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AD 408320

AIR TRANSPORTABLE  
COMMUNICATIONS SYSTEM  
AN/TSC-24(V)

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**ENGINEERING DRAFT**

ITT COMMUNICATION SYSTEMS, INC.

PARAMUS, NEW JERSEY

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Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

ILLUSTRATIONS

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Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

Function:

This completely self-powered communications facility is designed primarily for contingency usage. Ship-to-shore and point-to-point high frequency radio circuits are provided as well as ground-to-air and short-haul VHF and UHF links.

The ATCU-100 complement includes a Medium Power Shelter, Receiver-Control Shelter, Maintenance and Supply Shelter and Diesel generators.

The Receiver-Control Shelter houses voice terminal equipment for two 2 wire/4 wire circuits as well as the following telegraph terminal capacity:

- (a) 16 channel frequency division multiplex
- (b) 4 channel time division multiplex
- (c) Two single channel terminals for use with the VHF and UHF equipment.

A subscriber equipment cable head is located in a tent near the Receiver Control Shelter.

To the above equipment, the ATCU-100A procurement adds a High Power Shelter (2-10 kw PEP HF Transmitters), a Relay Shelter with torn-tape message relay equipment, security equipment and additional Diesel generators.

A typical antenna and facility siting plan is illustrated in Figure 1. Figure 2 shows a typical interconnection of shelters while Figures 2A, B, and C provide functional block diagrams of the four operational shelters. Dimensional views of all shelters and power generators are shown in Figures 7, 8, and 9.

Individual shelter types may be employed independently when a requirement exists to supplement existing facilities.

Transport methods for the maximum of 5 Shelters and 4 Diesel generators (total weight approximately 30 tons) are detailed as part of the system description which follows.

Manufacturer: Technical Materiel Corp., Mamaroneck, N.Y.

Federal Stock Number: \_\_\_\_\_

Estimated Cost: ATCU-100, \$323,000; ATCU-100A, \$566,000. (Cryptographic units not included.)

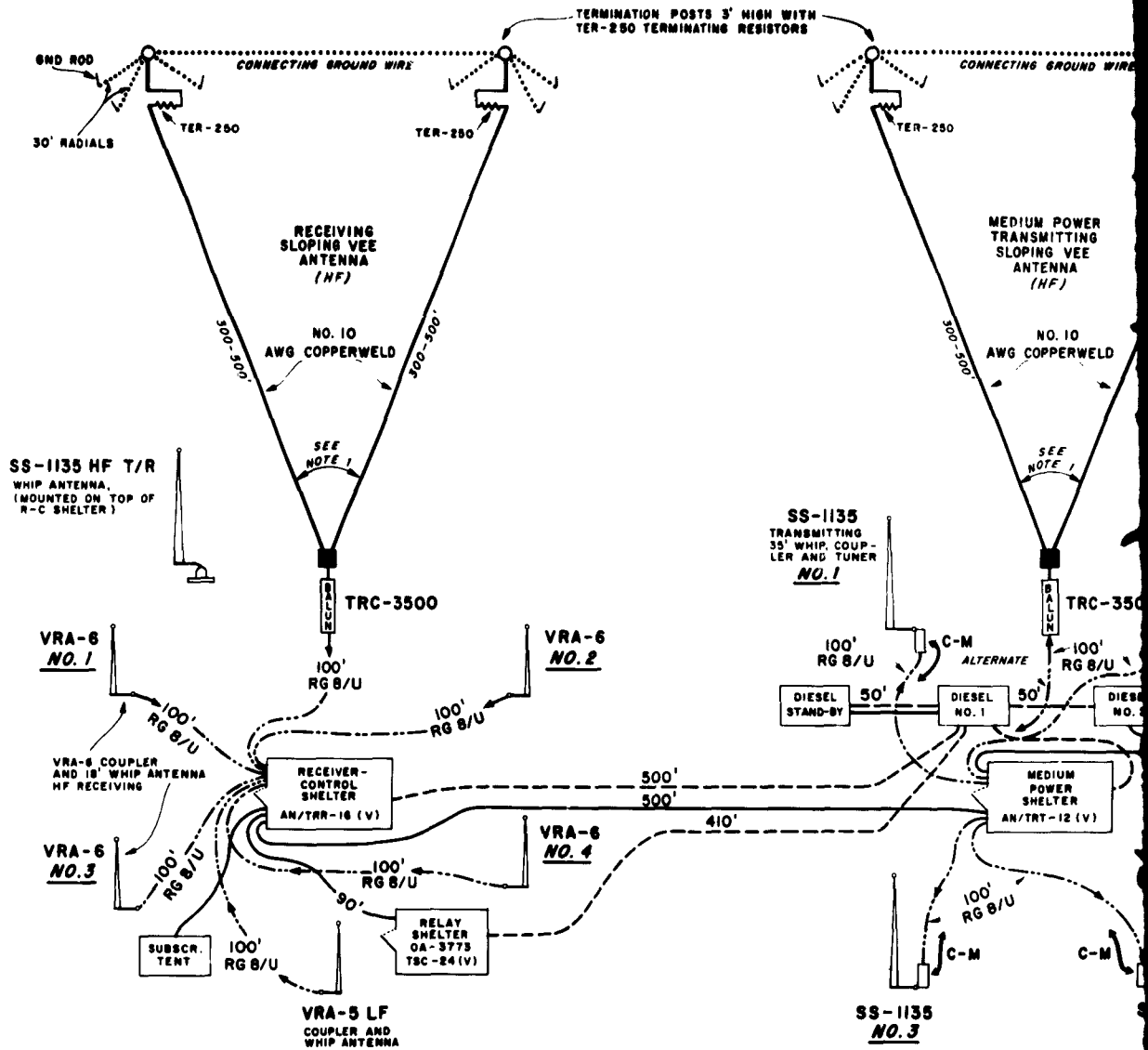
Air Transportable Communications System  
ATCU-100 and ATCU-100A  
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Function (Cont.)

Status: Most components are short cycle procurement; Shelter fabrication is special.

Reference(s): TMC Technical Manual AN/TSC-24 (V) 1 June 1962

Installation Time (estimated):	<u>Configuration</u>	<u>Man Hours</u>	<u>Allocation</u>
	ATCU-100	12	4 men, 3 Hours
	ATCU-100A	24	4 men, 6 Hours



**NOTES:**

1. ANTENNA ENCLOSED APEX ANGLE AND/OR LEG LENGTH IS VARIED AS REQUIRED FOR DESIRED FREQUENCY VS. ANGLE OF RADIATION CHARACTERISTIC.
2. MAINTENANCE AND SUPPLY SHELTER MAY BE LOCATED WITH ANY OF THE OTHER SHELTERS AND POWERED FROM ANY OF THE DIESEL GENERATORS.
3. THE FOUR AN/URT-19 (V) TRANSMITTERS (1KW PEP) IN THE MEDIUM POWER SHELTER ARE NORMALLY COUPLED TO THE SS-1135 35' WHIP ANTENNAS. (VEE IS ALTERNATE). AN/URA-27 DIRECTIONAL COUPLERS AND TUNERS ARE INCLUDED.
4. ALL SHELTERS HAVE GROUNDING LUGS ON EXTERIOR CONNECTION PANELS; GROUND RODS ARE PROVIDED.

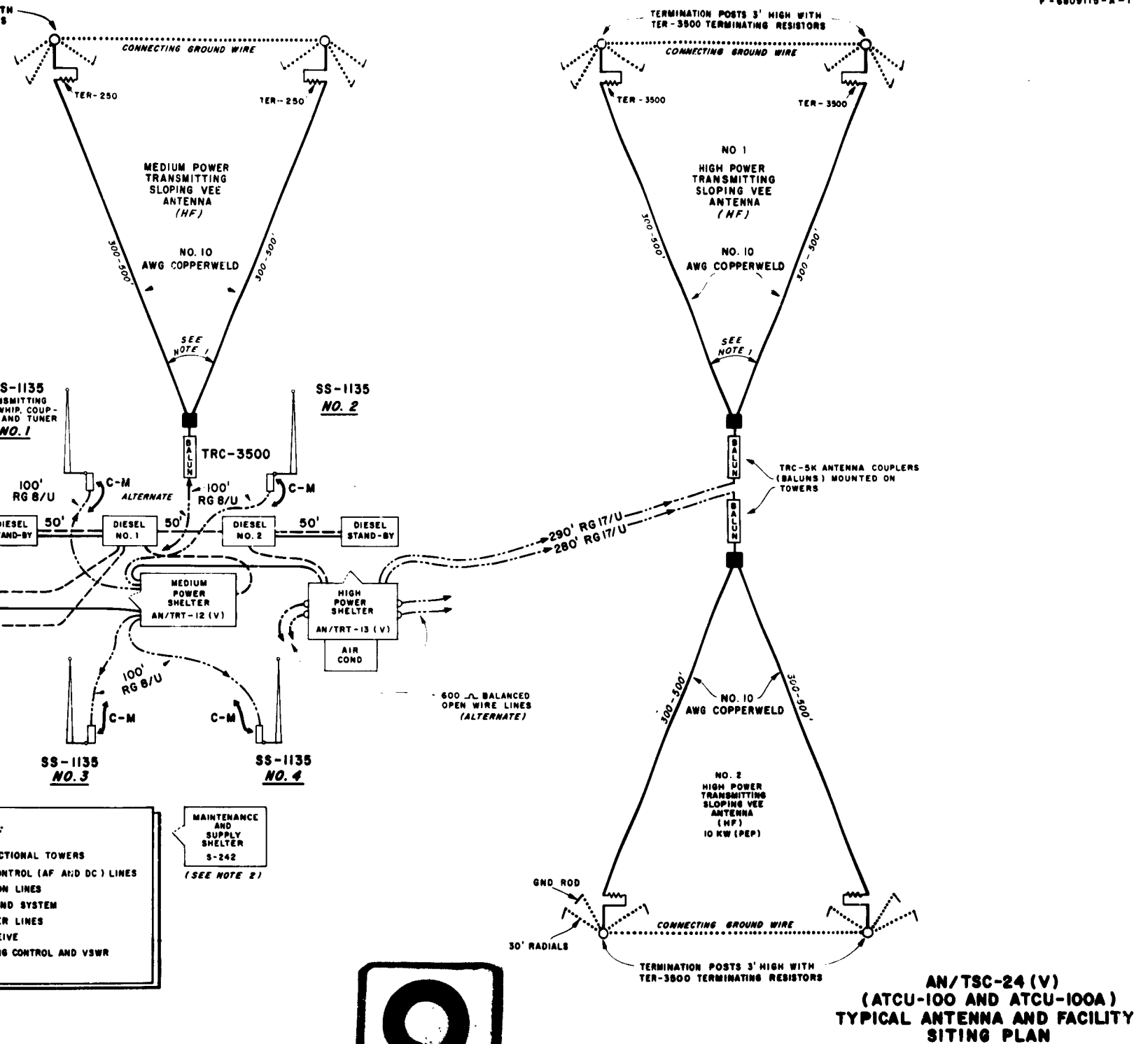
**LEGEND:**

- 50' GUYED SECTIONAL TOWERS
- SIGNAL AND CONTROL (AF AND DC) LINES
- - - RF TRANSMISSION LINES
- ..... ANTENNA GROUND SYSTEM
- PRIMARY POWER LINES
- T/R TRANSMIT/RECEIVE
- C-M ANTENNA TUNING CONTROL AND VSWR MONITOR LINES

MAINTENANCE AND SUPPLY SHELTER S-242 (SEE NOTE 2)

1





SS-1135 TRANSMITTING WHIP COUPLER AND TUNER NO. 1

SS-1135 NO. 2

SS-1135 NO. 3

SS-1135 NO. 4

FUNCTIONAL TOWERS  
CONTROL (AF AND DC) LINES  
ON LINES  
AND SYSTEM  
ER LINES  
IVE  
G CONTROL AND VSWR

MAINTENANCE AND SUPPLY SHELTER S-242 (SEE NOTE 2)



**AN/TSC-24 (V)  
(ATCU-100 AND ATCU-100A)  
TYPICAL ANTENNA AND FACILITY  
SITING PLAN**

FIGURE 1  
(SHEET 3 OF 99)

FIRST MADE FOR			SIGNATURE & DATE		
SUBJECT NO.	NO.	DRWG. NO.	DATE	SIGNATURE	DATE
			4.2.57		
INTERNATIONAL TELECOMMUNICATIONS SYSTEMS, INC. 6809115 A					

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

INTERFACE CHARACTERISTICS

HF Facilities

Transmitters;

Frequency Range; 2 to 28 MC\* and 2 to 32 MC\*\*.

Emission; (AM) ISB, SSB, DSB. Also CW, FSK.

Frequency Stability;

(a) Synthesizer, AN/URA-30,  $1/10^8$  per day

(b) Crystal, AN/URA-28,  $1/10^6$  per day

Carrier Suppression; continuously adjustable  
"0" to -55 db

<u>HF Transmitter</u>	<u>Output Power</u>	<u>Antenna</u>
(a) AN/URT-19(V) **	1 KW	35' whip
(b) AN/FRT-39B *	10 KW	Sloping Vee
(c) KWM-2A *	100 W	35' whip

Receivers;

Frequency Range; 0.5 to 32 MC, continuously tunable

Type reception; AM (ISB, SSB, DSB. Also CW, FSK).

Sensitivity; 3 microvolts for  $\frac{S}{N} = 10$  db

N

Bandwidth; 13 KC minimum

AFC; Locks on - 20 db suppressed carrier and is based upon phase comparison with local carrier oscillator as a standard.

Antennas; 18' whip and Sloping Vee

UHF Facilities

Transmitter;

Frequency Range; 225 to 400 MC

Emission; (AM) Voice, MCW. Also FSK.

Output Power; 12 to 15 watts

Antenna; Discone

Receiver;

Frequency Range; 225 to 400 MC

Type Reception; (AM) Voice, CW. Also FSK.

Sensitivity; 8 microvolts for  $S/N = 10$  db

Antenna; Discone

VHF Facilities

Transmitter;

Frequency Range; 115 to 156 MC

Emission; (AM) Voice, MCW. Also CW, FSK

Output Power; 30 watts

Antenna; VHF Ground Plane (vertical)

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
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INTERFACE CHARACTERISTICS (Cont'd.)

Receiver;

Frequency Range; 105 to 190 MC  
Type Reception; (AM) Voice, MCW. Also CW, FSK  
Sensitivity; (Mfr. data pending)  
Antenna; VHF Ground Plane (Vertical)

Terminal Facilities

Telegraph Terminals;

- (a) AN/FGC-60/14. FDM\* 16 channel voice frequency carrier telegraph terminal. 32 receivers provided for 16 channel space diversity applications. Maximum keying speed, 100 wpm.
- (b) AN/UGC-1A, 4 channel TDM\*\*. Keying speeds 60, 75 and 100 wpm.
- (c) AN/SGC-1A, Single Channel Radioteletype Terminal Set. DC Start-Stop input; audio 500/700 cps output.
- (d) TH-39A/UGT; Single channel maximum 100 wpm FSK.

Telephone Terminals;

WA-623 2W/4W single channel.

Voice Frequency Multiplex/Demultiplex;

TD-410 MUX and TD-411 DEMUX  
(2X3KC:6KC and 6KC:2X3KC respectively)

Converters, SSB and FSK; See Figure 2B.

\* Frequency division multiplex  
\*\* Time division multiplex

Air Transportable Communication System  
ATCU 100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

Interface Characteristics ( Intra-System )

The four operations shelters (Medium Power, High Power, Receiver-Control, and Relay) all have labeled external connector panels for:

- (a) AF and DC signal and control
- (b) RF receiver and Transmit antenna cables.
- (c) Primary power.
- (d) Grounding.

The Medium Power Shelter includes capability for roof-mounting the VHF, and UHF antennas and the Receiver-Control Shelter is designed to accommodate the HF transmit-receiver whip antenna provided.

The Maintenance and Supply Shelter has external connectors for primary power and grounding.

The Diesel generators include the necessary power cables and generator terminations.

All inter-shelter power and signal and control cables are provided with the required mating connectors. All RF cables are likewise provided with the proper antenna coupler-mating connectors as well as shelter-end connectors.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]

AIR TRANSPORTABLE COMMUNICATION SHELTERS-AN/TS

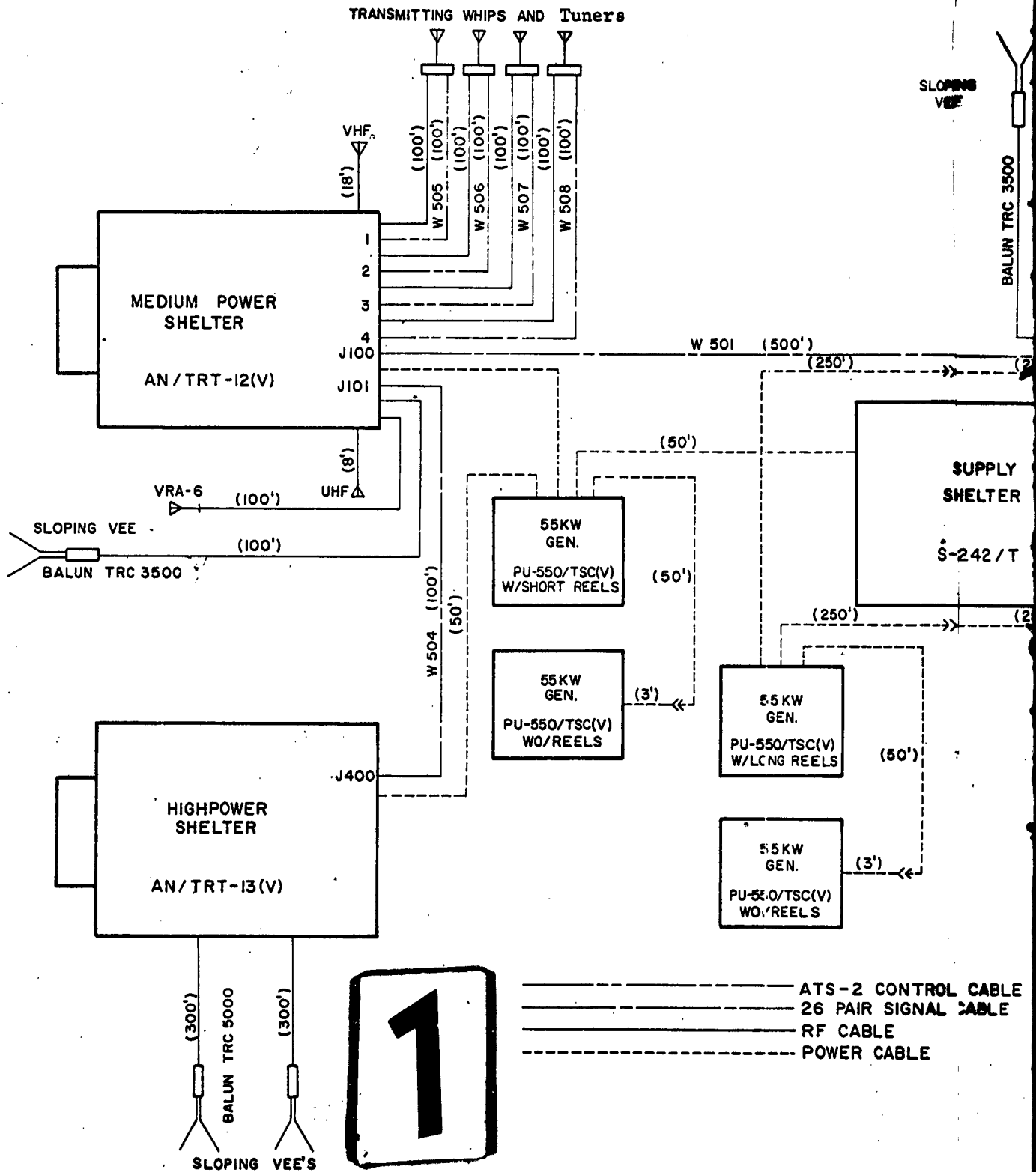


Figure 2

AIR TRANSPORTABLE COMMUNICATION SHELTERS-AN/TSC-24(V)

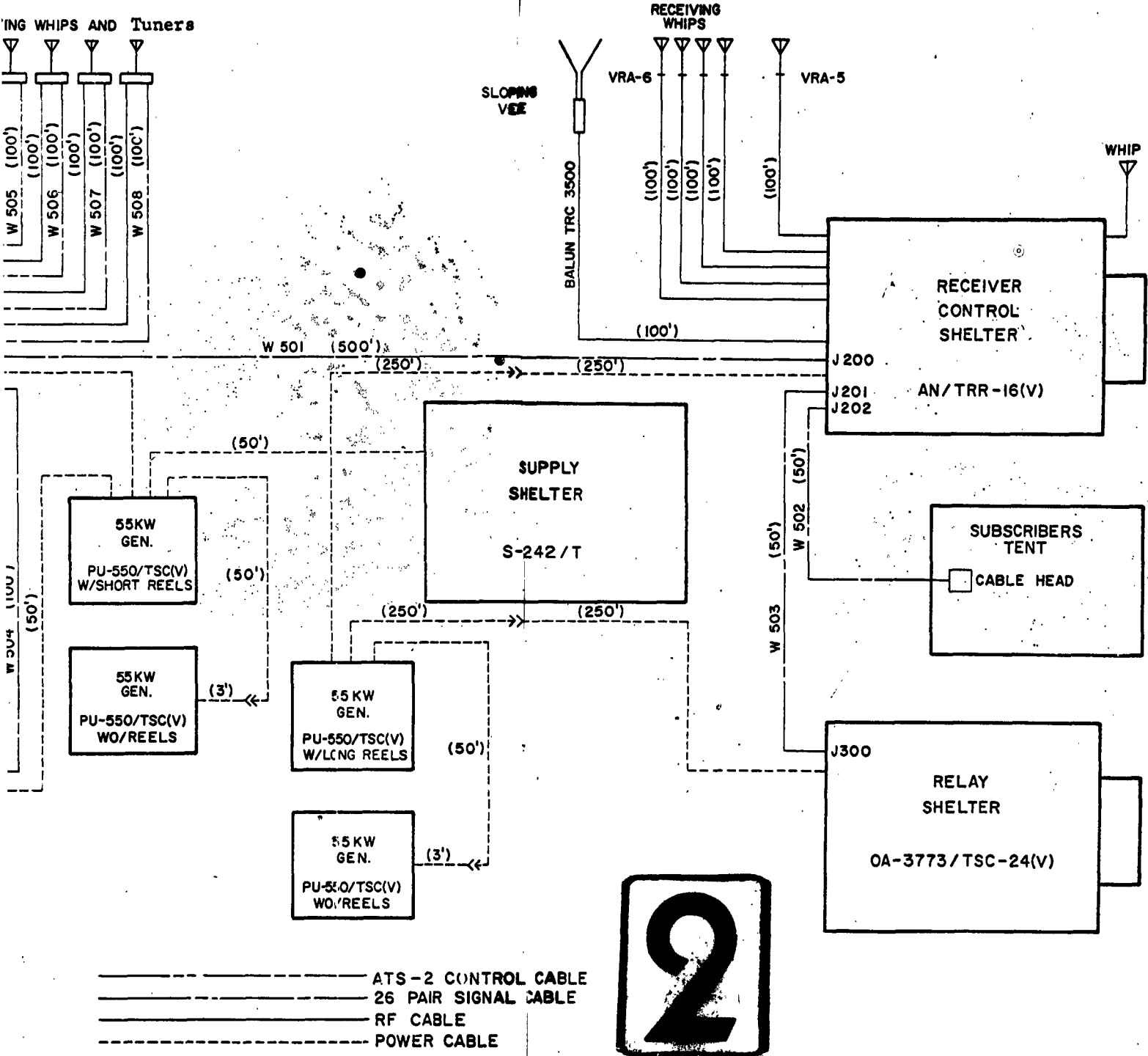
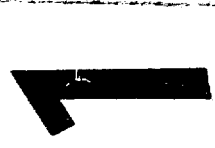
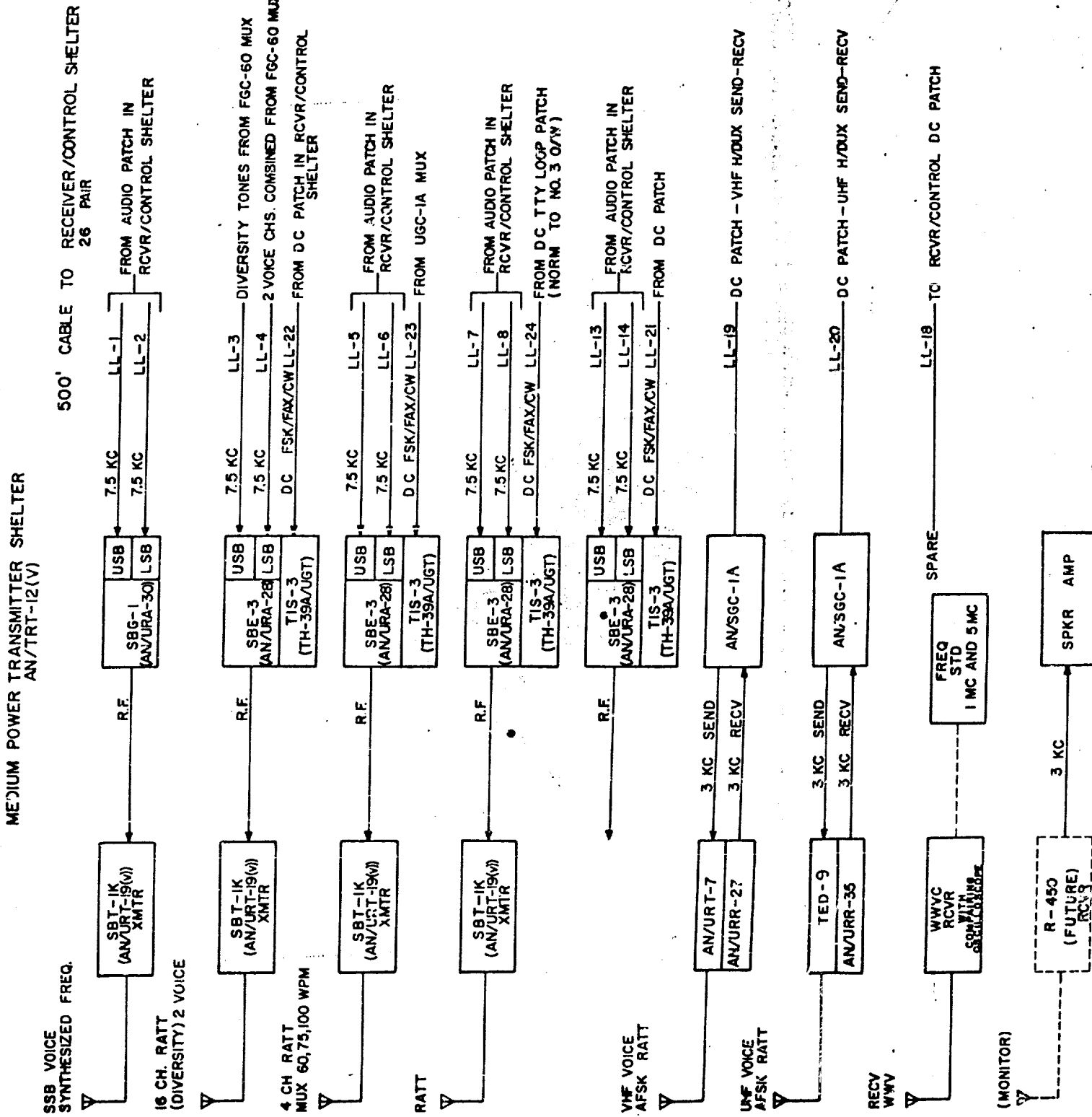
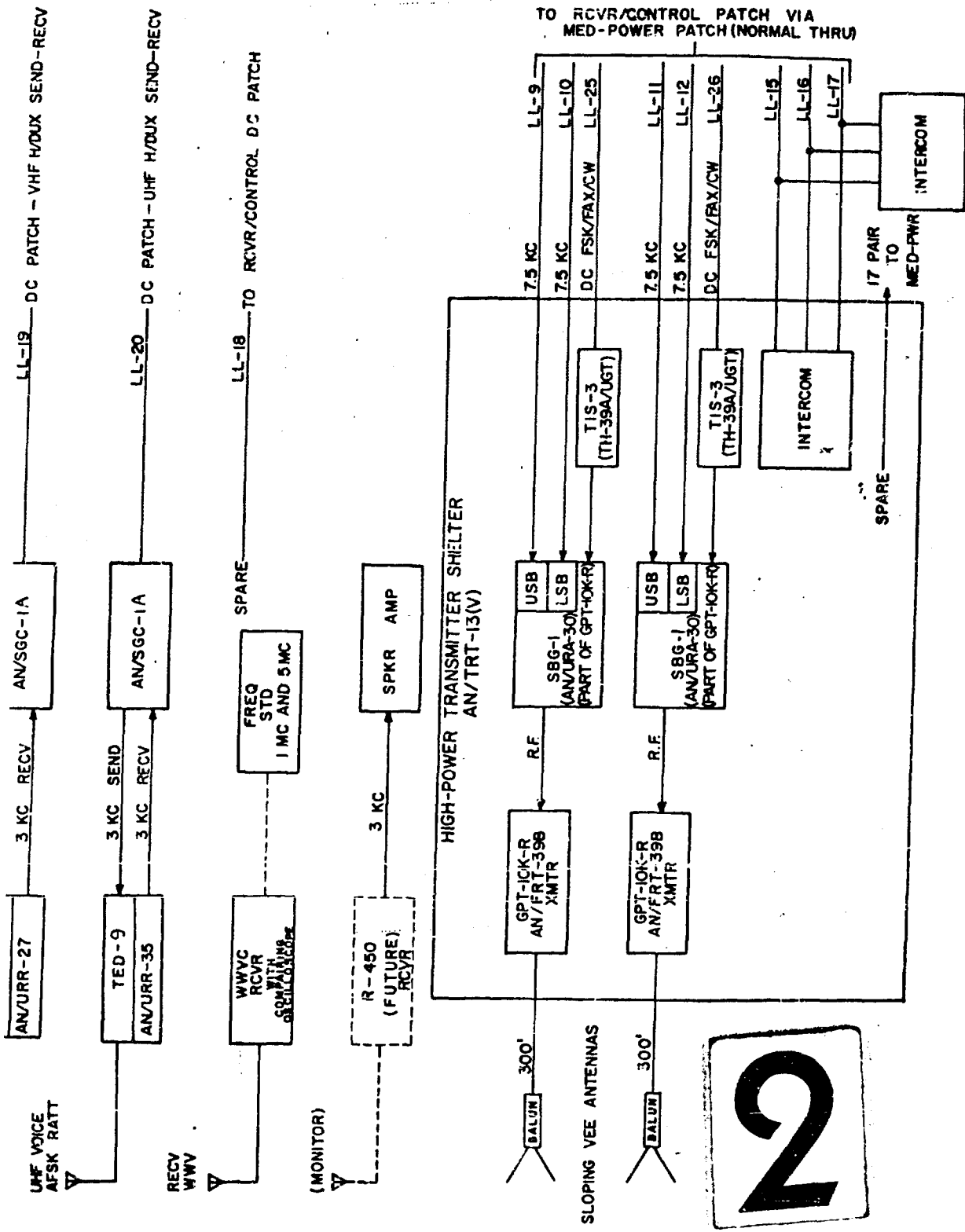


Figure 2 Interconnection of Shelters

**Air Transportable Communications System**  
 [Part of AN/TSC-24 (V)]





REMARKS

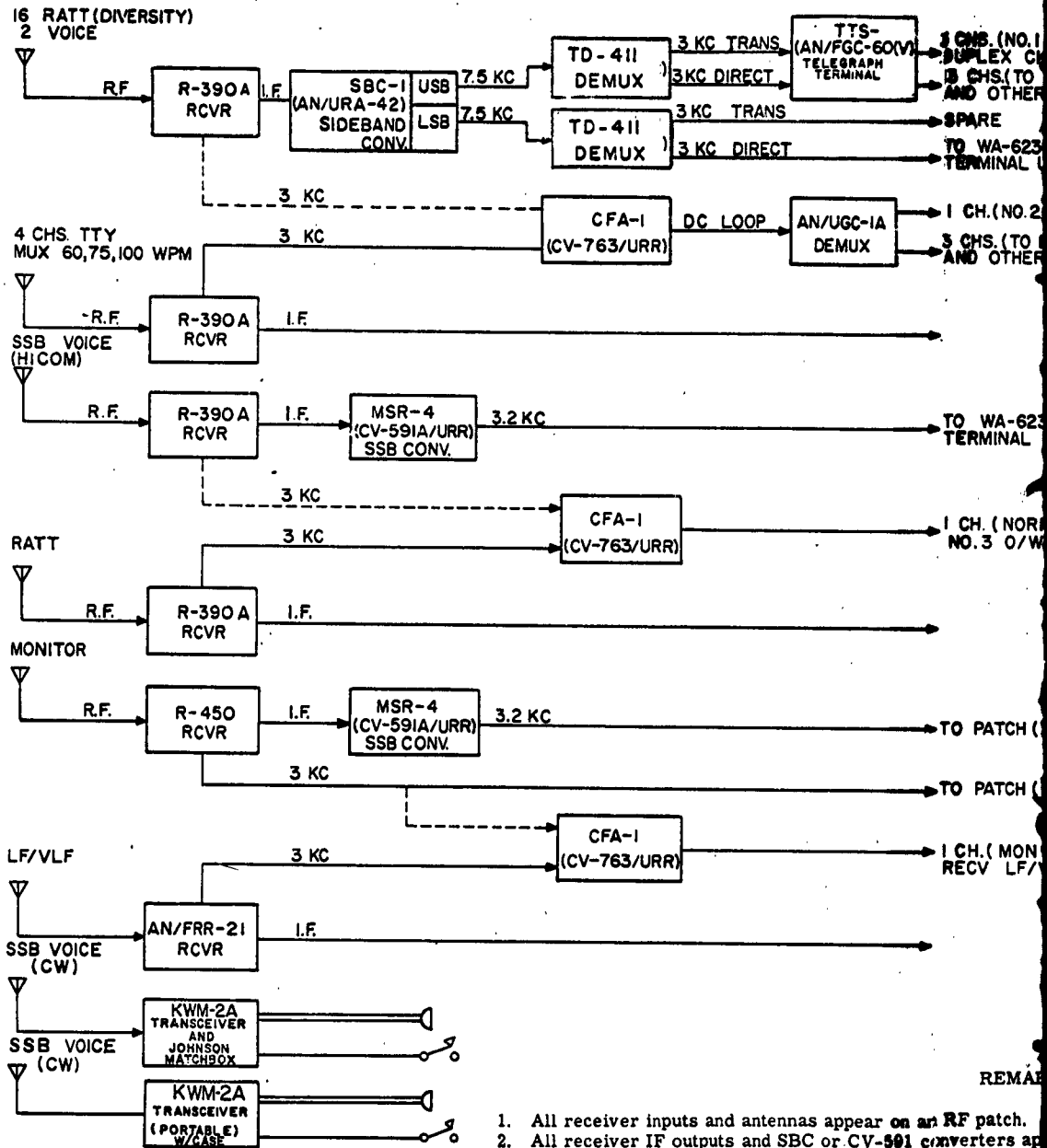
1. All transmitters and exciters appear on an RF patch panel (except UHF and VHF).
2. Four sloping vee antennas with baluns are provided with the AN/TSC-24. All antenna systems are complete kits providing all necessary materials and allowing rapid assembly at the field location.
3. Cross-connections are made by a unique computer-type program board patch system replacing the old "Christmas tree" soldered terminal type MDF.
4. Mounting bases, wiring, and patching are incorporated to accept three additional SEG frequency synthesizers in the medium power shelter.
5. All DC and audio circuits appear on the patch panel.

