedures outlined in this manual (ch. 4), then support from higher maintenance categories will be required.

Table 2-2. Power and Interconnection Cables, Test Set AN/USM-306(V)1

Description		From-	To-
Type	Length (in.)	(Rear Panel Jacks)	
POWER	96	RF Tuning Unit, TN-527/U (TO 360 115/230 VAC).	Spectrum Analyzer, IP-1018/U (115/230 VAC input).
POWER	96	RF Tuning Unit, TN-527/U (TO 305A-L 115/230 VAC).	AF-RF Monitor, TS-2968/U (PWR input from 305A-T 115/230 VAC).
Interconnecting BNC	36	RF Tuning Unit, TN-527/U (Output TO 360 18.8 MHz).	Spectrum Analyzer, IP-1018/U (from 305A-T 18.8 MHz).
Interconnecting BNC	36	RF Tuning Unit, TN-527/U (TO 305A-L 19.0 MHz).	AF-RF Monitor, TS-2968/U (input from 305A-T 19.0 MHz).
Interconnecting BNC	36	RF Tuning Unit, TN-527/U (TO 305A-L 40/72 MHz).	AF-RF Monitor, TS-2968/U (input from 305A-T 40/72 MHz).
Interconnecting BNC	36	RF Tuning Unit, TN-527/U (TO 305A-L 18.8 MHz).	AF-RF Monitor, TS-2968/U (input from 305A-T 18.8 MHz).
Interconnecting BNC	36	AF-RF Monitor, TS-2968/U (Output TO 360 21.1 MHz).	Spectrum Analyzer, IP-1018/U (from 305A-L 21.1 MHz).

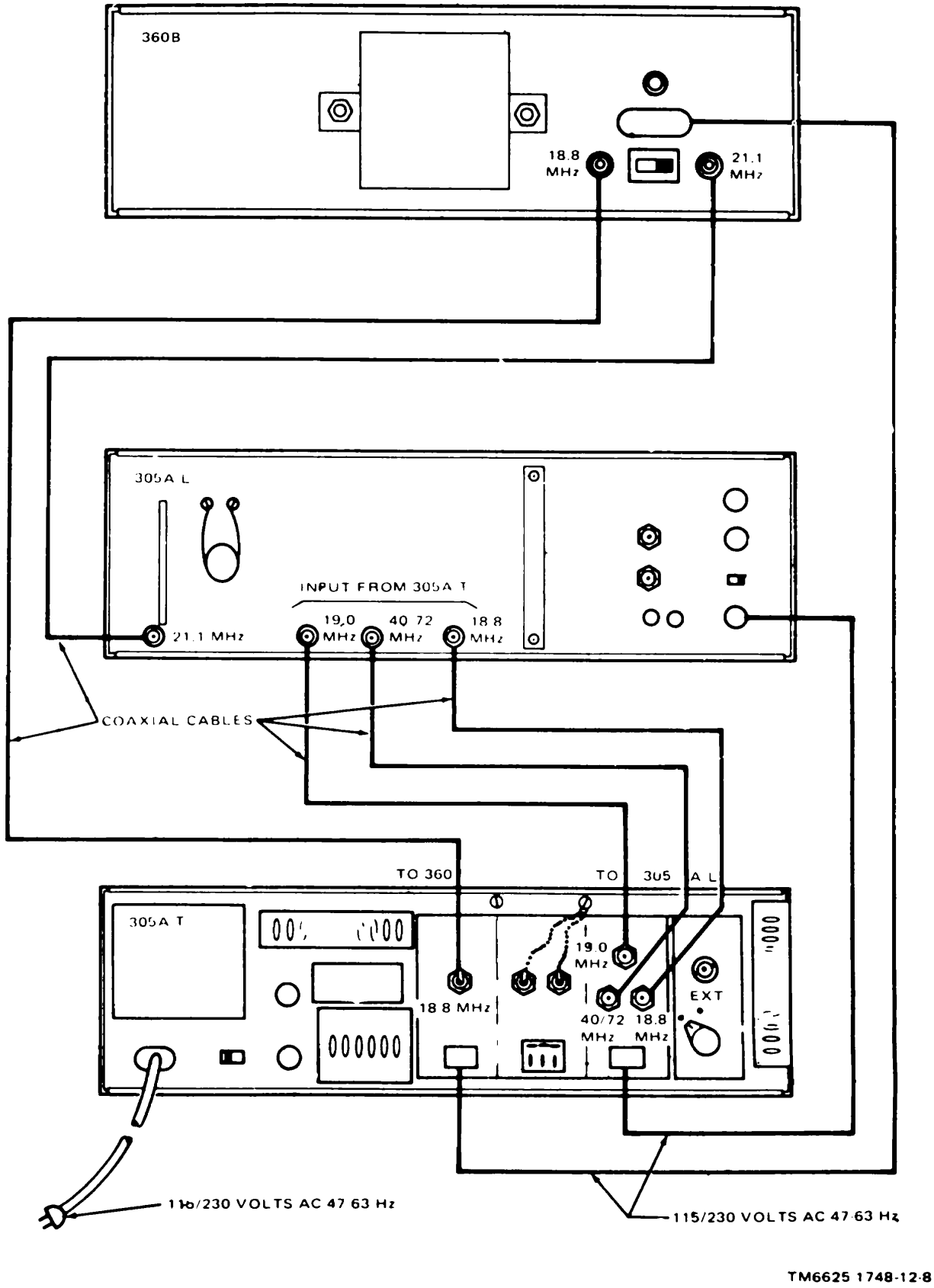


Figure 2-2. Interconnection diagram, Test Set, Radio AN/USM-306G(V)1.

CHAPTER 3
OPERATING INSTRUCTIONS

Section I. OPERATOR'S CONTROLS AND INDICATORS

NOTE

This section covers only items used by the operator; items used by maintenance personnel are covered in instructions for the appropriate maintenance category.

3-1. Damage From Improper Settings

Observe the following precautions when setting the controls:

a. Before measuring an unknown signal, set the AF-RF monitor's SENSITIVITY 10 db/STEP switch to the first position clockwise from the CAL, position. Set SCALE switch to NORM. Turn SENSITIVITY 1 db/STEP control fully counterclockwise. If this is not done the DECIBELS meter may be damaged by a strong signal, especially when operated on expanded scale.

CAUTION

If a bright spot appears instead of a horizontal trace line on the spectrum analyzer Display. immediately turn the INTENSITY control fully counterclockwise. For further instructions, refer to the troubleshooting chart (para 4-13).

b. The INTENSITY control on the spectrum analyzer, hereafter referred to as display unit, should not be turned higher than necessary for a visible, distinct trace. Too bright a trace may damage the CRT and shorten its useful life.

3-2. Operator's Controls and Indicators

a. Radio Frequency Tuning Unit (fig. 1-2).

(1) *Front panel* (fig. 1-2).

Control or indicator	*Function*
POWER switch	Pushbutton energizes the tuning unit when depressed. The switch lights green when ON.
COARSE TUNING control.	Provides maincoarse tuning capability.
FINE TUNING control	Provides fine tuning capability.
Tuning Lock control	Locks turning control (CW- lock. CCW- unlocked). (Adjacent to each TUNING, control.)
TUNING MODE switch	Pushbuttons select locked (LOCK) or continuous (CONT) tuning mode.
FREQUENCY display	Back-lighted digital frequency display indicates tuned frequency
OVEN lamp	Oscillator oven indicating lamp

(2) *Rear panel* fig. 1-2).

Control or indicator	*Function*
LINE SELECTOR switch.	Provide, for tuning unit operation on 115V or 230 VAC.
EXT- INT switch	Selects (external or internal clock
F1 and F2	Power line fuses. Protects unit from damage caused by line surges, wrong line voltage, or internal malfunction
1 MHZ STD FREQUENCY EXT. BNC connector.	Input for external clock
TO 305A-1, 19.0 MHz B NC connector.	19.0-MHz signal output to Monitor
TO 305A-I, 40/72 MHz BNC connector.	40- to 72-MHz coarse tuning signal to Audio-Radio frequency monitor.
TO 305A-L 18.8 MHz B NC connector.	18.8 MHz fine tuning signal to audio-radio frequency monitor.
TO 305A-L 115/230 VAC three-prong female connector.	Ac power connection for audio-radio frequency monitor.
TO 360 18.8 MHz BNC connector.	18.8-MHz fine tuning MARKER reference signal to spectrum analyzer unit.
TO 360 115/230 VAC three-prong female con-nector.	Ac power connection for spectrum analyzer unit.

b. Audio-Radio Frequency Monitor (gig. 1-3).

CAUTION

The screwdriver-adjusted control marked REF OSC (directly below the CAL control), is for higher category of maintenance use only.

(1) *Front panel* (fig. 1-3).

Control, connector, or indicator	*Function*
CAL, control	Provides for calibrating the DECIBELS meter for 0 dbm. with the SENSITIVITY switch in the CAL mode.
SENSITIVITY switch	Selects CAL, NORM, or HIGH sensitivity.

Control or indicator	*Function*
	Position *Action* CAL 1 MHz .....For 0-db calibration of DECIBELS meter NORM.....Provides for normal sensitivity. HIGH .....Provides for 20-db gain in sensitivity.
SENSITIVITY 1 Db STEP switch.	Provides for attenuation of input in 1-db steps.
SENSITIVITY 10-db/ STEP switch.	Provides for attenuation of input in 10 db steps.
AUDIO MODE switch	Selects audio mode desired. *Position* *Action* LSB.....Lower side band. AM.....Amplitude modulation. USB .....Uppersideband.
AUDIO GAIN control	Adjusts audio amplitude
SCALE switch.....	Selects normal (NORM) or expanded (EXPAND) scale of the DECIBELS meter.
SELECTIVITY switch	Pushbuttons select the 250-Hz or the 3.1-kHz bandpass filter
INPUT LEVEL indication	Indicates the level of the input signal referenced to meter zero.
DECIBELS meter	Indicates any modification of the INPUT LEVEL INDICATOR READING.
INPUT 75 Ω BNC connector.	Signal input, BNC connector
-16V (PROBE), jack.....	Provides -16 VDC to operate Probe MX-8642/U
AUDIO OUTPUT, phone jack.	Provides for connecting earphones to audio output.

(2) *Rear panel* (fig. 1-3)}.

Fuse or Connector	*Function*
LINE SELECTOR switch (rear panel).	Provides for monitor operation on 115 or 230V ac.
F1 and F2	Powerline fuses. Protects unit from damage caused by line surges, wrong line voltage. or internal malfunction.
75 Ω INPUT, Jack -16V (PROBE).	Connects input signal to unit. jack. Provides - 16 volts dc, jack.
INPUT FROM 305A-T 19.0 MHz. BNC connector.	19.0-MHz. signal from tuning unit.
INPUT FROM 305A-T 40/72 MHz. BNC connector.	40-72-MHz coarse tuning signal from tuning unit.
INPUT FROM 305A-T 18.8 MHz. BNC connector.	18.8-MHz fine tuning signal from tuning unit.
OUTPUT TO 360 21.1 MHz. BNC connector.	21.1-MHz second IF signal to spectrum analyzer unit.
RECORDER OUTPUT jack.	Provides signal for making a permanent record of DECIBELS meter level on a strip chart recorder.
AUDIO OUTPUT phone	Provides audio output for a

c. *Spectrum Analyzer* Unit (fig. 1-4.

(1) Front panel (fig. 1-4).

Control or, connector, or indicator	*Function*
FOCUS control.....	CRT spot size adjustment
INTENSITY control.....	Trace brilliance adjustment.
SWEEP kHz/DIV switch...	Provides for single sweep or continuous sweep mode. *Position* *Action* 10.....10 kHz/DIV 1.....1 kHz/DIV .3.....3 kHz/DIV
SINGLE SWEEP button	Single sweep trigger switch.
SWEEP RATE switch	Provides for normal (NORM) or fast (FAST) sweep rate.
10 kHz/DIV CAL control	Horizontal trace width adjustment.
HORIZONTAL POSITION control.	Display horizontal position adjustment.
ATTENUATOR DB switch	Provides for attenuation of signal from the audio-radio frequency monitor. *Position* *Action* 0.....0 db attenuation 20.....20 db attenuation 40.....40 db attenuation
0 db CAL control.....	Provides for amplitude calibration.
MARKER control.....	ON/OFF switch and amplitude adjustment.
MARKER IDENT.....	Provides for marker identification by removing all other signals.
VERTICAL POSITION.....	Display vertical position adjustment.
SCALE ILLUM control.....	Adjusts intensity of graticule scale illumination.
PWR OFF switch (part of SCALE ILLUM control).	Ac line power switch.

(2) *Rear panel* (fig. 1-4).

Control, fuse, or connector	*Function*
LINE SELECTOR switch	Provides for operation at 115 or 230 VAC.
F1.....	Ac powerline fuse. Protects unit from damage caused by line surges, wrong line voltage, and internal malfunction.
HV Fuse (fig. 1-4	Primary fusing for high volt-age supply. Protects high voltage transformer and inverter circuitry against filter capacitor or load short circuits.
FROM 305A-T 18.8 MHz BNC connector.	18.8-MHz fine tuning signal from tuning unit.
FROM 305A-L 21.1 MHz, BNC connector	21.1 MHz, second IF signal from AF-RF monitor.

d. Probe (fig. 1-5).