Figure 2A, Functional Block Diagram  
Medium Power Shelter  
High Power Shelter



AIR TRANSPORTABLE COMMUNICATIONS SYSTEM  
 ATCU-100 AND ATCU-100 A  
 [PART OF AN/TSC-24(V)]

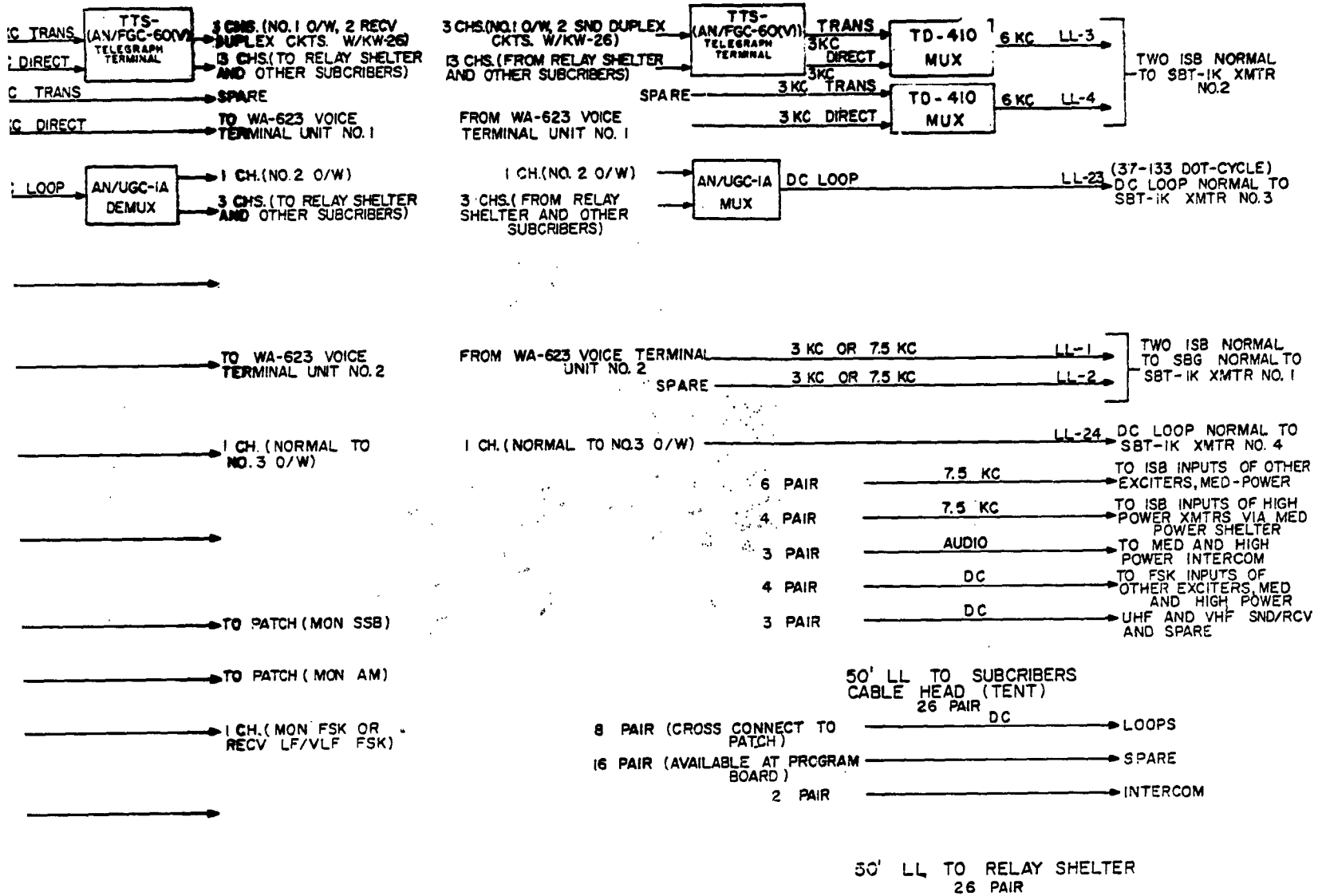
RECEIVER - CONT  
 AN



- REMA
1. All receiver inputs and antennas appear on an RF patch.
  2. All receiver IF outputs and SBC or CV-591 converters appear on the patch panel.
  3. Cross-connections are made by a unique "computer-type patch tree" soldered terminal type MDF.
  4. All circuits DC and audio appear on the patch panel (except on the program board).
  5. Intercom appears on patches to provide additional line and facilities.
  6. Voice Terminal Unit (WA-623) will terminate either 2 or 3 channels.
  7. Push-to-talk and receiver muting facilities are available.
  8. Ample spare trunking is provided.
  9. A subscriber cable head provides a convenient interconnection to additional local facilities.

RECEIVER - CONTROL SHELTER  
AN/TRR-16(V)

500' LL TO MEDIUM POWER  
SHELTER  
26 PAIR



REMARKS

and antennas appear on an RF patch.  
 uts and SBC or CV-501 converters appear on an IF patch.  
 re made by a unique computer-type program board patch system replacing the old "christmas  
 inal type MDF.  
 audio appear on the patch panel (except spare pairs in subscriber cable head-these terminate  
 d).  
 patches to provide additional line and speaker facilities in event of saturation of other  
 (WA-623) will terminate either 2 or four wire voice circuits.  
 eiver muting facilities are available and appear on the DC patch panel.  
 g is provided.  
 ead provides a convenient interconnection point to landlines for remote subscribers or  
 ities.

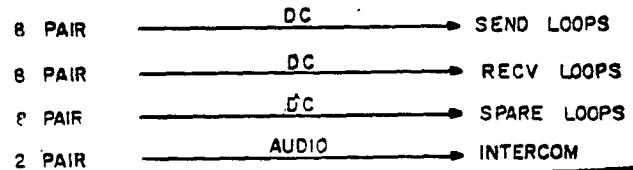


Figure 2B, Functional Block Diagram  
Receiver-Control Shelter

Air Transportable Communications System  
[Part of AN/TSC-24 (V)]

26 PAIR CABLE FROM RECEIVER/CONTROL

8 PAIR SEND

LL-27-34

8 PAIR (TRUNKS)  
SPARE

LL-35-38, 49-54

8 PAIR RECV

LL-41-48

2 PAIR INTERCOM

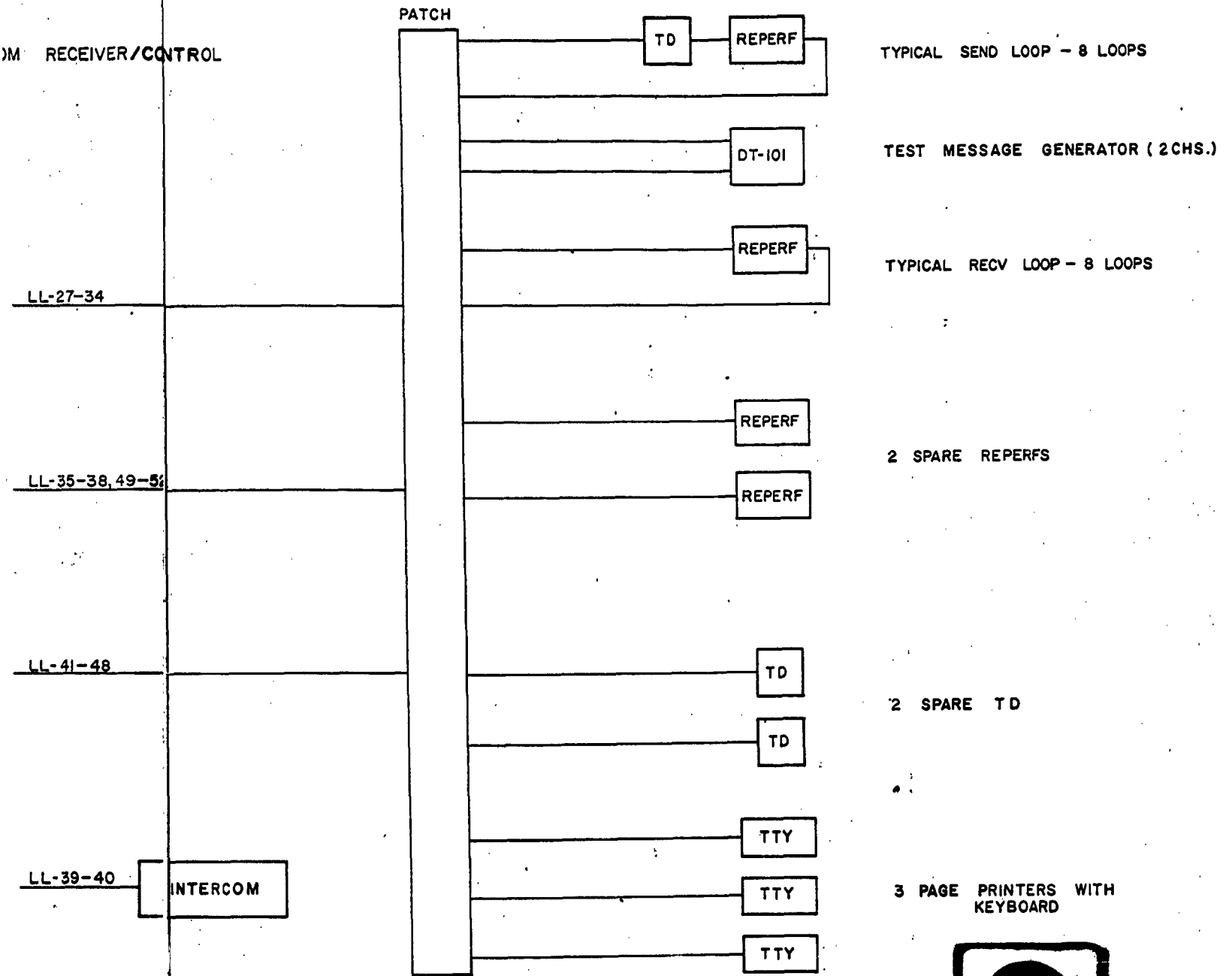
LL-39-40

INTERCOM

1

1. Cross-connections are made by a "tree" soldered terminal type MDF.

RELAY SHELTER  
OA-3773/TSC-24(V)



REMARKS

Cross-connections are made by a unique computer-type program board patch system replacing the old "christmas tree" soldered terminal type MDF.



Figure 2C, Functional Block Diagram  
Relay Shelter

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
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Transportability Data

Table 1 includes detailed dimensions and weights of individual shelters and Diesel generators.

The total weights for the 3-Shelter and 5-Shelter configurations and their associated Diesel generators are shown below:

<u>Shelter type</u>	<u>ATCU-100</u>	<u>ATCU-100A</u>
Medium Power	7720	7720
Receiver-Control	8630	8630
Maint. & Supply	8390	8390
Relay	- -	7420
High Power	- -	9260
Generator w/o cable reels	3805 (1)	7610 (2)
Generator with short cable reels	- -	6380 (1)
Generator with large cable reels	6760 (1)	6760 (1)
Total Weight	35305 Lbs.	62165 Lbs.

The following paragraphs detail some typical transport methods for these AN/TSC-24 (V) systems.

Via Cargo Aircraft:

The ATCU-100A configuration (5 shelters and 4 Diesel generators) as well as an initial fuel load and a prime mover (towing vehicle) can be transported in one C-133 type cargo aircraft, or alternately in two C-124's.

The 3 shelter - 2 diesel generator configuration (ATCU-100) initial fuel load and towing vehicle can be transported in one C-124 type cargo aircraft.

Via Cargo Helicopter:

Any one of the 5 shelters or Diesel generators can be transported as a "sling load" using the CH-47A "Chinook" Helicopter (Vertol-Boeing). This helicopter can air lift a payload of 12,000 pounds for an average 100 mile mission. The CH-45A Cargo helicopter can be used for payloads not exceeding 7500 pounds.

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
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Via Land:

Demountable shelter wheels are provided for limited ground transport of the shelters using towing vehicles. This permits low-speed (10 MPH max.) moving of the shelters on roads or in cleared areas with level terrain.

When shelter destination is reached, wheels can be removed using the wheel jacks provided and the shelter will rest on its base skids. The Diesel generators include their own 2 wheel trailer-mount which can be readily towed to the desired site location.

Towing vehicles should have a pintle tow capability of 10,000 pounds. (The heaviest shelter is the High Power unit, 9260 pounds.)

Other Methods:

Conventional rail or boat transport.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
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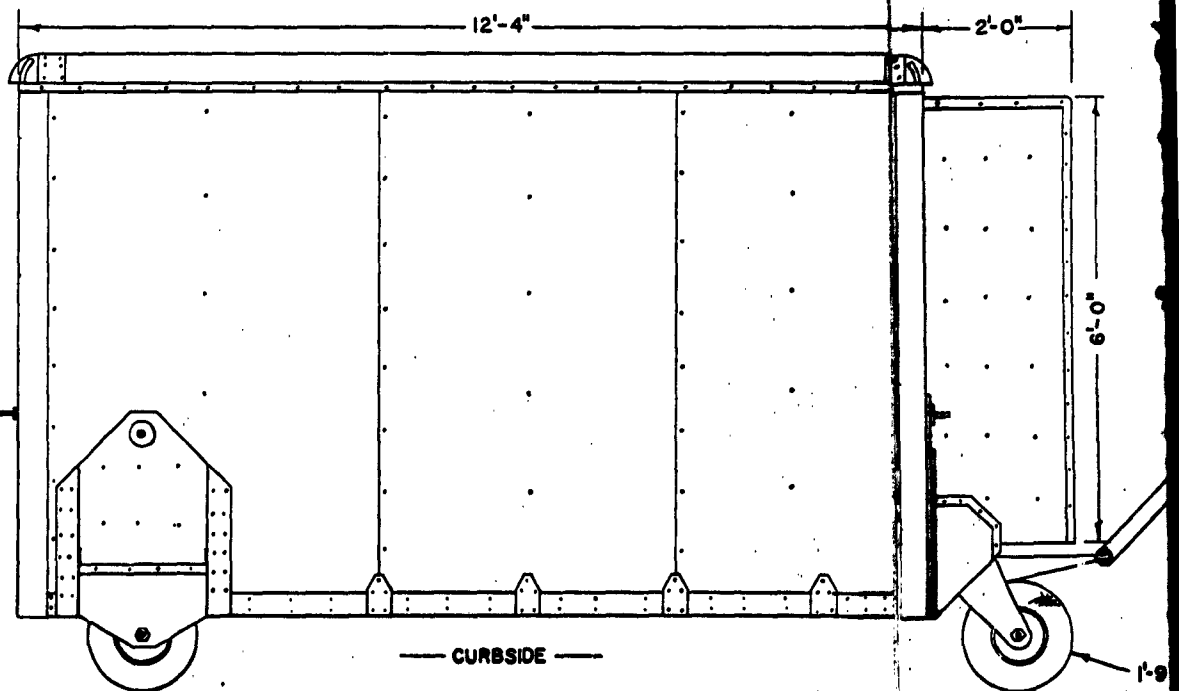
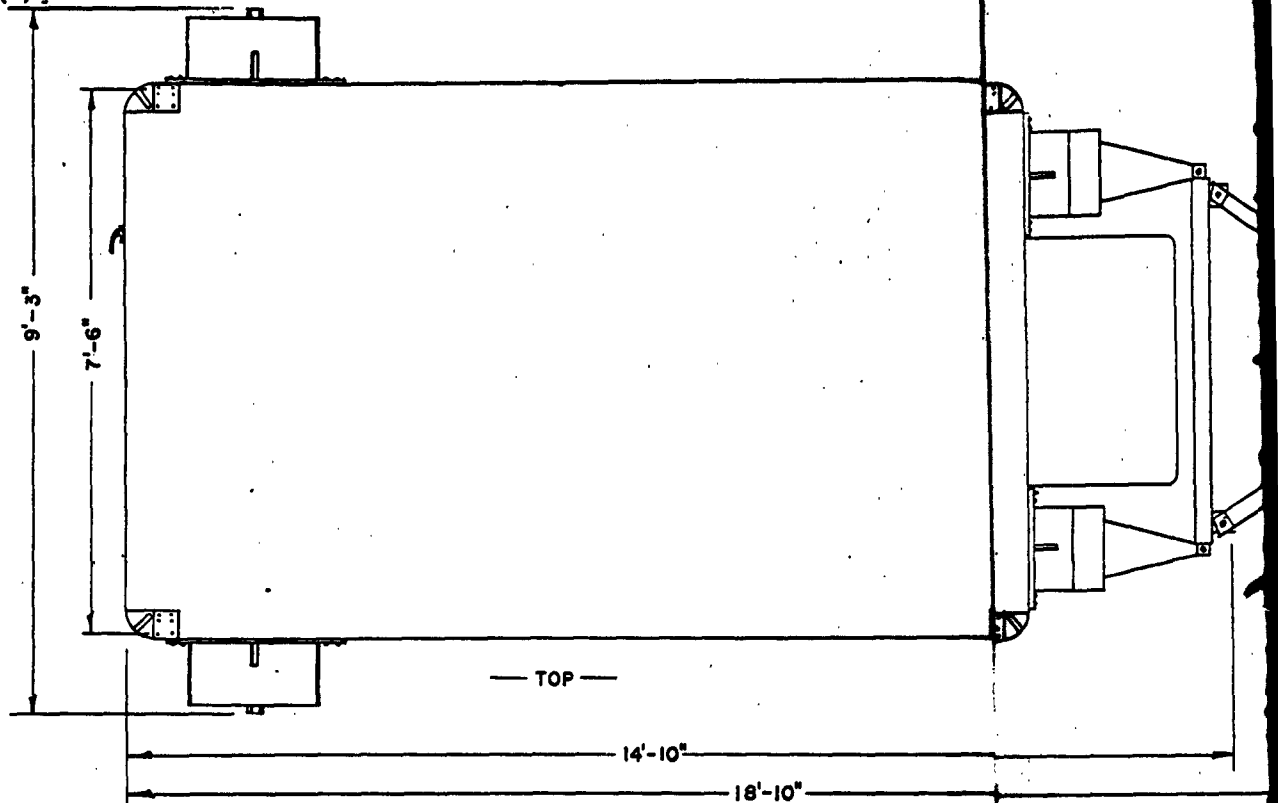
TABLE 1 PHYSICAL CHARACTERISTICS

	HEIGHT	LENGTH	WIDTH	VOLUME (CU FT)	
All Shelters Except High Power	8' 6"	15' 5"	9' 4"	1220	
High Power Shelter	9' 6"	15' 5"	9' 4"	1340	
Diesel-Generator Sets	4' 7"	10' 2"	6' 4"	310	
Diesel-Generator Set Weight (lbs)	w/large reels.		w/small reels	w/o reels	
	6760		6380	3805	
Shelter Undercarriage Specifications					
wheel base	140.5"	front tread	59"	rear tread	102"
	MEDIUM POWER SHELTER WEIGHT (LBS)	RECEIVER CONTROL SHELTER WEIGHT (LBS)	RELAY SHELTER WEIGHT (LBS)	HIGH POWER SHELTER WEIGHT (LBS)	MAINTENANCE AND SUPPLY SHELTER WEIGHT (LBS)
Roadside Front	1955	1960	1865	1570	1290
Curbside Front	1095	2000	2245	2745	2110
Roadside Rear	2370	2415	1790	2765	2880
Curbside Rear	2300	2255	1520	2180	2110
Front Total	3050	3960	4110	4315	3400
Rear Total	4670	4670	3310	4945	4990
Roadside Total	4325	4375	3655	4335	4170
Curbside Total	3305	4255	3765	4925	4220
Grand Total	7720	8630	7420	9260	8390
Longitudinal Balance from Rear Axle Center	69.6"	73.25"	68.5"	71.2"	68.8"
Cross Balance from Roadside Tread Center	52.1"	51.9"	49.0"	50.2"	50.0"

NOTE

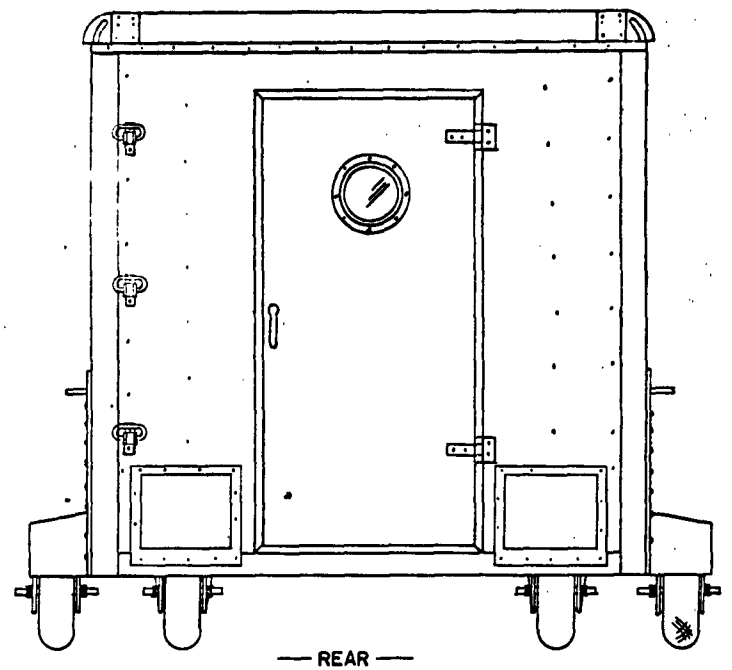
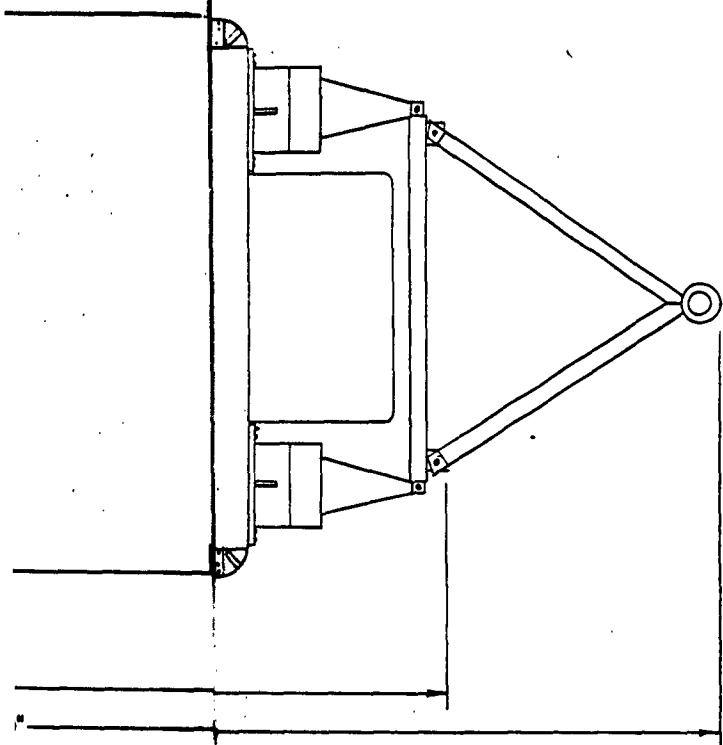
The information on centers of gravity listed in Table 1 assumes that auxiliary equipment is carried separately.

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (v)]



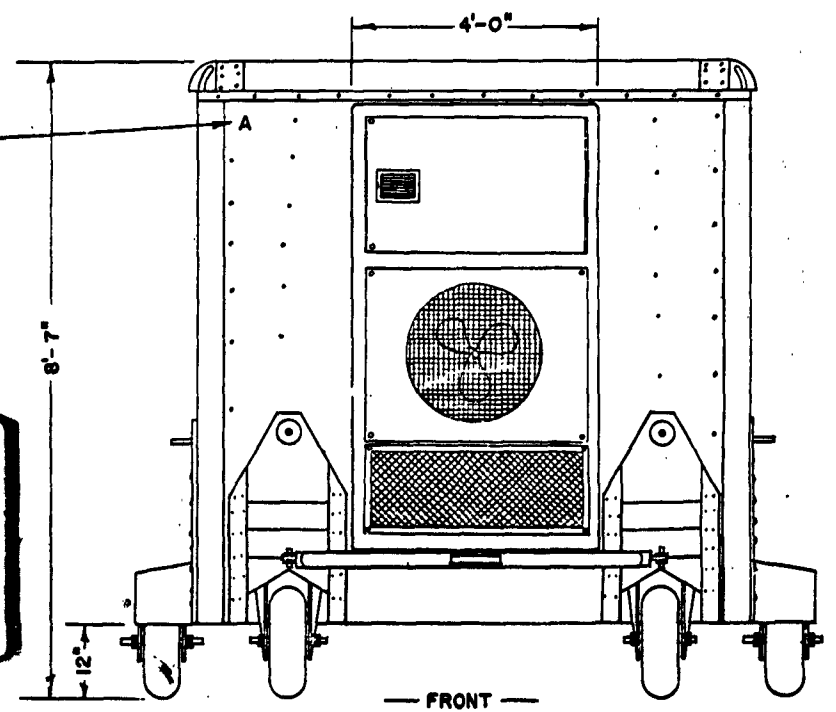
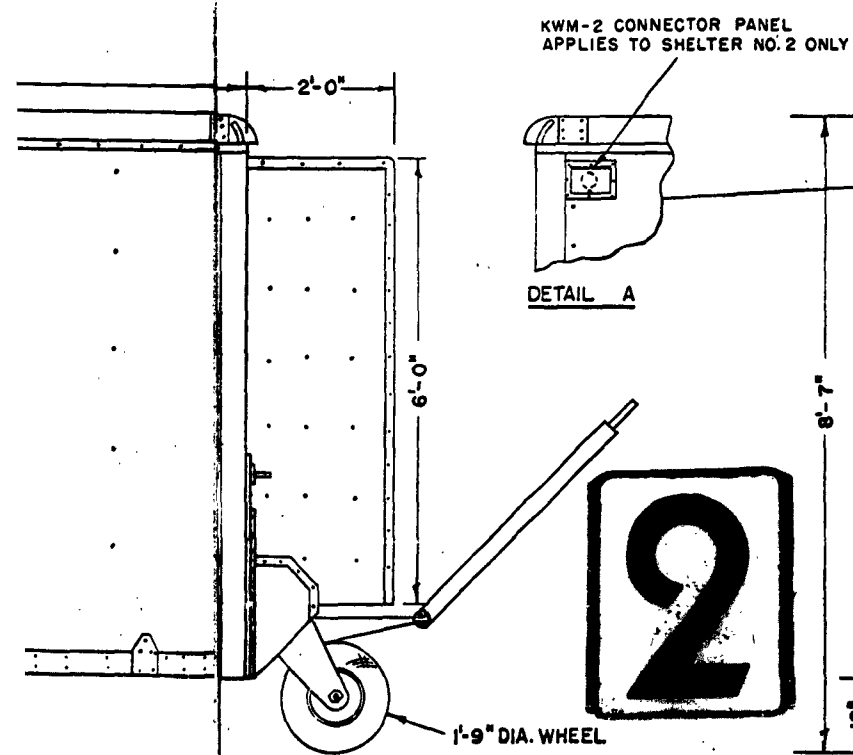
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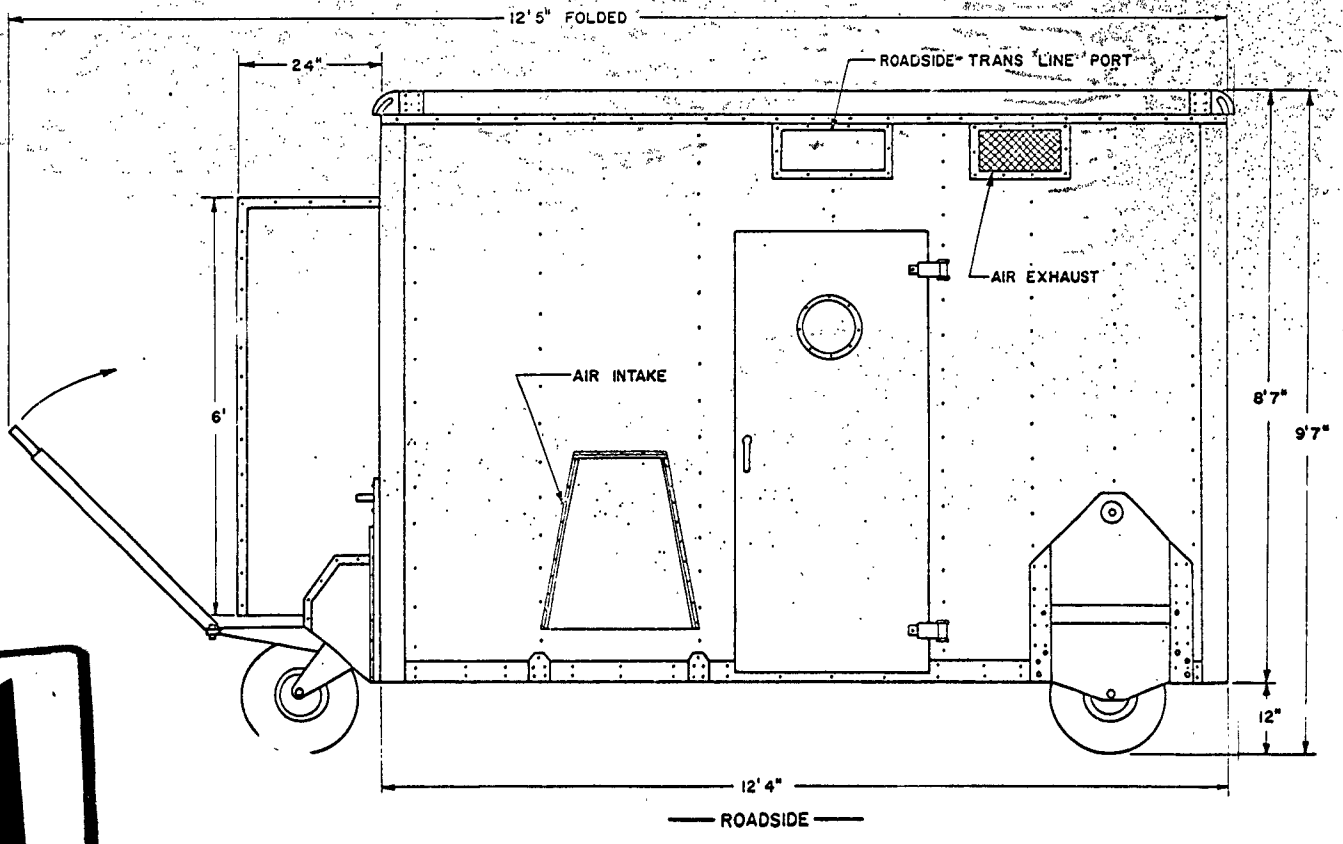
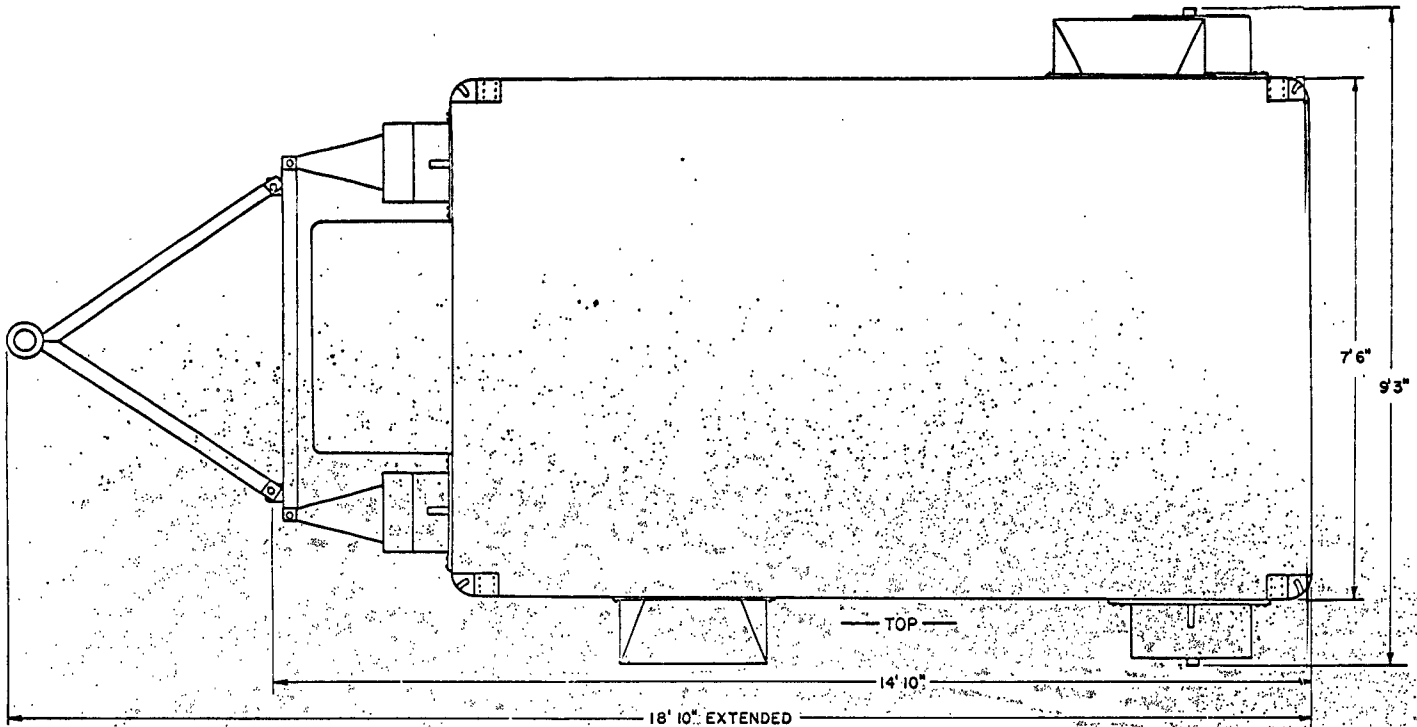
NOTE: MAINTENANCE AND SUPPLY SHELTER HAS NO AIR CONDITIONER.



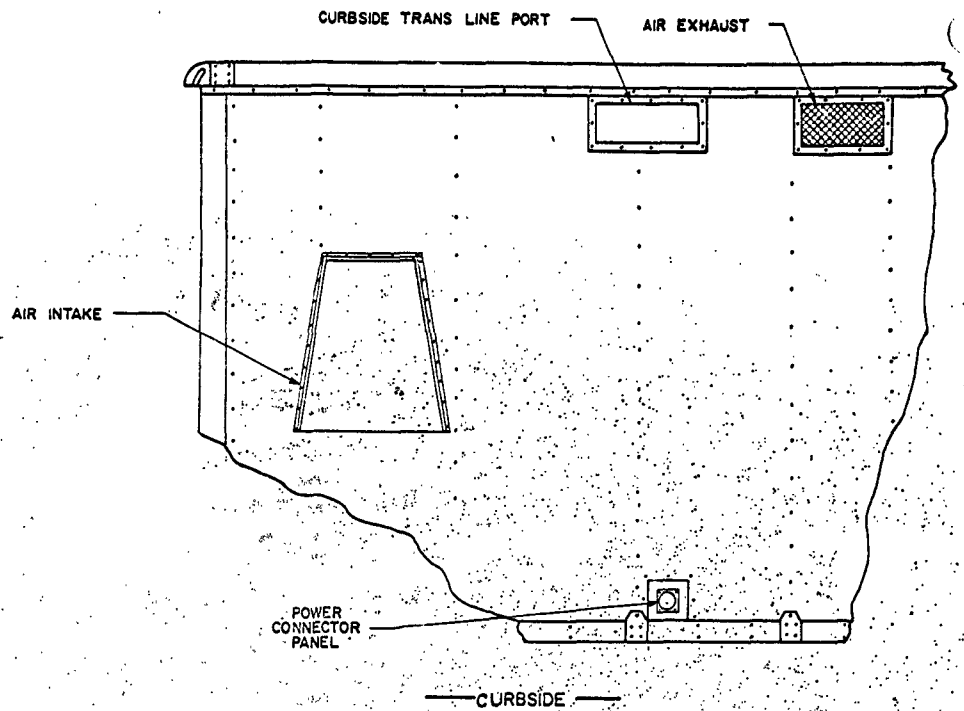
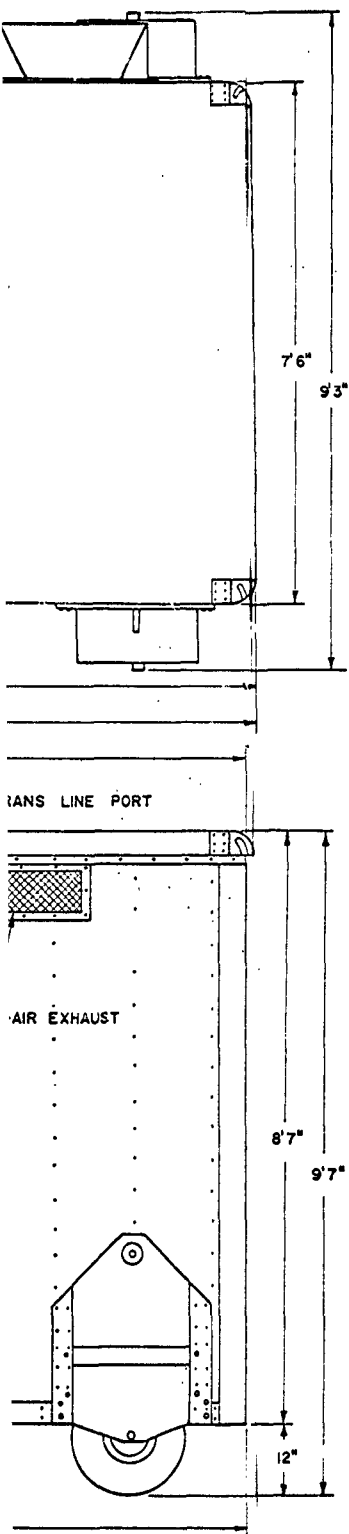
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Figure 7 Medium Power Shelter, Receiver Control Shelter, Relay Shelter, and Maintenance and Supply Shelter, Dimensional View

Air Transportable Communications System  
ATCU-100A  
[Part of AN/TSC-24 (v)]



1



**2**

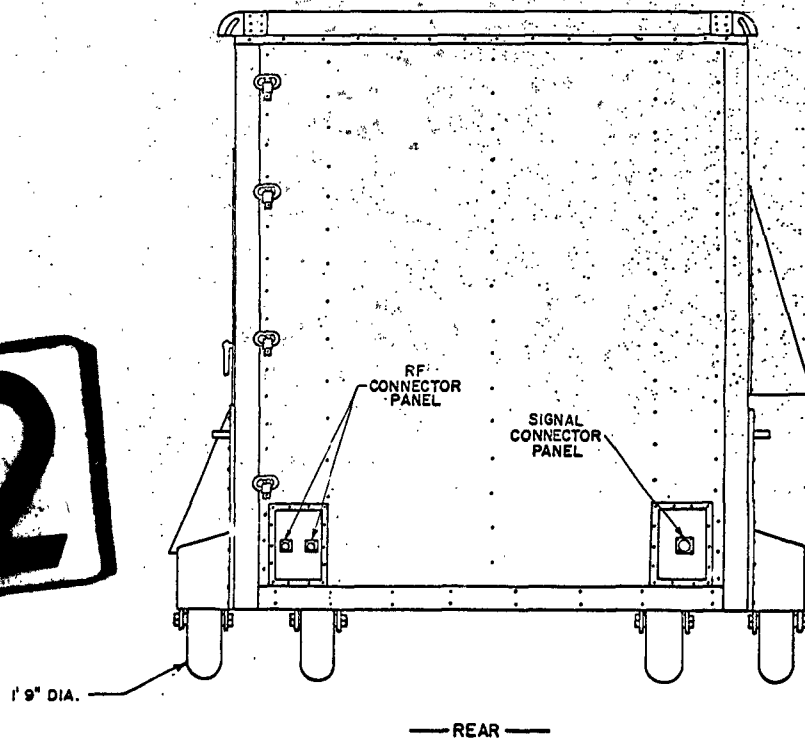


Figure 8 High Power Shelter, Dimensional View  
(Sheet 15 of 99)



Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (v)]

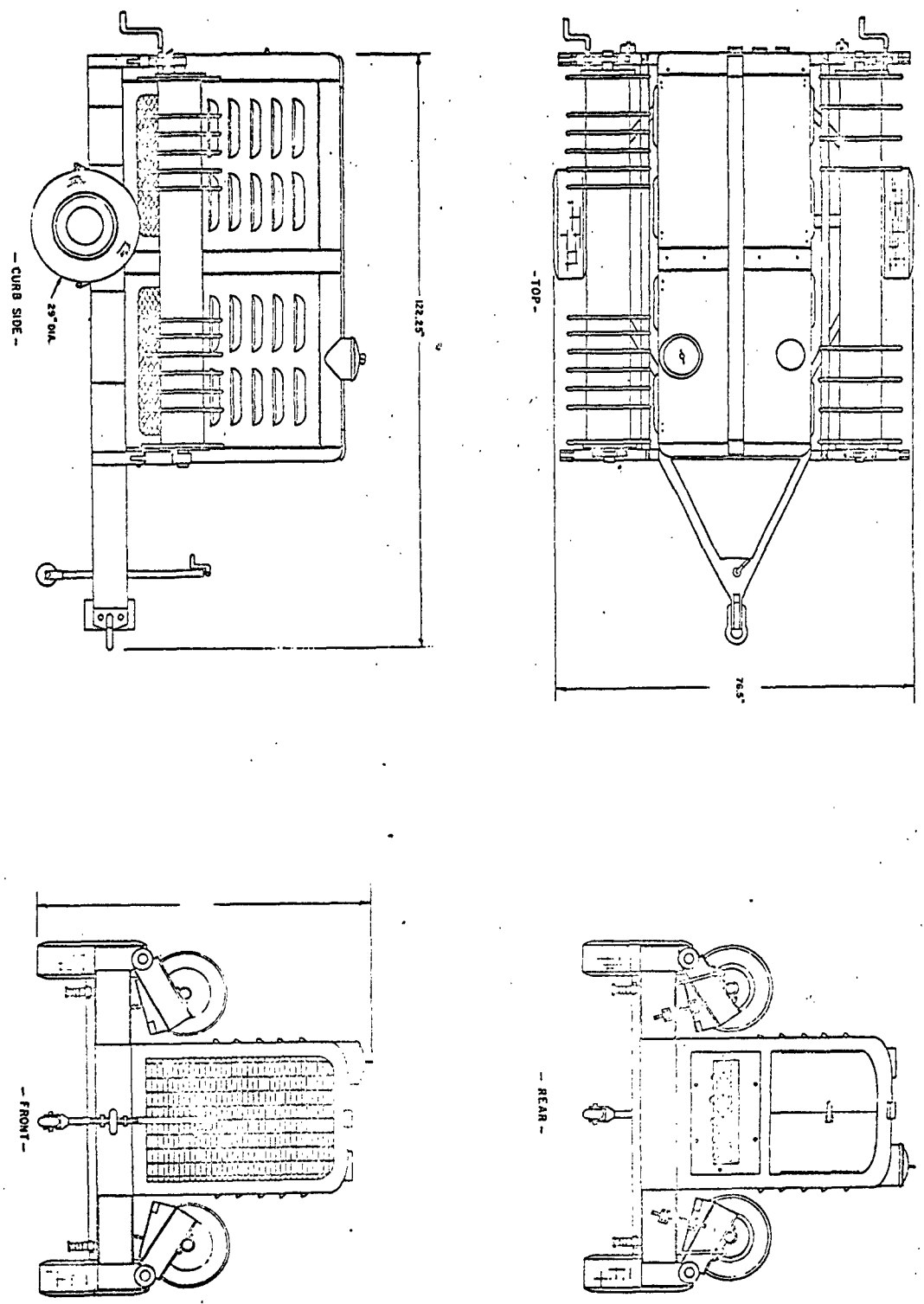


Figure 9. Diesel-Generator Set

Air Transportable Communication System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

System Description

Medium Power Shelter, AN/TRT-12 (V):

(See Figure 2A for functional diagram; Figures 3 and 3A detail equipment locations within the shelter.)

This shelter houses four one kilowatt (PEP) single sideband transmitters capable of single sideband, independent sideband, and double sideband operation with carrier suppression continuously variable (using the exciters supplied) from -55 db up to full carrier output. One synthesized exciter with frequency stability of one part in  $10^8$  per day is supplied for use with any of the four transmitters. Non-synthesized exciters provide excitation for the remaining transmitters. Audio tone keyers are supplied for frequency shift keying (including facsimile) applications. Space and wiring are provided for the future addition of three more synthesized exciters.

Landlines from the Receiver-Control Shelter provide the following types of exciter inputs at the Medium Power Shelter. These signals are used to program the four high frequency transmitters and the VHF and UHF transmitters.

<u>Character of Exciter Input Received</u>	<u>Received from the Following Receiver- Control Units</u>	<u>Type of Originating Subscriber Equipment (Remote)</u>
Voice	Telephone Terminal via VF "Mux"*	Microphone
Voice Frequency Telegraph (Com- posite Tones)	16 Channel (FDM**) Carrier Telegraph Terminal and VF Mux*	Teletypewriter (Start-Stop)
Start-Stop D.C. Teletypewriter	Routed only via Receiver-Control	Teletypewriter (Start-Stop)
On-off DC (Mul- tiplexed TTY)	4 Channel (TDM***) Telegraph Terminal	Teletypewriter (Start-Stop)

\* Voice Frequency Multiplex (two 3 kc channels in; one 6 kc channel out)

\*\* Frequency Division Multiplex

\*\*\*Time Division Multiplex

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

System Description (Cont.)

Medium Power Shelter, AN/TRT-12 (V) (Cont.)

Also provided are one UHF Transmitter with Receiver and one VHF Transmitter with Receiver for use in half duplex voice or teletype operation. A single channel telegraph terminal is supplied for use with each of the transmitter-receiver combinations. Full duplex operation is possible by using the UHF and VHF equipments simultaneously.

A receiver for frequency monitoring of the National Bureau of Standards stations is included in this shelter as well as a commercial frequency standard.

Signal distribution equipment in the Medium Power Shelter consists of a DC and AF jackfield and a 480 position computer type program board that replaces the former "Christmas tree" soldered terminal Main Distribution Frame. Control and signal lines from the Receiver-Control Shelter make it possible for the Medium Power Shelter operator to set up any normal-through configuration of equipments that may be requested by the supervisor in the Receiver-Control Shelter. Part of the station's intercommunication system is also located here. High Power Shelter equipment can be controlled from the Medium Power Shelter since the Receiver-Control Shelter lines for this function are routed via the jackfield in the Medium Power Shelter.

Receiver-Control Shelter, AN/TRR-16 (V):

(See Figure 2B for functional diagram; Figures 4 and 4A detail equipment locations within the shelter.)

The various receiver types provided and their primary applications are shown in Table 2. The necessary sideband converters and frequency shift converters are also included in this shelter. The receiver inputs and antennas appear on the RF patch panel, while receiver IF outputs and sideband converter inputs appear on an IF patch panel.

One cabinet-mounted and one portable KWM-2A HF Transceiver (100 Watts [PEP] SSB) located in this shelter are used for SSB voice or CW applications.

Telephone terminals and 100 WPM teletypewriter equipment consisting of page printers, reperforators, transmitter-distributors and repeaters

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24(v)]

System Description

Radio Frequency Transmitters:

Type	Spectrum	Qty	Output Watts	Primary Use	Shelter
KWM-2A	HF	2	100 (PEP)*	Ship-to-Shore	Revr-Cont.
AN/URT-19 (v)	HF	4	1,000 (PEP)*	Point-to-Point Long-haul	Med. Pwr.
AN/FRT-39B	HF	2	10,000 (PEP)*	Point-to-Point Long-haul	High Pwr.
TED-9	UHF	1	15 (AVE)	Air-to-ground	Med. Pwr.
AN/URT-7	VHF	1	30 (AVE)	Ship-to-Shore	Med. Pwr.

Radio Frequency Receivers:

Type	Spectrum	Qty	Intelligence	Primary Use	Shelter
KWM-2A	HF	2	Voice* CW	Ship-to-Shore	Med. Pwr.
AN/URR-27	VHF	1	Voice; 1/2 Duplex TTY	Ship-to-Shore	Med. Pwr.
AN/URR-35	UHF	1	Voice; 1/2 Duplex TTY	Air-to-Ground	Med. Pwr.
WWVC	LF/MF/HF	1	CW, MCW, Voice	Monitor stand- ard frequency	Med. Pwr.
R-390	HF	1	Frequency (tone) diversity TTY* voice*	Point-to-Point	Revr-Control
R-390	HF	1	FSK Radio- teletype	Point-to-Point	Revr-Control
R-390	HF	1	Voice (hicom)*	Point-to-Point	Revr-Control
R-390	HF	1	FSK Radio- teletype	Point-to-Point	Revr-Control
R-450	HF	1	FSK, Voice* (Monitor)	Ship-to-Shore Point-to-Point	Revr-Control
AN/FRR-21	LF/VLF	1	FSK, CW, Voice	Ship-to-Shore Point-to-Point	Revr-Control

\* SSB

Note: Refer to Figures 2A and 2B  
 for AN/TSC-24(v) application diagrams.

TABLE 2



Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

System Description (Cont.)

Receiver-Control Shelter, AN/TRR-16 (V) (Cont.)

are provided. Two telegraph terminals, one 16 channel frequency division multiplex and one 4 channel time division multiplex, are also located in this shelter. Cryptographic equipment included in this shelter is used for order-wire or limited traffic functions.

The control cabinet in this shelter houses a 1632 position computer type program board, DC and AF jackfields, voice frequency multiplex and demultiplex units and auxiliary line amplifiers and metering circuitry.

Relay Shelter, OA-3773/TSC-24 (V)  
(See Figure 2C for functional diagram; Figures 5 and 5A detail equipment locations within the shelter.)

This shelter houses the message relay center. Torn-tape teletypewriter relay and security equipment for eight full duplex (100 WPM capability) channels is provided. Each channel consists of a transmitter-distributor, send-monitor reperforator, receiving reperforator, KWT-26\*, KWR-26\* and a monitor page printer trunk circuit arranged on red and black patching loops. Each item of teletype equipment may be placed in the red or the black side of the channel by appropriate patching. Each channel may be arranged independently for classified or unclassified traffic. Safeguards against accidental compromise include a double patching requirement and an indicator light system in the send circuit to indicate a circuit connected. A station intercommunication unit is included.

The program board for the Relay Shelter is physically divided into two sections (816 positions each) in order to comply with military communication requirements for classified message handling. One section is designated as the "Black" Program Board and is located above the associated "Black" jack field. The other section is designated as the "Red" Program Board and is located in a different cabinet above the "Red" jack field.

Two spare teletypewriter reperforators and two spare transmitter-distributor units and a test message generator are also provided.

\*Cryptograph equipment

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

System Description (Cont.)

(See Figure 2A for functional diagram; Figure 6 details equipment layout within the shelter)

High Power Shelter, AN/TRT-13 (V)

The High Power Shelter houses two AN/FRT-39B 10 kilowatt (PEP) HF transmitters. Each transmitter has a synthesized sideband exciter. Transmitter outputs may be either balanced or unbalanced, however, in normal operation the unbalanced output is used and the coaxial transmission lines are coupled to the balanced Sloping Vee antenna inputs by use of a balun. (Two Sloping Vee antennas are provided for use with these transmitters).

Control and signal circuits are brought to this shelter in a 26 pair cable.

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

----- System Description ----- (Cont'd.)

Antennas used:

(See Figure 1 for Typical Field Layout)

(a) Medium Power Shelter

The four one kilowatt (PEP) HF transmitters are normally coupled (via the AN/URA-27 antenna couplers) to the four 35 foot SS-1135 transmitting whip antennas which are each located approximately 80 to 100 feet from the shelter at maximum separation. However, one sloping vee antenna and coupler is supplied as shown in Figure 1 for optional use as required for HF point-to-point applications. This Sloping Vee antenna is a horizontally polarized traveling wave antenna with characteristics similar to antennas of the rhombic type.

The AN/URT-7 Transmitter and AN/URR-27 Receiver utilize a F-11 VHF ground plane antenna (vertically polarized). This is installed atop the Medium Power Shelter.

The AT-197 GR Antenna System, UHF used with the TED-9 Transmitter and AN/URR-35 Receiver is a horizontally polarized discone type. This antenna is also mounted on top of the Medium Power Shelter.

(b) Receiver-Control Shelter

Four VRA-6 Receiving Whip Antennas and couplers are each installed approximately 80 feet from the Receiver-Control Shelter with the maximum separation between each of the antennas. These are used with the R-390A and R-450 Receivers.

One VRA-5 Receiving whip antenna and coupler is also installed approximately 80 feet from the shelter and is used with the AN/FRR-21 LF/VLF Receiver.

One SS-1135 shelter mounted whip antenna is coupled to the rack mounted KWM-2A HF Transceiver via a "Johnson Match-box". The portable KWM-2A Transceiver is supplied with a 140 foot length of #16 insulated wire.

(c) High Power Shelter

As illustrated in Figure 1, two Sloping Vee HF Antennas are provided for the AN/FRT-39B HF Transmitters. These antennas are supplied with couplers and terminating resistors capable of handling the required 10 KW (PEP) transmitter output.

Detailed specifications on all the antenna couplers mentioned above are provided in the "Components" section of this report.

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]

System Description (Cont.)

Primary Power and Fuel Requirements

(See Figures 1 and 2 for typical generator siting and interconnection. Dimensional views of the Diesel generators are shown in Figure 9).

As illustrated in the above diagrams, the Diesel generators are paired with one operational unit and one stand-by or backup unit. The ATCU-100 configuration requires only one 55 KW operational unit plus the stand-by unit to assure a minimum of down-time due to loss of primary power. The ATCU-100A requires a second pair of these 55 KW Diesel generators to provide similar primary power reliability for the additional shelters (High Power Shelter and Relay Shelter).

Fuel consumption for each of the above PU-550/TSC-24 Diesel generators is five gallons per hour; (120 gallons per generator for 24 hours). Fuel tank capacities should be commensurate with this need and the anticipated replenishment logistics.

TABLE 3

SHELTER MAIN POWER REQUIREMENTS

SHELTER	FULL LOAD	AIR CONDITIONER ONLY
Medium Power	19.5 kw	7.5 kw
Receiver Control	16 kw	7.5 kw
Relay	19.5 kw	7.5 kw
High Power	35 kw	7.5 kw
Maintenance and Supply	2 kw	

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]

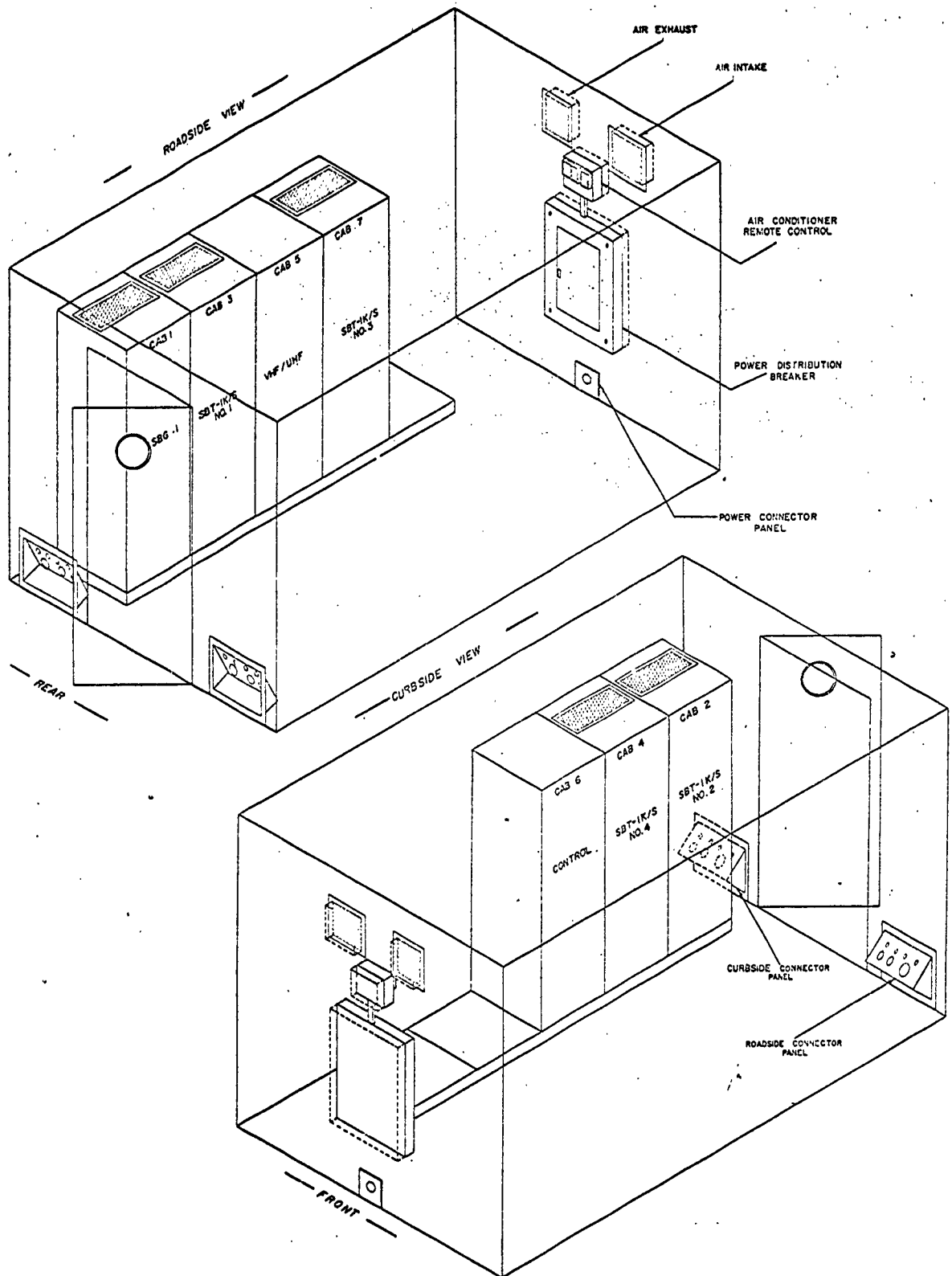


Figure 3 Equipment Layout, Medium Power Shelter  
 (Sheet 24 of 99)

Air Transportable Communication System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

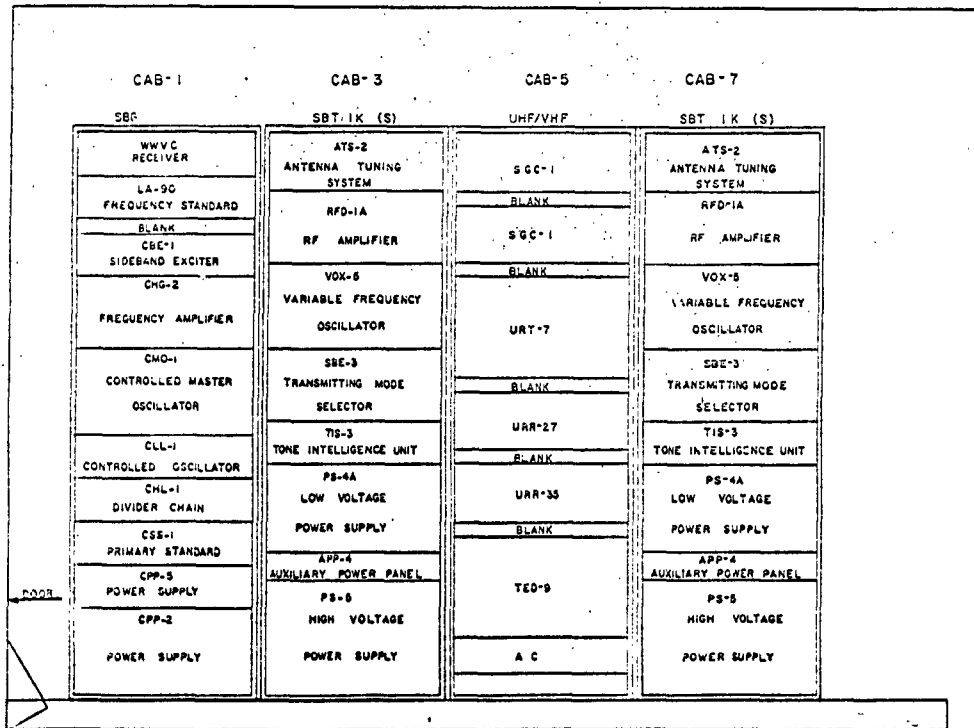
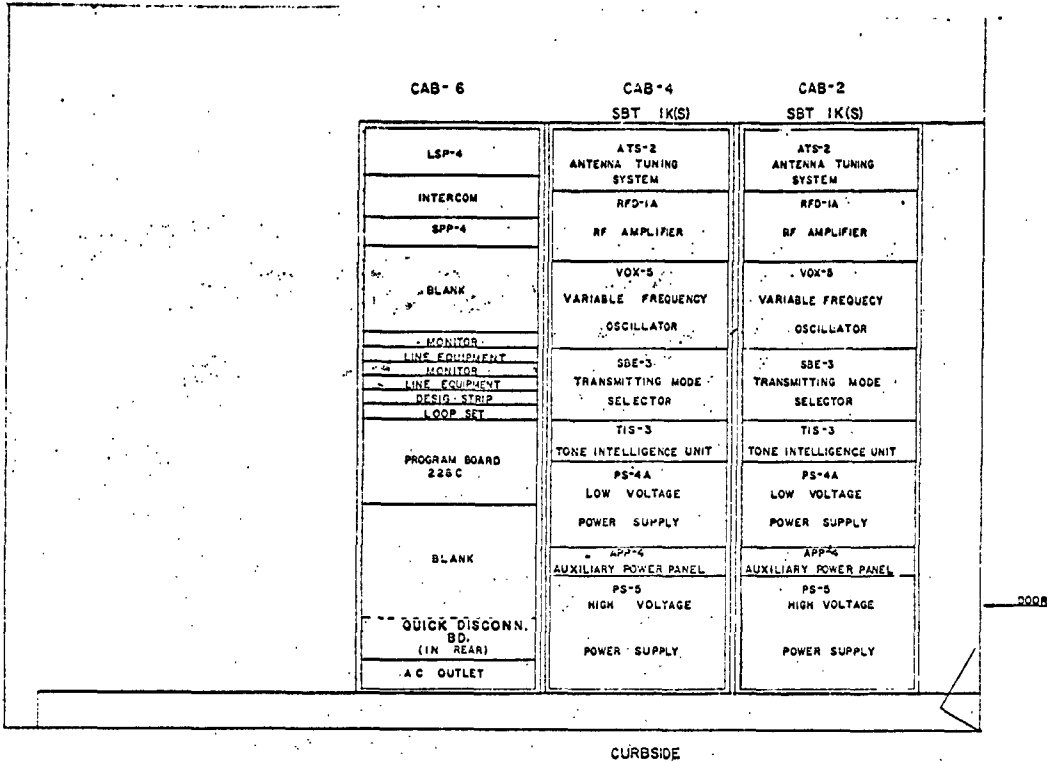


Figure 3A Equipment, Curbside and Roadside  
 Medium Power Shelter

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]

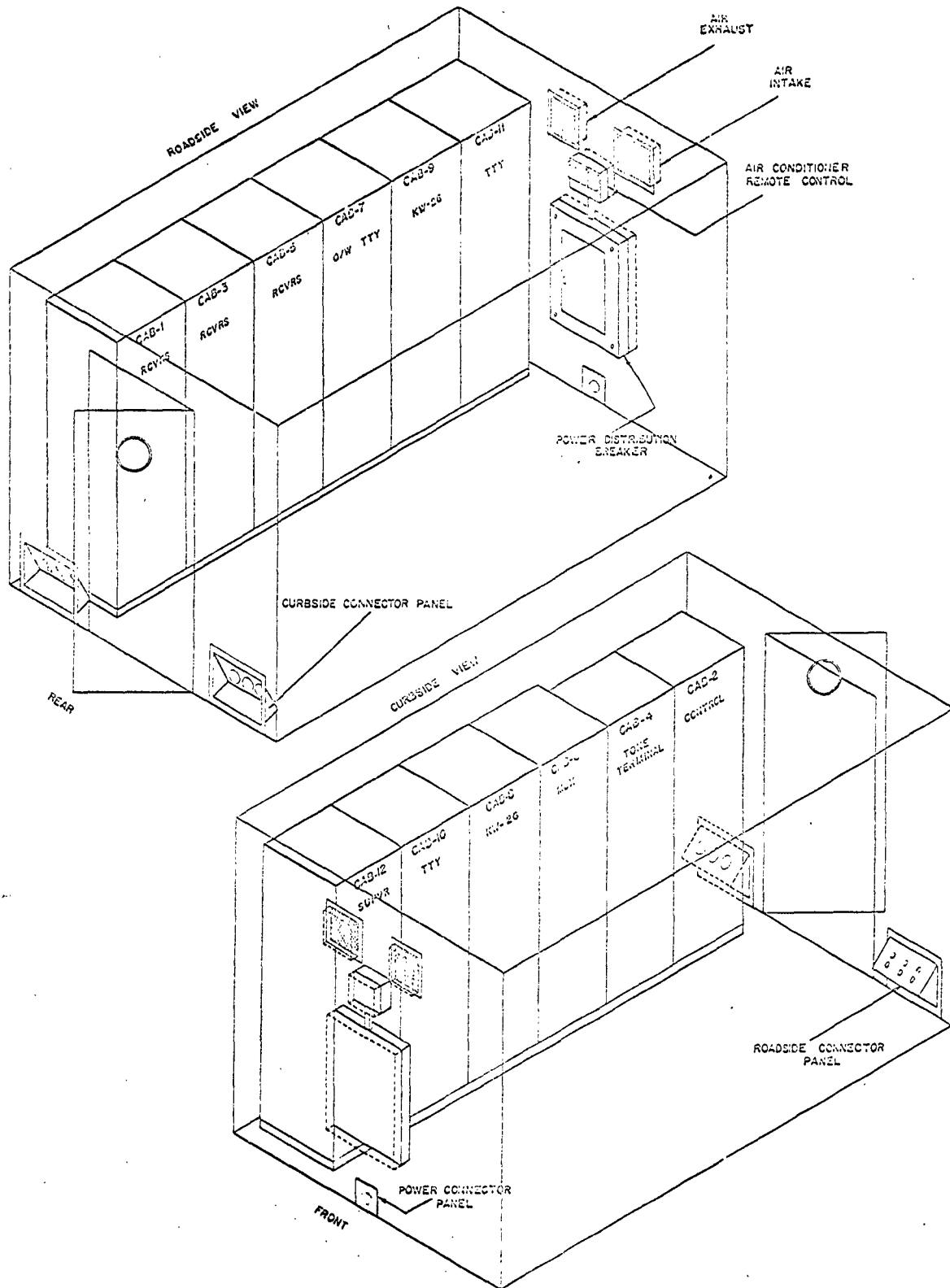


Figure 4 Equipment Layout, Receiver Control Shelter

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]