Switch	*Function*
TERM-BRDG	Selects either bridging or terminating function of probe.
75Ω - 50Ω	Selects either the 75-ohm or 50-ohm impedance.

Section II. OPERATION

3-3. Types of Operation

a. The Test Set, Radio AN/USM-306(V)1, may be used to measure an unknown frequency, to find the level of an unknown frequency, or to analyze a segment of the frequency spectrum.

b. For any type of operation perform the following procedures:

(1) Starting procedure (para 3-4).

(2) Procedure for desired type of operation (para 3-5).

(3) Stopping procedure (para 3-6).

3-4. Starting Procedure

Make sure the initial adjustments described in paragraph 2-6 have been made before this procedure is started.

NOTE

If an abnormal indication is obtained during the starting procedure, refer to the daily maintenance checks and services chart (para 4-5) for corrective measures.

a. Preliminary Procedure.

(1) Place the radio test set in standby condition by doing the following:

(*a*) Set RF tuning unit POWER to OFF.

(*b*) Set spectrum display analyzer unit POWER to OFF.

(*c*) Connect the tuning RF unit power cord to a line source of the correct voltage and frequency.

NOTE

The RF tuning unit and the AF-RF monitor will be ready for operation in approximately 15 minutes, due to the warmup time of the internal reference oven oscillator in the RF tuning unit. Three-hour warmup time is required for extreme frequency accuracy and stability. The oscillator oven is energized whenever the RF tuning unit power plug is connected to a proper line voltage source.

(2) Set the front panel controls as follows:

Unit	*Control*	*Position*
AF-RF monitor	SCALE	NORM
	SELECTIVITY	250 Hz
	SENSITIVITY	CAL 1 MHz
	SENSITIVITY 10 db/STEP	CAL
	SENSITIVITY 1 db/STEP	Fully counterclockwise
	AUDIO MODE	AM
	AUDIO GAIN	Full CCW
Spectrum analyzer unit	FOCUS	Midposition
	INTENSITY	Midposition
	SWEEP	10 kHz/DIV CONTINUOUS
	MARKER	Midposition
	ATTENUATOR DB	0 db CAL
	SWEEP RATE	FAST DEPRESSED}

b. Starting

(1) Audio-radio frequency monitor adjustment. Adjust the audio-radio frequency monitor by the following procedure:

(*a*) Depress the tuning unit POWER switch. The green ON light should illuminate.

(*b*) Turn the display unit ON.

(*c*) Allow 15 minutes warmup time.

(*d*) Depress the TUNING MODE LOCK switch.

(*e*) Vary the tuning unit's COARSE TUNING control until the FREQUENCY display reads 010xx.xx kHz.

NOTE

FREQUENCY display x's, referred to herein, denote digits not affected by a particular tuning adjustment.

(*f*) Tune the FINE TUNING control so as to obtain 1000.00 kHz on the FREQUENCY display, and continue to tune for a maximum deflection of the DECIBEL meter.

(*g*) Adjust the monitor's CAL control. The DECIBELS meter shall read 0 db.

(*h*) To adjust the instrument on the expanded scale, change the SCALE switch to EXPAND. Readjust the RF tuning unit's FINE TUNING control for maximum DECIBELS meter deflection, and adjust the CAL control to meter 0 db; return control to NORM.

(2) *Spectrum analyzer display trace adjustme*nts. To adjust the spectrum analyzer unit's CRT trace do the following:

(*a*) Adjust the INTENSITY control for suitable trace brilliance.

(*b*) Adjust the SCALE ILLUM control for the desired graticule illumination.

(*c*) Adjust the FOCUS control for sharpest trace.

(*d*) Adjust the VERTICAL POSITION control until the horizontal trace is on the -20-db line of the vertical scale on the graticule.

(3) *Spectrum analyzer adjustment*. To adjust the spectrum analyzer unit for frequency and 0 db level with respect to the AF-RF monitor. perform the following:

(*a*) Adjust the AF-RF monitor as described in (1) above.

(*b*) Adjust the RF tuning unit's COURSE and FINE TUNING controls until the FREQUENCY display indicates 01100.00 kHz HIGH. The pulse from the 1-MHz CAL oscillator of the AF-RF monitor will be on the left side of the spectrum analyzer display CRT graticule, and the marker pulse from the fine tuning oscillator of the RF tuning unit will be on the right side.

(*c*) Adjust the 0-db CAL and the MARKER controls for convenient pulse heights (approximately 0 db).

(*d*) Set the SWEEP RATE to NORM.

(*e*) Adjust the HORIZONTAL POSITION and the 10 kHz/DIV CAL controls until the lefthand pulse (1-MHz CAL oscillator) is on the horizontal scale 0-kHz mark and the right-hand pulse (Marker) is on the 100-kHz mark (upper 0-100 kHz scale).

NOTE

These are interacting controls. repeat these adjustments until pulses are properly aligned. Finish the adjustment with the POSITION control.

(f) Adjust the 0-db CAL control until the lefthand pulse reaches the 0-db line of the vertical scale. The horizontal baseline will be on the - 20 db line 1 12} (d) above).

3-5. Operating Procedures

a. Radio Frequency Tuning Unit Operation.

(1) *Continuous tuning mod*e. To operate the radio frequency tuning unit in the continuous tuning mode, proceed as follows:

(*a*) Verify that the POWER switch is depressed and the green ON indicator is illuminated.

(*b*) Depress the TUNING MODE CONT switch. The FREQUENCY display shall show only the first three digits and the MHz from 0.0 M Hz to 33.5 MHz (A, fig. 3-1).

(*c*) Rotate the COURSE TUNING control to the desired frequency. The tuning controls may be locked in place by turning the dial directly behind each control clockwise (para 3-2.a.(1)).

NOTE

A MHz LOW indication (C. fig. 3-1) on the RF tuning unit's FREQUENCY display indicates that the COARSE TUNING control is set below 0.0 MHz Rotate the COARSE TUNING control clockwise.

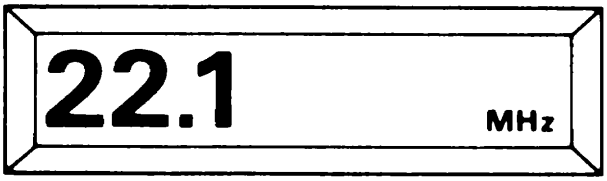
(2) *Locked tuning mode*. To operate the tuning unit in the locked tuning mode, proceed as follows:

(*a*) Insure that the POWER switch has been depressed, and that the green ON light is lit.

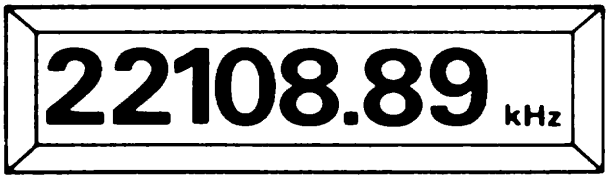
(*b*) Depress the TUNING MODE LOCK switch. If the FREQUENCY display fails to indicate "kHz," rotate the COARSE TUNING control slowly until a full FREQUENCY display appears (i.e.. all seven digits) and "kHz" is illuminated. An audible click may be present at each of the lock points. Tuning range in the locked mode is from 0 to 33.5 M Hz.

NOTE

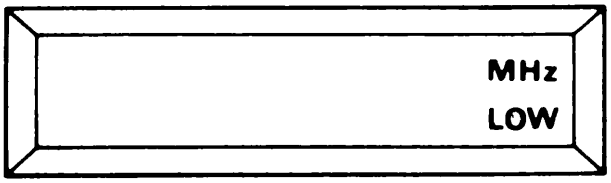
A locked condition is indicated by full seven digit frequency display. The "kHz" indication will also be illuminated on the readout (B, fig. -1).



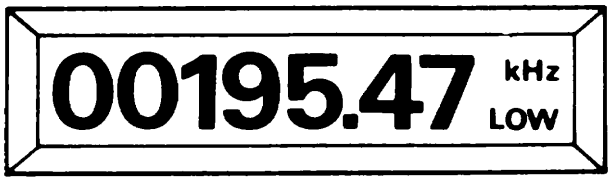
A. CONTINUOUS MODE DISPLAY



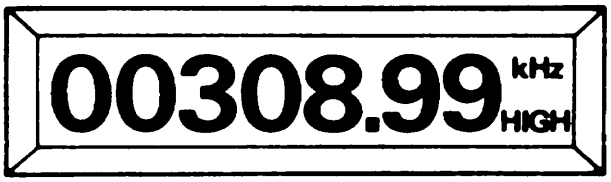
B. LOCKED MODE DISPLAY



C. MHz LOW INDICATION



D. kHz LOW INDICATION



E. kHz HIGH INDICATION

TM6625-1748-12-9

Figure 3-1. Typical FREQUENCY DISPLAY indications. TN-527/U radio frequency tuning unit.

(*c*) Tune the COURSE TUNING control to the desired frequency range in 100-kHz steps and verify that a locked condition exists. Rotate the FINE TUNING control to the exact frequency desired. For example, if the desired frequency is 5847.00 kHz, the COURSE TUNING control is rotated until the first two digits are correct : in this case 058XX.SS) and a locked condition exists. The FINE TUNING control is then used to obtain 5847.00 kHz. The tuning controls may be locked in position by turning the adjacent dials clockwise.

NOTE

KHz LOW (D fig. 3-1) and kHz HIGH (E, fig. 3-1) indications are provided on the FREQUENCY display to indicate that the FINE TUNING control is set outside its normal 100-kHz tuning range. However, setting of the FINE TUNING control below or above the normal 100-kHz range will not introduce any errors in frequency or in level measurements.

b. Audio-Radio Frequency Monitor Operation.

(1) *Unknown Frequency level measurement.* To measure an unknown signal carry out the procedure below.

(a) Set the AF-RF monitor controls as follows:

Control	*Position*
SCALE	NORM
SENSITIVITY	NORM
SELECTIVITY	3.1 kHz {green)
Sensitivity 10 db, STEP.	Approximate level of signal, if known, or set to MAX SENSITIVITY if signal level unknown. Sensitivity is displayed on the INPUT LEVEL indicator.)

NOTE

If measurements are being made on a low level signal which is in the presence of a much higher level signal, set the SENSITIVITY switch to HIGH.

(*b*) Connect signal source to front panel connector, INPUT 75 TERMINATING. For other impedances probe accessories must be used.

(*c*) Set RF tuning unit's FINE TUNING control to zero or until a kHz LOW indicates on the FREQUENCY display. Depress the TUNING MODE CONT pushbutton switch.

(*d*) Slowly rotate the COURSE TUNING control until a signal is indicated on the monitor's DECIBELS meter. Readjust the SENSITIVITY 10 db/STEP control to maintain a NORM SCALE meter indication.

(*e*) Depress the TUNING MODE LOCK switch. Rotate the COARSE TUNING control counterclockwise until a locked condition is indicated (a(2) (b) above).

(*f*) Rotate the FINE TUNING control clock-wise until a signal is again indicated on the monitors DECIBELS meter.

(*g*) Readjust the monitor's SENSITIVITY 10 db/STEP control until the DECIBELS meter reaches a convenient reading range.

(*h*) Switch the monitor's SELECTIVITY to 250 Hz (white), and readjust the RF tuning unit's FINE TUNING control for maximum DECIBEL meter deflection.

(*i*) The level of the signal being measured is the sum of the INPUT LEVEL display and the DECIBEL meter reading.

Example INPUT LEVEL display = 20 dbm, DECIBEL meter reading = -4.5 db, the signal level = -20 db + (-4.5 dbm) = -24.5 dbm.

(*j*) For greater resolution use the expanded meter scale. Adjust the monitor's SENSITIVITY 1 db/STEP switch to bring the meter within 0 ±2 db. Next set the monitor's SCALE switch to EXPAND.

CAUTION

Damage to meter may result if DECIBELS meter is not with 0 ±2 db range before switching to expanded scale.

(*k*) The level of the signal is the sum of the INPUT LEVEL display and the EXPANDED SCALE of the DECIBEL meter.

Example: INPUT LEVEL display = -25 dbm and DECIBEL meter EXPANDED SCALE = +0.5 DB, THEN THE SIGNAL LEVEL = -25 DB +(0.5 DB) = -24.5 DB.

(2) K*nown frequency level measurement*. To measure the level of a known frequency proceed as follows:

(*a*) Set the AF-RF monitor controls as in (1) (a) above.

(*b*) Set the RF tuning unit's TUNING MODE switch to LOCK and tune the RF tuning unit until the frequency is shown on the FREQUENCY display.

(*c*) Carry out steps (1) (g) through (k) above.

c. Spectrum Analyzer Operation.

(1) *120-kHz bandwidth display.* Figure 3-2 shows a typical spectrum =display of multiple-channel carrier system. In this illustration, the spectrum analyzer is operating in the 10 kHz/DIV sweep mode, sweeping across a 120-kHz portion of the spectrum under test. The equivalent of 30 4-kHz channel spaces are under observation. Note the high signal density appearing between horizontal positions 5 and 6

(2) *Operation in 10 kHz/DIV SWEEP mode.* To operate the analyzer in the 10 kHz/DIV SWEEP mode perform the following:

(*a*) Set the SWEEP control to 10 kHz/DIV CONTINUOUS, the SWEEP RATE to NORM and the MARKER to OFF.

(*b*) Tune to the desired input signal frequency and adjust for suitable amplitude on the spectrum display screen.