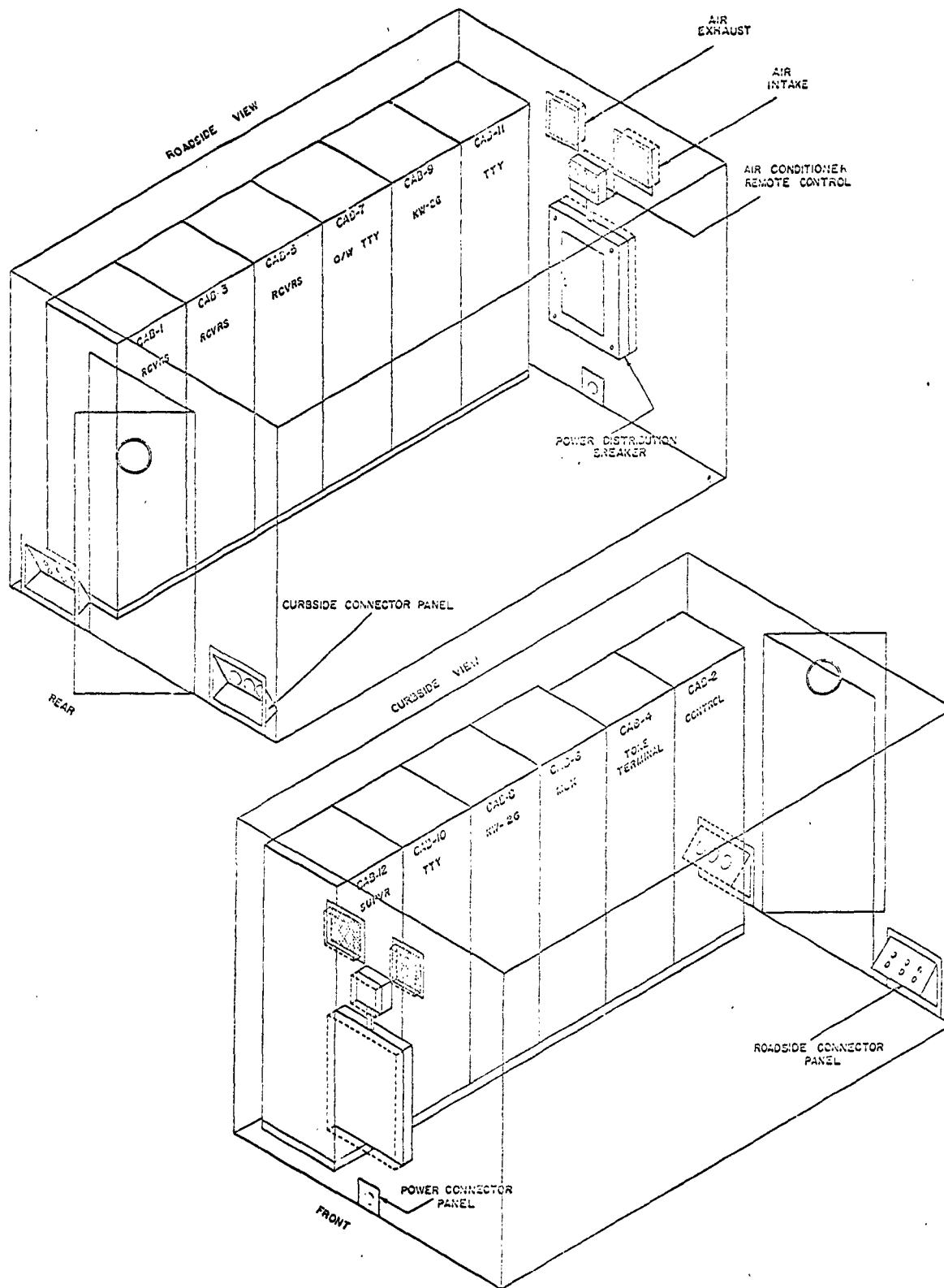
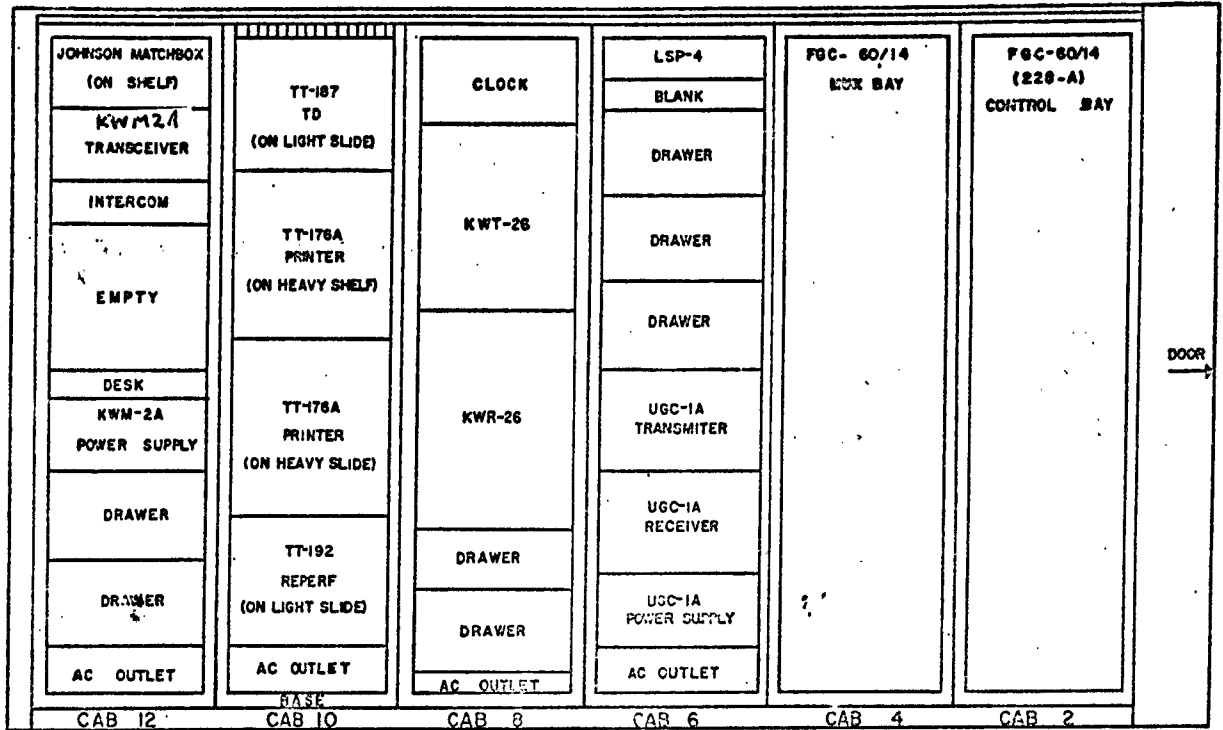


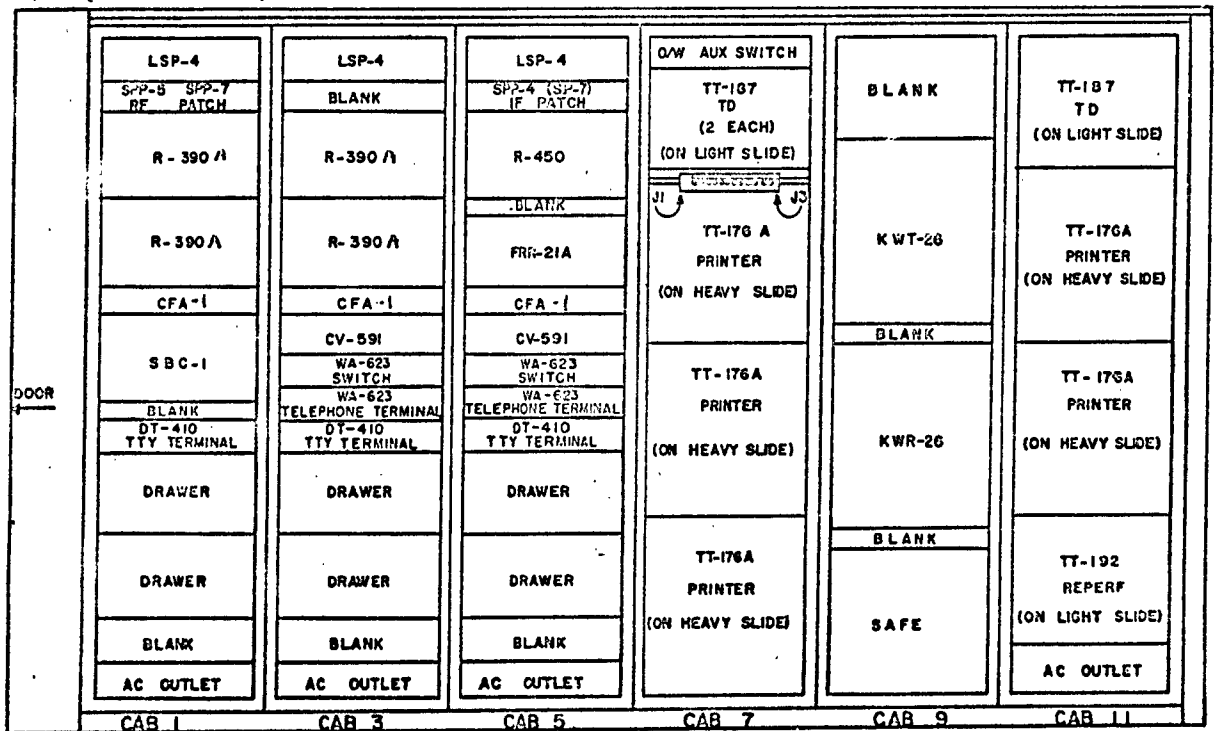
Figure 4 Equipment Layout, Receiver Control Shelter



Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]



Equipment, Curbside



Equipment, Roadside

Figure 4A

Receiver, Control Shelter

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]

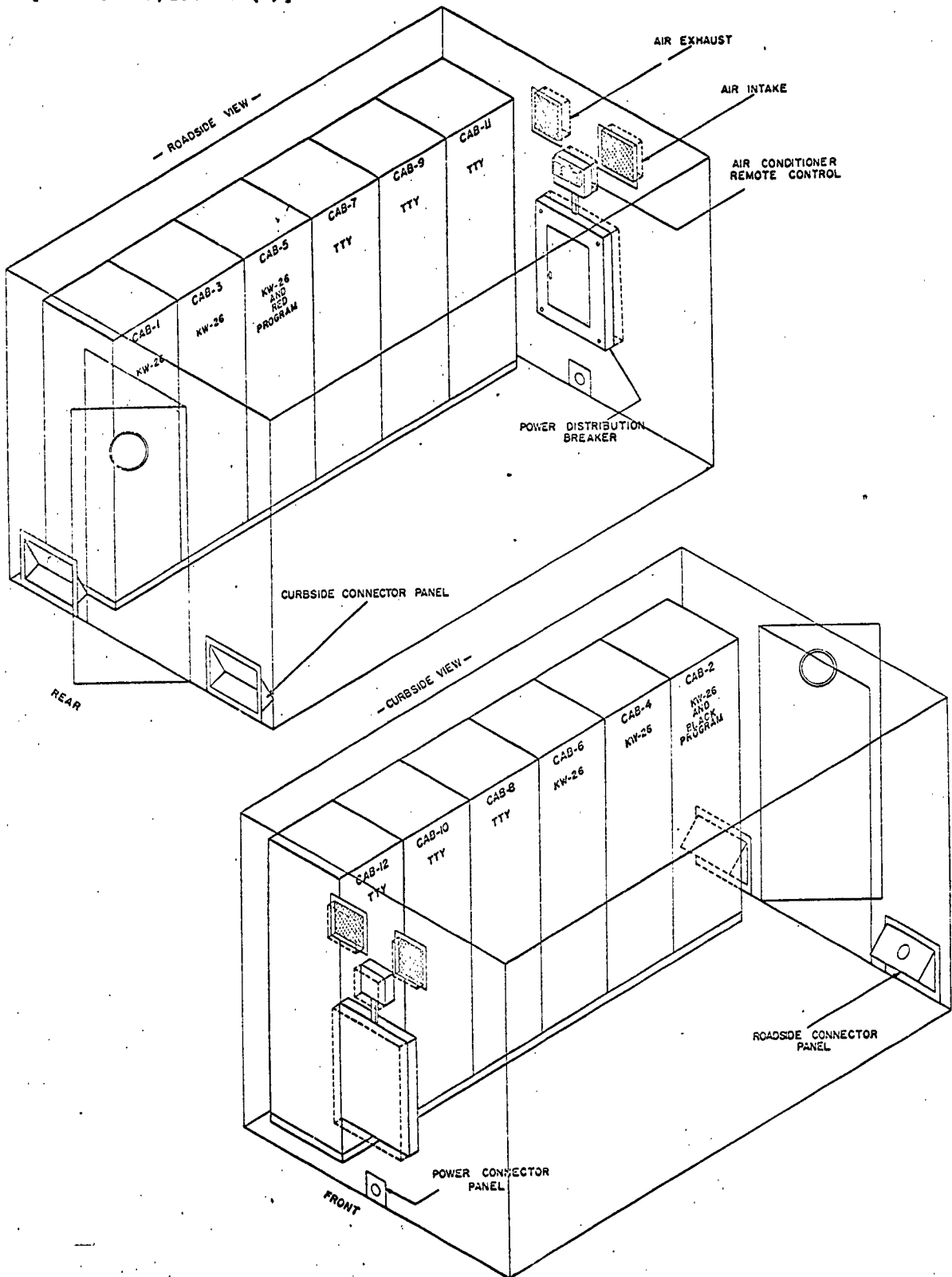
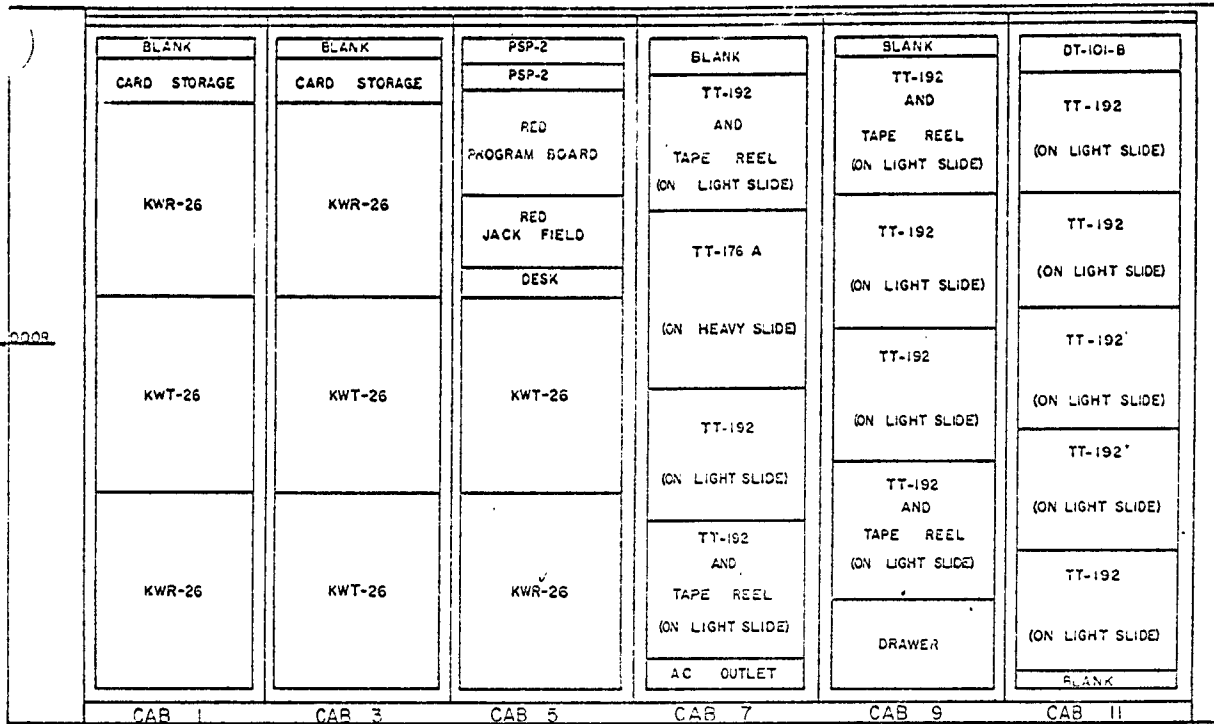


Figure 5 Equipment Layout, Relay Shelter

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]

ROADSIDE



CURBSIDE

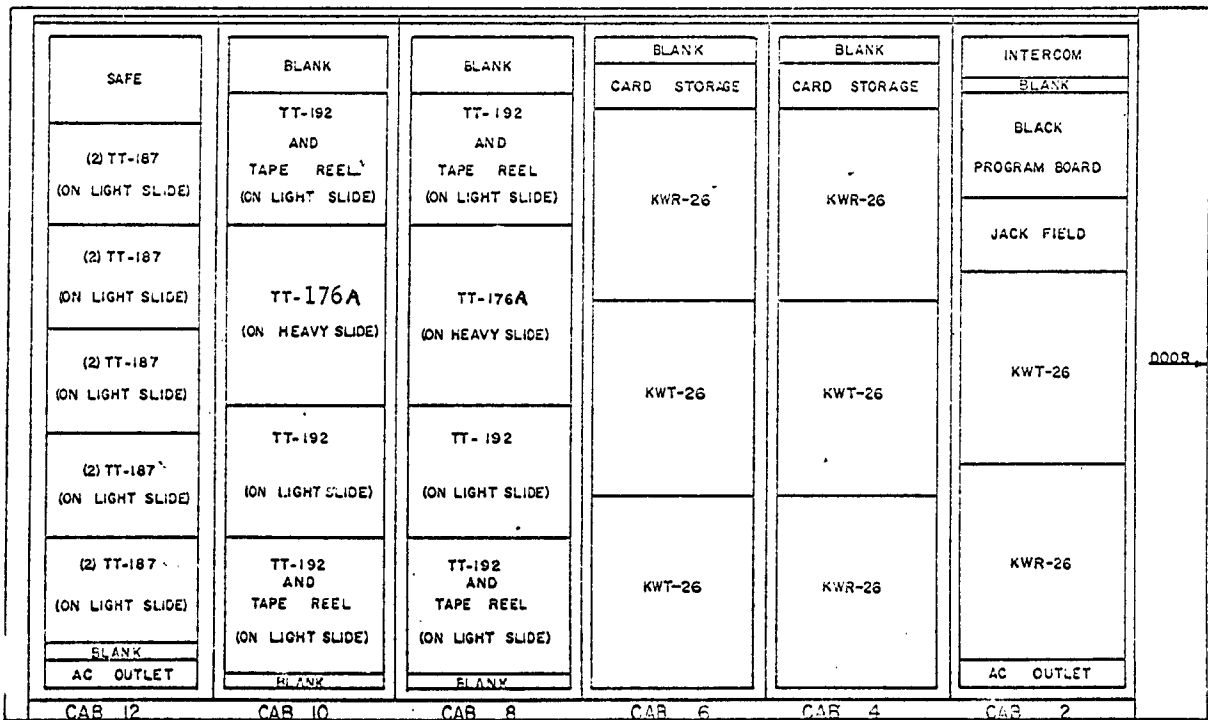


Figure 5A Equipment, Curbside and Roadside  
 Relay Shelter

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]

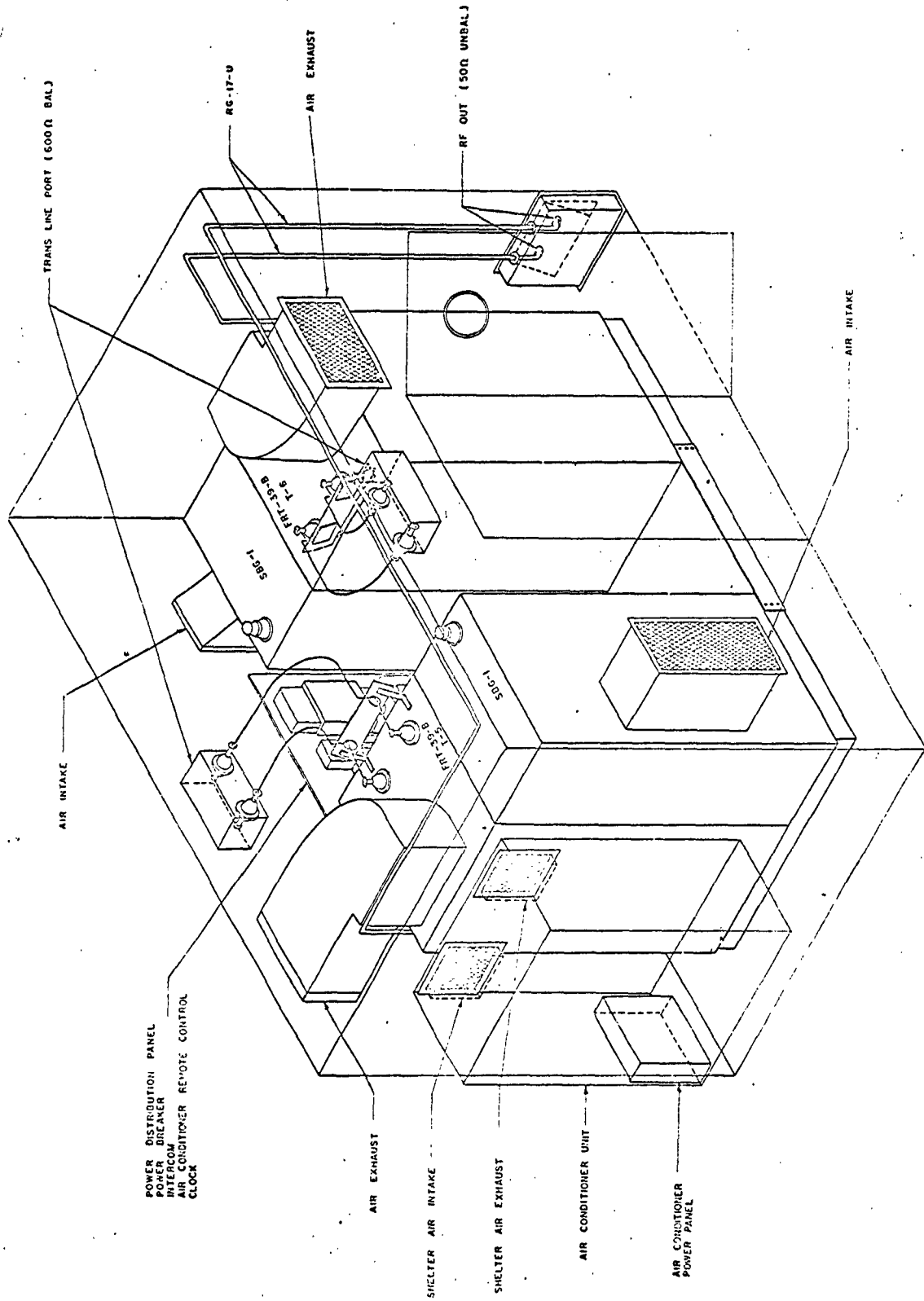


Figure 6 Equipment Layout, High Power Shelter

Air Transportable Communications System  
 ATCU: and ATCU-100A  
 [Part of AN/TSC-24 (v) ]

TABLE 4  
 MAJOR COMPONENTS

QTY.	MAJOR COMPONENTS	IN SHELTER*	NOMENCLATURE		CFE** or GFE	MFR.	INSTRUCTION MANUALS		
			JCENS	COMMERCIAL			TYPES	NAVSHIPS	IDENTITY
X	Transmitter HF, 1 kw	1 S	AN/URT-19 (v)	SBT-1k (S)	CFE	TMC	Ops., Test Data		TMC
2	Transmitter H, 10 kw	1 S	AN/FRT-39B	GPT-10K-R	CFE	TMC	Ops., Maint.		TMC
M	Sideband Generator	MPS	AN/URA-30	SBG-1	CFE	TMC	Ops., Test Data		TMC
T	Sideband Generator	HPS	AN/URA-30	SBG-1	CFE	TMC	Ops., Test Data		TMC
R	Sideband Exciter	MPS	AN/URA-28	SBE-3	CFE	TMC	Ops., Maint.		TMC
2	Transceiver, HF, 100 w	RCS		KWM-2A	GFE	Collins	Ops., Maint.		Collins
1	Transmitter, UHF, 15 w	MPS	TED-9		GFE	Ranland-Borg	Ops., Maint. 93212 & 91357.42		91684
1	Transmitter, VHF, 30 w	MPS	AN/URT-7		GFE		Ops., Maint.		
T	Signal Distrib. Sys.	MPS		Model 228C	CFE	Telesignal	Ops., Install.		Telesig
1	Signal Distrib. Sys.	RCS		Model 228A	CFE	Telesignal	Ops., Install.		Telesig
E	Signal Distrib. Sys.	RS		Model 228B	CFE	Telesignal	Ops., Install.		Telesig
1	Telegraph Terminal	RCS	AN/FGC-60/14	Type200Q2002	CFE	Telesignal	Ops., Maint.	93841A	Telesig
1	Telegraph Terminal	RCS	AN/UGC-1A		CFE	Teletype	Ops., Maint.		Teletype
2	Telegraph Terminal	MPS	AN/SGC-1A		GFE	Remler	Ops., Maint.	91503	
4	Telegraph Terminal	MPS	TH-39 A/UGT	TIS-3	CFE	TMC	Ops., Maint.		TMC
2	Telegraph Terminal	HPS	TH-39 A/UGT	TIS-3	CFE	TMC	Ops., Maint.		TMC
I	Voice Terminal Unit	RCS		WA-623	CFE	Hayes Int'l.	Comm'l Spec.		Hayes
2	Freq. Shift Conv.	RCS	CV-763/URR	CFA-1	CFE	TMC	Ops., Maint.		TMC
N	SSB Converter	RCS	CV-591 A/URR	MSR-4	CFE	TMC	Ops., Maint.	93210	
A	SSB Converter	RCS	AN/URA-42	SBC-1	CFE	TMC	Comm'l Spec.		TMC
1	VF Multiplexer	RCS	TD-410/UGC	Model 123	CFE	Telesig al	Ops., Maint.	93856A	Telesig
2	VF Demultiplexer	RCS	TD-411/UGC	Model 124	CFE	Telesignal	Ops., Maint.	93857A	Telesig
3	Telegraph Repeater	RCS		DT-410	CFE	Digitech	Comm'l Spec.		TMC
2	TTY Reperforator	RCS	TT-192/UG	Model 28	CFE	Teletype	Tech. Bulletin 246B, 1167B, 247B		
18	TTY Reperforator	RS	TT-192/UG	Model 28	CFE	Teletype	Tech. Bulletin 246B, 1167B, 247B		
4	TTY Trans.-Distrib.	RCS	TT-187/UG	Model 28	CFE	Teletype	Tech. Bulletin 1161B, 235B, 258B		
5	TTY Trans.-Distrib.	RS	TT-187/UG	Model 28	CFE	Teletype	Tech. Bulletin 1161B, 235B, 258B		
7	Teletypewriter	RCS	TT-176 A/UG	Model 28	CFE	Teletype	Tech. Bulletin 216B, 1149B, 217B		
3	Teletypewriter	RS	TT-176 A/UG	Model 28	CFE	Teletype	Tech. Bulletin 216B, 1149B, 217B		

\* RS: Relay Shelter; MPS: Medium Power Shelter; RCS: Receiver-Control Shelter; HPS: High Power Shelter.  
 \*\* CFE: Contractor Furnished Equipment; GFE: Government Furnished Equipment.

NOTE: Federal Stock Numbers, where assigned, are shown in detailed "Component" descriptions which follow this table.

Air Transportable Communications System  
 AN 0 and ATCU-100A  
 [Par. of AN/TSC-24 (v) ]

TABLE 4  
MAJOR COMPONENTS

QTY.	MAJOR COMPONENTS	IN SHELTER*	NOMENCLATURE		CFE** OR GFE	MFR.	INSTRUCTION MANUALS	
			JCENS	COMMERCIAL			TYPES	IDENTITY
4	Receiver, HF	RCS	R-390 A/URR		GFE	Collins	91582	TMS56A    Spec. Prod. La Voie TMC
1	Receiver, MF/HF	RCS	R-450		GFE		91771	
1	Receiver, VHF	MPS	AN/URR-27		GFE		92676	
1	Receiver, UHF	MPS	AN/URR-35		GFE		92211	
1	Receiver, LF/VLF	RCS	AN/FRR-21		GFE			
1	Receiver (Comparator)	MPS		Model MWVC	CFE	Specific Prod.	Comm'l Spec.	
1	HF	MPS		LA-90	CFE	La Voie	Comm'l Spec.	
4	Frequency Standard Generator, Diesel Cryptographic Eqpt. Antennas, See Figure 1 and Component Sheets	-	PU-550/TSC-24		CFE	TMC	Ops., Maint.	

\* BS: Relay Shelter; MPS: Medium Power Shelter; RCS: Receiver-Control Shelter; HPS: High Power Shelter.  
 \*\* CFE: Contractor Furnished Equipment; GFE: Government Furnished Equipment.

NOTE: Federal Stock Numbers, where assigned, are shown in detailed "Component" descriptions which follow this table.

**Air Transportable Communications Set  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (v)]**

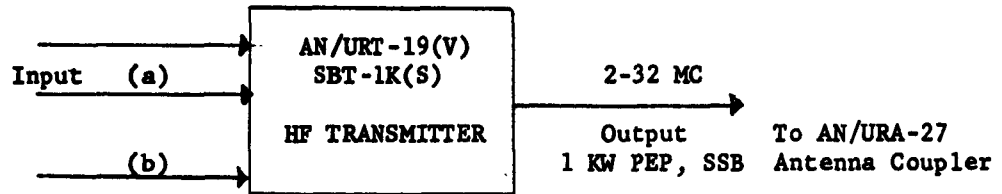
**COMPONENTS**

**AN/URT-19 (v) Transmitter\*, HF, 1KW PEP  
(Four used; located in Medium Power Shelter)**

**CHARACTERISTICS:**

**Physical: Dimensions: 20-5/8" wide, 22-1/2" deep, 72-1/4" high  
Weight: 715 lbs.  
Volume: 21 cu. ft.**

**Technical:**



**INPUT:**

**Audio: (a) Two 600 ohm channels, balanced or unbalanced;  
-20 to +20 dbm.  
(b) One 500,000 ohm input for crystal or dynamic mike;  
-50 dbm for full output, SBE-2 and SBE-3 only.**

**Power Required: 115/230 VAC, 50-60 CPS, single phase, 2,220 watts.**

**OUTPUT:**

**Frequency Range: 2 to 32 MC  
Power: 1000 watts PEP, SSB  
Impedance: 50 or 70 ohms unbalanced  
Emission Types: ISB, SSB, DSB, CW, FSK**

**OTHER:**

**Frequency stability: (1) Crystal (AN/URA-28), 1 part in  $10^6$  per day.  
(2) Synthesizer (AN/URA-30), 1 part in  $10^8$  per day.**

**Carrier Insertion - 55 db to full output (continuously variable using AN/URA-28 or AN/URA-30).**

**Harmonic suppression: Second harmonic at least 40 db below PEP.  
Third harmonic at least 50 db below PEP.**

**Signal Distortion Ratio: Distortion at least 40 db below either tone of a standard two tone test, 2 to 22 MC.  
Distortion at least 35 db below either tone of a standard two tone test, 22 to 32 MC.**

**\*Commercial designation is SBT-1K(s)**

ATCU-100 and ATCU-100A (Cont.)

AN/URT-19 (v) (Cont.)

-2-

OTHER:

Unwanted Sideband Rejection: 1000 CPS tone at least 60 db down.

Audio Response: Using SBG-1 and SBE-3 - flat within 3 db, 350 to 7500 CPS.

Tuning: All tuning and bandswitch controls on front panels.

Metering: Front panel meters indicate operation of all critical circuits.

ALDC: An automatic load and drive control is furnished to limit distortion during high drive peaks or load changes.

T/R Function: A coaxial antenna relay and receiver muting circuit is provided to facilitate half-duplex operation.

Cooling: Pressurized cabinet, filtered forced air.

Safety Features: Full interlock protection. Full overload and fuse protection.

Environmental Conditions: Designed to operate in any ambient temperature between 0° and 50° centigrade and humidity up to 90%.

Note:

The AN/URT-19 Transmitters used in the ATCU-100 and ATCU-100A application consist of the following components:

Military Nomenclature

Commercial Name

AN/URA-28 Modulator-Power Supply Group  
AN/URA-30 Modulator-Oscillator Group\*  
TH-39A/UGT Telegraph Terminal  
O-330B/FR Oscillator, Radio Frequency  
AN/URA-36 Amplifier-Power Supply Group  
AN/URA-27 Antenna Coupler Group

SBE-3 Xmtg. Mode Selector  
SBG-1 Sideband Generator  
TIS-3 Tone Intelligence System  
VOX-5 Variable Frequency Oscillator  
PAL-1K Linear RF Amplifier  
ATS-2 Antenna Tuning System

\* One unit supplied for use with any of four transmitters.



**Air Transportable Communications Set  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (v)]**

**COMPONENTS**

**AN/URA-36 Amplifier-Power Supply Group\*  
 (Part of AN/URT-19(V) 1KW Transmitter)**

**CHARACTERISTICS:**

Physical*:		<u>Dimensions (inches)</u>			<u>Weight (lbs)</u>
		<u>Width</u>	<u>Depth</u>	<u>Height</u>	
(a)		19	19	8 3/4	40
(b)		19	19	10 1/2	60
(c)		19	19	15 3/4	160

**Technical:**



**INPUT:**

RF. Power: 100 milliwatts input will produce 1KW output\*\*  
 Frequency: 2-32 MC  
 Connection: Type UHF coaxial

**OUTPUT:**

RF. Power: At least 1KW (PEP) SSB; 1KW CW, and FSK\*\*  
 Impedance: 50 or 70 ohms unbalanced.  
 Connection: Type C coaxial

**OTHER:**

**Operating Modes:**

CW, MCW, SSB, DSB, ISB, FS(with appropriate exciter).

**Tuning:**

All tuning and bandswitching accomplished from front panel.

**Signal-to-distortion ratio:**

Better than 40 db down relative to PEP output.

- \* Consists of (a) AM-2785A/URA-36 Amplifier Radio Frequency (RFD-1A)  
 (b) PP-2765A/URA-36 Power Supply (PS4A)  
 (c) PP-2766/URA-36 Power Supply (PS-5)

**ATCU-100 and ATCU-100A**

**AN/URA-36 (Cont.)**

**CHARACTERISTICS**

**OTHER:**

**Harmonic suppression:**

Second harmonic at least 40 db down relative to PEP output.  
All other harmonics at least 50 db down relative to PEP output.

**ALDC:**

An automatic load and drive control is provided to limit distortion during high drive peaks or load changes.

**Primary Power Requirements:**

115/230 volts, single phase,                      cycles, approximately  
1900 watts.

**Cooling:**

Filtered forced air cooling.

**Air Transportable Communications System  
ATCU-100 and ATCU-100A  
/Part of AN/TSC-24 (v)/**

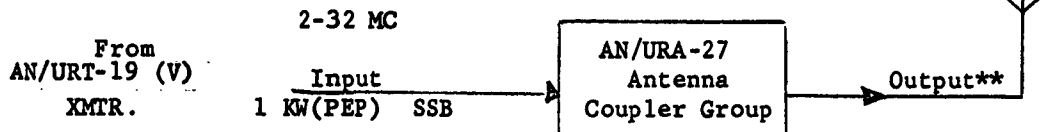
**COMPONENTS**

**AN/URA-27 Antenna Coupler Group\*  
(Part of AN/URT-19 (V) 1KW Transmitter)**

**CHARACTERISTICS:**

Physical:	Dimensions:	Width	Depth	Height	Weight (lbs)
	(a)	9-1/2"	3-1/2"	3-1/2"	2
	(b)	15-1/4"	12"	8-1/4"	49
	(c)	19"	7"	7-1/4"	14

**Technical:**



**INPUT:**

Frequency Range: 2 to 30 MC.  
Impedance: 50 ohms unbalanced.  
RF. Power: 1000 watts continuous at 100% modulation.

**OUTPUT:**

Frequency Range: 2 to 30 MC  
Impedance: 50 ohm system will match any antenna with a resistance of 5-500 ohms and -J850 to +J750 reactance to obtain a VSWR of less than 2.5/1.0  
RF. Power: 1000 watts continuous at 100% modulation.

**OTHER:**

Power Input to Control Monitor, 115/230 volts, 50/60 cps, single phase, 150 watts.

Directivity of Directional Coupler:

Better than 20 db with 1:1 VSWR

- \* Consists of: (a) CU-773/URA-27 Directional Coupler  
(b) CU-772/URA-27 Coupler  
(c) C-2995/URA-27 (ATS-MCU-2)

Item (c) is Mounted in AN/URT-19 Rack;

Items (a) and (b) are external.

**\*\* Efficiency:**

Better than 80% over the 2 to 30 MC range when used with the TMC A-1486 35' antenna and Base Insulator.

Air Transportable Communications System  
ATCU-100A  
[Part of AN/TSC-24 (v)]

COMPONENTS

AN/FRT-39B HF Transmitter

Function: The AN/FRT-39B is a general purpose radio transmitter capable of providing 10 KW Peak Envelope Power in the frequency range of 2 to 28 MC. with a frequency stability of 1 part in  $10^8$  per day. It has been designed primarily to transmit intelligence in the Independent Sideband (ISB) or Single Sideband (SSB) mode. over long-haul circuits.

Manufacturer: Technical Materiel Corp.  
Federal Stock No.: F5820-448-0468  
Reference(s): TMC IN 234  
TMC Technical Manual for AN/TSC-24 (v)  
Estimated Cost: \$31,700  
Status: Models 39B and 39C have been superceded by Model 39D

ATCU-100A  
[Part of AN/TSC-24 (V)]  
AN/FRT-39B Transmitter (Cont.)

CHARACTERISTICS:

Physical:

Dimensions: 55-3/4" wide, 43-1/2" deep, 79" high  
Weight: 2541 lbs.  
Volume: 110.8 cu. ft.

(Two of these 10 KW transmitters are located in the High Power Shelter.)

Technical:

INPUT :

Audio Input: 600 ohm balanced, -20 to +10 dbm, continuously adjustable to full PEP output. An unbalanced input can also be applied.