(*c*) If the signal frequency is only approximately known, use the FAST SWEEP RATE on the analyzer and the CONTINUOUS mode on the RF tuning unit until the signal is located on the display unit screen. Signals will appear to move to the left when the main tuning dial of the RF tuning unit is tuned higher in frequency. Set the tuning unit to the 100-kHz lock pint just below the desired frequency. Switch SWEEP RATE to NORM.

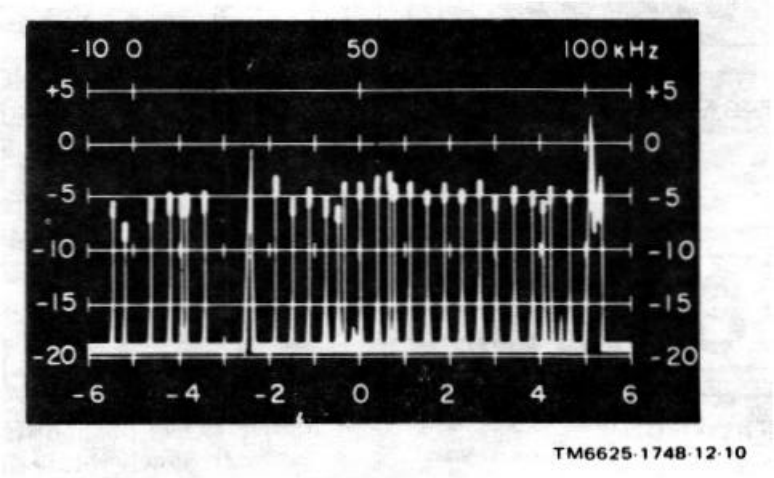


Figure 3-2. Typical 120-kHz display. IP-1018 spectrum analyzer

(*d*) With the RF tuning unit in the locked mode at the 100-kHz point just below the desired signal, the band seen on the analyzer screen will be from 10 kHz below to 110 kHz above the coarse tuning lock point. The 0-kHz mark on the display unit upper scale will be at the coarse tuning lock point frequency.

(*e*) To determine the frequency of the desired signal, when only approximately known, add the frequency indicated on the horizontal scale of the display unit to the frequency of the coarse tuning 100-kHz lock point.

(*f*) The fine tuning dial may be set to the frequency of any signal on the display as follows:

1. Note the frequency on the 0-100-kHz horizontal scale at which the desired signal appears. If the coarse tuning must be in the locked mode and set to a 100-kHz lock point.)

2. Turn up the MARKER control and press the MARKER INDENT. button. This removes the signals and leaves only the marker pulse showing.

3. Set the marker to the desired frequency on the horizontal scale by adjusting the fine tuning dial on the tuning unit. The marker moves to the right when the dial is tuned higher in frequency.

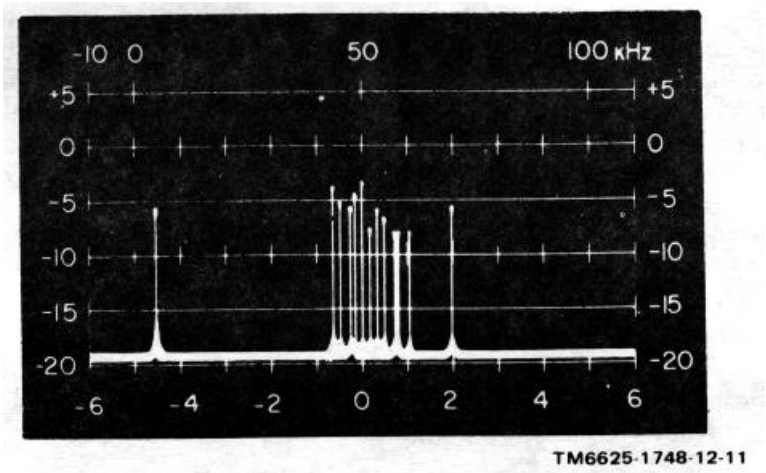


Figure 3-3. Typical 12-kHz display, IP-1018/U spectrum analyzer.

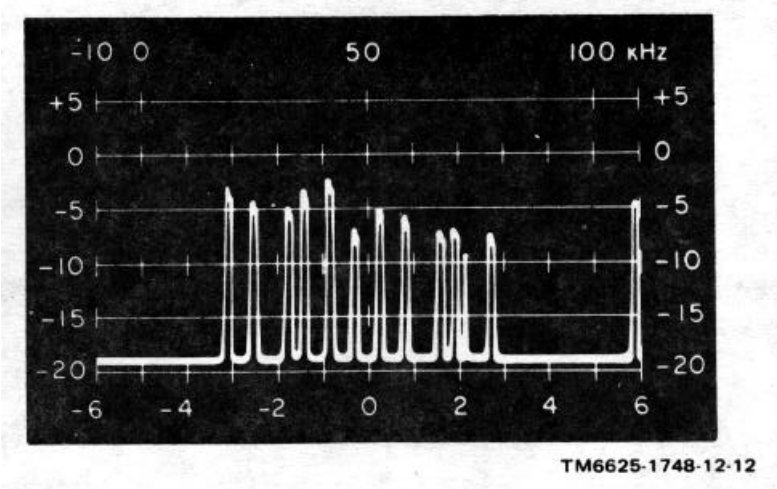


Figure 3-4. Typical 3.6-kHz display, IP-1018/U spectrum analyzer.

4. Release the MARKER INDENT button and turn the MARKER control to OFF.

5. Adjust FINE TUNING for maximum indication on the DECIBELS meter.

6. As an alternate method - Set the FINE TUNING dial to the frequency of the signal indicated by the display's horizontal scale. Check the marker pulse position. Tune for maximum meter indication.

(3) *12-kHz bandwidth display.* In figure 3-3 the spectrum analyzer has been switched to 1 kHz/DIV SWEEP mode. and the tuning unit has been returned to the center frequency of the high density channel observed in figure 3-2. In this mode a 12-kHz bandwidth portion of the spectrum is under observation. The high density signal observed in figure 3-2 now appears as 11 teletype subcarriers.

(4) *3.6-kHz bandwidth display.* In figure 3-4 the spectrum analyzer has been switched to the 0.3 kHz/DIV SWEEP mode. and only a bandwidth of 3.6 kHz is under observation. The 3d, 9th, and 11th subcarriers appear to be momentarily shifted to the right, indicating a "space" condition resulting from FSK modulation. The pulse appearing immediately to the right of the 10th subcarrier probably represents a momentary shift of the 10th subcarrier to a spacing condition. The pulse at the far right is a subcarrier in the next higher channel.

(5) *Operation in 1 kHz/DIV and .3 kHz/DIV SWEEP modes.*

(*a*) These two sweep modes provide a "window," either 12 kHz (fig. 3-3) or 3.6 kHz wide (fig. 3-4). which may be shifted over the 120-kHz band from 10 kHz below to 110 kHz above the coarse tuning lock point by adjusting the fine tuning dial of the tuning unit. The frequency at the center of the "window" is the frequency showing on the tuning unit FREQUENCY display. The marker pulse will always be at the center of the display in these two sweep modes.

(*b*) When the fine tuning dial has been set so that the marker pulse coincides with the signal of interest in the 10 kHz/DIV SWEEP mode (c(2) (f) above). that signal will appear in the center of the display when the SWEEP switch is placed in either the 1 kHz/DIV or the .3 kHz/DIV CONTINUOUS mode positions.

(*c*) Set marker to desired signal and select either of the sweep modes according to the magnification desired.

(*d*) Position the signal horizontally on the display, if necessary, by adjusting the fine tuning dial of the tuning unit. The display will appear to move to the left as the tuning dial is set to a higher frequency.

NOTE

The CRT spot may be brought to the point of interest more rapidly by momentarily switching to the FAST sweep mode.

(6) *Operation in SINGLE SWEEP mode*

(*a*) Place the SWEEP switch in the SINGLE SWEEP mode and set to the bandwidth desired.

(*b*) Press the SINGLE SWEEP button all tie way in and release.

(*c*) Sweep speed is 10 seconds per sweep tor each of the bandwidths in this mode.

(7) *Level measurements*. The spectrum analyzer and AF-RF monitor must be adjusted together as in paragraph 3-4. The signal amplitude on the analyzer screen indicates the actual peak amplitude.

(*a*) Tune in the desired signal according to a and b above.

(*b*) Adjust the monitor's SENSITIVITY 10 db/STEP and 1 db,/STEP attenuator until the peak amplitude of the desired signal. is a little below, or slightly above, the 0 db line on the display unit vertical scale. (Make certain the SWEEP RATE switch is in the NORM position.)

(*c*) Read the analyzer in the same manner as the monitor. 0 db on the DECIBELS meter-corresponds to 0 db on the analyzer CRT scale. The signal amplitude is the algebraic sum of the monitor's INPUT LEVEL display and the amplitude read on the analyzer vertical scale. *For example:*

INPUT LEVEL display	*Analyzer scale reading*	*Signal amplitude*
-40 db	-5 db	-45 db
+10 db	-6 db	+4 db
-30 db	+2 db	-28 db

(*d*) To read the amplitude of an adjacent off-scale signal, adjust the analyzer ATTENUATOR until the signal is within the range of the vertical scale on the analyzer screen. The amplitude is then the algebraic sum of the analyzer vertical scale reading, the analyzer ATTENUATOR setting, and the INPUT LEVEL display. *For example:*

Analyzer Unit

Input level display	*Scale reading*	*Attenuator*	*Signal amplitude*
-50 db	-8 db	(+)40 db	-18 db
-20 db	+2 db	(+)20 db	+2 db

NOTE

Pulses will appear to be lower in amplitude in the FAST mode due to the effect of the faster sweep and the very narrow bandwidth filters. The peak of a complex wave signal may read higher on the analyzer screen scale than is indicated by the monitor's DECIBEL meter. This is due to some averaging of the amplitude of several closely spaced frequencies by the monitor while the analyzer shows the amplitude of the individual frequencies.

(8) *Spurious signal indications.* Several types of spurious responses may appear in the display when strong signals of certain frequencies exist in the input of the monitor.

(*a*) *Zero frequency lock point response.* When the COARSE TUNING dial is set to the zero frequency lock point, a response due to the local oscillator of the Monitor will appear at the left side of the display in the 10 kHz/DIV SWEEP mode. If the FINE TUNING dial is tuned to zero frequency in the 1 kHz/DIV SWEEP mode this response will also be seen. This is normal since the monitor local oscillator is tuned to the IF under these conditions.

(*b*) *IF feedthrough*. This could be caused by signals in the IF band of frequencies (21.1120.99 MHz) which are present in the input of the monitor and are strong enough to feed through the preamplifier and mixer circuits. They may be identified as those signals that do not change position on the CRT scale as the COARSE TUNING dial of the tuning unit is adjusted. These signals (do not heterodyne with the local oscillator and so are not affected by tuning.

(c) *Images (input frequencies between 42 and 57 MHz).* The frequency of a signal causing an image is the local oscillator frequency plus the monitor IF. Since the signal causing the image is higher than the local oscillator frequency while the true signal is lower, they will move in opposite directions when the main tuning (local oscillator) dial is adjusted. If the main tuning dial is adjusted to a higher frequency, the true signals will appear to move to the left on the CRT display while the response due to an image move to the right, and vice versa.

(*d*) *Local oscillator harmonics*. While local oscillator harmonics are very low in amplitude, a very strong signal may beat with one of them to produce a response in the IF band of the monitor. These responses are identified by the fact that, when the main tuning is adjuster they move in the same direction as the true signals, but they move two or three times as fast. This is so because the rate of change of the frequency of a local oscillator harmonic is in direct relation to the order of the harmonic.

d. Probe Operation. To operate the probe proceed as follows:

(1) Calibrate the Monitor (para 3-4b).

(2) Connect the probe plug into the INPUT 75Ω TERMINATING and the -16V (PROBE) jacks on the front of the monitor.

(3) Attach the selected connector head to the probe body, insuring that it snaps securely in place.

(4) Select the bridging or terminating function by placing the BRDG/TERM switch to the appropriate position.

(5) Select the 50Ω or 75Ω circuit impedance by placing the switch in the appropriate position.

CAUTION

The maximum acceptable dc input voltage level to the probe is 25 volts dc.

(6) Connect probe with connector head to source of signals. The DECIBEL meter will directly indicate the level of the monitored signal.

3-6. Stopping Procedure

a. Standby Condition. To place Test Set, Radio AN,/USM-306(V)1 in standby, depress the tuning unit power switch. The green ON light will go out. This removes ac power from the spectrum analyzer unit, the monitor unit, and all portions of the tuning unit except the crystal oscillator oven.

b. Complete Shutdown. Disconnect test set main power cord from the ac line voltage source.

CHAPTER 4

MAINTENANCE

4-1. Scope of Maintenance

The maintenance duties assigned to the operator of Test Set, Radio AN/USM-306(V)1 are listed below together with a reference to the paragraphs and tables covering, the specific maintenance functions.

a. Daily preventive maintenance checks and services (para 4-5).

b. Weekly preventive maintenance checks and services (para 4-6).

c. Monthly preventive maintenance checks and services (para 4-7).

d. Quarterly preventive maintenance checks and services (para 4-8).

e. Cleaning (para 4-9).

f. Touchup painting instructions (para 4-10).

g. Lubrication (para 4-11).

h. Troubleshooting chart (para 4-13).

i. Power circuit sectionalization (para 4-14).

j. Signal circuit checks (para 4-15).

k. Lamp replacement (para 4-16).

I. Fuse replacement (paras 4-17, 4-18).

4-2. Special Tools and Equipment Required for Maintenance

Any special tools, parts, and special equipment sets supplied for use with the Test Set, Radio AN/USM-306(V)1 are listed in paragraph 1-6.

a. Special Tools. Special tools required and their uses are listed below. These tools are supplied with the equipment and are attached to the rear of the AF-RF monitor.

1 each Readout Lamp Extractor; for replacing digital display readout lamps (fig. 13).

1 each Pushbutton Lamp Extractor; for replacing lamps used in lighted pushbuttons (fig. 13).

b. Test Equipment. The only test equipment required for maintenance at the organizational level is Multimeter AN/URM-105. It is used to check for continuity in the power input circuits, and to check for continuity and shorts in the interconnecting coaxial cables.

4-3. Preventive Maintenance

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

a. Systematic Care. The procedures given in paragraphs 4-9, 4-10 and 4-11 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (para 4-5, 4-6, 4-7, and 4-8) outline functions to be performed at a specific interval. These checks and services are to maintain Army electronic equipment in a 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, how to check, and what the normal conditions 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; higher category of maintenance or repair is require(' Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

4-4. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services of the Test Set, Radio AN/USM-306(V)1, are required daily, weekly monthly and quarterly. Paragraph 4-5 specifies checks and services that must be accomplished daily and under the special conditions listed below.

a. When the equipment is initially placed in service.

b. Whenever the equipment has been physically picked up and transported to another location.

c. Prior to each day's use, when equipment is not maintained in standby condition.

d. At least once each week if the equipment is maintained in standby condition.

4-5. Daily Preventive Maintenance Checks and Services Chart

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
								B-BEFORE OPERATION D-DURING OPERATION A-AFTER OPERATION W-WEEKLY M-MONTHLY Q-QUARTERLY	
1	X						Test set	See that the equipment is complete	Appendix B
2	X						Cables and connectors	Inspect cables and power cords for chaffed, cracked, or frayed insulation. Replace connectors and connector heads that are broken, arced, stripped, or worn excessively.	Para 1-6. 1-8b. and 1-14b.
3	X						Meter and indicator cover glass	Check all meter and indicator cover glasses for cracks	Fig. 1-1
4	X						Input power (standby) condition).	If the equipment is on STANDBY - *a.* Verify that the OVEN pilot lamp on the tuning unit is lighted. *b*. If the GREEN ON lamp is lighted. depress the POWER button to turn the equipment off. The OVEN lamp should remain lighted. *c*. Turn the SCALE ILLUM-PWR OFF control on the analyzer fully counterclockwise until a click indicates the switch in the OFF position. *d*. Omit steps (5), (6), and (7), and proceed with sequence No. (8).	 *a.* Para 4-13 *b.* Para 4-13
5	X						Input power (equipment not on standby).	Make sure the equipment is *NOT* connected to a primary power source. Turn the SCALE ILLUM-PWR OFF control on the analyzer fully counterclockwise until it clicks.	
6	X						Input power SELECTOR switches.	Verify that the line selector switch on the rear panels of each of the three units is in the proper position for the line voltage to be utilized 115 or 230 VAC).	Para 2-6*a*
7	X						Input power connections .	Verify that- *a.* The AC power cable of the monitor is connected to jack 12 on the tuning unit (TO 305A -L, 115/230 VAC). *b*. The AC power cable of the analyzer is connected to jack J4 on the tuning unit (TO 360, 115/230 VAC. **CAUTION** **During the performance of steps 8, 9, and 10, be careful *NOT* to disturb the settings of the LINE SELECTOR switches.**	Fig. 2-2
8	X						Signal cables (rear)	Verify that five interconnecting signal cables are connected as follows- a. From tuning unit jack TO 305A-L 19.0 MHz to monitor 19.0 MHz input jack b. From tuning unit jack TO 305A-L 40/72 MHz to monitor 40/72 MHz input jack c. From tuning unit jack TO 305A-L 18.8 MHz to monitor 18.8 MHz input jack.	 Fig. 2-2 Fig. 2-2 Fig. 2-2

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE B-BEFORE OPERATION A-AFTER OPERATION M-MONTHLY D-DURING OPERATION W-WEEKLY Q-QUARTERLY 0	REFERENCE
								d. From tuning unit jack TO 360 18.8 MHz to analyzer 305A-T 18.8 MHz input jack	Fig. 2-2
								e. From monitor jack OUTPUT TO 360B 21.1 MHz to analyzer 305A-L 21.1 MHz input jack	Fig. 2-2
								f. Terminate the unused T 305 A-G 40/72 MHz and 18.8 MHz outputs with the terminating caps furnished.	Fig. 2-2
9	X						Clock selector (rear)	305A-T tuning unit 1 MHz STD FREQUENCY INT EXT switch is to be set to INT unless an external FREQUENCY STANDARD is used.	Fig. 1-2
10	X						Clock selector	If an external FREQUENCY STANDARD is used- *a.* Verify that an interconnecting cable is connected between the external FREQUENCY STANDARD and the 1 MHz STD FREQUENCY EXT jack on the back of the RF tuning unit	Fig. 1-2
								b. Place switch located immediately below the EXT jack in the EXT position.	
								c. Make sure the external FREQUENCY STANDARD is in operation before proceeding	
11	X						Input power	Connect the power cable from the tuning unit to a source of primary power that corresponds to the settings of the line selector switches (either 115V or 230 VAC). If the green ON lamp on the tuning unit lights, depress the POWER switch. The OVEN lamp should remain lighted.	Para 4-13 Figs. 1-2, 1-3 and 1-4
12		X					Controls and indicators	While making the operating checks (items 13 thru 24), observe that the mechanical action of each knob, dial, and switch is smooth and free of external or internal binding and no excessive looseness is apparent. Also check meter for sticking.	
13		X					Preliminary	et the front panel controls as follows: Set the front panel controls as follows *a. Monitor* (1) SCALE — NORM (2) SELECTIVITY — 250 Hz (3) SENSITIVITY — CAL 1 MHz (4) SENSITIVITY 10 dB/STEP — CAL (5) AUDIO MODE — AM (6) AUDIO GAIN — Full CCW	Fig. 1-3
								b. Analyzer (1) FOCUS — Midposition (2) INTENSITY — Midposition (3) SWEEP — 10 kHz/DIV CONTINUOUS (4) MARKER — Midposition (5) ATTENUATOR dB — 0 dB CAL	Fig. 1- 4

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE B-BEFORE OPERATION A-AFTER OPERATION M-MONTHLY D-DURING OPERATION W-WEEKLY Q-QUARTERLY	REFERENCE
								(6) 0 dB CAL Midposition (7) Sweep Rate Fast	
14		X					Power on switches (2)	Depress the Tuning Unit POWER switch. Rotate the PWR OFF-SCALE ILLUM control on the display UNIT TO MIDPOSITION. Verify that- *a.* The green ON light of the tuning unit lights *b.* Illuminated numbers appear in the FREQUENCY display window. *c.* The DECIBEL meter on the monitor lights *d.* The scale on the analyzer should light. (If in doubt, rotate the PWR OFF-SCALE ILLUM control farther in a clockwise direction.) *e.* Between 10 and 15 seconds after the PWR OFF-SCALE ILLUM switch is turned on, a horizontal trace should appear on the screen of the analyzer. *f. If a bright spot, rather than a horizontal line appears, turn the display unit OFF immediately.*	Fig. 1-2 Fig. 1-4 *a.* Para 4-13 *b.* Para 4-13 *c.* Para 4-13 *d*. Para 4-13 *e.* Para 4-13 *f.* Para 4-13
15		X					Continuous tuning mode	Depress the TUNING MODE switch to obtain the CONT mode of operation. Rotate the COARSE TUNING dial from full ccw stop to the full cw stop. Verify that- *a*. At full ccw position, the red MHz LOW signal illuminates *b.* Only the first three digits of FREQUENCY display illuminate. *c.* That FREQUENCY display shows frequencies from 0.0 MHz to 32.0 MHz. *d*. That decimal point is in right place (between 2d and 3d digits).	Fig. 1-2 *a.* Fig. 3-1, para 4,13 *b.* Fig. 3-1, para 4-13 *c* Fig. 3-1, para 4-13 *d.* Fig. 3-1, para 4-13
16		X					Locked tuning mode	Depress. the TUNING MODE LOCK switch. If the FREQUENCY display fails to indicate kHz, rotate the COARSE TUNING control slowly until a full 7-digit FREQUENCY display appears, and kHz is illuminated.	Fig. 3-1, para 4-13
17		X					Automatic locking	Continue rotating the COARSE TUNING control slowly, and verify that the display alternates between the following two conditions: *a. LOCK.* (1) A full 7-digit frequency display is shown . (2) The kHz indication is illuminated (3) An audible click is heard each time the lock condition occurs. (4) The decimal point appears between the fifth and sixth digits of the display. *b. Between LOCK points.* (1) Only the- first 3 digits of the display are lighted	 (1) 3-1, para 4-13 (2) Fig. 3-1, para 4-13 (4) Fig. 3-1, para 4-13 (1) Fig. 3-1, para 4-13

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE B-BEFORE OPERATION A-AFTER OPERATION M-MONTHLY D-DURING OPERATION W-WEEKLY Q-QUARTERLY	REFERENCE
								(2) The kHz indication is replaced by MHz	(2) Fig. 3-1A, para 4-13
								(3) The decimal point appears between the second and third digits of the display.	(3) Fig. 3-1, para 4-13
18		X					Fine tuning (decrease)	With the unit in the LOCK mode (full 7-digit display, and the kHz indication illuminated), rotate the FINE TUNING control counterclockwise. Verify that-	
								a. The frequency *decreases* as the FINE TUNING control is rotated in a ccw direction.	Para 4-13
								b. As the control approaches the ccw stop, the kHz indication is replaced with a red kHz LOW indication.	Fig. 3-1
19		X					Fine tuning (increase)	With the unit still in the LOCK mode, rotate the FINE TUNING control in a clockwise direction. Verify that-	Para 4-13
								a. The frequency *increases* as the FINE TUNING control is rotated in a cw direction.	
								b. As the control approaches the cw stop, the kHz indication is replaced with a kHz HIGH indication.	Fig. 3-1
20		X					Tuning range	With the unit still operating in the LOCK mode, verify that the tuning range can be varied between 0 MHz and 33.5 MHz (33500.00 kHz) by means of the COARSE and FINE TUNING controls.	Para 4-13
21		X					Monitor (calibrate and check).	*a*. Verify that the DECIBELS meter is illuminated	Para 4-13
								b. Set Monitor controls as follows: (1) Set the SCALE switch to NORM. (2) SELECTIVITY Pushbutton Switch to 250 Hz. (3) SENSITIVITY Switch to CAL. (4) SENSITIVITY 10 db/STEP Switch to CAL.	
								c. Turn FINE TUNING control fully ccw. Tune the Tuning Unit's COARSE TUNING control to 10xx.xx kHz in the LOCK mode.	
								d. Tune the Tuning Unit's FINE TUNING control to obtain a FREQUENCY Display reading of approximately 1000.00 kHz.	
								e. While observing the DECIBELS Meter on the monitor, vary the FINE TUNING control for MAXIMUM deflection (to the right) of the DECIBELS meter pointer.	Fig. 1-3
								f. Adjust the CAL control on the monitor to obtain a 0 db reading on the *upper* scale of the DECIBELS meter.	Fig. 1-3
								g. Turn the SCALE Switch on the monitor to the EXPAND position.	Fig. 1-3
								h. Readjust the FINE TUNING control on the RF tuning unit for MAXIMUM deflection (to the right) of the DECIBELS meter pointer.	