OUTPUT :

Frequency Range: 2 to 28 mc  
Power Output: 10 KW two tone PEP signal-to-distortion ratio at least 35 db  
Output Impedance: 50 or 70 ohms unbalanced, 600 ohms balanced, pi-L network will match a load with VSWR of 2:1 maximum.

OTHER :

Operating Modes: SSB, ISB, CW, MCW, AM, FSK and FAX  
Heat Dissipation: Maximum 15 KW  
Primary Power: 230 volts, 50/60 cps, 3 phase; maximum 20,000 watts.

The ATCU-100A version of the AN/FRT-39B differs from the standard AN/FRT-39B only in the replacement of transmitter rear doors with screw fastened panels, and the addition of shock-mounts.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24(V)]

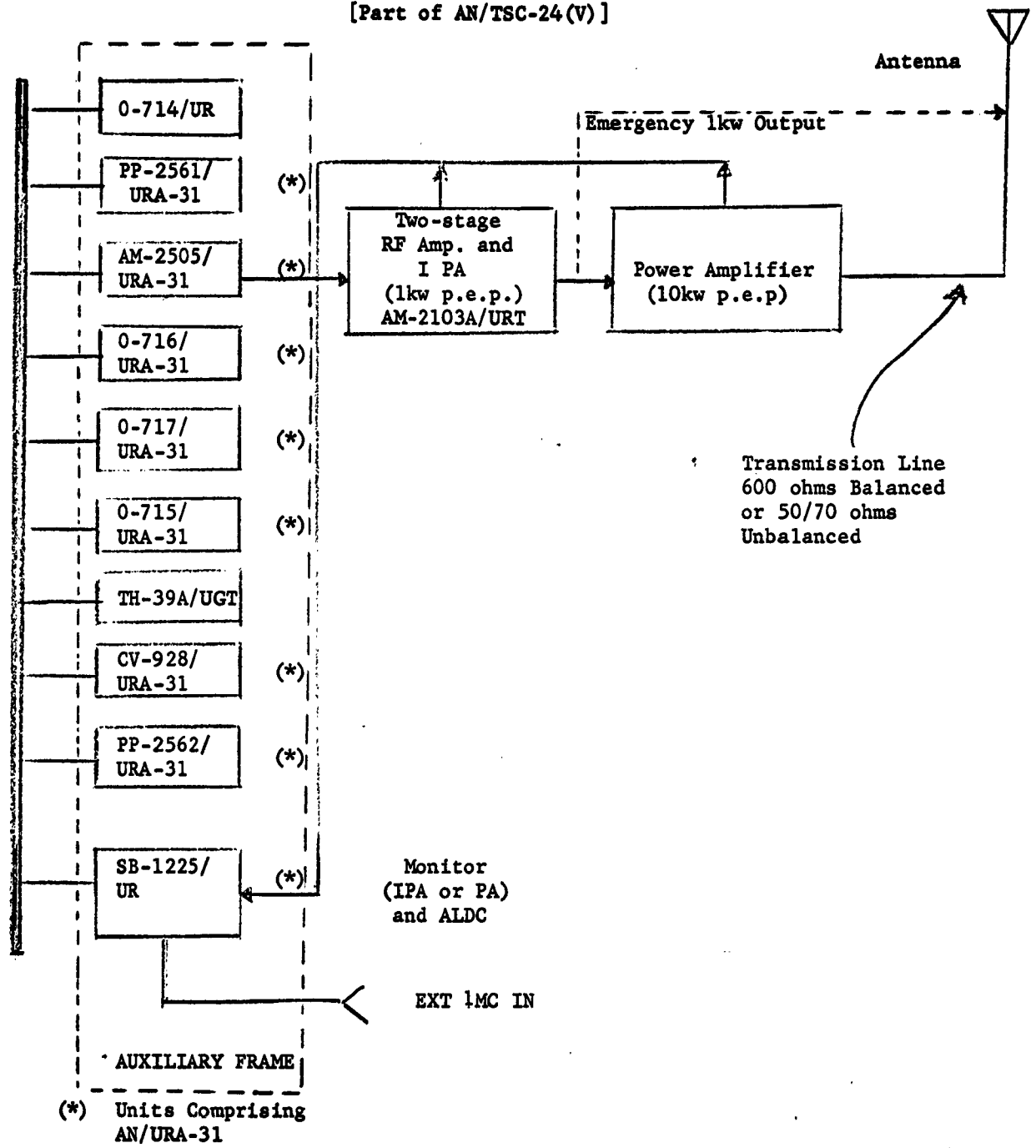


Figure \_\_\_\_\_ Block Diagram  
 AN/FRT-39B HF TRANSMITTER  
 (Synthesized Exciter)

ATCU-100A  
[Part of AN/TSC-24(V)]  
AN/FRT-39B Transmitter (Cont.)

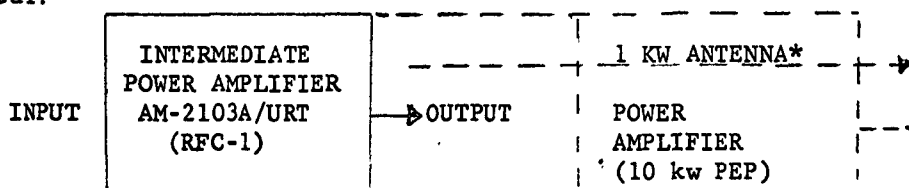
INTERMEDIATE POWER AMPLIFIER AM-2103A/URT (RFC-1)

CHARACTERISTICS:

Physical:

Dimensions: 35-1/2" wide, 26" deep, 16" high  
Weight: 176 lbs.  
Volume: 8.5 cu. ft.

Technical:



INPUT :

Input Frequency Range: 2 to 32 mc, bandswitched  
Input Impedance Range: 50/70 ohms  
RF Input for Full Output: 0.1 watts PEP  
Input Cable: RG/9BU coaxial, type BNC connector

OUTPUT :

Output Frequency Range: 2 to 32 mc  
Output Power: 1 kw (PEP) balanced; 1 kw PEP unbalanced  
Output Impedance: 50/70 ohms unbalanced; 600 ohms balanced: pi-L network  
VSWR: 2 to 1 (Max.)

OTHER:

Operating Modes: CW, MCW, SSB, ISB, DSB, FSK, AM  
Tuning: All tuning and bandswitching channels are on the front panels.  
Distortion Products: Better than 35 db down relative to PEP output, including 3rd order products.  
Harmonic Suppression: Second harmonic at least 65 db from PEP output.  
ALDC: An automatic load and drive control is provided to limit distortion during high drive peaks or load changes.  
Metering: Two meters accurately indicate operation of all internal circuits.

\* Emergency 1 kw balanced or unbalanced output (requires "Emergency" hook-up kit)

ATCU-100A

AN/FRT-39B Transmitter; AM-2103A/URT (cont.)

OTHER:

Environmental:

Ambient temperatures between 0°C and 50°C (32°F to 122°F) for any value of humidity up to 90%.

Cooling:

Filtered, forced air cooling; semi-pressurized cabinet; 1600 cfm at static pressure 2.25 psi.

Primary Power:

220 v, 50/60 cps, 3 phase; the unit receives its power requirements from AX-104 power supply unit.

NOTE: This unit and the Power Amplifier are in the same rack, but since there is an emergency 1 KW output from AM-2103A/URT, therefore, it is being shown as a separate block.



ATCU-100A  
[Part of AN/TSC-24(V)]  
AN/FRT-39B Transmitter (Cont.)

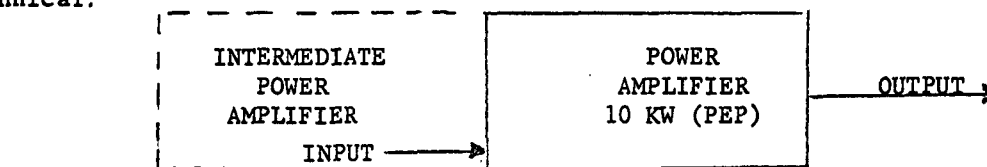
POWER AMPLIFIER

CHARACTERISTICS:

Physical:

Dimensions: 32" wide, 38" deep, 72" high  
Weight: 835 lbs.  
Volume: 52 cu. ft.

Technical:



INPUT :

Input Frequency Range: 2 to 28 mc, bandswitched  
Input Impedance: 50/70 ohms, unbalanced  
Type of Input Cable: Internal coaxial with UG-212C/U connector

OUTPUT :

Output Frequency Range: 2 to 28 mc  
Output Power: 10 kw, two-tone PEP with 35 db down third order distortion; 5 kw, two-tone PEP, with 40 db down third order distortion; 5 kw, CW, FS, and AM; 1 kw, Emergency (see I.P.A. data)  
Output Impedance: 600 ohm balanced; pi-L network 50/70 ohm unbalanced; mounting kit available for following type coaxial connections:  
1. QDL-50  
2. LC-50  
3. 1-5/8" dia. Helix Cable (50 ohms)  
4. 1-5/8" dia. Helix Cable (70 ohms)

ATCO-100A

AN/FRT-39B Transmitter Power Amplifier, (Cont.)

OTHER:

Operating Modes: CW, MCW, SSB, ISB, DSB, FSK and AM.  
Tuning: Manual - all tuning and bandswitching controls are on front panels.  
Distortion Products: Better than 35 db down relative to PEP output, including 3rd order products; (referred to output power).  
Harmonic Suppression: Second harmonic at least 50 db from PEP output, third harmonic at least 65 db from PEP output.  
ALDC: An automatic load and drive control is provided to limit distortion during high drive peaks or load changes.  
Environmental: Ambient temperatures between 0°C and 50°C (32°F to 122°F) for up to 90% humidity.  
Cooling: Filtered, forced air cooling; semi-pressurized cabinet; 1600 cfm at static pressure 2.25 psi.  
Primary Power Requirements: 15 kw, 230 volts, 50/60 cps, 3 phase.

**Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]**

**COMPONENTS**

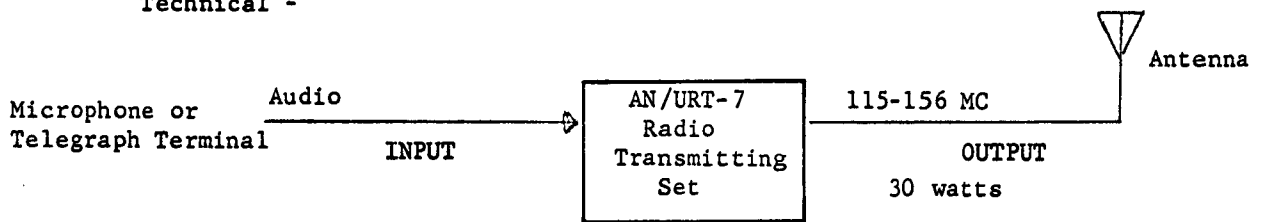
**Radio Transmitting Set AN/URT-7 (VHF)**  
 (one used in Medium Power Shelter)

**CHARACTERISTICS:**

**Physical -**

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19	13 23/32	16 1/2	146

**Technical -**



**Input:**

Impedance; 600 ohms

Audio Level; 0.1 to 3.4 volts

**Output:**

Frequency range; 115 to 156 MC

Type; CW, MCW, voice

Power; 30 watts, nominal

Impedance; 50 ohms

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

Radio Transmitting Set AN/URT-7 - - - - - (Cont'd.)

CHARACTERISTICS:

Other -

Frequency control; crystal

Frequency stability;  $\pm .007\%$

Audio frequency response; flat within  $\pm 3$  db from 300 to 3,500 cps (Ref. 1000 cps)

Power required; 115 to 230 VAC  $\pm 10\%$ , 50 to 60 cps  $\pm 5\%$ , 1 phase, 750 watts

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

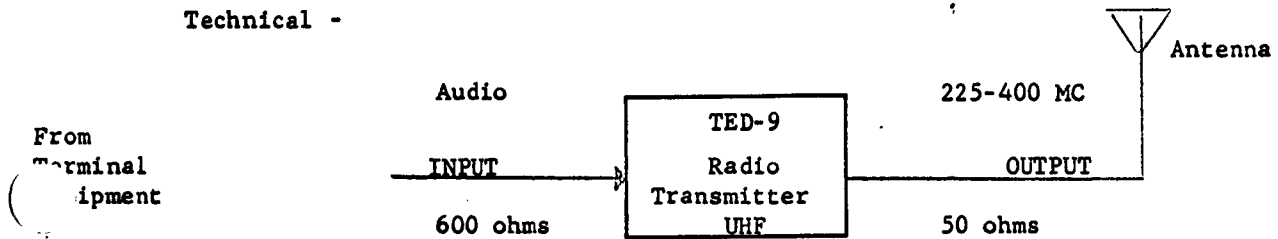
-- TED-9 Radio Transmitting Equipment, UHF --  
 (one used in Medium Power Shelter)

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19	13 23/32	16 1/2	144

Technical -



Input:

Type; audio

Impedance; 600 ohms

Level; 0 dbm

Output:

Type; RF, 225-400 MC

Nominal carrier output power; 12 to 15 watts

Impedance; 50 ohms

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

TED-9 Transmitting Equipment, UHF (Cont'd.)

CHARACTERISTICS:

Other -

Audio frequency response; flat within  $\pm 3$  db from 300-3500 cps, reference 1000 cps

Frequency control; crystal

Frequency stability;  $\pm .007\%$

Modulation capability; 100%

Maximum permissible line voltage variation;  $\pm 10\%$

Heat dissipation; 725 watts

Power required; 115/230 VAC 0.85 pf, 50-60 cps, 1 phase

Note: The TED-9 is electrically and functionally interchangeable with  
TED-8 Radio Transmitting Equipment.

Manufacturer/s; Westinghouse  
Rauland-Borg

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24]

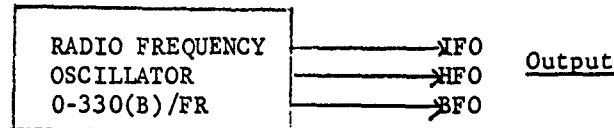
0-330(B)/FR VARIABLE FREQUENCY OSCILLATOR\*

CHARACTERISTICS:

Physical:

Dimensions: 19" wide, 16" deep, 10-1/2" high  
Weight: 157 lbs.  
Volume: 1.8 cu. ft.

Technical:



OUTPUT :

HF OSCILLATOR:

Frequency Range: 2 to 64 mc continuous, bandswitched  
Output Impedance: 75 ohms coaxial  
Output Level: 2 watts throughout basic range of  
2 to 4 mc and 0.5 watt. 4 to 64 mc  
adjustable  
Output Connections: Three BNC RF connectors  
Crystal Frequencies: 2 to 4 mc for output frequencies of  
2 to 64 mc  
Crystal Position: Three each, available on front  
panel switch  
Crystal Unit: CR-18/U  
Output Voltage: Sinusoidal with no spurious frequencies  
Stability: 20 cycles per mc for 0 to 50°C  
(32°F to 122°F) ambient temperature  
Calibration: Direct reading calibration in  
cycles per second from 2 to 4 mc  
Readability: 20 cycles per mc  
Resettability: 20 cycles per mc to a calibrated  
frequency  
Line Voltage  
Change Effects: Maximum change of 10 cycles per mc  
for ±10% change in line voltage  
HF Oscillator  
Calibration: Against 100-kc crystal oscillator  
at 50 kc points

BF OSCILLATOR:

Frequency Range: 300 to 1000 kc (Crystal Oscillator)  
Output Level: 6 volts across 1000 ohms with output  
level control  
Output Connection: Three BNC RF connectors  
Crystal Holders: CR-45/U  
Crystal Position: Two each, available on rear panel  
switch

\* Commercial name: VOX-5 Variable Frequency Oscillator.

ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]  
O-330 B/FR (Cont.)

OTHER:

IF OSCILLATOR:

Frequency Range:	3.2 to 3.9 mc (Crystal Oscillator)
Output Level:	2 volts in 75 ohms
Crystal Type:	CR-18/U
Output Connections:	Three BNC RF connectors
Primary Power:	115 or 230 volts, 50 to 60 cps. Approximately 100 watt average or 250 watt peak during cycling of oven heating elements.



Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

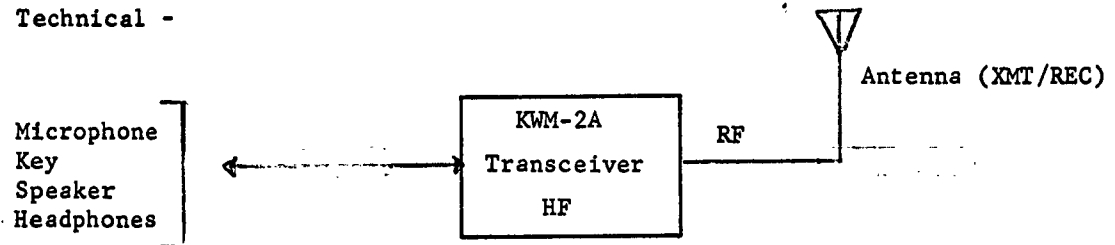
KWM-2A Transceiver HF  
 (2 supplied with AN/TSC-24 (v) and located in Receiver-Control Shelter)

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	14 3/4	13 1/4	7 3/4	45

Technical -



Input:

Frequency range: 3.4 to 5 MC and 6.5 to 30.0 MC with proper crystals  
 (Has board for 14 additional crystals to cover frequencies outside of amateur band)

Receiver Sensitivity: 0.5 microvolts for 10 db  $\frac{S+N}{N}$  ratio  
 Receiver Selectivity: 2.1 KC determined by mechanical filter

Output:

Transmitter power: 100 watts (PEP) SSB  
 90 watts CW

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

----- KWM-2A Transceiver HF ----- (Cont'd.)

CHARACTERISTICS:

Other - The KWM-2A has a board for 14 additional crystals to cover frequencies outside of amateur band and also includes a front panel switch and indicator allowing instant switching between the two boards.

Emission types: USB, LSB Voice or CW (FSK with audio tone keyer)

Power required: 115 or 220 VAC, 50 to 400 CPS, 255 Watts

Federal Stock No. 5820-856-6833

Manufacturer: Collins Radio Co., Cedar Rapids, Iowa

Estimated Cost: \$1200.00

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]

COMPONENTS

AN/URA-28 MODULATOR - POWER SUPPLY GROUP\*

CHARACTERISTICS:

Physical:

NOTE: The AN/URA-28 consists of an O-672/URA-28 RF oscillator, and a PP-1769/URA-23 power supply, each mounted on separate 19" removable panels.

Dimensions:

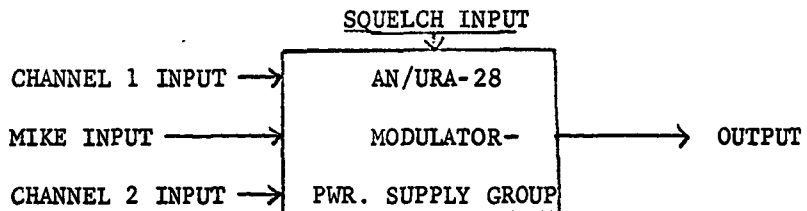
O-672/URA-28: 19" wide, 15" deep, 8-3/4" high  
PP-1769/URA-23: 19" wide, 8-5/16" deep,  
5-1/2" high

Weight:

O-672/URA-28: 35 lbs.  
PP-1769/URA-23: 36 lbs.

Volume: 2.3 cu. ft. total

Technical: The AN/URA-28 modulator is a filter-type single or double sideband generator designed for radio telephone, radio telegraph and frequency shift operation. It is continuously tunable from 2 to 32 mc and has a frequency stability of 1 part in  $10^6$  per day. It is used primarily as an exciter in single sideband communication systems.



INPUT :

Audio Input: Two independent 600 ohm channels, balanced or unbalanced, -20 db to +10 db, adjustable, for full RF output; 500 K ohms for high impedance crystal or dynamic mike, -50 db for full RF output

OUTPUT :

Output Impedance: 72 ohms nominal  
Output Power: Continuously adjustable from zero to a maximum of 1 watt PEP  
Frequency Range: 2 to 32 mc continuous, bandswitched

\* Commercial name: SBE-3 Transmitting Mode Selector (Sideband Exciter)

ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]  
AN/URA-28 (Cont.)

OTHER:

Primary Input Power: 115 to 230 v, 50 or 60 cps, single phase, 120 watts average consumption; 140 watts at intervals when oven cycles

Operating Modes: SSB, DSB, ISB, FSK, AM, CW, or MCW

Audio Response Per Sideband: Within  $\pm 3$  db from 350 to 7500 cps

Frequency Control: Temperature-controlled crystals or external VFO

Stability: 1 part in  $10^6$  for 24 hour period

Crystal Oven Temperature: 75°C (167°F) for 250 kc oscillator, and 70°C (158°F) for MF and HF oscillator

MF Injection Requirements, Crystal or VMO: Crystal Positions: 10 crystals, each with independent trimmer. Selection by front panel switch. Crystals CR-27/U to be inserted in holders HC-6/U.  
VMO Input Frequency: 2 to 4 mc to serve for entire output range of 2 to 32 mc.  
VMO Input Impedance: 72 ohms nominal.  
VMO Input Voltage: Approximately 1.5 v rms.

Carrier Suppression: At least 55 db down from PEP level

Carrier Insertion: Continuously adjustable.

Connections: VFO Input BNC  
RF Output BNC  
Monitor BNC  
Audio Control Terminal Barrier  
Mike Input 3 Pin Mike Jack

Spurious Output: At least 60 db below PEP output.

Distortion Products: At full PEP output, odd order distortion products are at least 45 db below either tone of a standard two tone test.

Harmonic Radiation: Second harmonic at least 40 db below PEP output. All other harmonics at least 50 db below PEP output

Rejection of Unused Sideband: 500 cps tone 60 db below transmitter PEP

Voice Operation: Voice control with antitrip features, adjustable gain, and squelch controls

Metering: Peakreading VTVM indicates:  
a. Audio level in USB or LSB channel  
b. Midfrequency level for tuning purposes  
c. RF output (percent of maximum power)

Air Transportable Communications System  
ATCU-100 and ATCU-100A

[Part of AN/TSC-24(V)]

COMPONENTS

AN/URA-30 Modulator Oscillator Group\*

This is a stabilized general purpose exciter system adjustable to 320,000 frequencies over the frequency range of 1.75 to 33.75 MC in 100 cycle steps with a basic stability of one part in  $10^8$  per day. In order to provide this stability, all frequency determining elements in the AN/URA-30 are derived from a 1 MC source. In addition to the master 1 MC standard, an emergency standard is provided which has a stability of 1 part in  $10^6$  per day. The AN/URA-30 may also be connected to an external standard of greater stability without degeneration of that standard.

The AN/URA-30 includes:

Oscillator - Power Supply Group AN/URA-31 (Controlled Precision Oscillator).

Oscillator Radio Frequency 0-714/UR (Sideband Exciter).

Detailed descriptions of these components follow.

\* Commercial name is SBG-1 Sideband Generator

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]

COMPONENTS

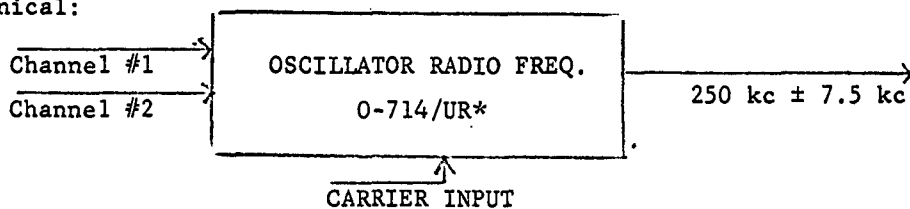
0-714/UR Oscillator, Radio Frequency (Part of AN/URA-30)

CHARACTERISTICS:

Physical:

Dimensions: 19" wide, 5 1/2" high, 10 3/4" deep  
Weight: 54 lbs. gross  
Volume: 0.6 cubic feet

Technical:



Input:

Audio: Two independent 600-ohm channels, balanced or unbalanced. - 20 dbm level produces full rf Input. Two potentiometers control LSB and USB gain for audio inputs having range of -20 dbm to +20 dbm.

Carrier: 250 kc with stability of 1 part in  $10^6$  for 24 hour period and amplitude of 1.0 volt constant to within  $\pm 10\%$ .

Output:

Frequency Range: 242.5 kc to 257.5 kc.

Output Impedance: 70-ohm, nominal

Output Power: Continuously adjustable from zero to a max. of 10-milliwatts (PEP).

Other:

1. Operating Modes: Single sideband, double sideband, Independent sideband (separate intelligence on each sideband).
2. Audio Response per sideband: Within 3 db from 350 to 7500 cps.

\* Commercial name is CBE-1 Sideband Exciter

ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]  
O-714/UR oscillator (Cont.)

-2-

3. Carrier insertion: Continuously adjustable in all operating modes.
4. Carrier suppression: At least 55 db down from PEP.
5. Non-harmonic spurious output: At least 60 db below PEP output.
6. Rejection of unused sideband: 500 cps tone 60 db below transmitter PEP.
7. Single sideband bandwidth (with suppressed carrier): 7.2 kc each at 3 db points.
8. Metering: Peak reading VTVM's indicate relative sideband power levels for USB and LSB before final power amplifier stage.
9. Connections: a) Audio input-terminal block  
b) 250 kc input-BNC coaxial connection  
c) RF output-BNC coaxial connection
10. Input power supply: 115-or 230-volts, 50 or 60 cps single phase, 30-watts average consumption.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24(V)]

COMPONENTS

AN/URA-31 Oscillator - Power Supply Group\* (Part of AN/URA-30)

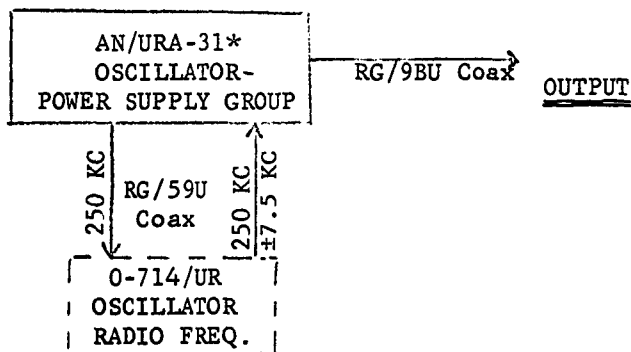
CHARACTERISTICS:

Physical:

The AN/URA-31 consists of the following units:

<u>Nomenclature</u>	<u>Width</u>	<u>Height</u>	<u>Depth</u>
AM-2505/URA-31 (Amplif. R.F.)	19"	10 1/2"	19 1/4"
O-716/URA-31 (Oscil. R.F.)	19"	10 1/2"	16"
O-717/URA-31 (Oscil. A.F.)	19"	5 1/4"	19"
CV-928/URA-31 (Frequency Divider)	19"	5 1/4"	15"
O-715/URA-31 (Oscil. R.F.)	19"	5 1/4"	14 3/4"
PP-2561/URA-31 (Power Supply)	19"	5 1/4"	16 1/2"
PP-2562/URA-31 (Power Supply)	19"	12 1/4"	16"
Weight: Total of 243 pounds			
Volume 9.7 cubic feet			

Technical:



Frequency Range: 1.75 to 33.75 mc synthesized in 100 cycle steps.

Output Power: 0.1 to 1.0 watt (PEP) into 70 ohms.

Output Stability: At the 100-cps discrete frequency steps, the automatic phased control system stabilizes frequency to one part in  $10^8$  per day.

\* Commercial name is CPO-1, Controlled Precision Oscillator



ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]  
AN/URA-31 (Cont.)

-2-

Other:

Primary Power: 115/230 volt, 50/60 cps, 10 (1200 watts)

Two units of AN/URA-31 namely O-716/URA-31 and AM-2505-URA-31 can be used independently to excite the transmitter, if high stability is not required. The output characteristics will remain the same, except for the frequency stability which will be 2 parts in  $10^5$ .

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (v)]

COMPONENTS

PROGRAM BOARDS

(Part of Signal Distribution System, Telesignal Models 228A, 228B, 228C)

The Program Board terminations of the AN/TSC-24 (v) Signal Distribution System replace the former soldered "Christmas tree" type of terminal board distribution frames. By terminating all equipment and external lines on one section of this computer type Program Board and terminating all DC and AF jackfield ties on another section of the board, it is possible to quickly program required station circuit configurations by using cross-connect patchcords. Initial programming is entered on a Cross-Connect Record Card and all subsequent programming modifications should be promptly entered. All of the external circuit cables that are routed to the signal distribution cabinet appear there on a plug-receptacle type of quick-disconnect panel. This facilitates the interconnection of the circuits between various Shelters and between cabinets within a Shelter.

The Program Board is installed either directly above or below the standard jackfield in the front of the signal distribution cabinet. Changes in programming should be authorized only by a responsible technical supervisor who has a thorough knowledge of all station equipment and circuitry.

The Medium Power Shelter (Cabinet 6) utilizes the Model 228C (Telesignal Corp.) Program Board which has a total of 480 positions (maximum number of single wire terminations; some DC connections are single wire while audio frequency terminations are normally on a pair basis requiring two "positions" for one channel). Control and signal lines from the Receiver-Control Shelter allow the Medium Power Shelter operator to set up any normal-through configuration of equipments required by the supervisor in the Receiver-Control Shelter.

The Receiver-Control Shelter includes a Model 228A (1632 positions) Program Board mounted in Cabinet 2.

The Relay Shelter Model 228B Program Board is physically divided into two sections in order to comply with military communication requirements for classified message handling. One section is the Cabinet 2 Black Program Board, and the other section which serves as the Red Program Board is located in Cabinet 5.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

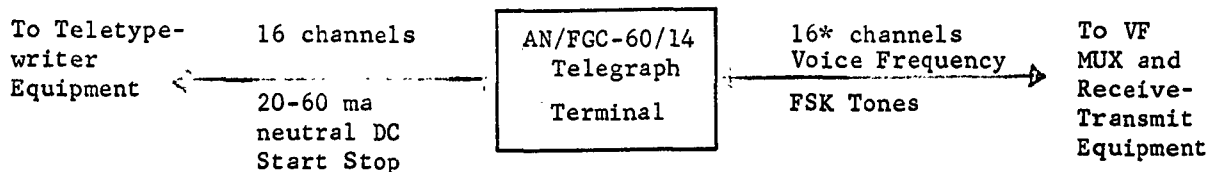
COMPONENTS

AN/FGC-60/14 Telegraph Terminal -----

CHARACTERISTICS:

Physical - (In Receiver-Control Shelter)	-----Approximate-----			
	Width (inches)	Depth (inches)	Height (inches)	Weight (lbs.)
1 cabinet	22	24	84	500
(Part of second cabinet is used to house VF MUX and DEMUX, Line Amplifiers and metering.)				

Technical -



Input:

Transmit section:

16 D.C. Start-Stop, 20-60 ma neutral TTY signals

Receive section:

16\* Voice frequency (3kc channel) FSK tones, -10 dbm per channel

Output:

Transmit section:

16 Voice frequency FSK tones (3kc channel), -10 dbm per channel

Receive section:

16 D.C. Start-Stop, 20-60 ma neutral TTY signals

Maximum keying speed, 100 WPM

(Sheet 61 of 99)

\*In space diversity application 2 groups of 16 channels (32 tones) are received.

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

AN/FGC-60/14 Telegraph Terminal - - - - - (Cont'd.)

CHARACTERISTICS:

Other -

The AN/FGC-60/14 Telegraph Terminal supplied in the Receiver-Control Shelter of the AN/TSC-24 (v) transportable system is identical to the AN/FGC-60 (v) equipment as described in "DCS Equipment Characteristics, Volume I, Section IIC, Multiplex" dated 31 January, 1963, with the following exceptions:

(1) Diversity Comparator units (CM-185/UGC) were not supplied as individual plug-in modules but were mounted "piggy-back" on the back of the CV-972 (P) UGC Frequency Shift Converters. (one comparator serves two converters).

(2) Model 109 P/B Electronic Switch replaces the Model 109 (SA-733/UGD) as the transistorized output coupling device working with the CV-972 (P) UGC Frequency Shift Converters. It provides necessary isolation and is not limited in speed as is the conventional electromechanical relay isolation unit. It does not include self-contained line battery; (Model 109 does include) and uses neutral keying only. It also mounts on the rear of the CV-972 (P) UGC Frequency Shift Converter.

Space (dual) diversity reception is possible since 32 receivers (CV-972 (P) UGC Frequency Shift Converters) are supplied. Quadruple diversity (combined space and frequency diversity) may also be programmed. The initial AN/TSC-24 (v) programming as illustrated in Figures 2A and 2B indicates only frequency diversity application. However, because of the flexibility afforded by the program board type of interconnections, changes in operating modes can be made quickly whenever required.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

AN/UGC-1A Telegraph Terminal  
 [Used with AN/TSC-24(V)]  
 and located in Receiver Control Shelter]

CHARACTERISTICS:

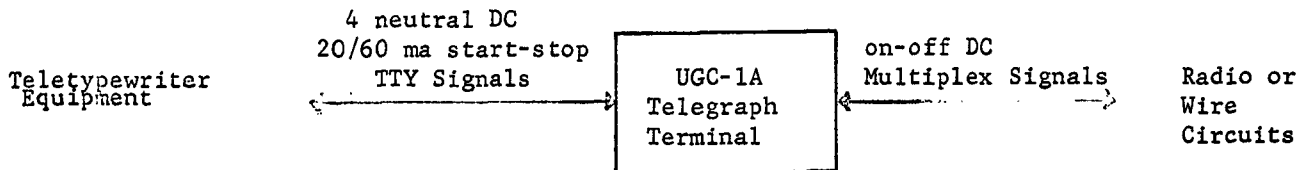
Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	17	25	33 1/4	197

Consists of:

- One OA-872/UGC-1A Oscillator Power Supply
- One OA-3444/UGC-1A Receiver Group
- One OA-3445/UGC-1A Transmitter Group
- One Indicator, Code Converter, ID-965/UGC-1A

Technical -



Input:

Transmitter group: Maximum of four neutral 20/60 ma DC Start-Stop TTY signals.

Receiver group: On-off DC Multiplex signals

Output:

Transmitter group: On-off DC Multiplex signals

Receiver group: DC start-stop TTY signals; neutral 20/60 ma

Keying Speeds; 60, 75 and 100 WPM.

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

AN/UGC-1A Telegraph Terminal ----- (Cont'd.)

CHARACTERISTICS:

Other -

The UGC-1A Telegraph Terminal is electrically and functionally interchangeable with the UGC-1 type documented in "DCS Equipment Characteristics, Volume I, Section IIC, Multiplex" dated 31 January 1963. The differences in the two models are as follows:

- (a) The UGC-1A omitted the neon readout light provided in the UGC-1 type.
- (b) The UGC-1A incorporated modifications to enable interfacing with cryptographic equipment.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

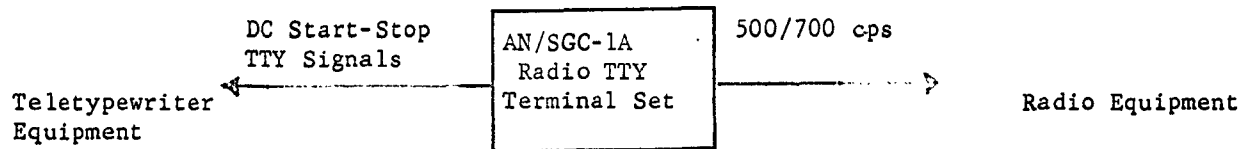
AN/SGC-1A Radio Teletype Terminal Set

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19 1/4	17 9/16	9 11/16	50

Technical -



Input:

Transmitter Section; DC start-stop TTY signals  
 Receiver Section; Audio frequency  
 Receiver Section; Level, minimum -40 dbm  
 Receiver Section; Impedance, 600 ohms

Output:

Transmitter Section; audio frequency 500/700 cps  
 Transmitter Section; level, maximum +10 dbm  
 Transmitter Section; impedance, 600 ohms or 50 ohms  
 Receiver Section; DC start-stop TTY signals

Other:

Power required; 115 VAC, 50 to 60 cps, 1 phase 86 watt  
 Manufacturer; Remler Co. San Francisco, California.