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
								i. Readjust the CAL control on the monitor, as necessary, to obtain a 0-db reading on the *lower* EXPANDED SCALE of the DECIBELS meter.	Para 4-13
22		X					Monitor, selectivity switch	Alternately depress SELECTIVITY 250-Hz and 3.1-kHz push-button switches. Verify that the DECIBELS meter reading does not vary as the SELECTIVITY switches are alternately operated. Tolerance: ±0.1 db on the EXPANDED SCALE.	Para 4-13
23							Analyzer unit	Verify that the controls on the analyzer unit are set in accordance with item 13, (*b*) above. *a*. Make the following adjustments: (1) Reduce the illumination on the graticule by turning the SCALE ILLUM control in a ccw direction. (Do *NOT* turn this control to the OFF position.) (2) Adjust the INTENSITY control for a suitable trace brilliance. (3) Adjust FOCUS control for sharpest trace. (4) Use a small flat-bladed screwdriver to adjust the vertical POSITION control to place the horizontal trace on the -20 db line of the vertical scale on the graticule. (This control is located directly below the VERTICAL ATTENUATOR switch.) *b*. Check Calibration as follows: (1) Set the Tuning Unit to the locked tuning mode. Turn the COARSE TUNING control to a locked position. (2) Rotate the FINE TUNING control clockwise until the kHz HIGH indication appears. (3) Rotate the FINE TUNING control in a counterclockwise direction until the last four or last five digits of the frequency display are zeroes. (*Example*: 13700.00 kHz; 21000.00 kHz.) (4) The pulse from the 1 MHz calibration reference oscillator in the monitor should appear on the left side of the spectrum display unit screen. Adjust the 0 dB CAL control on the spectrum display unit to obtain a convenient pulse height. (5) The marker pulse from the tuning unit FINE TUNING oscillator should appear on the right side of the spectrum display unit screen. Adjust the MARKER control on the analyzer unit to obtain a convenient pulse height. (6) Set the SWEEP RATE switch to NORM. (7) Requirements: (a) This pulse appearing on the left-hand side of the screen should coincide with the horizontal scale 0kHz mark. (b) The pulse appearing on tie right-hand side of the screen should coincide with the horizontal scale 100 kHz mark	Fig. 1-4 Fig. 1-4 Para 3-5*a*(2) Para3-4*b*(3)*(e)*

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
								B-BEFORE OPERATION D-DURING OPERATION A-AFTER OPERATION W-WEEKLY M-MONTHLY Q-QUARTERLY	
								(8) If either or both of the requirements of (7) (*a*) and (*b*) are not met, proceed as follows: (a) Using a small flat-bladed screwdriver, vary the adjustment of the 10 kHz/DIV CAL control until the spacing between the two pulses is the same as the spacing between the 0 kHz and the 100 kHz marks on the graticule. (b) Use the screwdriver to vary the horizontal POSITION control (just to the right of the 10 kHz/DIV CAL control), to align the pulses with the 0 kHz and 100 kHz marks on the graticule. (c) Repeat (a) and (b) above as necessary to meet the requirements of (7) (a) and (b). (9) Readjust the 0 dB CAL control on the spectrum analyzer unit to cause the top of the left-hand pulse to just reach the 0 db line on the vertical scale. (10)Verify that the horizontal baseline still coincides with the -20 db line of the vertical scale on the graticule. If it does *NOT*, repeat step (a) (4) and then step (8). *c.* Vary the FINE TUNING CONTROL on the tuning unit and verify that the marker moves across the display screen between the 100 kHz and the 0 kHz marks. *d.* 1 kHz/DIV and 0.3 kHz/DIV SWEEP modes. (1) Turn the HORIZONTAL SWEEP-kHz DIV control to 1 under CONTINUOUS. Verify that the marker pulse appears in the center of the display by varying the MARKER control. (2) Turn the HORIZONTAL SWEEP-kHz DIV control to 0.3 under CONTINUOUS. Verify that the marker pulse appears in the center of the display by varying the MARKER control.	Fig. 1-4 Fig. 1-4
21		X					Final settings	*a.* Turn the INTENSITY control on the Spectrum Analyzer fully ccw. (Extinguish trace.) *b.* Set Level Meter SCALE control to NORM. *c.* Set Level Meter SENSITIVITY CONTROL to NORM. *d.* Turn Monitor 10 db STEP control to the first position cw from the CAL position. *e.* Turn AF-RF Monitor 1db STEP control to the extreme ccw position. This completes the Preventive Maintenance Checkout Procedure.	

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
25			X				Standby	If equipment is to be operated in a standby status, turn it OFF by means of the POWER switch on the tuning unit.	
			X					*D0 NOT* disconnect the equipment from the MAIN power source. The OVEN lamp on the tuning unit should remain lighted.	

B-BEFORE OPERATION D-DURING OPERATION A-AFTER OPERATION W-WEEKLY M-MONTHLY Q-QUARTERLY

4-6. Weekly Preventive Maintenance Checks and Services Chart

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
1				X			External cables	Inspect external cords and interconnecting cables for chafed, cracked or frayed insulation. Replace connectors and probes that are broken, arced, stripped or worn excessively.	
2				X			Handles and latches	Inspect handles, latches, hinges and wheels for looseness. Tighten or replace as necessary.	Para 4-10
3				X			Metal surfaces	Inspect exposed metal surfaces for rust and corrosion. Clean and touch up paint as required.	Para 4-9
4				X			Cleaning	Inspect and clean as required.	

B-BEFORE OPERATION D-DURING OPERATION A-AFTER OPERATION W-WEEKLY M-MONTHLY Q-QUARTERLY

4-7. Monthly Preventive Maintenance Checks and Services Chart

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
1					X		Pluckout items	Disconnect main power cable. Disconnect all interconnecting cables from .the backs of the tuning unit, Monitor and spectrum analyzer. Remove all three units from the cabinet. Remove top covers from all three units. Inspect seating of all plugin modules. Check all lamps for proper seating in sockets.	Fig. 2-7
2					X		Limit-stop worm shafts, COARSE and FINE TUNING drive assemblies.	Inspect and lubricate as necessary in accordance with Instructions given in paragraph 4-11 and figure 4-1.	Para 4-11, *a* through *g*, fig. 4-1
3					X		Operational test	Perform steps 11 through 25, inclusive, of para 4-5 to verify proper operation of the test set.	Para 4-5

4-8. Quarterly Preventive Maintenance Checks and Services Chart

ITEM NO	Interval: Operator Daily B	D	A	Org. W	M	Q	ITEM TO BE INSPECTED	PROCEDURE	REFERENCE
							B-BEFORE OPERATION D-DURING OPERATION	A-AFTER OPERATION W-WEEKLY	M-MONTHLY Q-QUARTERLY
1						X	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310-4
2						X	Modifications	Check DA Pam 310 7 to determine if new applicable MWO's have been published. ALL URGENT MWO's must be applied immediately. ALL NORMAL MWO's must be scheduled.	DA Pam 310-7
3						X	Spare parts	Check all spare parts (operator and organizational) for general condition and method of storage. No overstock should be evident and all shortages must be on valid requisitions.	App. C and TM 11-6625-1748-12

4-9. Cleaning

Inspect the exterior surfaces of the Test Set Radio AN/USM-306(V)1. The exterior surfaces should be clean, free of dust, dirt, grease, and fungus.

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

WARNING

Adequate ventilation should be provided while using TRICHLOROTRI-FLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRI-FLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

b. Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with TRICHLOROTRIFLUOROETHANE.

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

CAUTION

Do not press on the meter faces (glass) when cleaning; the meter may be damaged.

d. Clean the front panels, meters, and control knobs; use a soft clean cloth. If dirt is difficult to remove, dampen the cloth with water; use mild soap if necessary.

4-10. Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to applicable cleaning and refinishing practices specified in TB 43-0118.

4-11. Lubrication

a. No lubrication of the external moving parts of Test Set, Radio AN/USM-306 (V) 1 is required. The caster wheels, hinges, etc., are all designed for dry operation.

b. The only parts of the test set that require lubrication are the worm shafts located in the FINE TUNING and COARSE TUNING drive assemblies in the tuning unit (fig. 4-1).

c. Periodic lubrication of the worm shafts shall be on an as-needed basis. In temperate climates the period between oilings will ordinarily be on the order of once every several months. Under certain climatic conditions, particularly in hot, dry, atmospheres, lubricants evaporate rather rapidly. Therefore it is mandatory that the worm shafts be inspected for adequate lubrication during the monthly maintenance checks and services to be performed in accordance with paragraph 4-7.

CAUTION

Use only the lubricant specified in *d*, below. Other lubricants will attack and eventually destroy the rubber O-rings at each end of the worm shafts.

d. The worm shafts shall be lubricated with the following lubricant only: Lube Oil, Machine Sideways, MIL-L-46017 Type 1, Medium, Mobile Vactra No. 2.

e. Remove the bottom cover plate from the tuning unit. Stand the tuning unit on its left side, as viewed from the front. Operate the COURSE TUNING and FINE TUNING controls throughout their entire ranges between fully clockwise and fully counterclockwise. Check for any tendency to bind or drag throughout the range of the controls. Visually inspect the worm shafts (fig. 4-1) for the presence of a thin film of lubricant.

f. To lubricate, first place a folded rag directly below the worm shaft to be oiled to catch and absorb any spillage. Use a small diameter piece of wire to dip into the oil and apply two or three drops along the top of the worm shaft (fig. 4-1). Operate the tuning drive several times throughout its range to distribute the oil evenly along the shaft. Use a clean rag or wad of cotton to remove any excess oil from the under side of the shaft. Carefully wipe away any excess oil that may have accumulated on the O-rings at the ends of the shaft.

g. Remove the drip cloths and replace bottom cover plate.

4-12. General Troubleshooting Information

Troubleshooting this equipment is based upon the operational checks contained in the daily preventive maintenance checks and services chart. To troubleshoot the equipment, perform all functions starting with item number 4 in the daily preventive maintenance checks and services chart (para 4-5) and proceed through the items until an abnormal condition or result is observed. When an abnormal condition or result is observed, note the item number and turn to the troubleshooting chart (para 4-13). Perform the checks and corrective actions indicated in the troubleshooting chart. If the corrective measures indicated do not, result in correction of the trouble, higher echelon maintenance is required. Paragraphs 4-14 through 4-18 contain additional information and step-by-step instructions for performing equipment tests and parts replacements to be used during the troubleshooting procedures.

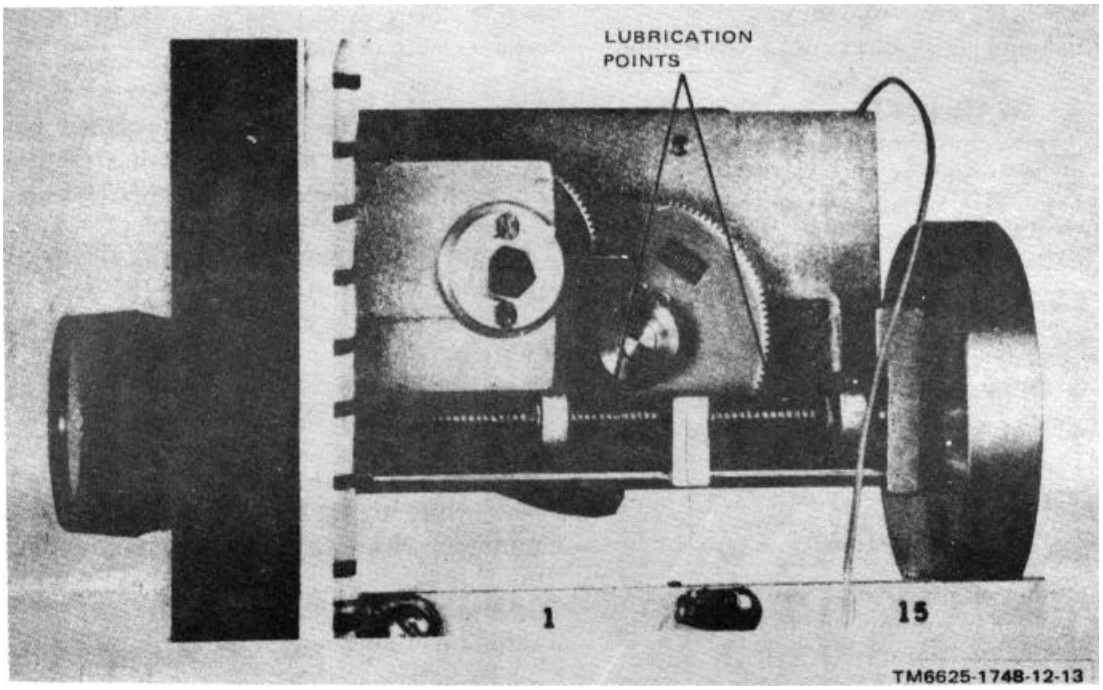


Figure 4-1. Tuning Drive Assembly TN-527/U tuning unit, showing lubrication.

4-13. Troubleshooting Chart

Item No.	Trouble Symptom	Probable Trouble	Checks and Corrective Measures
1	OVEN pilot not lighted	Power cable not connected	Connect to live power source.
		Fuse F1 blown	Replace fuse F1 (para 4-17,4-18).
		Fuse F2 blown	Replace fuse F2 (para 4-17,4-18).
		Defective pilot lamp	Replace pilot lamp (para 4-16).
2	*a*. Green ON light on RF tuning unit fails to light.	Defective pilot lamp	Replace pilot lamp (para 4-16).
		Improperly seated modules	Check plug-in modules for proper seating.
		Detailed troubleshooting required	Refer to higher category of maintenance.
	b. No indications of any kind appear on	Detailed troubleshooting required	Refer to higher category of maintenance.
	c. The DECIBEL meter on the monitor fails to light.	Power cord from monitor not connected.	Check that power cord from Monitor is plugged into J2 at the back of tuning unit. (Item 7*a* of weekly maintenance checks.)
		Fuse F1 at back of level meter blown	Replace fuse F1 (para 4-17, 4-18).
		Meter lamp defective	Replace meter lamp (para 4-16).
		Detailed troubleshooting required	Refer to higher category of maintenance.

Item No.	Trouble Symptom	Probable Trouble	Checks and Corrective Measures
	d. Scale (Graticule) does not light.	Power cord from spectrum analyzer unit not connected.	Check that power cord from analyzer unit is plugged into jack J4 at the back of tuning unit. (Item 7*b* of weekly maintenance checks.)
		Fuse F1 blown	Replace fuse F1 (para 4-17, 4-18).
		Graticule lamp defective	Replace graticule lamp (para 4-16).
		Detailed troubleshooting required	Refer to higher category of maintenance.
	e. Scale illumination dim at highest setting of SCALE-ILLUM control.	Line selector switch at rear or spectrum analyzer unit in 230V position, primary power source 115 VAC.	Set line selector switch to correspond with primary power source. (Item 6 of weekly maintenance checks.)
	f. Horizontal trace does not appear approximately 15 seconds after PWR OFF-SCALE ILLUM control is turned to midposition.	Intensity control set too low	Rotate INTENSITY control clockwise.
		High voltage fuse F1 blown	Replace HV fuse F1 on rear panel of Spectrum Analyzer, Unit IP-1018/U (para 4-17, 4-18, fig. 1-4).
		One or more modules not properly seated in jacks.	Check circuit modules for proper seating.
		Loose socket on cathode ray display tube.	Make sure cathode ray display tube socket is secured to tube.
		Detailed troubleshooting required	Refer to higher category of maintenance.
	g. Bright spot appears on display instead of horizontal line.	Deflection modules not properly seated in jacks.	Check circuit modules for proper seating.
		Loose CRT socket	Make sure cathode ray display tribe socket is secured to tube.
		Detailed troubleshooting required	Refer to higher category of maintenance.
3	*a*. Indication on FREQUENCY display, power switch green ON light illuminated, TUNING MODE indicator lights out.	Mode lamp burned out	Replace lamp (para 4-16).
	b. MHz LOW or one of first three digits of FRE-(QUENCY display fails to light.	Display lamp(s) burned out	Replace lamp(s) (para 4-16).
		Detailed troubleshooting required	Refer to higher category of maintenance.
4	*a*. Frequency display shows 7 digits, kHz is illuminated, green LOCK light fails to come on.	Mode lamp burned out	Replace lamp (para 4-16).
	b. Green LOCK indicator lights, one (or more display digits fail to light.	Display lamp(s) burned out	Replace lamp(s) (para 4-16).
5	With Mode Switch set for LOCK Mode, green LOCK Indicator fails to light, full 7-digit FREQUENCY display does not come on, kHz indicator does not light, as COARSE tuning control is rotated through its entire range.	TN-527/U tuning unit 1 MHz STD FREQUENCY INT-EXT switch set to EXT. External standard not connected or not operating.	Connect external standard and place in operation, or, turn INT-EXT switch to INT.
		Detailed troubleshooting required	Refer to higher category of maintenance.
6	One or more of the FREQUENCY display digits not lit. COARSE and FINE tuning controls have no effect.	Counter lockup	Refer to higher category of maintenance.
7	Fine tuning range insufficient to cause kHz LOW indication to appear near at ccw ex-	Loose flywheel setscrews	Tighten setscrews.
		Detailed troubleshooting required	Refer to higher category of maintenance.

Item No.	Trouble Symptom	Probable Trouble	Checks and Corrective Measures
	treme, or kHz HIGH indication to appear near cw extreme.		
8	COARSE tuning control does not cover the full range of frequencies between 0 MHz and 33.5 MHz (33500.00 kHz).	Loose flywheel setscrews Detailed troubleshooting required	Tighten setscrews. Refer to higher category of maintenance.
9	a. DECIBELS meter on AF-RF monitor not illuminated.	See 2a above	See 2a above.
	b. No indication on DECIBELS meter.	Incorrect control settings	Verify that AF-RF monitor controls are set as per 13*a* of the daily preventive maintenance checks.
		B+ fuse F2 blown	Replace fuse F2 (para 4-17, 4-18).
		Interconnecting cables loose or- incorrectly connected.	Recheck interconnecting cables as per 8 *a, b* and *c* of the daily preventive maintenance checks.
		Detailed troubleshooting required	Refer to higher category of maintenance.
10	DECIBELS meter reading varies more than ±0.1 db as SELECTIVITY switches are alternately operated.	Incorrect setting of FINE TUNING control. Detailed troubleshooting required	Repeat step 21 of the daily preventive maintenance checks. Refer to higher category of maintenance.
11	a. Spacing between pulses insufficient. Maximum setting of 10 kHz/DIV CAL control will not separate pulses enough to make them coincide with 0 kHz and 100 kHz marks on scale.	FINE TUNING not set to 100.00 kHz Defective horizontal-deflection circuit	Repeat step *b*(2). Refer to higher category of maintenance.
	b. Top of left-hand pulse does not reach 0-db line on the vertical scale.	Incorrect setting of VERTICAL ATTENUATOR.	Reset VERTICAL ATTENUATOR to 0 db CAL.
		Incorrect setting of VERTICAL POSITION control.	Reset VERTICAL POSITION Control as per 23*a*(4).
		Detailed troubleshooting required	Refer to higher category of maintenance.
	e. Horizontal trace does not extend and overlap 0 kHg and 100 kHz marks on scale.	Deflection circuit defects	Refer to higher category of maintenance.
	d. Marker does not appear on both the 1 kHz/DIV and 0.3 kHz/DIV Sweep Modes.	Detailed troubleshooting required	Refer to higher category of maintenance.

4-14. Power Circuit Sectionalization

When it is apparent that power is not being applied to one or more of the units comprising Test Set AN/USM306(V)1, it is necessary to sectionalize the trouble to either the main power cable, one of the interconnecting cables, or to one of the units. Make certain that all fuses are good before proceeding with the following steps (pare 4-17).

a. Main Power Cable. Unplug the main power cable from the TN-527/U tuning unit. Check continuity of each of the conductors with an ohmmeter.

b. Radio Frequency Tuning Unit. Check continuity between the two outside connectors of the 115/230 VAC INPUT socket (B, fig. 1-2). If no continuity exists, depress the POWER switch and recheck continuity. If there is still

no continuity reading, an open circuit exists in the POWER switch or associated wiring: higher category of repair is required.

c. Audio-Radio Frequency Monitor TS-2968/U. Unplug the power cable of the monitor from the 305A-L, 115/230 VAC socket at the back of the tuning unit (B, fig. 1-2). Check for continuity between the two blades of the power plug on the end of the monitor power cord. If no continuity exists, the trouble is in the power input circuit of the monitor; higher category of maintenance is required. If continuity does exist in the above test, ponitor at the 305A-L 115/230 VAC socket at the back of the tuning unit. A wiring defect exists in the TN-527/U tuning unit: higher category of maintenance is required.

d. IP-1018/U Spectrum Analyzer Unit. Disconnect the power cord from the IP-1018/U spectrum analyzer unit and from the 360 115/230 VAC socket at the back of the TN-527/U tuning unit (B, fig. 1-2). Check each conductor of the power cord for continuity. Turn the PWR OFF-SCALE ILLUM control on the spectrum analyzer clockwise (ON), and check for continuity between the outer two contacts of the 115/230 VAC power input jack at the rear of the spectrum analyzer Unit (B, fig. 1-4). If no continuity exists, there is a wiring or switch defect in the unit; higher category of maintenance is required. If continuity does exist in the above test, a wiring defect exists in the power circuit of the TN-527/U tuning unit and higher category of maintenance is required.

4-15. Signal Circuit Cable Checks

With the exception of the calibrating signal for the TS-2968/U monitor, all internal signals required to operate the AN/USM-306(V)1 originate in the tuning unit. These signals are furnished to the monitor ,via three coaxial cables, and to the spectrum analyzer unit via two coaxial cables. When a malfunction occurs that cannot be isolated by the procedures given in the troubleshooting chart, these five coaxial cables should be removed and tested prior to referring the equipment to higher category of maintenance.

a. Check each cable for continuity of the center conductor, using the lowest range ohms scale on the AN/URM- 105 multimeter.

b. Check each cable for continuity of the outer conductor, using the lowest range ohms scale on the AN/URM- 105 multimeter.

c. Check for shorts or leakage between the inner and outer conductor. using the highest ohms range on the multimeter. A reading at or near infinity should be obtained.

4-16. Lamp Replacement

a. DECIBELS Meter. Disconnect and pull the monitor unit, out of the front of the case. The lamps for the DECIBELS meter are accessible with the top cover of the monitor unit removed.

b. Pushbutton Lamps.

(1) *Tuning Unit and Monitor.* Grasp the plastic button and pull out. Using the lamp extractor (located on the back of the monitor unit), slide the extractor over the defective lamp. Squeeze the extractor and pull the bulb out. Insert new bulb into the end of the extractor, insert base of bulb into socket. Release pressure and remove extractor. Replace pushbutton.

(2) *Spectrum Analyzer.* To replace the pushbutton switch lamp, remove the bottom cover and push the switch out. On the sides of the switches are holes covered on the inside by thin pieces of metal. Move the metal strip either up or down by using a scribe in the hole. When the hole is uncovered, remove the faulty lamp. Replace the bulb, and keeping pressure on the bulb, reposition the metal strip.

WARNING

When replacing the bezel lamps in the spectrum display unit, take care not to strike the front of the exposed cathode ray tube with any hard object that might cause it to implode. Implosion of the CRT can rupture your eardrums. Flying glass could cause serious lacerations.

c. Graticule Lamps, Display Unit. Remove the upper cover plate from the spectrum analyzer unit. Remove the four finger nuts from the front bezel. (A, fig. 1-4.) Remove bezel, glass, and graticule. Pull lamp socket away from lamp (fig. 4-2). Use a pair of long-nosed pliers to squeeze the tabs of the lampholder together. Grasp lamp bulb and pull out from the front panel. Replace lamp, socket, graticule, glass, bezel and finger nuts.

d. Readout Lamps. To replace the readout lamps, remove one screw from the front bezel. Loosen the other. With the readout lamp extractor (located on the back panel of the level meter), engage the horizontal slots in the affected display and pull straight out. Operate the top and bottom snap

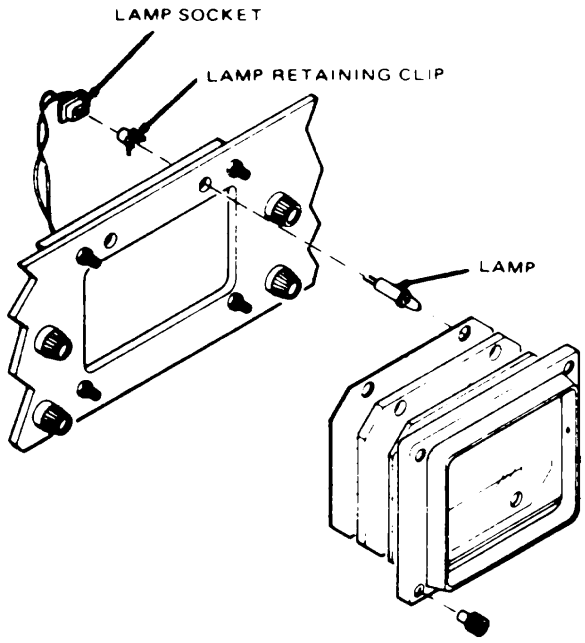


Figure 4-2. Graticule lamp replacement.

springs and remove the front frame. The eleven bulbs are then accessible.

4-17. Fuse Replacement, 115 VAC Operation

a. Tuning Unit.

(1) The main equipment fuse is located in a holder on the lower left portion of the rear panel of the tuning unit. This fuse is designated as F1 on the panel. Turn fuse cap ccw and remove fuse. Replace with a 125/250V 2.0 amp slow-blow fuse.

(2) Fuse F2, located immediately above fuse F1 at the rear of the tuning unit, is used to protect the tuning unit only. Replace with a 125/250V 1.0 amp slow-blow fuse.

b. Monitor Unit.

(1) The fuses for the level meter are located at the upper right-hand corner of the rear panel. Fuse Fl. located just above the power cord entry, is the primary power fuse. Replace with a 125/250V 0.5 amp slow-blow fuse.

(2) Fuse F2, located immediately above fuse Fl, is the 13+ fuse. Replace with a 125/250V 0.5 amp slow-blow fuse.

c Spectrum .Analyzer Unit.

(1) Primary ac power fuse Fl is located on the rear panel of the unit directly above the ac power cord input connector. Replace with a 125/250V 0.5 amp slow-blow fuse.

(2) The high voltage power supply is also located on the rear panel of the spectrum analyzer unit. (The location is shown on figure 1-4.) Replace with a 0.75 amp fast-blow fuse 312.750 or 3AG type.

4-18. Fuse Replacement, 230 VAC Operation

a. Tuning Unit. For 230 VAC operation, replace fuse F1 with a 125/250 1.0 amp slow-blow fuse. Replace fuse F2 with 125/250V 0.5 amp slow-blow fuse.

b. Monitor Unit. For 230-VAC operation, replace fuse F1 with a 125/250V, 0.25 amp slow-blow fuse. (The F2 fuse remains the same for the 230-volt operation.)

c. Spectrum Analyzer Unit.

(1) For 230 VAC operation. replace primary ac power fuse F1, located directly above the ac power cord input connector, with a 12.5/250V 0.25 amp slow-blow fuse.

(2) The fuse used in the high voltage power supply is the same for 230 volt operation as for 115 volt operation. Replace as per paragraph 4-17*c*(2).

CHAPTER 5

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

5-1. Disassembly of Equipment

To prepare the Test Set. Radio AN/USM-306(V)1 for shipment and storage-

a. Disconnect all power cords and interconnecting cables.

b. Remove the three modular units from the cabinet.

5-2. Repackaging for Shipment or Limited Storage

The exact procedure for repackaging depends on the material available and the conditions under which the equipment is to be shipped or stored. Adapt the procedures outlined below whenever circumstances permit. The information concerning the original packaging (para 2-1) will also be helpful.

a. Material Requirements. The following materials are required for packaging Test Set, Radio AN/USM-306(V) 1. For stock numbers of materials, refer to SB 38- 100.