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]

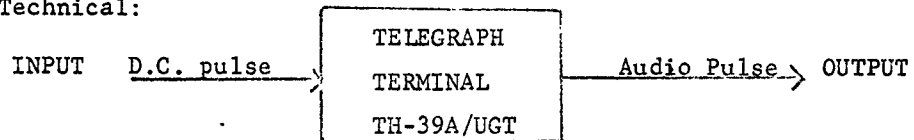
TELEGRAPH TERMINAL TH-39A/UGT\*

CHARACTERISTICS:

Physical:

Dimensions: 19" wide, 14" deep, 5-1/4" high  
Weight: 38 lbs.  
Volume: 0.8 cu. ft.

Technical:



INPUT :

Input Keying: 1. 50 v, 100 v, 20 ma, 60 ma; all neutral, floating, or either side grounded.  
2. 0 to 20 volts positive for a linear shift of 1200 cycles (FAX).  
Input Impedance: 1. 60 ma position 1000 ohms  
2. 20 ma position 2200 ohms  
3. 50 v position 47,000 ohms  
4. 100 v position, 100,000 ohms  
5. FAX position (0-20 v) 47,000 ohms  
Keying Rate: Up to 75 bauds (100 wpm) FSK; up to 140 bauds CW; up to 400 bauds FAX.

OUTPUT :

Output Level: Continuously adjustable, -20 dbm to 0 dbm (1 milliwatt)  
Output Impedance: 600 ohms balanced  
CW Output Frequency: 1000 cps  
FSK Output Frequency Shift: 12 to 1000 cps continuously adjustable.  
Output Center Frequencies: 2550 cps, 2000 cps, 1900 cps, and spare position.

\* Commercial name is TIS-3 Tone Intelligence System. This is the audio tone keyer used with SBT-IK(S) and AN/FRT-39B.



ATCU-100 and ATCU-100A  
[Part of AN/TSC-24(V)]  
Telegraph Terminal TH-39A/UG (Cont.)

OTHER:

Frequency Stability: Better than 0.5% for 0 to 50°C  
(32°F to 122°F) ambient temperature  
±10% line voltage variation, and 0  
to 95% relative humidity.

Crystal Types:	<u>Center Frequency</u>	<u>Crystal Used</u>
	1900 cps	CR-47/U - 0.198100-P
	2000 cps	CR-47/U - 0.198000-P
	2550 cps	CR-47/U - 0.197450-P

For fourth position, order crystal  
frequency  $f_x = 0.2$  - center frequency  
(both in mc).

Power Supply: 105/115/125/210/230 v; 50-60 cps;  
single phase, 100 watts continuous;  
170 watts intermittent (oven cycling).

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

WA-623 VOICE TERMINAL UNIT

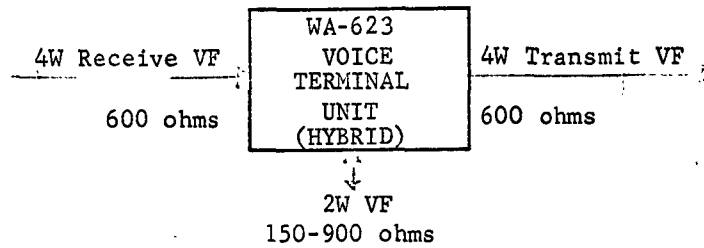
(Two used in Receiver-Control Shelter)

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19	8	3 1/2	7

Technical -



Input:

Level - 2 wire from Receive Amplifier; max. +5dbm

Impedance - 4W Receive; 600 ohms  
 - 2W Receive; 150-900 ohms

Frequency; 300-3700 cps

Output:

Level - 2W to 4W or 4W to 4W; 0dbm

Impedance - 4W Transmit; 600 ohms  
 - 2W Transmit; 150-900 ohms

Frequency; 300-3700 cps

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

WA-623 Voice Terminal Unit ----- (Cont'd.)

CHARACTERISTICS:

Other -

Receive gain (a) 4W to 2W 12 to 14 dbm; min. receive level of -30dbm.  
(b) 4W to 4W 18 to 20 dbm; min. receive level of -30 dbm.

Frequency response;  $\pm 1$ db, 500-3700 cps.

Trans-hybrid loss; 50 db min.

Distortion; Less than 3% over nominal input range.

Switching; Instantaneous remote switching to or from 2W to 4W or 4W to 4W.

Power required; 105-120 VAC, 50/60 cps. 10 watts.

Environmental conditioning; moisture and fungus treated.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

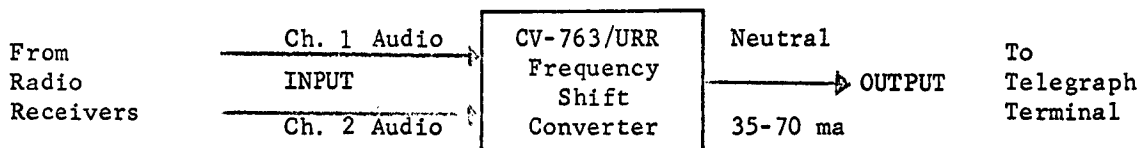
CV-763/URR Frequency Shift Converter\*

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19	16	3 1/2	32

Technical -



Input:

Level; -30 to +30 dbm  
 Limiting; Between 50 to 60 db each channel  
 Input Frequency Shift Limits; 100 to 1000 cps. centered about 2700 cps.

Output:

Level; 35 to 70 ma neutral DC into 2000 ohm load  
 Either side grounded or floating. (Smaller currents into higher load impedances)

\*CFA-1 Frequency Shift Converter is commercial name.  
 Two used in Receiver-Control Shelter.

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

CV-763/URR Frequency Shift Converter \_ \_ \_ \_ (Cont'd.)

CHARACTERISTICS:

Other -

Keying speeds

100-600 WPM ("High speed" position)

Up to 100 WPM ("Low speed" position)

Input frequency drift limits; 1 1/2 times maximum shift (1500 cps)

Tuning indicator; 2" cathode ray tube

Power required; 110/220 VAC  $\pm 10\%$ , 50/60 cps., approx. 80 watts

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

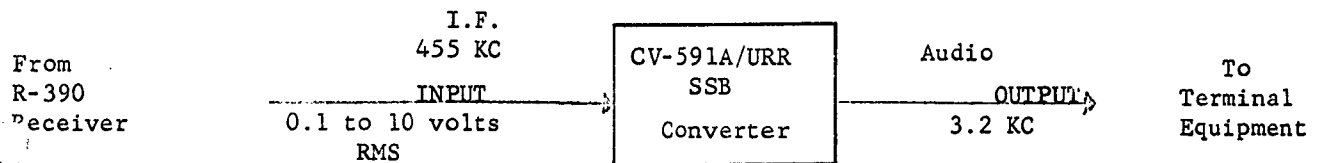
CV-591A/URR Single Sideband Converter  
 (Two used in Receiver-Control Shelter)

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19	11 1/4	5 1/4	24

Technical -



Input:

Frequency; 455 KC I.F.

Type; SSB (upper or lower) AM, CW, FSK (including Fax)

Level; 0.1 to 10 volts RMS

Impedance; High Z, at least 200 K ohms

Tuning (bandspread); ±3 KC

Output:

Level: High, 2 watts for 600 ohms or 8 ohms Z

Low, (a) 1 milliwatt for 600 ohms

(b) 150 milliwatts for 600 ohms or 8 ohms Z

Impedances; Loudspeaker - 8 ohms

Line - 600 ohms

Head Set - High or Low Z headset may be used

Filter Characteristics: 3.2 KC at 3 db points

5.2 KC at 45 db points

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

CV-591A/URR Single Sideband Converter (Cont'd.)

CHARACTERISTICS:

Other -

AVC Characteristics;

With 40 db change in input, output remains constant within  $\pm 4.5$  db

AVC speeds - slow/fast

Audio distortion; less than 5%

Hum Level; at least 50 db down from full audio output

Power required; 115/230 VAC, 50/60 cps, 1 phase, 65 watts

Temperature and Humidity Spec.; 0 to 50°C, up to 90% humidity

Federal Stock No.;

With spares - F5820-543-1593

Less spares - F5820-633-0470

Manufacturer: Technical Materiel Corp.

Mamaroneck, N.Y.

Reference: TMC Bulletin

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

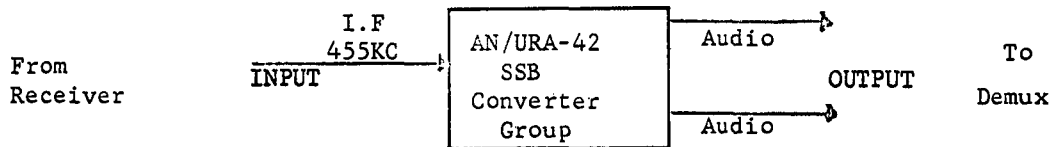
COMPONENTS

AN/URA-42 SSB Converter Group\*  
 (one used in Receiver-Control Shelter) -----

CHARACTERISTICS:

Physical -	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19	17	10 1/2	50

Technical -



Input:

- Frequency; 455KC
- Impedance; (a) 50 ohms nominal  
 (b) High Z
- Voltage range; for 50 ohms, 1 millivolt to 1 volt  
 High Z, up to 3 volts
- Tuning range;  $\pm$  3KC

Output:

- Audio;
  - (a) High level, two zero to 1 watt, balanced 600 ohm
  - (b) Low level, two zero to 100 milliwatt, balanced 600 ohm

\* Commercial name SBC-1 (TMC)



Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

AN/URA-42 SSB Converter Group ----- (Cont'd.)

CHARACTERISTICS:

Other -

Types of detection; SSB, ISB with full carrier up to 30 db carrier suppression with AFC, or SSB, ISB, AM, CW, MCW with AFC disabled.

Carrier reinsertion; (a) Reconditioned carrier

(b) Local carrier or oven controlled crystal oscillator

Carrier suppression; Will operate with carrier suppression of 0 db to -30 db

Unwanted sideband

rejection;

Undesired sidebands, removed more than 250 cps from the carrier and rejected by a minimum of 60 db

In-band distortion; -40 db

Cross-channel  
distortion;

-60 db

AGC;

AGC voltage selectable front panel from USB, LSB, or carrier. Fast attack time; adjustable release time

AGC controls;

(a) Channel A plus B

(b) Channel A only

(c) Channel B only

(d) Carrier only

(e) Manual

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

--- AN/URA-42 SSB Converter Group --- (Cont'd.)

CHARACTERISTICS:

Other -

I.F. Bandwidths;

± 1.5 db, 250-7500 cps USB and LSB

± 1.5 db, 250-3300 cps USB and LSB

AFC Characteristics;

The AFC system will synchronize with a 30 db suppressed carrier which has an error of ± 50 cps and will follow a maximum drift rate of ± 10 cps/second. The system will stay synchronized over a minimum frequency range of ± 1000 cps from the center frequency.

AFC Accuracy;

Less than 1 cycle error over the entire AFC control range.

AFC Correction;

The AFC circuit will maintain the frequency of the audio output within a residual error of less than 1 cycle of the transmitted intelligence.

Stability;

Without AFC, within 1 CPS.

Drift Alarm;

A drift alarm light indicates when carrier error is greater than ± 750 cps.

Fade Alarm;

A fade alarm provides visual indication when carrier is interrupted or fades below a predetermined level. Connections for a remote fade alarm indicator are available on rear apron.

Monitoring;

Headphone monitoring of either audio channel.

Threshold;

Continuously adjustable threshold control provided on front panel of AFC section to reduce sensitivity when excess noise is encountered.

Audio Response;

Audio amplifier, ± 1.5 db 100 to 22,000 cps.

Audio Distortion;

-45 db

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

AN/URA-42 SSB Converter Group (Cont'd)

CHARACTERISTICS:

Other -

Metering;

- (a) Independent VU meters for each low level 600 ohm channel.
- (b) AFC drift indicator.
- (c) Carrier level indicator.

Hum Output;

-50 db

Power Required;

115/230 VAC 50/60/400 cps, 1 phase, 320 watts.

Environment;

(continuous duty)

Temperature range 0 to 50°C. Humidity up to 90%.

Air Transportable Communications System  
ATC U-100 and ATCU-100A  
[Part of AN/TSC-24(v)]

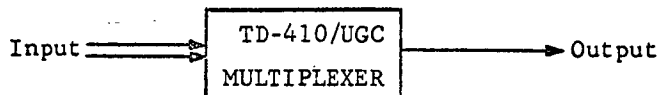
COMPONENTS

TD-410/UGC (MULTIPLEXER)

CHARACTERISTICS:

Physical: Dimensions: 8" wide, 10-3/4" deep, 5-1/4" high  
Weight: 10 lbs. (approx.)

Technical:



**INPUT** :

Number : 2  
Frequency Bandwidth: 375 to 3025 cps, each input  
Impedance: 600 ohms balanced, each input  
Level:  
Telephone: -15 to +4 dbm  
Facsimile: -15 to +4 dbm  
Telegraph: -25 to +4 dbm per input channel  
(16 channels)

**OUTPUT** :

Number : 1  
Frequency Bandwidth: 375 to 5915 cps  
Impedance: 600 ohms balanced  
Level:  
Telephone: -4 dbm  
Facsimile: 0 dbm  
Telegraph: -10 dbm per channel (16 channels)  
Single Frequency: +16 dbm maximum

OTHER:

Operating Temperature: 0° to 50°C (32° to 122°F)  
Monitoring: (a) VU meter  
(b) 6 front panel test points  
Power Requirements: 115/230 VAC, 50-60 cps, 1 phase, approximately 4 watts  
General: Transistorized equivalent of TD-97/UGC vacuum tube multiplexer. For use on ISB/SSB radio circuits to combine 2 voice freq. (VF) circuits into one channel  
Internal Carrier Stability: 1 part per 10<sup>5</sup>  
Accuracy: ±0.1 cps at 6290 cps

Air Transportable Communications System  
ATC U-100 and ATCU-100A  
[Part of AN/TSC-24(v)]

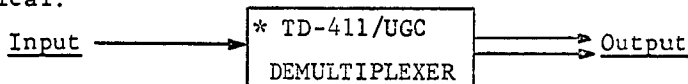
COMPONENTS

TD-411/UGC (Demultiplexer) A transistorized equivalent of the TD-98/UGC vacuum-tube equipment. Used at the receiving terminal to convert the single input channel signal to the original two voice frequency channels which appeared at the Multiplexer input at the Transmitting Terminal.

CHARACTERISTICS:

Physical: Dimensions: 8" wide, 10-3/4" deep, 5-1/4" high  
Weight: 10 Lbs. (approx)

Technical:



**INPUT :**

Number: 1  
Frequency Bandwidth: 375 to 5915 cps  
Impedance: 600 ohms balanced  
Level:  
Telephone: -15 to +4 dbm  
Facsimile: -15 to +4 dbm  
Telegraph: -25 to +4 dbm (16 channels)

**OUTPUT :**

Number: 2  
Frequency Bandwidth: 375 to 3025 cps (each output)  
Impedance: 600 ohms balanced (each output)  
Level:  
Telephone: -4 dbm  
Facsimile: 0 dbm  
Telegraph: -10 dbm per channel (16 channels)  
Single Frequency: +16 dbm maximum

**OTHER:**

Internal Carrier Stability: 1 part per 10<sup>5</sup>  
Internal Carrier Accuracy: ±0.1 cps at 6290 cps  
Operating Temperatures: 0° to 50°C (32° to 122°F)  
Monitoring: 6 front panel test points, VU meter, Neon "power-on" pilot lamp

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

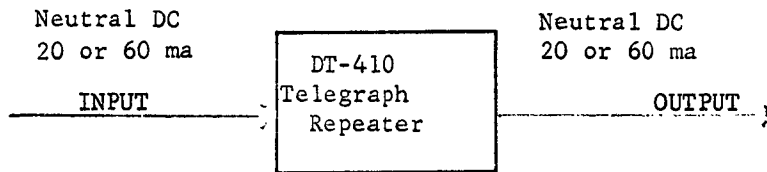
DT-410 Telegraph/Data Repeater (3 used in Receiver-Control Shelter)

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19	4	3 1/2	5

Technical -



Input:

Level; 20 or 60 ma. neutral, 130 volts maximum

Impedance; Full duplex service, each loop - 250 ohms for 20 ma., 85 ohms, 60 ma.

Output:

Level; 20 or 60 ma. neutral (70 ma. max., 130 V. max.)

Impedance; Full duplex service, each loop - less than 50 ohms (mark)

Other:

Keying speed; Up to 1200 bits per second

Distortion; Less than 2%

Power required; 115 VAC ±10%, 50-420 cps, 2.5 watts (Sheet 80 of 99)

Connection options; Full duplex, half duplex, or 2W/4W

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

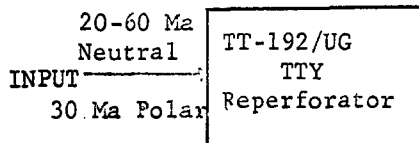
TT-192/UG Reperforator, TTY (Receive only)  
(2 used in Receiver - Control Shelter)  
(18 used in Relay Shelter)

CHARACTERISTICS:

Physical -

<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
12-1/4	16-1/4	10-1/4	48

Technical -



Input: Serial input signal, 20-60 Ma DC neutral, or 30 Ma polar  
Speed: 60, 75, or 100 WPM  
Code Pattern: 7.42 Units.

Other: Tape width: 11/16"  
Tape Feed: Sprocket  
Tape Perforation: chadless

Motor: Synchronous, 3600 RPM, 115 VAC, 60 CPS  
Power required: 115 VAC, 1 phase, 60 CPS, 65 W

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

TT-187/UG Distributor-Transmitter, TTY - - -

(Send only)

CHARACTERISTICS:

Physical -

<u>Width</u>	<u>Depth</u>	<u>Height</u>	<u>Weight</u>
(inches)	(inches)	(inches)	(lbs.)

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Technical -

TT-187/UG Distributor Transmitter
---

20-60 ma DC  
OUTPUT  
Neutral

Output:

Level; 20-60 ma DC  
Speed; 60, 75, 100 WPM  
Bias tolerance;  $\pm 5\%$   
Code Pattern; 7.42 unit

Other:

Power required; 115 VAC, 60 cps. 1 phase, 120 watts  
Tape width; 11/16"  
Tape feed; sprocket  
Tape type; chad or chadless  
Motor; Synchronous. 3600 RPM, 115 VAC. 60 cps  
(4 used in Receiver-Control Shelter;  
5 used in Relay Shelter.)



Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

TT-176A/UG TTY -----  
Page Printer: Send/Receive

CHARACTERISTICS:

Physical -

<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
17	19	13-1/2	

Technical -

Neutral  
20-60 MA DC  
INPUT  
Polar, 30 MA

TT-176A/UG  
Teletypewriter

Neutral  
20-60 MA DC  
OUTPUT

Input: Level 20-60 Ma. DC neutral, or 30 ma polar.  
Speed: 60 or 100 WPM  
Bias Tolerance; 368 OPM, 40%  
Code Pattern; 7.42 units

Output: Level 20-60 Ma. DC neutral  
Speed: 60 or 100 WPM  
Bias tolerance; 5%

Other -

Motor; Synchronous, 3600 RPM, 105-125 VAC, 60 CPS.  
Power required: 115 VAC, 1 phase, 60 CPS.  
Paper Width: 8-1/2"  
Paper feed: friction  
Keyboard: standard  
(7 located in Receiver - Control Shelter;  
3 located in Relay Shelter)

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

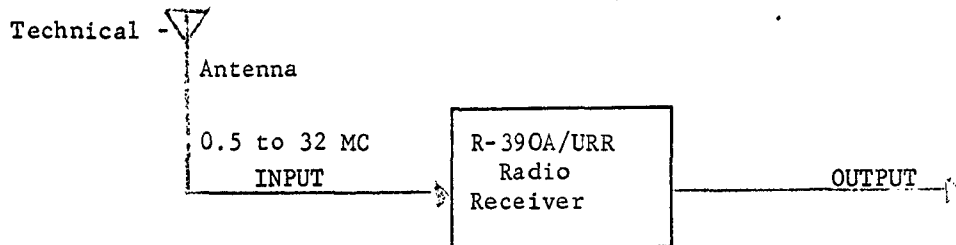
COMPONENTS

R-390A/URR Radio Receiver

CHARACTERISTICS:

Physical -	Width (inches)	Depth (inches)	Height (inches)	Weight (lbs.)
	19	16 19/32	10 15/32	75

(Four used in Receiver-Control Shelter)



Input:

Frequency Range:	0.5 to 32 mc (in 32 steps)
Input Impedance:	Balanced, 125 ohms; use for 50-200 ohms, or unbalanced input using adapters
Type of Reception:	A1-CW, A2-MCW, A3-Voice, A9-SSB, F1-FSK
Bandwidth:	13 kc minimum
Sensitivity:	AM - 3 $\mu$ v minimum CW - 1 $\mu$ v minimum

Output:

Audio Output;	600 ohm unbalanced line - 500 mw minimum 600 ohm balanced line - 10 mw minimum Headphones - 1 mw minimum
I.F. Output	50 ohms, 455 kc

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

R-390A/URR Radio Receiver ----- (Cont'd.)

CHARACTERISTICS:

Other -

Primary Power:	115/230 VAC, 48-60 cps, 225 watts
Temperature:	-40° to 149°F (-40° to 166°C)
Altitude:	10,000 ft. maximum
No. of Vacuum Tubes:	26
Manufacturer	Stewart-Warner Corp., Chicago, Ill.
Federal Stock No.	5820-538-7555
Reference:	TM 11-856A
Estimated Cost	\$1,400.00
Status:	No longer manufactured

The R-390A/URR is a high performance, exceptionally stable, general purpose receiver for use in both fixed and mobile service. The receiver provides reception of continuous-wave (CW), modulated continuous wave (MCW), amplitude modulated (AM), frequency shift keyed (FSK), and single sideband (SSB) signals within a frequency range of 0.5 to 32 megacycles. The calibration of the receiver is accurate to within 300 cps. The major circuit difference between the R-390 and R-390A models is the addition of mechanical filters in the IF circuitry of model R-390A.

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

R-390A/URR Radio Receiver ----- (Cont'd.)

CHARACTERISTICS:

Other -

Primary Power:	115/230 VAC, 48-60 cps, 225 watts
Temperature:	-40° to 149°F (-40° to 166°C)
Altitude:	10,000 ft. maximum
No. of Vacuum Tubes:	26
Manufacturer	Stewart-Warner Corp., Chicago, Ill.
Federal Stock No.	5820-538-7555
Reference:	TM 11-856A
Estimated Cost	\$1,400.00
Status:	No longer manufactured

The R-390A/URR is a high performance, exceptionally stable, general purpose receiver for use in both fixed and mobile service. The receiver provides reception of continuous-wave (CW), modulated continuous wave (MCW), amplitude modulated (AM), frequency shift keyed (FSK), and single sideband (SSB) signals within a frequency range of 0.5 to 32 megacycles. The calibration of the receiver is accurate to within 300 cps. The major circuit difference between the R-390 and R-390A models is the addition of mechanical filters in the IF circuitry of model R-390A.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

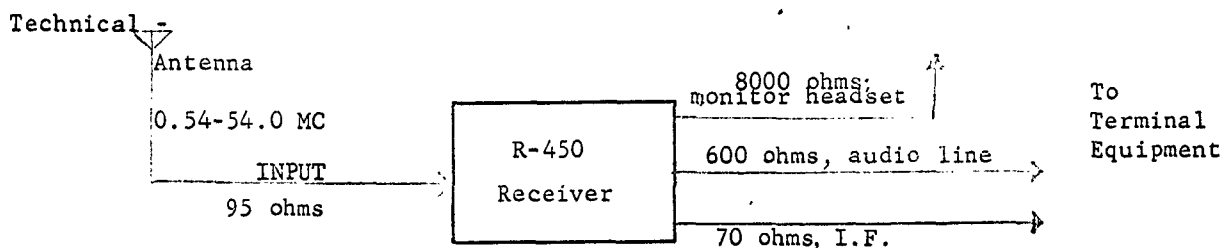
R-450 Receiver\*

CHARACTERISTICS:

Physical -

<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
19	16 1/2	10 1/2	66

(one R-450 used in Receiver-Control Shelter; future R-450 to be  
 added to Medium Power Shelter)



Input:

Frequency range; 0.54 to 54.0 MC

Frequency stability; .001 to .01% (after 15 min. warmup)

Impedance; 95 ohms

Sensitivity; (a) MCW, 2 microvolts for  $\frac{S+N}{N} = 10$  db audio terminals.

(b) CW, 0.75 microvolts

Output:

Power; maximum undistorted audio, 2 watts for 2 microvolts RF input for  
 $\frac{S+N}{N} = 10$  db

Impedance; Audio line - 600 ohms, balanced

Headphones - 8000 ohms

I.F. - 70 ohms

\* Commercial designation is model SP-600 JX-17 (Hammarlund)

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

----- R-450 Receiver ----- (Cont'd.)

CHARACTERISTICS:

Other -

I.F. Frequencies; 0.54 to 7.4 MC - 455 KC

7.4 to 54.0 MC - (1) 3955 (2) 455 KC

Fixed frequency reception; 4 crystal-controlled positions for any frequency  
within range of receiver

AVC action; Maintains the output constant within 12 db when the input is  
increased 80 db

Variable Selectivity; three crystal filter and three non-crystal filter  
positions provide 6 db bandwidths from 200 cps to 13 KC

Image Rejection; better than 72 db throughout the frequency range

Beat Frequency Oscillator; variable from zero beat to  $\pm 3$  KC

Tuning Meter; calibrated in db from 1 microvolt on AVC and in db from 6  
milliwatts audio output.

No. vacuum tubes; 20

Power required; 90-270 VAC, 50-60 cps, 1 phase, 130 watts

**Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]**

**COMPONENTS**

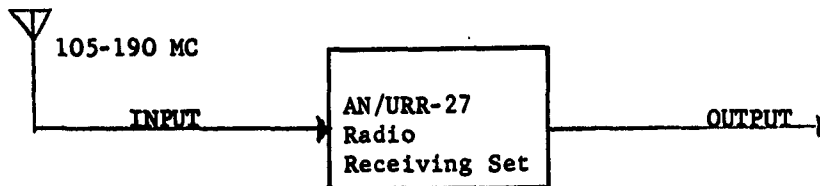
Radio Receiving Set AN/URR-27 (VHF) -----  
 (one used in Medium Power Shelter)

**CHARACTERISTICS:**

**Physical -**

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	17 1/2	19 1/8	8 7/16	57

**Technical -**



**Input:**

Frequency; 105 to 190 MC  
 Type; (AM) Voice, MCW. Also CW, FSK  
 Impedance; 51 ohms

**Output:**

Audio channel; 60 mw. maximum into 600 ohms or 600 mw. maximum into 60 ohms  
 with 7% distortion.  
 Phone jack; 60 mw. maximum into 600 ohms

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

Radio Receiving Set AN/URR-27 ----- (Cont'd.)

CHARACTERISTICS:

Other -

Preset frequencies;

    manual tuning - none

    crystal tuning - one; determined by crystal unit installed

Frequency control; crystal-controlled oscillator (crystal tuning only)

Type Receiver; Superheterodyne

I.F.; 18.6 MC  $\pm$  2 KC

Power required; 110 to 120 VAC, 60 cps, 1 phase, 120 watts.



Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

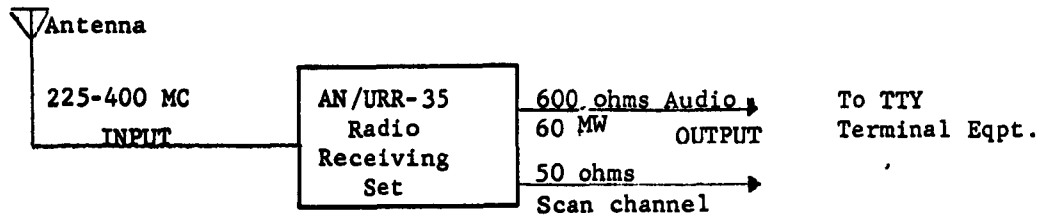
Radio Receiving Set AN/URR-35 (UHF) -----  
 (one used in Medium Power Shelter)

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	17 1/2	19 1/8	8 7/16	57
<hr/>				
<hr/>				
<hr/>				

Technical -



Input:

Type signals; AM (voice, CW) and AFSK Radioteletype

Frequency; 225-400 MC

Sensitivity; 8 microvolts in series with 50 ohms for 10 db S/N ratio  
 (signal modulated 30% at 1000 cps)

Impedance; 50 ohms

Output:

Audio channel.

or Phone jack; 60 MW into 600 ohm load, 7% maximum distortion.

Impedance; scan channel output; 50 ohms

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

Radio Receiving Set AN/URR-35 ----- (Cont'd.)

CHARACTERISTICS:

Other -

Preset frequencies;

Manual tuning: none

Crystal tuning; one, as determined by crystal unit installed

Receiver type; double superheterodyne

I.F. frequencies; 18.6 MC, 1.775 MC

Scan channel output; 10 microvolts minimum across 50 ohm load for maximum input signal of 75 microvolts.

Frequency stability;

% Drift

Crystal

Manual

Voltage 115 VAC  $\pm 10\%$

Negligible

$\pm 0.02$

-4°F. and +122°F

and 30-90% humidity

.008

$\pm 0.1$

Selectivity; 70 to 85 KC, down 6 db; less than 190 KC down 60 db

Power required: 0.97 amps, 105 to 125 VAC, 50-60 cps, 1 phase, 98 watts.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

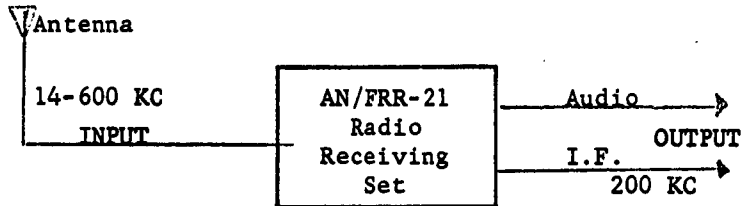
Radio Receiving Set AN/FRR-21  
 (one used in Receiver - Control Shelter) -----

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	18 1/2	17 1/2	8 3/4	75

Technical -



Input:

Frequency range; 14 KC to 600 KC

Type signal; CW, voice, FSK

Impedance; (a) 73 ohms, (b) 200 ohms

Sensitivity; (a) 14-18 KC, 8.0 microvolts, min. (CW with high Z antenna)  
 (b) 18-100 KC, 5.0 microvolts, min. (CW with high Z antenna)  
 (c) 100-600 KC, 3.5 microvolts, min. (CW with high Z antenna)

Output:

Level; 6 milliwatts (Audio)

Impedance; 600 ohms

Air Transportable Communication System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

Radio Receiving Set AN/FRR-21 ----- (Cont'd.)

CHARACTERISTICS:

Other -

Power required; 0.85 amp, 90% pf, 105, 115, or 125 VAC 50 to 60 or 400 cps,  
1 phase.

Type modulation; AM; A1, A2.

Receiver type; Double conversion superheterodyne

First I.F.; (a) 14 to 30 KC and 133 to 283 KC, I.F. is 60 KC

(b) 30 to 133 KC and 283 to 600 KC, I.F. is 200 KC

Air Transportable Communications System  
ATCU 100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

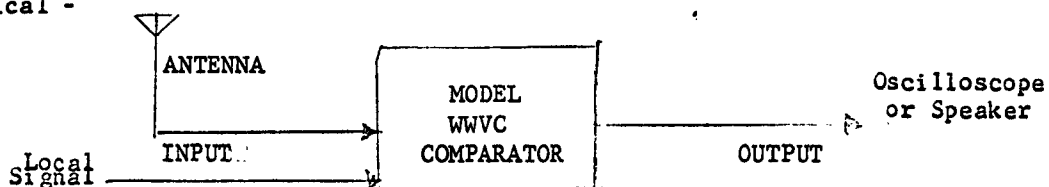
COMPONENTS

Model WWVC Comparator

CHARACTERISTICS:

Physical -	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	19	10 $\frac{1}{2}$	5 $\frac{1}{4}$	22

Technical -



Input:

Frequency; 2.5, 5.0, 10.0, 15.0, 20.0 and 25.0 MC.  
Sensitivity; 1 microvolt.  
Impedance, antenna input; 52 ohms nominal.  
Impedance, local comparison input; 100 to 22,000 ohms resistive.

Output:

Audio level;  
(a) "LO" - Up to 4 volts across 500 ohm load.  
(b) "HI" - Up to 40 volts across 10,000 ohm load.

Other -

Crystal controlled.  
2" oscilloscope.  
3" speaker.  
Power required: 117 VAC, 50/60 cps, 100 watts.  
Used for monitoring WWV and WWVH standard frequency broadcasts.  
Estimated cost; \$790.00 (Rack mount).  
Manufacturer; Specific Products,  
Woodland Hills, Calif.  
Federal Stock No.; 5820-529-6817.

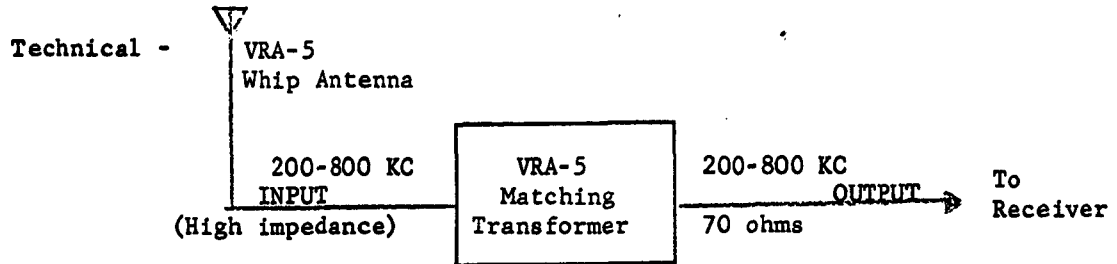
Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

VRA-5 Vertical Receiving Antenna\* -----  
 (Includes matching transformer)

CHARACTERISTICS:

Physical -	Width (inches)	Depth (inches)	Height (inches)	Weight (lbs.)
Impedance Match Transformer	16 1/8	7	18 1/2	27
Antenna	Aluminum mast extends 18'			



Input: Type; RF, 200-800 KC  
 Impedance; high

Output: Type; RF, 200-800 KC  
 Impedance; 70 ohms

Other: Frequency characteristic; Flat within ±1.5 db  
 200-800 KC; optimized at 400 KC

\* One VRA-5 used with Receiver-Control Shelter; AN/FRR-21 LF Receiver

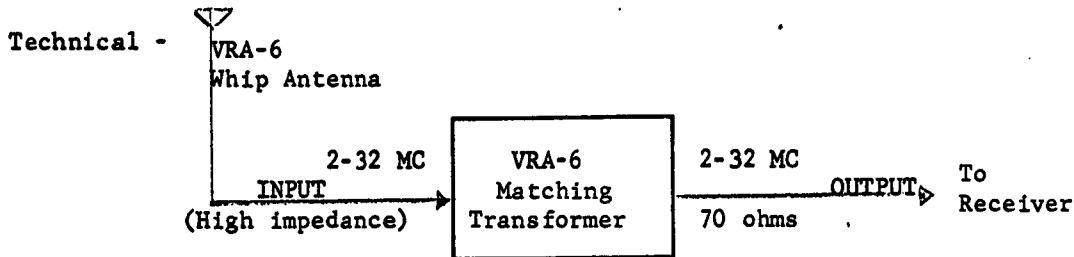
Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

VRA-6 Vertical Receiving Antenna \* - - - - -  
 (Includes matching transformer)

CHARACTERISTICS:

Physical -	Width (inches)	Depth (inches)	Height (inches)	Weight (lbs.)
Impedance Match Transformer	16 1/8	7	18 1/2	27
Antenna	Aluminum mast extends 18'			



Input: Type; RF, 2-32 MC  
 Impedance; high

Output: Type; RF, 2-32 MC  
 Impedance; 70 ohms

Output: Frequency characteristic; Flat within  
 $\pm 1.5$  db, 2 to 32 MC

\* One VRA-6 used with Medium Power Shelter Monitor Receiver/s.  
 Four VRA-6 used with Receiver-Control Shelter; R-390 and R 450 receivers.

Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

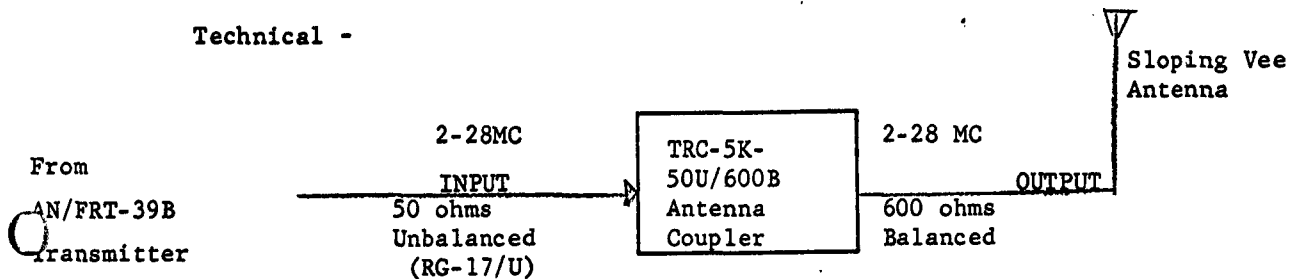
--- TRC-5K-50U/600B Antenna Coupler\* ---

CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	8	5	14	20
-----				
-----				
-----				

Technical -



Input:

Frequency range; 2-28 MC  
 RF Power; 5000 watts average, \*\*10,000 watts PEP  
 Impedance; 50 ohms unbalanced

Output:

Frequency range; 2-28 MC  
 RF Power; approx. 5000 watts average, \*\*10,000 watts PEP. (Insertion loss less than 1 db)  
 Impedance; 600 ohms balanced  
 Other;  
 Operating temperature; 40°C. to +75°C. ambient

\*Two used with High Power Shelter Sloping Vee Antennas (Transmit only)

\*\*Based on VSWR 2:1

(Sheet 97 of 99)



Air Transportable Communications System  
 ATCU-100 and ATCU-100A  
 [Part of AN/TSC-24 (V)]

COMPONENTS

----- TRC-3500-50U/600B Antenna Coupler\* -----

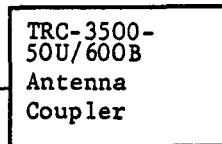
CHARACTERISTICS:

Physical -

	<u>Width</u> (inches)	<u>Depth</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
	9	5	14	32

Technical -

Sloping  
 Vee  
 Antenna  
 2-30 MC



2-30 MC

50 ohms  
 unbalanced  
 (RG 8/U)

Transmitter  
 or  
 Receiver

Input:

Frequency range; 2-30 MC

RF Power; (Transmitting); 1800 watts average, \*\*3600 watts PEP

Impedance;

Transmitting - 50 ohms unbalanced from transmitter

Receiving - 50 ohms unbalanced to receiver

Output:

Frequency range; 2-30 MC

RF Power; (Transmitting) approx. 1800 watts average, \*\*3600 watts PEP.  
 Insertion loss of coupler is less than 1 db

Impedance; (Coupler out to antenna in) 600 ohms balanced, transmitting or receiving.

\*One used with Medium Power Shelter Sloping Vee Antenna; one used with Receiver-Control Shelter Sloping Vee Antenna.

\*\*Based on VSWR of 2:1

Air Transportable Communications System  
ATCU-100 and ATCU-100A  
[Part of AN/TSC-24 (V)]

COMPONENTS

PU-550/TSC-24 (V) Generator Set, Diesel Engine, Trailer mounted

CHARACTERISTICS:

Physical -	(overall including trailer)			
	<u>Width</u> (inches)	<u>Length</u> (inches)	<u>Height</u> (inches)	<u>Weight</u> (lbs.)
(a) With large cable reels	76 1/2	122 1/4	55	6760
(b) With small cable reels	76 1/2	122 1/4	55	6380
(c) Without cable reels	76 1/2	122 1/4	55	3805

Technical -

Output: 55 Kilowatts  
60 cps AC, 3 phase, 0.8 power factor  
208 V. line-to-line  
120 V. line-to-neutral

Other: Self-excited  
50°C ambient temperature; 40° rise for continuous operation  
Radio interference suppression included.  
Fuel consumption; 5 gallons per hour, full load.

Trailer data: two wheels, flat bed body. Steel. Straight adjustable lunette coupler.

Components: 1-- Diesel Generator, 55 KW  
1 - Starting battery

Manufacturer: Technical Materiel Corp.  
Mamaroneck, New York

COMMUNICATIONS CENTRAL

AN/TSC-16

# ENGINEERING DRAFT

ITT COMMUNICATION SYSTEMS, INC.  
PARAMUS, NEW JERSEY

## COMMUNICATIONS CENTRAL AN/TSC-16

### 1.0 GENERAL DESCRIPTION

Communications Central AN/TSC-16 is a mobile air-transportable communication facility for use between a Contingency Warfare Theater Commander and a DCS Pivotal Station. The AN/TSC-16 includes a radio transmitter van, Receiver-Comcenter Van, and their associated generator sets and tractors. The HF transmitting and receiving facilities operating in the standard ISB mode provide four full duplex voice frequency channels. The receiver-comcenter has capability to terminate 4 full duplex link-encrypted teletype loops and twelve additional clear DC teletype loops which are patchable to subscribers. With its AN/TXC-1F, facsimile transceiving equipment, the AN/TSC-16 may either send or receive one facsimile channel. Two VF channels are available for long-haul voice communications, one of which is normally assigned as a voice order wire. Other important system provisions include a 3-wire curtain transmitting rhombic antenna, two single wire curtain rhombic antennas for diversity reception, two double doublet receiving antennas and a terminated folded-dipole for transmission. A four (4) VF channel UHF radio system is provided for intersite communication between the transmitter and receiver sites.

Prime Contractor:	Adler Electronics, Inc New Rochelle, New York
Federal Stock No.:	Not available
Estimated Price:	
Reference:	(U.S. Army) Instruction Manual for Communication Central AN/TSC-16 dated 13 April 1959 and Addendum 1, dated 13 May 1959
Status:	Four (4) systems produced. Manufactured on Order No. 3172-PP-59

Installation Time: The complete system comprising the Receiver-Comcenter Van, Transmitter Van, two tractors, two trailer-mounted generator sets, a general utility cargo truck (2-1/2 ton 6 x 6) plus the 48-man operating team can be assembled, loaded into three C-124 aircraft and be airborne within 12 hours. On arrival, the system can be ready for interim operations in about four hours using the doublet antennas. Two days are required for erecting the rhombic antennas for full operational capability.

**ENGINEERING DRAFT**

## 2.0 INTERFACE CHARACTERISTICS

### 2.1 LONG-HAUL HF FACILITIES

#### 2.1.1 Transmitter Van

Frequency Range: 2-28 mc, continuously tunable  
Emission Modes: CW, Compatible-AM, and ISB/SSB  
Output Stability:  $1 \times 10^{-6}$  per day  
Audio Response: 250 to 7500 cps (per sideband)  
(when equipped with AN/URA-28)  
Carrier Suppression: Continuously adjustable between 0  
and -55 db  
Output Power: 10 kw PEP  
Antenna: Three wire curtain rhombic. A trans-  
mitting dipole is also provided.

#### 2.1.2 Receiver-Comcenter Van

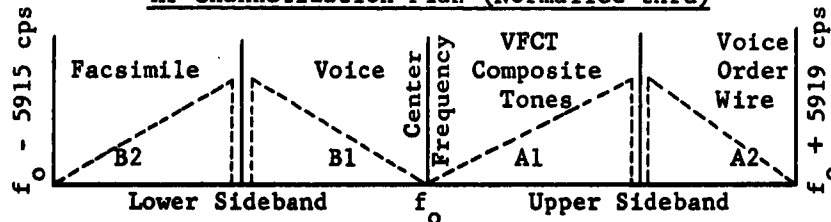
##### 2.1.2.1 Receiver Facility

Frequency Range: .5 to 30 mc, continuously tunable  
Emission Modes: CW, MCW, AM and SSB/ISB  
Sensitivity: 3 microvolts for  $10 \text{ db } \frac{S+N}{N}$   
Audio Response: Adjustable in discrete steps to  
16 kc (both sidebands)  
Automatic Frequency  
Control: Locks on -20 db suppressed  
carrier and is based upon  
phase comparison with local  
carrier oscillator as a standard.

Antennas: Two single wire curtain rhombics  
for space diversity. Two double  
doublets and a whip antenna are  
also provided.

##### 2.1.2.2 Comcenter Facilities

#### HF Channelization Plan (Normalled thru)



VFCT Modulation Plan

<u>Channel No.</u>	<u>Spacing (cps)</u>	<u>Center (cps)</u>	<u>Marking (cps)</u>
1 (*)	1,742.5	1,785	1,827.5
2	467.5	425	382.5
3 (*)	1,912.5	1,955	1,997.5
4	637.5	595	552.5
5 (*)	2,082.5	2,125	2,167.5
6	807.5	765	722.5
7 (*)	2,252.5	2,295	2,337.5
8	977.5	935	892.5
9	2,422.5	2,465	2,507.5
10	1,147.5	1,105	1,062.5
11	2,592.5	2,635	2,677.5
12	1,317.5	1,275	1,232.5
13	2,762.5	2,805	2,847.5
14	1,487.5	1,445	1,402.5
15	2,932.5	2,975	3,017.5
16	1,657.5	1,615	1,572.5

(\*) These channels normalled-thru to terminate in teletype equipment in Comcenter.  
Other channels available to subscribers.

VFCT Diversity: Space and/or tone diversity available.

Crypto Facilities: Link encryption by SSM-33 equipment available for 4 duplex  
teletype channels. (indicated by asterisk)

Facsimile: (Half duplex only)

Mode of Transmission/Reception: FM, 1500 to 2300 cps

Drum Speed: 30 or 60 rpm

Index of Cooperation: 576

Scanning Lines Per Inch: 96

Voice: (2 Channels: long-haul voice communications and long-haul voice order  
wire)

Ringdown Frequency: 1600 cps

Voice Channel Bandwidth: 375 to 3025 cps

**2.2 INTERSITE FACILITIES (Between Transmitter Van and Receiver-Com-center)**

**2.2.1 RF Equipment**

**Intersite VF Channels** Four plus local voice order wire

**Baseband Frequency Range:**  $\pm 1$  db from 2 to 100 kc

**Type of Modulation:** FM  $\pm 200$  kc (maximum deviation)

**RF Gain:** (Terminal to Terminal) 90 db based on received signal level of 500 microvolts

**Maximum Transmission Range:** 10 miles

**Service Channel Frequency Range:** 300 to 3000 cps

**2.2.2 VF Multiplex**

**Type of Modulation:** (AN/TCC-3)  
Amplitude, single sideband, suppressed carrier (lower sidebands)

**Carrier Frequencies:**  
Channel 1: 8 kc  $\pm 0.01\%$   
Channel 2: 12 kc  $\pm 0.01\%$   
Channel 3: 16 kc  $\pm 0.01\%$   
Channel 4: 20 kc  $\pm 0.01\%$

**Frequency Bands Allocated to Channels:**  
Orderwire: 300 to 3100 cps  
Channel 1: 4500 to 7700 cps  
Channel 2: 8500 to 11,700 cps  
Channel 3: 12,500 to 15,700 cps  
Channel 4: 16,500 to 19,700 cps

**Frequency of Orderwire Signalling:** 1600 cps

**Frequency of System Alarm:** 4000 cps

**2.3 PRIMARY POWER FACILITIES**

**2.3.1 AC Power Supply: (Each Van)**

**Voltage:** 208 volts ac

**Phase:** 3

**Frequency:** 60 cps

**Power:** 30 kw (max.)

**Generator Type:** 2-71 (a dual generator set mounted on one trailer)

**Fuel Consumption:** (per 30 kw): approximately 3 gals. per hour

### 2.3.2 Total AC Power Consumption

Transmitter Van: 19 kw (approx.)  
Receiver Van: 18 kw (approx.)

### 3.0 PHYSICAL CHARACTERISTICS

The AN/TSC-16 is composed of two vans with their associated tractors and generator sets. Figure 1 illustrates the field layout of the system. Figures 2 and 3 show the equipment rack and unit locations for the transmitter van and Figures 4 and 5 similarly show the floor plan and the road-side and curbside elevations of the equipment racks for the Receiver-Com-center Van.

#### 3.1 TRANSMITTING FACILITY

##### 3.1.1 Transmitter Van

Type: V-51/G (modified)  
Dimensions: 312 inches long, 96 inches wide,  
132 inches high  
Volume: 2,290 cubic feet  
Weight: (Prepared for shipment. Bulk  
storage 90-day spares not included):  
17,640 pounds

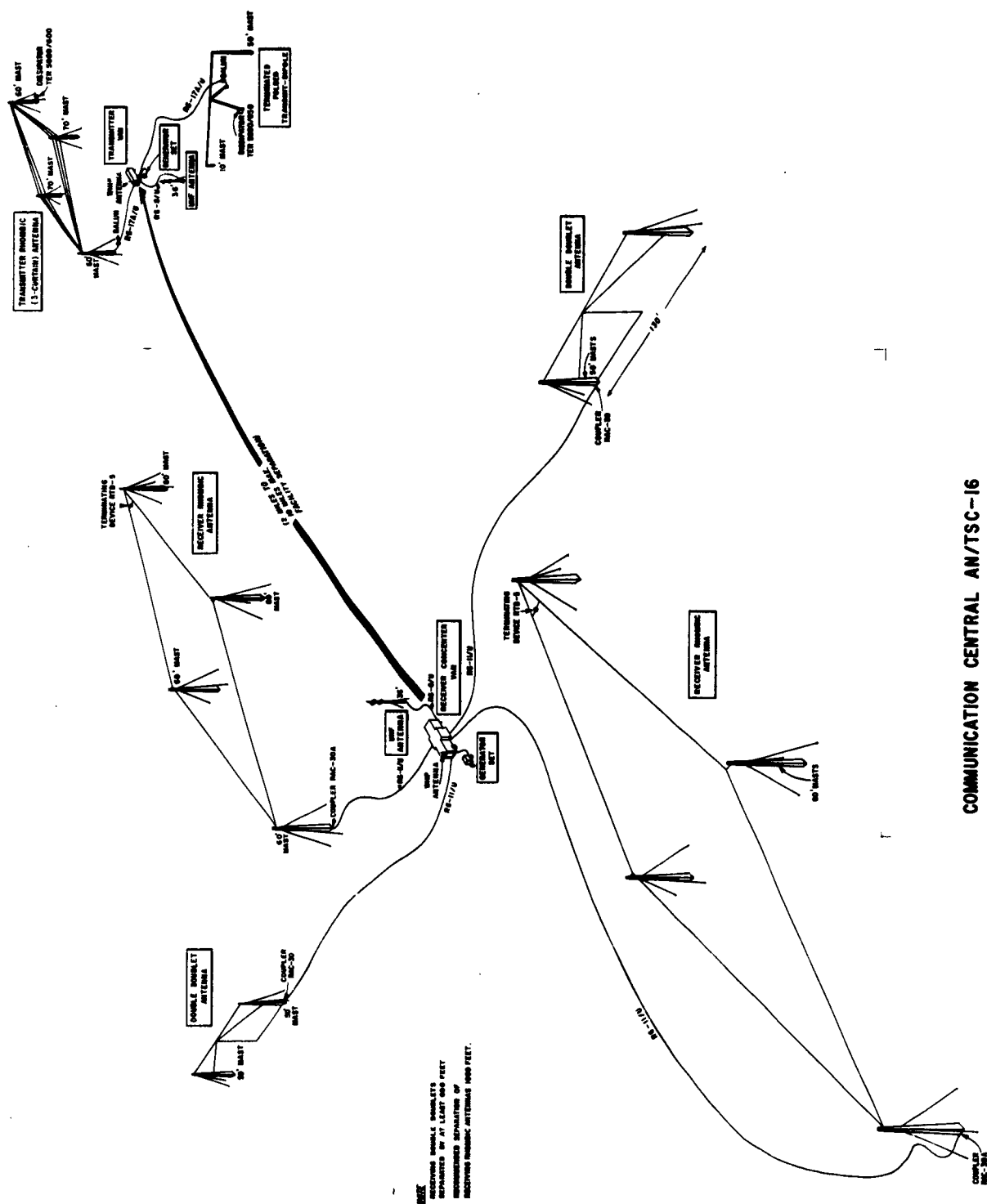
##### 3.1.2 Generator Set

Type: 2-71  
(Consists of two power units on one  
trailer)  
Dimensions: 205 inches long, 89 inches wide,  
94 inches high  
Volume: 981 cubic feet  
Weight: 7,650 pounds

##### 3.1.3 Tractor

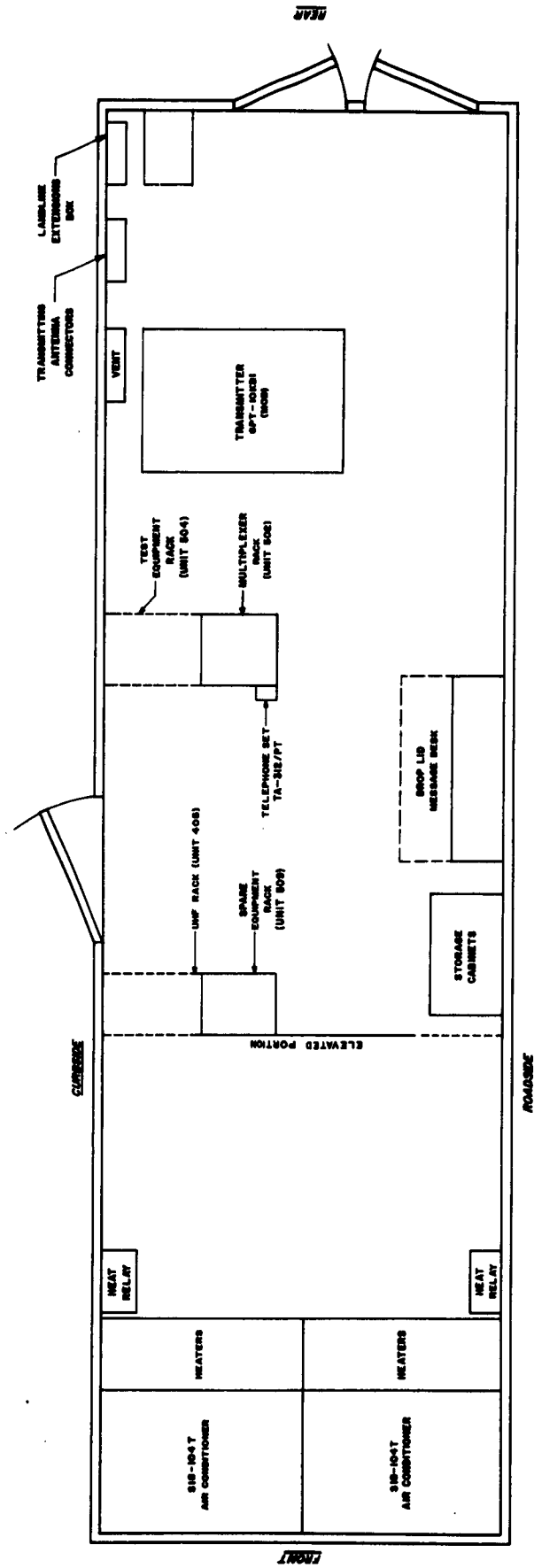
Type: M-48  
Dimensions: 240 inches long, 93 inches wide,  
81 inches high  
Volume: 1047 cubic feet  
Weight: 10,700 pounds





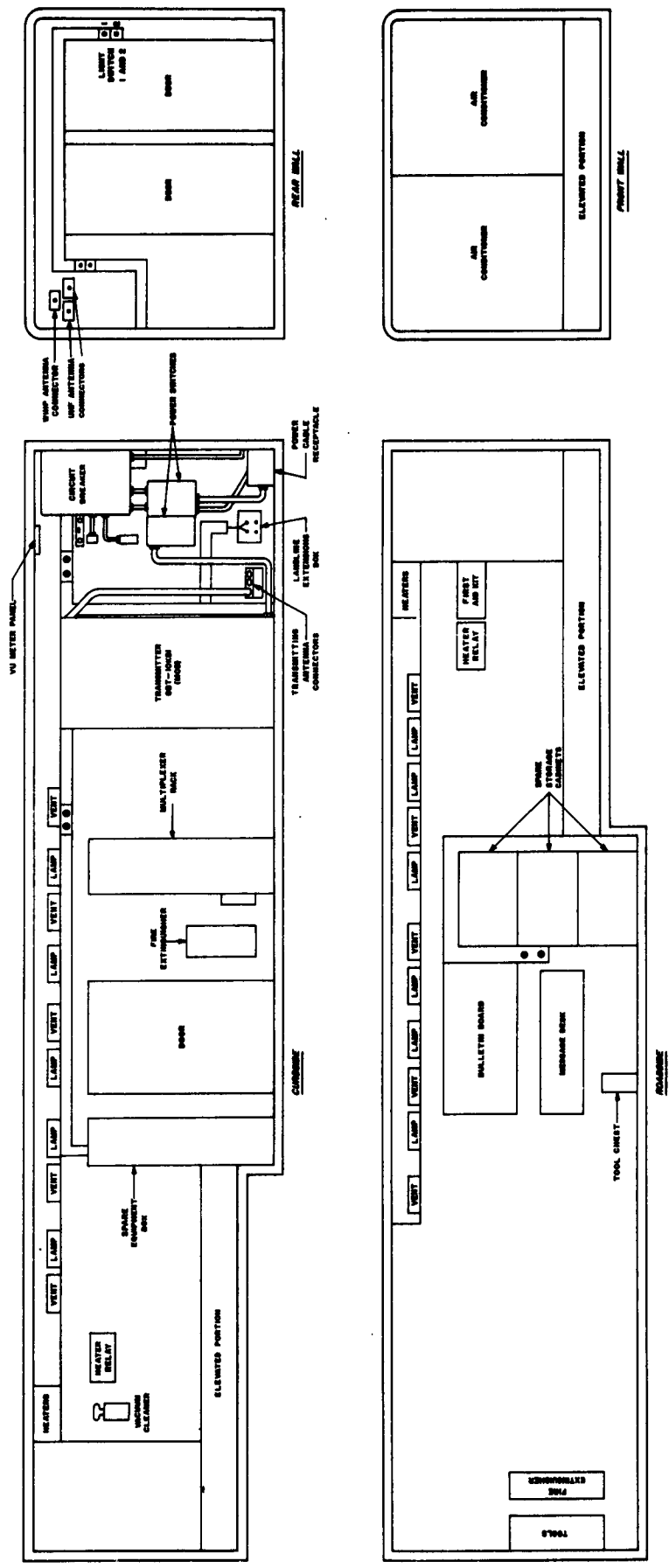
RECEIVING DOUBLE DOUBLET ANTENNAS SEPARATED BY AT LEAST 100 FEET MINIMUM SEPARATION OF RECEIVING INHIBIC ANTENNAS 1000 FEET.

COMMUNICATION CENTRAL AN/TSC-16  
SITING DIAGRAM  
FIGURE 1



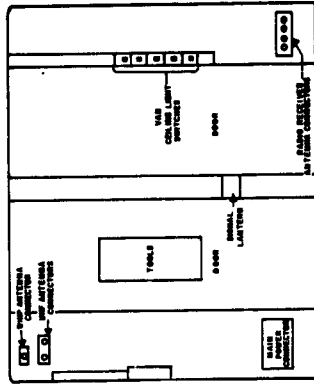
AN/TSC-16  
TRANSMITTER VAN,  
FLOOR PLAN  
FIGURE 2

9-5002785-4-1

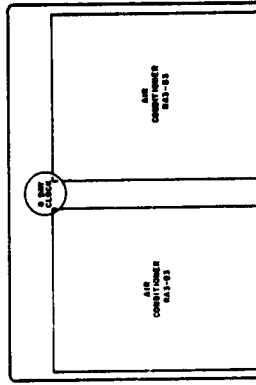


AN/TSC-16  
TRANSMITTER VAN,  
ELEVATION DIAGRAM  
FIGURE 3

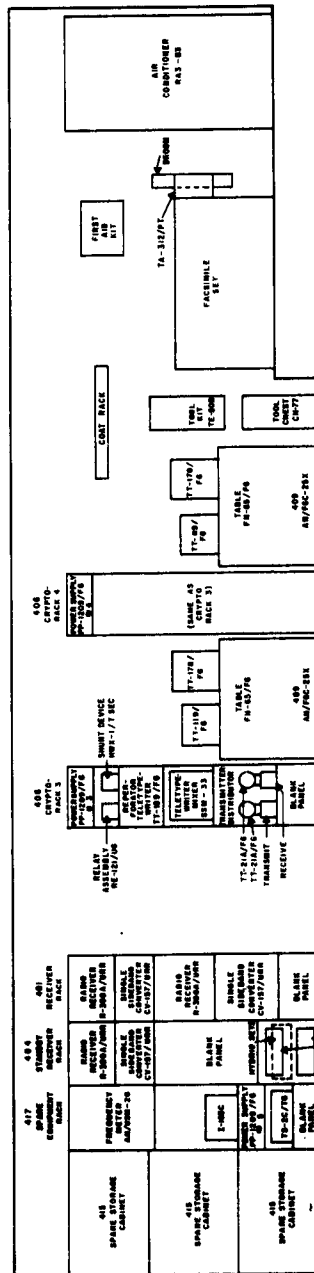




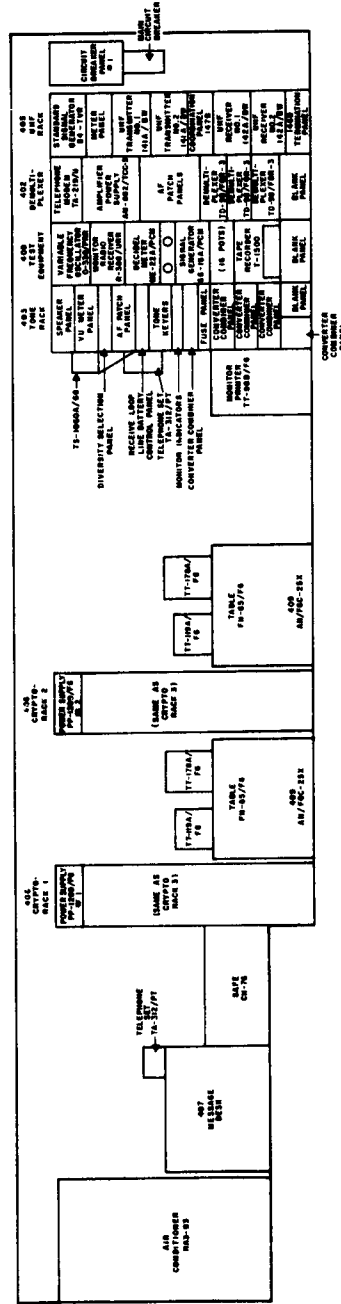
REAR WALL



FRONT WALL

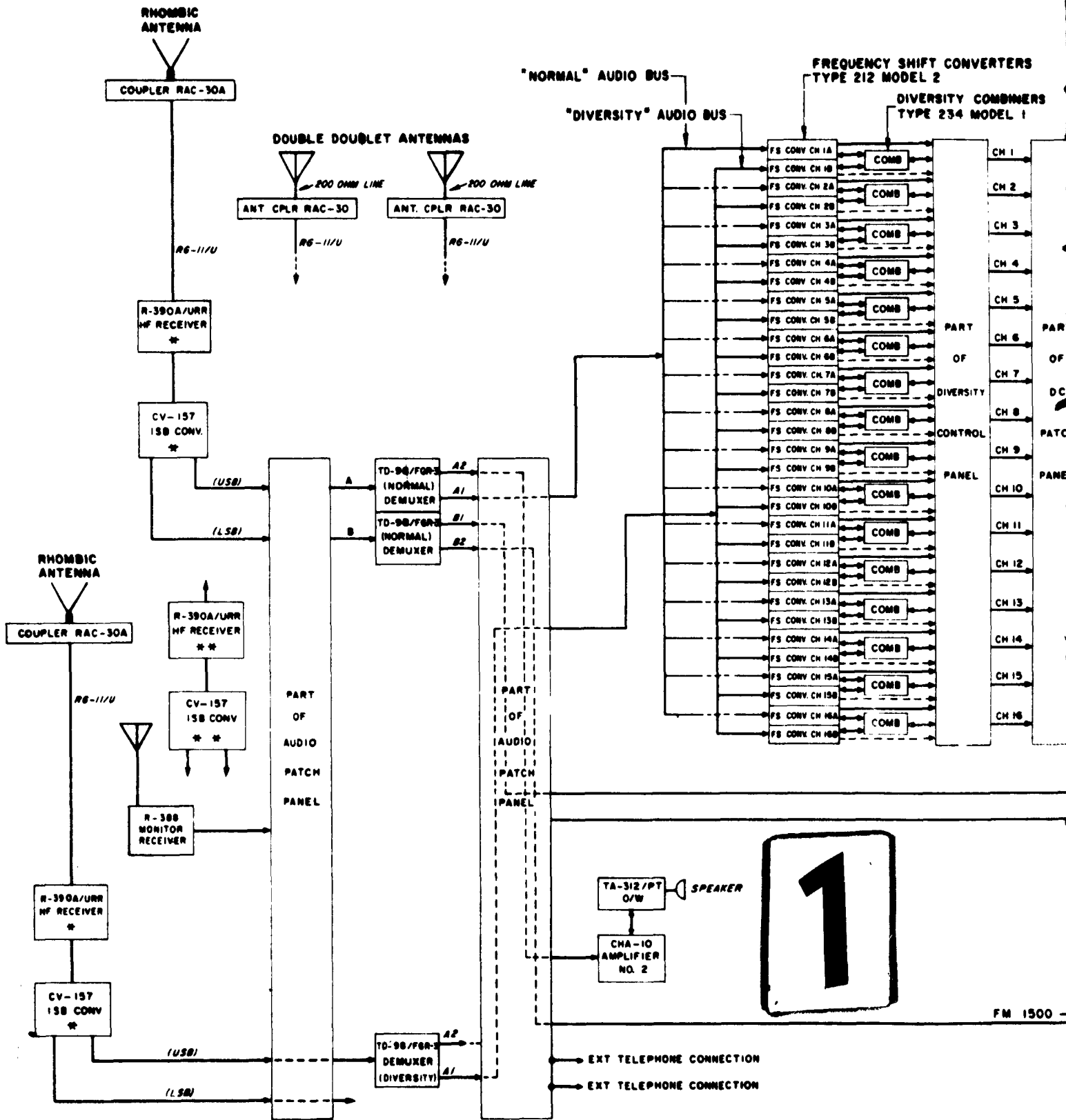


ROADSIDE



CURBSIDE

AN/TSC-16  
RECEIVER-COMCENTER VAN.  
ELEVATION DIAGRAM  
Figure 5

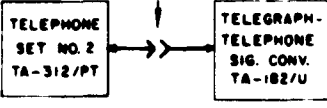
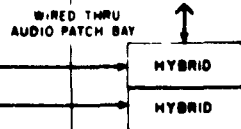
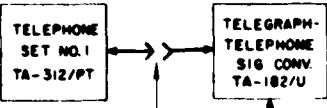
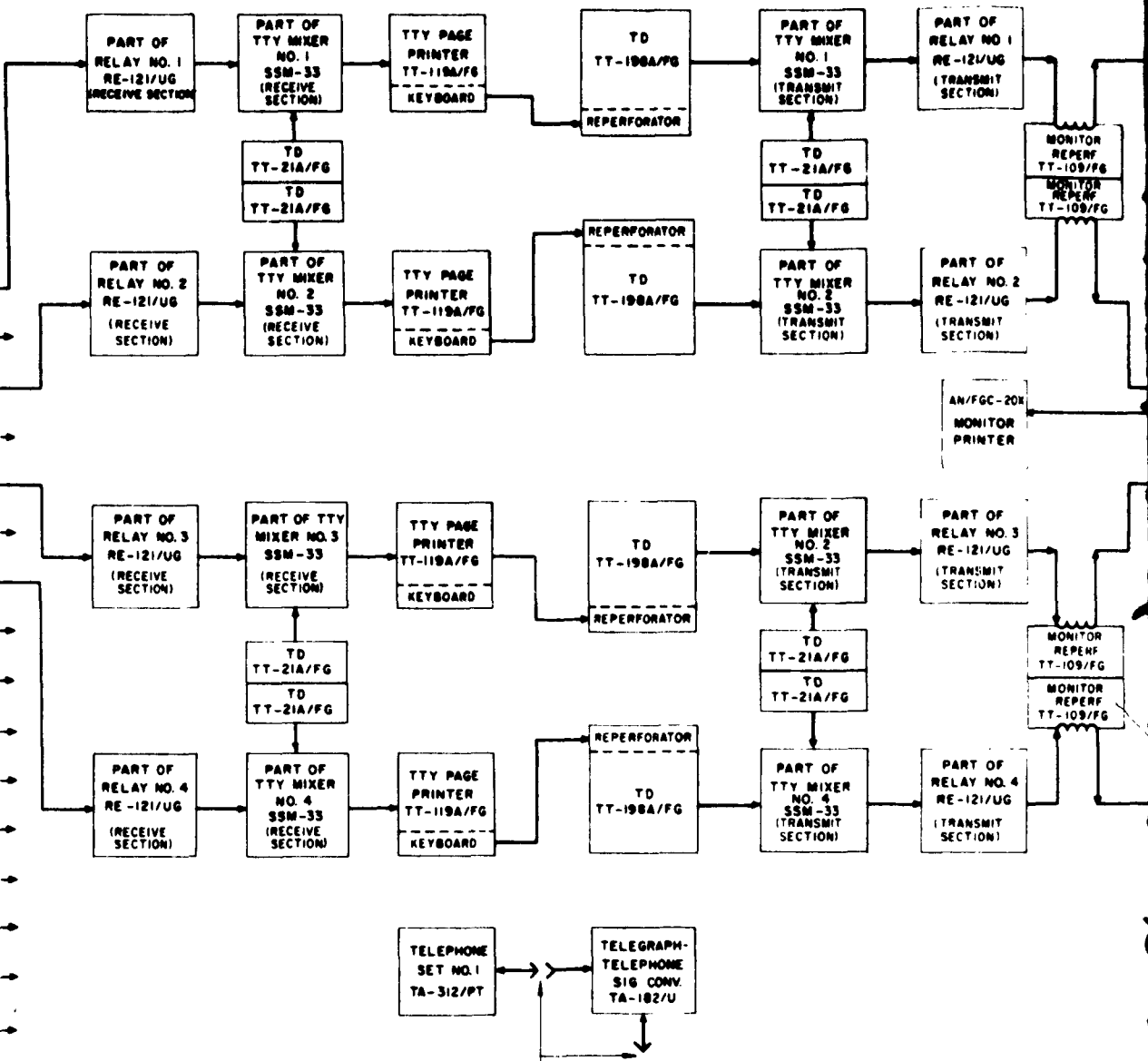
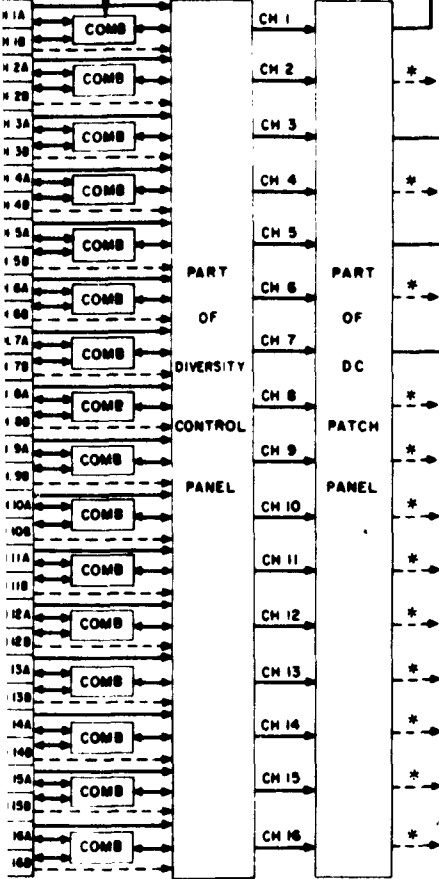