Barrier material, waterproof
Tape, cloth backing, waterproof
Twine, cotton
Fiberboard, corrugated
Tape, gummed paper
Cushioning material
Steel straps

WARNING

Prevent personal injury when applying or removing steel strapping by wearing heavy gloves and protective eyewear. Do not handle packing cartons by the steel strapping.

b. Packaging. Package the items comprising Test Set, Radio AN/USM-306(V)1 as outlined below.

(1) *Accessories.* Wrap probe subassemblies MX-8641/U and MX-8642/U, Probe Adapter MX-8640/U, oscilloscope light shield and any running spares in cushioning material. Place the cushioned units within a wrap of corrugated fiber board. Secure the wrap with gummed tape. Place instruction manual(s) in a heavy manila envelope, or wrap with heavy paper and gummed tape.

(2) *Rack. MT-4263/U.*

(*a*) Lock the equipment cabinet in the vertical position in the stand. Place the rack in a pan similar to that shown in figure 2-1. Pack folded or rolled corrugated fiber board around the wheels in the pan to prevent movement of the stand in the pan.

(*b*) Place instruction manuals, on the bottom shelf of the stand. Place all wrapped accessories ((1) above), on top of the manuals and secure them to the shelf with gummed tape.

(*c*) Wrap corrugated fiber board completely around the cabinet, as shown in figure 2-1, and secure with gummed tape.

(*d*) Measure the inside front-to-back and side-to-side dimensions of the shipping carton. Make up corrugated fiber board fillers to be placed on the front, back, and sides of the cabinet, at or near the top, to make a snug fit inside the carton.

(*e*) Stand the shipping carton next to the rack, and measure the height difference between the top of the rack and the top of the carton. Place corrugated fiber board fillers on top of the rack to a sufficient height so that the fillers will touch the inside top of the shipping carton when it is placed over the rack. The fillers must be large enough to touch, or very nearly touch, the front, back, and sides of the shipping carton.

(*f*) Lower the shipping carton over the rack and secure with two steel bands running over the top and under the hot tom of the carton.

CAUTION

limit banding tension to the minimum required to hold the carton together without distorting the rack assembly.

(3) *Individual chassis.* Spectrum Analyzer IP-1018/U, Audio-Radio Frequency Monitor TS-2968/U, and Radio Frequency Tuning Unit TN-527/U are all packed the same way, in a manner similar to that shown in figure 2-1. Pack each unit with sufficient corrugated fiber board filler or cushioning material at bottom, front, back, sides, and top to provide a snug fit in the shipping carton. Secure the shipping carton with gummed tape.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

5-3. Authority for Demolition

The demolition procedures given in paragraph 5-4 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon the order of the commander.

5-4. 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 demolish completely some portions of the equipment rather than partially destroy all the equipment units.

a. Smash. Use sledges, axes, hammers, crowbars, and any other heavy tools available to smash the interior units of the set.

(1) Use the heaviest tool on hand to smash the connectors, meters, knobs, dials, etc.

NOTE

Heavy tools will effectively destroy the external parts mentioned in (1) above, but the remainder of the exposed surfaces of the equipment are constructed of steel plate; attempts to damage it by smashing will be useless.

(2) Remove the modular units from the cabinet. Remove the top cover plates with a heavy hammer or bar. Remove plug-in modular pc boards for further destruction. Smash as many of the remaining exposed parts of the various chassis as possible.

b. Cut. Remove bottom cover plates with a heavy hammer or bar. Use axes, handaxes, or machete to cut the power cable. Cut all cords and cables in a number of places.

WARNING

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

c. Burn. Burn the technical manuals first. Burn as much of the equipment as is flammable; use gasoline, oil, flamethrowers, and similar materials. Pour gasoline on the cut cables and internal wiring and ignite it. Use a flamethrower to burn spare parts or pour gasoline on the spares and ignite them. Use incendiary grenades to complete the destruction of the unit.

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 if destruction of small parts and wiring is desired.

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.

APPENDIX A

REFERENCES

Following is a list of references available to the operator and organizational repairman of Test Set, Radio AN/USM-306 (V) 1.

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.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 9-213	Printing Instructions for Field Use.
SB 38-100	Preservation, Packaging and Packing Materials, Supplies, and Equipment Used by the Army.

APPENDIX B

COMPONENTS OF END ITEM LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists integral components of and basic issue items for the AN/USM-306(V)1 to help you inventory items required for safe and efficient operation.

B-2. General

This Components of End Item List is divided into the following sections:

a. Section II. Integral Components of the End Item. Not applicable. These items, when assembled, comprise the AN/USM-306(V)1 and must accompany it whenever it is transferred or turned in. The illustrations will help you identify these items.

b. Section III. Basic Issue Items. Not applicable. These are the minimum essential items required to place the AN/USM-306(V)1 in operation, to operate it, and to perform emergency repairs. Although shipped separately packed they must accompany the AN/USM-306(V)1 during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-3. Explanation of Columns

a. Illustration. This column is divided as follows:

(1) *Figure number*. Indicates the figure number of the illustration on which the item is shown.

(2) *Item number.* The number used to identify item called out in the illustration.

b. National Stock Number. Indicates the National stock number assigned to the item and which will be used for requisitioning.

c. Part Number. Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items. Following the part number, the Federal Supply Code for Manufacturers (FSCM) is shown in parentheses.

d. Description. Indicates the Federal item name and, if required, a minimum description to identify the item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code. Not applicable. “USABLE ON" codes are included to help you identify which component items are used on the different Models. Identification of the codes used in these lists are:

Code	Used on
PAA	Model TN527/U
PAB	Model TS2968/U
PAC	Model lP1018/U
PAD	Model MX8642/U

g. Quantity Required (Qty Req’d). This column lists the quantity of each item required for a complete major item.

h. Quantity. This column is left blank for use during an inventory. Under the Rcvd column, list the quantity you actually receive on your major item. The Date columns are for your use when you inventory the major item at a later date; such as for shipment to another site.

(Next printed page is B-2)

SECTION II INTERGAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (a) FIG. NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION PART NUMBER		(FSCM)	(4) LOCATION	(5) USABLE ON CODE	(6) QTY REQ'D	(7) QUANTITY RCVD	(7) QUANTITY DATE
1-2		6625-00-459-8562	TN-527/U RF TUNING UNIT	305A-T	(54778)		PAB PAC	1		
1-3		6625-00-459-8570	TS-2968/U AF-RF MONITOR	305A-L	(54778)		PAA PAC	1		
1-4		6625-00-459-1733	IP-1018/U SPECTRUM ANALYZER	360B	(54778)		PAA PAB	1		
1-1		6625-00-459-7419	MT-4263 CABINET	220A-5	(54778)			1		
1-5		6625-00-439-6157	MX-8642/U PROBE	230a	(54778)		PAB	1		
1-?		6625-00-459-4156	ADAPTER, PROBE MX-8640/U	233A-1	(54778)		PAD	1		
1-?		6625-00-459-9320	PROBE, SUBASSEMBLY MX-8641/U	230A	(54778)		PAD	1		

APPENDIX C

ORGANIZATIONAL REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

C-1. Scope

This appendix lists repair parts and special tools required for the performance of organizational maintenance of the AN/USM-306(V)1

C-2. General

This repair parts and special tools list is divided into the following sections:

a. Prescribed Load Allowance (PLA)-Section II. A composite listing of the repair parts, special tools, test and support equipment having quantitative allowances for initial stockage at the organizational level.

b. Repair Parts- Section III. A list of repair parts authorized for the performance of maintenance at the organizational level.

c. Special Tools, Test and Support Equipment-Section IV. Not applicable.

d. Index-Federal Stock Number Cross-Reference to Figure and Item Number or Reference Designation-Section V. A list of Federal stock numbers is ascending numerical sequence followed by a list of reference of reference numbers is ascending alphanumerical sequence, cross-referenced to the figure number and reference designation.

e. Index-Reference Designation Cross-Reference to Page Number - Section VI. A list of reference designations cross-referenced to page numbers.

C-3. Explanation of Columns

The following provides an explanation of columns in the tabular lists:

a. Source, Maintenance, and Recoverability Codes (SMR), Column 1.

(1) Source codes indicate the selection status and source for the listed item. Source codes are-

Code	Explanation
P	Repair parts which are stocked in or supplied from the GSA/DSA, or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair parts which are procured and stocked for insurance purposes because the combat or military essentially of the end item dictates that a minimum quantity be available in the supply system.
P9	Assigned to items which are NSA design controlled: unique repair parts, special tools, test, measuring and diagnostic equipment, which are stocked and supplied by the Army COMSEC logistic system, and which are not subject to the provisions of AR 380-41.
P10	Assigned to items which are NSA design controlled: special tools, test, measuring and diagnostic equipment for COMSEC support, which are accountable under the provisions of AR 380-41, and which are stocked and supplied by the Army COMSEC logistic system.
M	Repair parts which are not procured or stocked, but are to be manufactured at indicated maintenance levels.
A	Assemblies which are not procured or stocked as such, but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies which are not procured or stocked and the mortality of which normally is below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.

Code **Explanation**

X1-Repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.

X2-Repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain same through cannibalization. Where such repair parts are not obtainable though cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.

G--Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DSU and GSU level. These assemblies will not be stocked above DS and GS level or returned to depot supply level.

(2) Maintenance codes indicate the lowest category of maintenance authorized to install the listed item. The maintenance level codes are-

Code **Explanation**

C Operator/crew

O Organizational maintenance

(3) Recoverability codes indicate whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are-

Code **Explanation**

R-Repair parts and assemblies that are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.

S-Repair parts and assemblies which are economically repairable at DSU and GSU activities and which normally are furnished by supply on an exchange basis. When items are determined by a DSU to be uneconomically repairable, they will be evacuated to a depot for evaluation and analysis before final disposition,

T-High-dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts normally are repaired or overhauled at depot maintenance activities.

U-Repair parts specifically selected for salvage by reclamation units because of

Code **Explanation**

precious metal content, critical materials, or high-dollar value reusable casings or castings.

b. Federal Stock Number, Column 2. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description, Column 3. This column indicates the Federal item name and any additional description of the item required. The index number has been included as part of the description to aid in the location of "Same as" items. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses.

d. Unit of Measure, Column 4. A two-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Incorporated in Unit Column 5. This column indicates the quantity of the item used in the AN/USM-306(V)1. Subsequent appearances of the same item in the same assembly are indicated by the letters "REF."

f. 15-Day Organizational Maintenance Allowance, Column 3, of Section II and Column 6 of Section III.

(1) The allowance columns are divided into four subcolumns. Indicated in each subcolumn opposite the first appearance of each item is the total quantity of items authorized for the number of equipments supported. Subsequent appearances of the same item will have the letters "REF" in the allowance columns. Items authorized for use as required, but not for initial stockage, are identified with an asterisk in the allowance column.

(2) The quantitative allowances for organizational level of maintenance represents one initial prescribed load for a 15-day period for the number of equipments supported. Units and organizations authorized additional prescribed loads will multiply the number of prescribed loads authorized by the quantity of repair parts reflected in the density column applicable to the number of items supported to obtain the total quantity of repair parts authorized.

(3) Organizational units providing maintenance for more than 100 of these equipments shall determine the total quantity of parts required by converting the equipment quantity

to a decimal factor by placing a decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized in the 51-100 allowance column. Example, authorize allowance for 51-100 equipments is 40; for 150 equipments multiply 40 by 1.50 or 60 parts required.

(4) Subsequent changes to allowances will be limited as follow s: No change in the range of items is authorized. If additional items are considered necessary, recommendation should be forwarded to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-ME-NMP-EM, Fort Monmouth, N.J. 07703, for exception or revision to the allowance list. Revisions to the range of items authorized will be made by the USAECOM National Maintenance Point based upon engineering experience, demand data, or TAERS information.

g. Illustrations, Column 7. This column is divided as follows:

(1) *Figure number, column 7a*. Indicates the figure number in which the item is shown.

(2) *Item number or reference designation, column 7b.* Indicates the reference des!inatl6n used to identify the item in the illustration.

C-4. Special Information

Repair parts mortality is computed from failure rates derived from experience factors with the individual parts in a variety of equipments. Variations in the specific application and periods of use of electronics equipment, the fragility of electronic piece parts, plus intangible material and quality factors intrinsic to the manufacture of electronic parts, do not permit mortality to be based on hours of end item use. However, long periods of continuous use under adverse conditions are likely to increase repair parts mortality.

C-5. Location of Repair Parts

a. This appendix contains two cross-reference indexes (secs. V and VI) to be used to locate a repair parts when either the Federal stock number, reference number (manufacturer's part number), or reference designation is known. The first column in each index is prepared in alphanumerical sequence. The reference numbers (manufacturer's part numbers) are listed immediately following the last listed Federal stock number in the index of Federal stock numbers.

b. When the Federal stock number is known, follow the procedures given in (1), (2), and (3) below.

(1) Refer to the index of Federal stock numbers (sec. V) and locate the Federal stock number. The FSN is cross-referenced to the applicable figure and reference designation.

(2) Refer to the RPSTL (sec. III) and locate the figure number (col. 7a) and reference number (col. 7b) as noted in the FSN index.

(3) If the FSN or manufacturer's part number is not listed in the index, refer to columns 2 and 3 of the RPSTL (sec. III) and locate the Federal stock number or part number by scrutiny of the numbers listed in columns 2 and 3.

c. When the reference designation is determined, refer to the reference designation index (sec. VI). The reference designations are listed in alphanumerical order and are cross-referenced to the page number on which they appear in the repair parts list (sec. III). Refer to the page number noted in the index and locate the reference designation (col. 7b). If the word "REF" appears in the allowance column for the repair part, note the Federal stock number (col. 2) or manufacturer's part number (col. 3). Refer to the FSN index and note the reference designation for that FSN or part number. Refer to the reference designation index and note the page number given for the reference designation. Refer to the page noted in the RPSTL (sec. III) and locate the reference designation in column 7b of the repair parts list.

C-6. Federal Supply Code for Manufacturers

Code	Manufacturer's name
71400	Bussmann Mfg. Division of McGraw Edison Co.
71744	Chicago Miniature Lamp Works
72765	Drake Mfg. Co.
75915	Littelfuse, Inc.
	- - - - DELETED - - - -
54773	Lear Siegler, Inc. Sierra Electronic Division

SECTION II. PRESCRIBED LOAD ALLOWANCE

(1) FEDERAL STOCK NUMBER	(2) DESCRIPTION USABLE ON CODE		(3) 15-DAY ORG MAINT. ALW (a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100
5920-131-9816	FUSE, CARTRIDGE:	MDL1 (71400)			1	1
5920-228-7882	FUSE, CARTRIDGE:	MDL2 (71400)			1	1
5920-280-8344	FUSE, CARTRIDGE:	312-500 (75915)			1	1
5920-878-5571	FUSE, CARTRIDGE:	313-500 (75915)		1	1	2
6210-924-7869	INDICATOR, LIGHT:	R118-603 (72765)			1	1
6240-865-0111	LIGHT, INDICATOR:	CM8-682 (71744)			1	2
	FUSE, CARTRIDGE:	312-5003AG (75915)			1	1
	KNOB:	91600090 (54778)			1	1
	KNOB:	916000103 (54778)		1	1	2
	KNOB:	916000089 (54778)				1
	LAMP:	913800040 (54778)		1	2	3

SECTION III. REPAIR PARTS FOR ORGANIZATION MAINTENANCE (CONTINUED)

(1)	(2)	(3)		(4)	(5)	(6) 15-DAY ORGANIZATIONAL MAINTENANCE ALW				(7) ILLUSTRATION	
SMR CODE	FEDERAL STOCK NUMBER	REF NUMBER & MFR CODE	DESCRIPTION USABLE ON CODE	UNIT OF MEAS	QTY INC IN UNIT	(a) 1-5	(b) 6-20	(c) 21-50	(d) 51-100	(a) FIG NO.	(b) ITEM NO. OR REF. DESIG
	6625-459-8568	A001	Test SET, RADIO AN/USM-306(V)1: (This item is nonexpendable)							1-1	
P-O--	6625-439-6156	A002	ADAPTER, PROBE MX-8640/U	ea	1	*	*	*	*	1-1	A3
P-C-S	6625-465-1733	A008	ANALYZER, IP-1018/U	ea	1	*	*	*	*	1-1	A7
P-C--	5920-878-5571	A230	FUSE,CARTRIDGE: 313-500 (75915)	ea	1	*	1	1	2	1-4	A7F1
P-C--		A231	FUSE,CARTRIDGE: 312.750 (75915)	ea	1	*	*	1	1	1-4	A7F2
P-O--		A337	KNOB: 91600090 (54778)	ea	2	*	*	1	1		A7MP12
P-O--		A338	KNOB: SAME AS A337	ea	REF	REF	REF	REF	REF		A7MP13
P-O--		A339	KNOB: 916000103 (54778)	ea	5	*	1	1	2		A7MP14
P-O--		A340	KNOB: SAME AS A339	ea	REF	REF	REF	REF	REF		A7MP15
P-O--		A341	KNOB: SAME AS A339	ea	REF	REF	REF	REF	REF		A7MP16
P-O--		A342	KNOB: SAME AS A339	ea	REF	REF	REF	REF	REF		A7MP17
P-O__		A343	KNOB: SAME AS A339	ea	REF	REF	REF	REF	REF		A7MP18
P-O--	6240-865-0111	A346	LIGHT, INDICATOR: CM8-682 (71744)	ea	2	*	*	1	2	4-2	A7DS4
P-O--	6240-865-0111	A347	LIGHT, INDICATOR: SAME AS A346	ea	REF	REF	REF	REF	REF	4-2	A7DS5
P-O--	5920-280-8344	A467	FUSE, CARTRIDGE: 312-500 (75915)	ea	1	*	*	1	1		A7A13F1
P-C-S	6625-459-8570	A823	MONITOR, AUDIO-RADIOFREQUENCY: 305AL (54778)	ea	1	*	*	*	*	1-1	A5
P-C--	5920-378-5571	B007	FUSE, CARTRIDGE: SAME AS A230	ea	2	REF	REF	REF	REF	1-3	A5F1
P-C--	5920-878-3571	B008	FUSE, CARTRIDGE: SAME AS A230	ea	REF	REF	REF	REF	1-3		A5F2
P-O--		B029	KNOB: 916000089 (54778)	ea	2	*	*	*	1		A5MP7
		B030	KNOB: SAME AS B029	ea	REF	REF	REF	REF	REF		A5MP8
P-O--		B031	KNOB: SAME AS A337	ea	3 REF	REF	REF	REF			A5MP9
P-O--		B032	KNOB: SAME AS A337	ea	REF	REF	REF	REF	REF		A5MP10
P-O--		B033	KNOB: SAME AS A337	ea	REF	REF	REF	REF	REF		A5MP11
P-O--		B034	KNOB: SAME AS A339	ea	3	REF	REF	REF	REF		A5MP12
P-O--		B035	KNOB:SAME AS A339	ea	REF	REF	REF	REF	REF		A5MP13
P-O--		B036	KNOB: SAME AS A339	ea	REF	REF	REF	REF	REF		A5MP14
P-O--		B036A	LAMP: 913800040 (54778)	ea	2	*	1	2	3		A5DS1
P-O--		B036B	LAMP: SAME AS B036A	ea	REF	REF	REF	REF	REF		A5DS2
P-C-S	6625-439-6157	B653	PROBE SUBASSY MX-8642/U	ea	1	*	*	*	*	1-5	A2
P-C-S	6625-441-9320	B701	PROBE SUBASSY MX-8641/U	ea	1	*	*	*	*	1-5	A4
P-C-S	6625-459-8562	B131	TUNING UNIT, RF FREQ TN-527/U	ea	1	*	*	*	*	1-1	A6
P-O--	5920-131-9816	C164	FUSE, CARTRIDGE: MDL1 (71400)	ea	1	*	*	1	1	1-2	A6F2
P-O--	5920-228-7882	C165	FUSE, CARTRIDGE: MDL2 (71400)	ea	*	*	*	1	1	1-2	A6F1
P-O--	6210-924-7869	C170	INDICATOR, LIGHT: R118-603 (72765)	ea	1	*	*	1	1		A6DS1
P-O--		C197	KNOB: 916000056 (54778)	ea	2	*	*	*	*		A6MP7
P-O--		C198	KNOB: 916000087 (54778)	ea	2	*	*	*	*		A6MP8
P-O--		C199	KNOB:: SAME AS C198	ea	REF	REF	REF	REF	REF		A6MP9
P-O--		C200	KNOB: 916000091 (94668)	ea	2	*	*	*	*		A6MP10
P-O--		C201	KNOB: SAME AS C200	ea	REF	REF	REF	REF	REF		A6MP11
P-O--		C202	LAMP: SAME AS B036A	ea	3	REF	REF	REF	REF		A6DS2
P-O--		C203	LAMP: SAME AS B036A	ea	REF	REF	REF	REF	REF		A6DS3
P-O--		C204	LAMP: SAME AS B036A	ea	REF	REF	REF	REF	REF		A6DS4

SECTION V. INDEX-FEDERAL STOCK NUMBER CROSS REFERENCE TO FIGURE AND ITEM NUMBER OR REFERENCE DESIGNATION

FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION	FEDERAL STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER OR REF. DESIGNATION
5920-131-9816	1-2	A6F2			
5920-228-7882	1-2	A6F1			
5920-280-8344		A7A13F1			
5920-878-5571	1-3	A5F1			
5920-878-5571	1-3	A5F2			
5920-878-5571	1-4	A7F1			
6210-924-7869		A6DS1			
6240-865-0111	4-2	A7DS4			
6240-865-0111	4-2	A7DS5			
6225-439-6156	1-1	A3			
6625-439-6157	1-5	A2			
0625-441-9320	1-5	A4			
6625-459-8562	1-1	A6			
6625-459-8570	1-1	A5			
6625-465-1733	1-1	A7			

Reference No.	Mfg Code	Fig No.	Item No.
312-5003AG	75915	1-4	A7F2
913800040	54778		A5DS1
913800040	54778		A5DS2
913800040	54778		A6DS2
913800040	54778		A6DS3
913800040	54778		A6DS4
910000056	54778		A6MP7
916000087	54778		A6MP8
916000087	54778		A6MP9
916000089	54778		A5MP7
916000089	54778		A5MP8
916000091	54778		A6MP10
916000091	54778		A6MP11
916000103	54778		A5MP12
916000103	54778		A5MP13
915000103	54778		A5MP14
916000103	54778		A7MP14
916000103	54778		A7MP15
915000103	54778		A7MP16
916000103	54778		A7MP17
915000103	54778		A7MP18
91500090	54778		A5MP9
91600090	54778		A5MP10
91000090	54778		A5MP11
91600090	54778		A7MP12
91600090	54778		A7MP13

SECTION VI. INDEX- REFERENCE DESIGNATION CROSS REFERENCE TO PAGE NUMBER

APPENDIX D
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

D-1. General

This appendix provides a summary of the maintenance operations for Non-Aircraft Nickel-Cadmium Batteries. 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.

D-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

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

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons 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.

g. Install The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

D-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d Column 4, Maintenance Category. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the

number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly. component. module. end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time. troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C-Operator/Crew
O-Organizational
F-Direct Support
H-General Support
D-Depot

e. Column .5. Tools and Equipment. Column 5 specifies by code. those common tool sets (not individual tools) and special tools, test. and support equipment required to perform the designated function.

f. Column 6. Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

D-4. Tool and Test Equipment Requirements (Sec. III).

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

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

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit} in parentheses.

D-5. Remarks (Sec. IV)

a. Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in section II.

(Next printed page is D-3)

SECTION II MAINTENANCE ALLOCATION CHART
FOR
Test Set Radio AN/USM-306(V)1

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT. FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIP	(6) REMARKS
00	TEST SET, RADIO AN/USM-306(V)1	INSPECT		0.5					
		SERVICE		0.5					
		ALIGN				0.5			2,3,4,5,6,7,9
		TEST				0.1			2,3,4,5,6,7
		REPAIR				1.0			9
		OVERHAUL					2.0		1 THRU 13
01	ANALYZER SPECTRUM IP-1018/U	TEST				1.0			2,3,4,5,6,7,9
		ALIGN				0.5			2,3,4,5,6,7
		REPAIR				1.0			9
		OVERHAUL					2.0		1 THRU 13
02	MONITOR AUDIO RADIO FREQUENCY TS-2968/U	TEST				1.0			2,3,4,5,6,7,9
		ALIGN				0.5			2,3,4,5,6,7
		REPAIR				1.0			9
		OVERHAUL					2.0		1 THRU 13
03	TUNING UNIT, RADIO FREQUENCY TN-527/U	TEST				1.0			2,3,4,5,6,7,9
		ALIGN				0.5			2,3,1,5,6,7
		REPAIR				1.0			9
		OVERHAUL					2.0		1 THRU 13
04	PROBE SUBASSEMBLY MX-8642/U	TEST							4,7,8
		ALIGN							4,7,8,9
		OVERHAUL							4,7,3,9

SECTION III
TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR

TOOL OR TEST EQUIPMENT REF CODE	MAINT CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
	D	TRANSFORMER VARIABLE POWER CN-16/U	5950-00-235-2086	1
	H,D	COUNTER ELECTRONIC, DIGITAL READOUT AN/USM-207	6625-00-911-6368	2
	H,D	VOLTMETER, ELECTRONIC AN/URM-145	6625-00-973-3986	3
	H,D	VOLTMETER, ELECTRONIC ME-30/U	6625-00-669-0742	4
	H,D	MULTIMETER, TS -352B/U	6625-00-242-5023	5
	H. D	OSCILLOSCOPE, AN/USM-281A	6625-00-228-2201	6
	H,D	GENERATOR, SIGNAL, AN/GRM-50	6625-00-868-8353	7
	H,D	GENERATOR, SIGNAL, AN/URM-127	6625-00-783-5965	8
	H,D	TOOL KIT, TK-100/G	5180-00-605-0079	9
	D	25KHZ LOW PASS FILTER I-TEL FLT/20 SERIES OR EQUIVALENT		10
	D	100KHZ LOW PASS FILTER I-TEL FLT/20 SERIES OR EQUIVALENT		11
	D	220KHZ LOW PASS FILTER I-TEL FLT/20 SERIES OR EQUIVALENT		12
	D	2.6MHZ LOW PASS FILTER I-TEL FLT/20 SERIES OR EQUIVALENT		13

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

VERNE L. BOWVERS,
Major General, United States Army,
The Adjutant General.

Distribution:
To be distributed in accordance with DA Form 12-51 (qty rqr block #179) direct and general support maintenance requirements for the AN/GRC-106 Radio set.

U. S. GOVERNMENT PRINTING OFFICE: 1987 - 173-506/60036

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 017510-000