**NOTE**

- \* THESE EQUIPMENTS MAKE UP AN/FRR-41 PACKAGE.
- \*\* THESE EQUIPMENTS MAKE UP AN/FRR-40 PACKAGE (BACKUP HF RECEIVER SYSTEM)

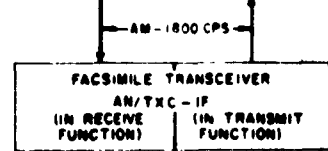
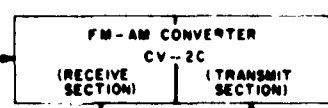
FREQUENCY SHIFT CONVERTERS  
TYPE 212 MODEL 2

DIVERSITY COMBINERS  
TYPE 234 MODEL 1



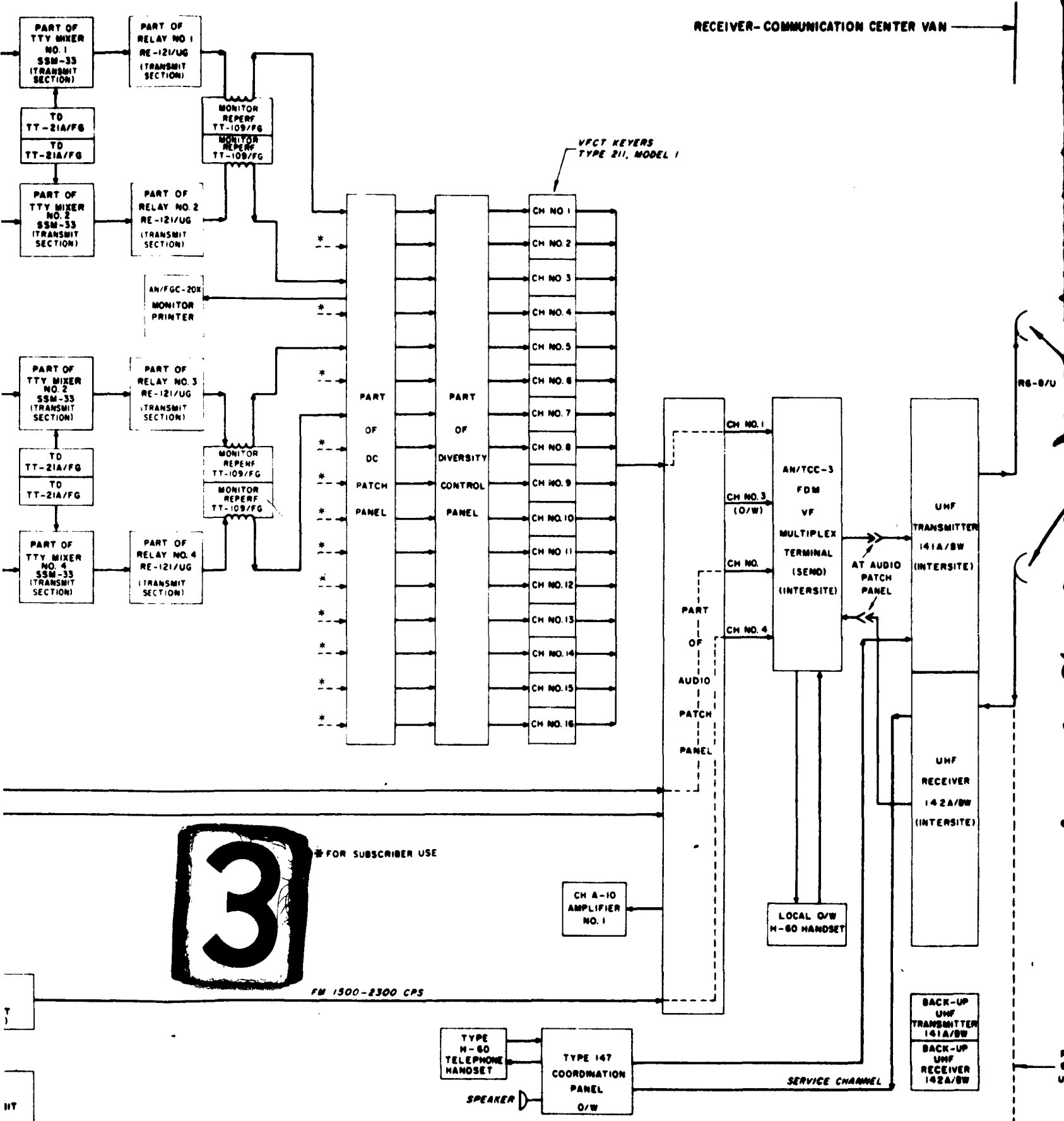
FM 1500 - 2300 CPS

\* FOR SUBSCRIBER USE



(FACSIMILE EQUIPMENT MAY TRANSMIT OR RECEIVE, BUT MAY NOT PERFORM BOTH FUNCTIONS SIMULTANEOUSLY)

RECEIVER-COMMUNICATION CENTER VAN



**3**

FOR SUBSCRIBER USE

FM 1500-2300 CPS

CH A-10  
AMPLIFIER  
NO. 1

TYPE  
H-60  
TELEPHONE  
HANDSET

TYPE 147  
COORDINATION  
PANEL  
O/W

SPEAKER

LOCAL O/W  
H-60 HANDSET

SERVICE CHANNEL

BACK-UP  
UHF  
TRANSMITTER  
141A/BW  
BACK-UP  
UHF  
RECEIVER  
142A/BW

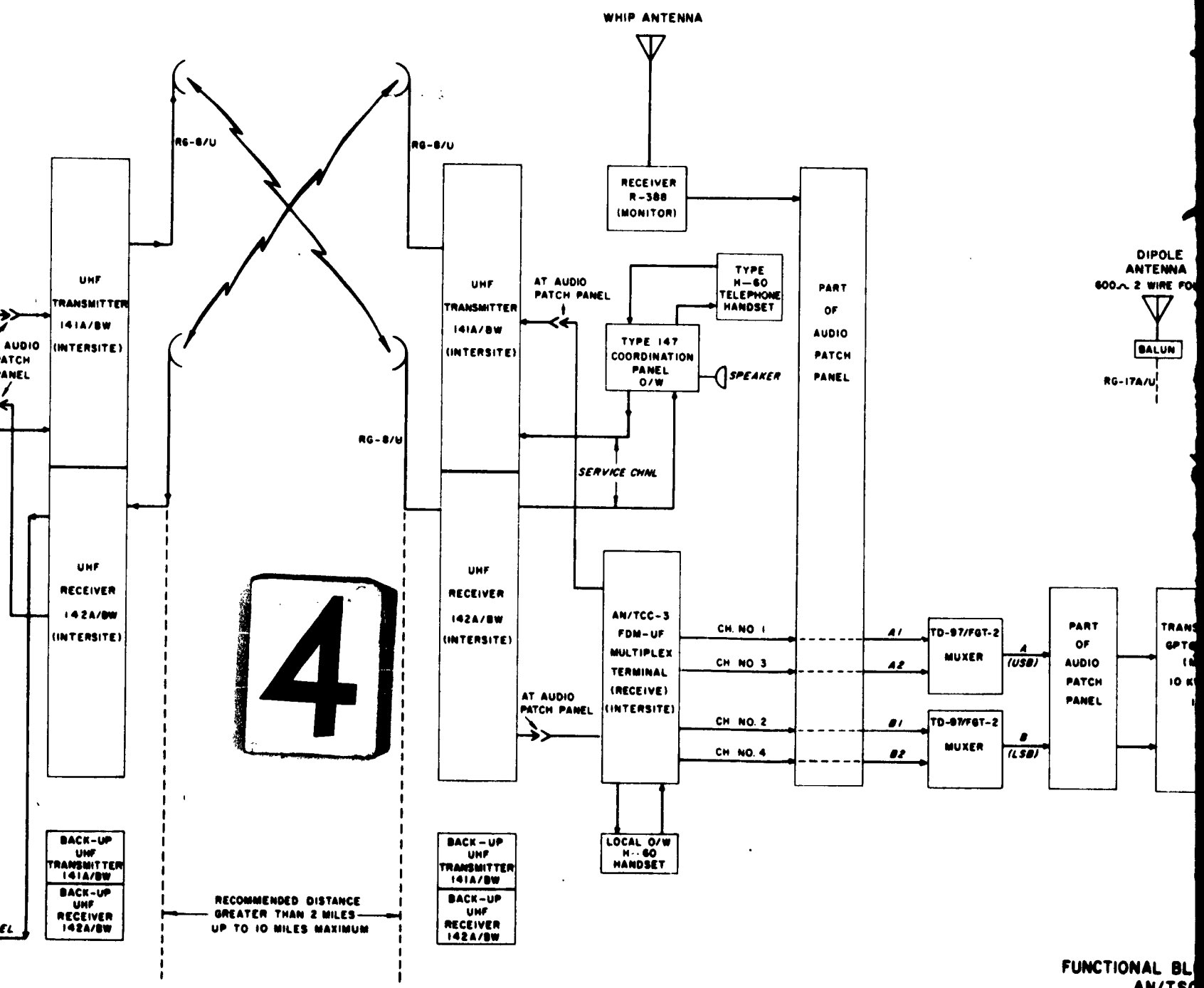
R6-8/U

SM/T  
200  
177



CENTER VAN

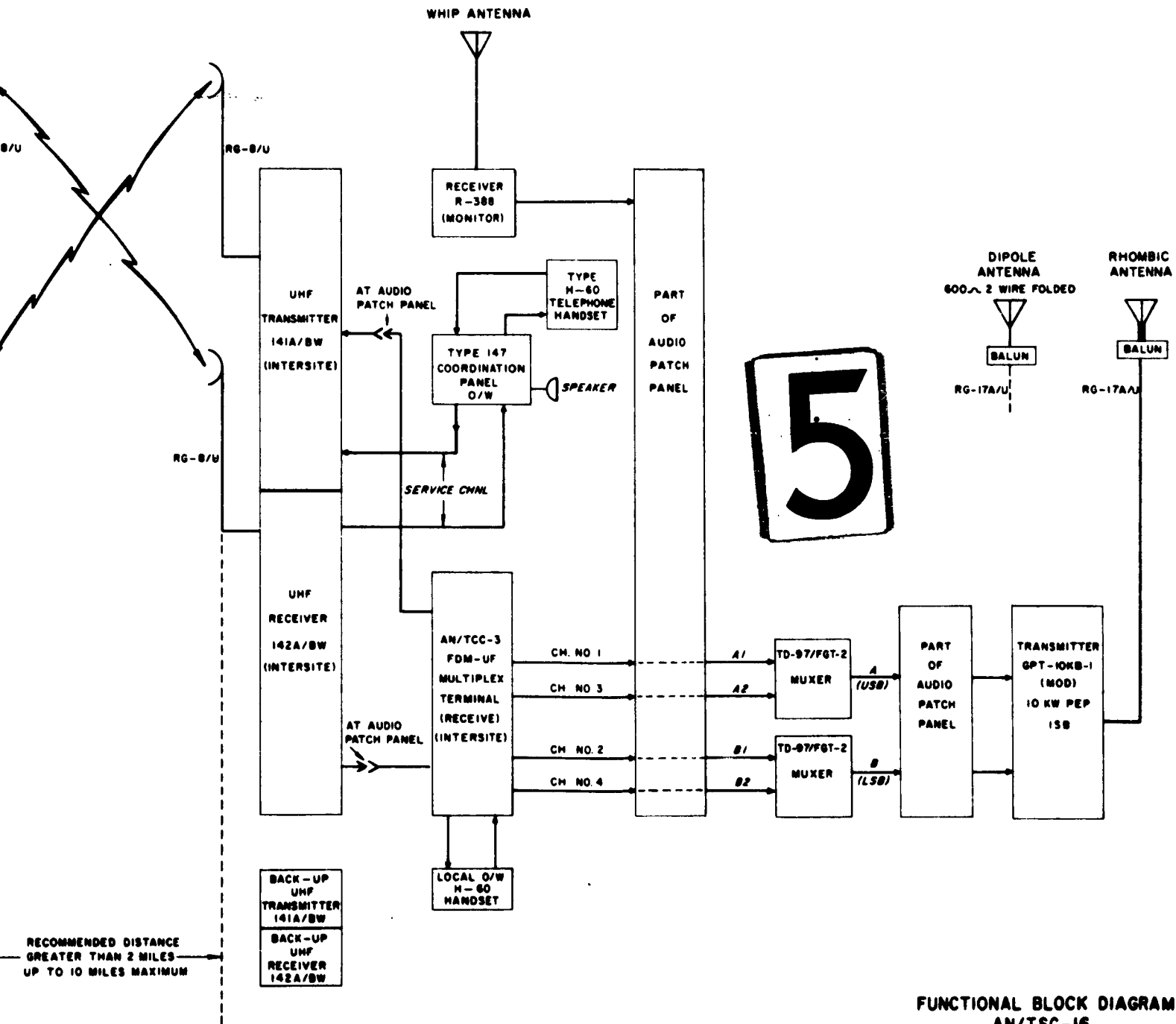
TRANSMITTER VAN



FUNCTIONAL BLOCK DIAGRAM OF AN/TSC-3  
FIGURE 1

TRANSMITTER VAN

N-660783-A-1



FUNCTIONAL BLOCK DIAGRAM AN/TSC-16 FIGURE 6

### 3.2 RECEIVING COMCENTER FACILITY

#### 3.2.1 Receiver-Comcenter Van

Type: V-79/G (modified)  
Dimensions: 350 inches long, 96 inches wide,  
132 inches high  
Volume: 2,560 cubic feet  
Weight: (Prepared for shipment. Bulk  
storage 90-day spares not included):  
21,340 pounds

#### 3.2.2 Generator

Type: 2-71  
Dimensions: 205 inches long, 89 inches wide,  
94 inches high  
Volume: 981 cubic feet  
Weight: 7,650 pounds

#### 3.2.3 Tractor

Type: M-48  
Dimensions: 240 inches long, 93 inches wide,  
81 inches high  
Volume: 1,047 cubic feet  
Weight: 10,700 pounds

### 4.0 DETAILED OVERALL SYSTEM DESCRIPTION

#### 4.1 GENERAL

The AN/TSC-16 provides equipment to terminate four full-duplex link-encrypted teletype channels and twelve tributary teletype channels for long-haul service. Two full-duplex voice channels and one-half-duplex facsimile may be operated simultaneously with the 16 teletype channels over the long-haul radio circuit. Refer to the Functional Block Diagram, Figure 6, for the complete system configuration.

#### 4.2 TELETYPE OPERATION

Written message traffic may be manually transmitted on the keyboard of Page Printer (TT-119A/FG) or its keyboard may actuate Reperforator TT-178A/FG to prepare a tape. This tape is inserted in the tape head of the transmitter-distributor of TT-178A/FG initiating a DC teletype loop which terminates in Teletypewriter Mixer Unit SSM-33 (Crypto).

A switch is provided on the crypto equipment which permits either crypto operation or clear text transmission. During encrypted operation, the teletype crypto mixer requires an auxiliary input which is supplied by TT-21A/FG. In either case SSM-33 initiates a new DC loop which terminates in isolation relay RE-121/UG (transmit section). RE-121/UG initiates a new DC loop connected in series with monitor-reperforator TT-109/FG, normalled-through the DC Patch Panel and terminates in the VFCT Keyer Type 211 Model 1 associated with this loop.

Teletype Channel Nos. 1, 3, 5 and 7 keyers serve, on a normal-through basis, the four teletype loops terminating in the Receiver-Comcenter. Twelve other VFCT keyers are available for remote subscribers. The sixteen keyer audio outputs (the modulation plan for the VFCT system is included in the section on interface characteristics) are common-connected on an audio bus, normalled-through the audio patch panel to channel 1 of Telephone Terminal Equipment, AN/TCC-3. When all keyers are in operation, a VF band from 382.5 to 3017.5 cps is required which is accommodated adequately in the AN/TCC-3.

The tones on VF Channel No. 1 are multiplexed with the traffic carried on the three other VF channels by FDM technique using single sideband, suppressed carrier (lower sidebands) in the AN/TCC-3. The baseband thus formed modulates UHF Transmitter 141A/BW for the radio link to the transmitter van.

In the Transmitter Van, this UHF signal is detected and applied to a second AN/TCC-3 for demultiplexing. The composite VFCT tones which originated at the Receiver-Comcenter appear on VF Channel No. 1 output of this AN/TCC-3, from which they are normalled-through the audio patch panel and are applied to Multiplexer TD-97/FGT-2 #1 (direct path (A1)).

TD-97/FGT-2 #1 combines the nominal 3 kc VF channel carrying the teletype composite tones with a second channel (usually voice), forming a nominal 6 kc channel which is directed to Channel "A", upper sideband, of Transmitter GPT-10KB1 (modified).

Radio Transmitter GPT-10KB1 normally employs A9B Independent Side Band (ISB) emission and is continuously tunable between 4 and 28 mc. In

this system, carrier suppression is normally adjusted to -20 db to provide sufficient pilot carrier to actuate AFC circuits at the distant end.

The output of the radio transmitter is loaded into a 3-wire curtain rhombic antenna which is directed toward the distant receiver site of the pivotal station. An RG-17A/U coaxial transmission line connects the transmitter to the antenna. A balun unit at the base of the antenna matches the unbalanced 50 ohm coaxial cable to the characteristic impedance of the rhombic.

The ISB radio signals are received from the distant end by two single-wire rhombic antennas separated by a distance of six to ten wavelengths. This separation is the minimum required for a space diversity system, as employed by the AN/TSC-16. The 600 ohm balanced lines from the rhombics are coupled to the RG-11A/U transmission lines by Antenna Couplers RAC-30A.

The ISB signals so received are amplified and detected in Receiver Systems AN/FRR-41. One system is usually referred to as the "normal" system, the other the "diversity" system.

The AN/FRR-41 is made up of Receiver R-390A/URR and ISB Converter CV-157/URR. The incoming signal is received, amplified and converted to the IF frequency (455 kc) which is fed to the converter. The converter translates the 455 kc signal to 100 kc for carrier re-insertion and sideband filtering and separation. A very small pass band centered on 100 kc permits AFC detection of the 20 db suppressed carrier which is received from the distant end. Upon a small drift of carrier frequency, the voltage derived from discriminator detection controls a motor-driven capacitor in the converter's local oscillator (555 kc), which compensates for the carrier frequency drift. The outputs of the AN/FRR-41 are sidebands "A" and "B", each having a nominal band width of 6 kc.

Two TD-98/FGR-3 equipments demultiplex the 6 kc sidebands "A" and "B" into 4 nominal 3 kc VF channels, A1, A2, B1 and B2. Another TD-98/FGR-3 demultiplexer performs a similar function for the "diversity" system.

As noted above the composite teletype tones are normalled-through on the A1 path. The tones from the "normal" system terminate on the normal audio bus and those from the "diversity" system, on the diversity bus. Both

diversity and normal paths appear at the audio patch panel as do the other outputs of the demultiplexers.

The VFCT terminal provides 32 tone converters, Type 212, Model 2, for the 16 channels of teletype audio shifted tones. Sixteen of these VFCT converters are employed on the "normal" system (i.e., connected to the "normal" bus). An identical group of sixteen converters are connected to the "diversity" audio bus. Diversity selection of the stronger signal is accomplished in the diversity combiners, Type 234, Model 1. Sixteen of these combiners are provided, one combiner for Channel No. 1A and 1B converters and so forth through Channel 16.

For each converter-combiner combination, a DC loop is originated carrying the encrypted (or clear) teletype binary information as transmitted from the distant end. The DC loops of Isolation Relay RE-121/UG Receive Section for Channel Nos. 1, 3, 5 and 7 terminate at the Receive-Comcenter Van. All 16 DC outputs of the VFCT terminal appear at the DC patch panel. Channel Nos. 2, 4, 6, 8 and 9 - 16 are available for remote subscriber use at the DC patch panel.

For Channel Nos. 1, 3, 5 and 7, new loops are initiated in Isolation Relay RE-121/UG which terminate on the receive side of Teletype-Mixers (Crypto) SSM-33. Auxiliary DC loops from TT-21A/FG transmitter-Distributors provide mixing information to SSM-33 mixers. A new DC loop is initiated in each case by the SSM-33 carrying clear text binary information which terminates in Teletype Printers Type TT-119A/FG (or Reperforators Type TT-198A/FG) (all part of AN/FGC-25X equipments).

#### 4.3 VOICE AND VOICE ORDERWIRE OPERATION

Two long-haul full-duplex voice circuits are provided in AN/TSC-16. These circuits have a nominal bandwidth of 3 kc consistent with standard HF practice. One of these circuits has been called the long-haul speech circuit and the other the long-haul order wire. Telephone signals in both cases originate in the microphones of Telephone Sets TA-312/PT. These sets are connected for 4-wire/2-wire operation through Telephone Signal Converters TA-182/U to hybrid networks. These networks couple these circuits to new audio pairs which are normalled-through the audio patch panel to Channels No. 2 and No. 3 of VF Multiplex Set AN/TCC-3.

As mentioned in the previous paragraphs under Teletype Operation, these VF channels are multiplexed and transmitted to the Transmitter Van. At this location they are demultiplexed in another AN/TCC-3, normalled-through an audio patch panel to Multiplexers TD-97/FGT-2 appearing on a normal-through patch as Channels B1 and A2 of the HF transmitter input signals and the teletype composite tones are carried on path A1. Radio transmission and reception techniques are similar to those mentioned before under Teletype Operation.

Diversity combining is not employed in the reception of speech in the AN/TSC-16 system, therefore the speech paths (A2 and B1) of the diversity receiving system terminate at the audio patch panel in the Receiver-Com-center. In the "normal" system paths A2 and B1 are normalled-through the audio patch panel from their respective TD-98/FGR-3 Demultiplexers through a hybrid network circuit, and TA-182/U Converters to the Telephone Sets TA-312/PT.

The TA-182/U converts the local 20-cps ringing current signal to a 1600 cps signal compatible for HF transmission. Conversely, a received ringing signal of 1600 cps is converted to 20 cps ringing current, which will actuate a ringer on a Telephone Set TA-312/PT.

#### 4.4 FACSIMILE OPERATION

The AN/TSC-16 Transportable Communication Systems permits half-duplex facsimile operation with facsimile Recorder-Transmitter AN/TXC-1F. The facsimile signal consistent with this equipment is in an AM mode with an 1800 cps carrier and sidebands extending outward 900 cps. CV-2C/TC converts this AM signal to an FM signal deviating between 1500 and 2300 cps.

For transmission this FM signal is normalled-through the audio patch panel to Channel No. 4 of the AN/TCC-3. It is relayed to the transmitter site in a similar manner as noted above in the sections under Teletype and Voice Operation.

At the transmitter site Channel No. 4 of the AN/TCC-3 is normalled-through the audio patch panel to the B2 path and its associated TD-97/FGT-2 for multiplexing, thence it forms a 3 kc segment of the 6 kc lower sideband of Transmitter GPT-10KB1 (modified).

Reception of facsimile signals from the distant pivotal station is similar to that described above for Voice Operation. The demultiplexed signal of the B2 path, which contains the FM facsimile signal, is normalled-through the audio patch panel in the Receiver-Comcenter Van to CV-2C/TX. This equipment converts the FM signal (1500-2300 cps) to an AM signal (1800 cps) which is directed to the facsimile printer AN/TXC-1F.

It should be noted that facsimile may be transmitted or received but both operations may not be carried on simultaneously in the AN/TSC-16 system as it is presently configured.

#### 4.5 INTERSITE VOICE ORDERWIRE

One full duplex voice channel is provided for coordination between vans. Access to this channel is provided by the H-60/PT Telephone Handset connected through Coordination Panel Type 147 to the microwave system service channel or through the AN/TCC-3 service channel which has a separate H-60/PT handset. Orderwire ringdown facility is provided in AN/TCC-3.



## 5.0 INDIVIDUAL EQUIPMENT CHARACTERISTICS

### 5.1 HF RADIO SYSTEM

#### 5.1.1 GPT-10KB1 (Modified) Transmitter

**FUNCTION:** Radio Transmitter GPT-10KB1 is an h-f transmitter continuously tunable between 2 and 28 mc with a maximum power output of 10 kw PEP. Originally this transmitter was equipped with the AN/URA-23 sideband generator which limited the bandwidth of each sideband to 350 to 3300 cps. Shortly after delivery by the manufacturer, it was retrofitted with the AN/URA-28 which permitted bandwidth limits of 250 to 7,500 cps per sideband. As modified, the GPT-10KB1 is similar to the AN/FRT-52, however, only one 0-330/FRR is provided.

**MANUFACTURER:** The Technical Materiel Corporation  
Mamaroneck, New York

**FEDERAL STOCK NO:** (AN/FRT-52): 5820-856-7464

**REFERENCE:** Commercial Instruction Manual

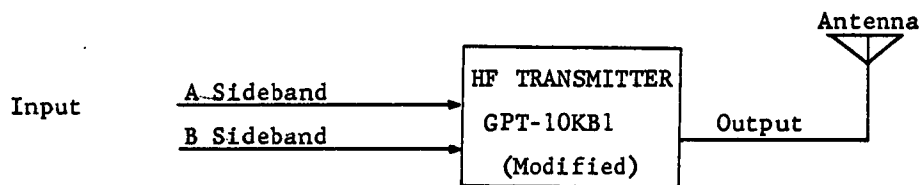
**APPROXIMATE COST:** \$25,000.

**STATUS:** Available on special order

**PHYSICAL CHARACTERISTICS:**

Dimensions: 84 inches high, 56 inches wide, 43.5 inches deep  
Weight: 2,740 pounds (approx.)

**TECHNICAL CHARACTERISTICS:**



#### **INPUT**

Number of Audio Inputs: 2  
Audio Response (AN/URA-28): flat within  $\pm 1.5$  db 250 to 7500 cps  
(per sideband)  
Impedance: 600 ohms balanced  
Levels: -20 to 10 dbm continuously adjustable for full RF output

#### **OUTPUT**

Frequency Range: 2-28 mc continuous  
Modes of Operation: SSB, ISB, CW and compatible AM

GPT-10KB1 (Modified) (Continued)

Power Output: 10 kw PEP with a signal to distortion ratio of 35 db  
5 kw PEP with a signal to distortion ratio of 40 db  
5 kw average power on CW

Output Impedance: 50 or 70 ohms unbalanced, 600 ohms balanced.  
Pi-L network. Will match a load with VSWR of 2:1 maximum

Stability and Frequency Control: 1 part in  $10^6$  per day from 10 oven controlled crystals in AN/URA-28(p/o GPT-10KB1 modified)

Unwanted Sideband Rejection: 500 cps single tone, 60 db down from full PEP output

Spurious Signals: At least 60 db below full PEP output

Carrier Suppression: Adjustable continuously from 0 to -55 db

Harmonic Suppression: On two-tone test, 2nd harmonic at least 50 db down from full PEP output,  
3rd harmonic at least 65 db down from full PEP output

OTHER TECHNICAL CHARACTERISTICS:

ALDC: Automatic load and drive control provided

Cooling: Filtered forced air cooling, semi-pressurized cabinet

Heat Dissipation: 10 kw approximately

Power Requirements: 208/230 volts AC, 50/60 cps, 3 phase, 0.98 power factor, 15 kw (approximate).  
Note: Primary of transformer may be connected for either "Delta" or "Y" input.

5.1.2 AN/FRR-41 Receiver

**FUNCTION:**

The Radio Receiving Set AN/FRR-41 is used for the reception of single sideband or independent sideband radio signals that carry multiplex teletypewriter, facsimile, and/or voice intelligence. It is composed of two receivers and two converters providing frequency or space diversity reception. The AN/FRR-41 is primarily used in long-range applications between installations that have a heavy flow message traffic. This equipment requires that carrier suppression be no greater than -20 db to provide sufficient pilot carrier to activate AFC circuits in the converters. At many activities the R-390A replaces the R-390 in this equipment.

**MANUFACTURER:**

Hoffman Laboratories, Inc.

**FEDERAL STOCK NO.:**

5820-503-1513

**REFERENCE(S):**

T.O. 31R2-2FRR40-6

**ESTIMATED COST:**

\$15,500

**STATUS:**

**PHYSICAL CHARACTERISTICS:**

**Dimensions:**

20-1/2" wide, 21-27/32" deep, 76" high

**Weight:**

409 lbs.

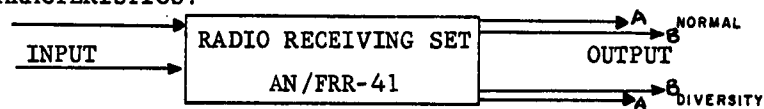
**Volume:**

19.6 cu. ft.

**Floor Space:**

5.5 sq. ft. (approx.)

**TECHNICAL CHARACTERISTICS:**



**INPUT**

**Frequency Range:**

0.5 to 32 mc

**OUTPUT**

**Audio Output Frequency Range:**

With low-pass filter out, 125 cps to 6 kc;  
with low-pass filter in, 125 cps to 3.5 kc

**Audio Output Level  
(Channel A&B):**

0 to 100 mw with minimum 5,000 microvolts  
from IF Receiver

**Output Impedance:**

600 ohms

**OTHER:**

**Type of Modulation:**

AM (single or double sideband)

**Power Requirements:**

1,040 watts, 105-125-210/250 volts,  
50/60 cps, single phase ac

COMPONENTS OF AN/FRR-41

R-390/URR & R-390A/URR RADIO RECEIVERS

MANUFACTURER: Collins Radio Company (for R-390)  
Stewart-Warner Corp. (for R-390A)

FEDERAL STOCK NO: 5820-503-1242 (for R-390)  
5820-538-7555 (for R-390A)

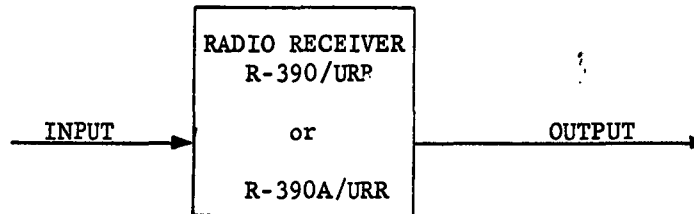
PHYSICAL CHARACTERISTICS:

Dimensions: 19" wide, 17-1/4" deep, 10-1/2" high - (R-390)  
19" wide, 16-19/32" deep, 10-15/32" high -  
(R-390A)

Weight: 80 lbs. (R-390)  
75 lbs. (R-390A)

Volume: 2 cu. ft. (both R-390 and R-390A)

TECHNICAL CHARACTERISTICS:



INPUT

Frequency Range: 0.5 to 32 mc (in 32 steps)

Input Impedance: Balanced, 125 ohms; use for 50 to 200 ohms,  
or unbalanced input using adapters

Type of Reception: A1, CW; A2, MCW; A3, Voice; A9, SSB; F-1, FSK

Bandwidth: 16 kc, minimum

Sensitivity: AM - 3 microvolts minimum  
CW - 1 microvolt minimum

OUTPUT

Audio Output: 600 ohms unbalanced line, 500 mw minimum; 600 ohm  
balanced line, 10 mw minimum; headphones, 1 mw  
minimum

OTHER:

Primary Power: 115/230 VAC, 48/60 cps, 270 watts - (R-390);  
115/230 VAC, 48/60 cps, 225 watts - (R-390A)

IF Output: 50 ohms; 455 kc - (R-390 & R-390A)

Temperature: -40°F to 131°F ambient (R-390)  
-40°F to 149°F ambient (R-390A)

Altitude: 10,000 feet maximum (R-390 & R-390A)

No. of Vacuum Tubes: 33 - (R-390); 26 - (R-390A)

Reference: TM 11-648 - (R-390)  
TM 11-856A - (R-390A)

NOTE: The major circuit difference between the R-390 and R-390A models of this receiver is the addition of mechanical filters in the R-390A IF circuitry.

COMPONENTS OF AN/FRR-41

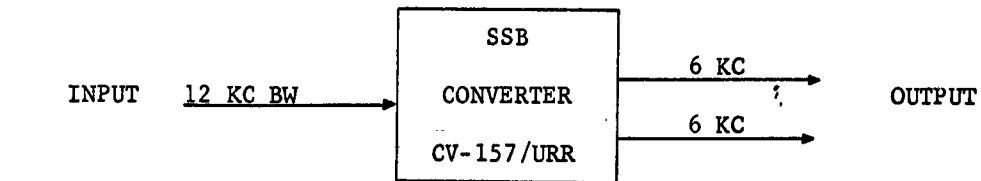
**CV-157/URR SSB CONVERTER**

MANUFACTURER: Hoffman Laboratories, Los Angeles, California  
FEDERAL STOCK NO: 5820-503-2594  
ESTIMATED COST: \$2,000.00  
REFERENCE(S): 31R1-2URR-231

PHYSICAL CHARACTERISTICS:

Dimensions: 19" wide, 15" deep, 15-3/4" high  
Weight: 104 lbs.  
Volume: 2.6 cu. ft.

TECHNICAL CHARACTERISTICS:



**INPUT**

Frequency Range: 450 to 510 kc  
Input Impedance: 50 ohm  
Input Cable: CG-409-E/U

**OUTPUT**

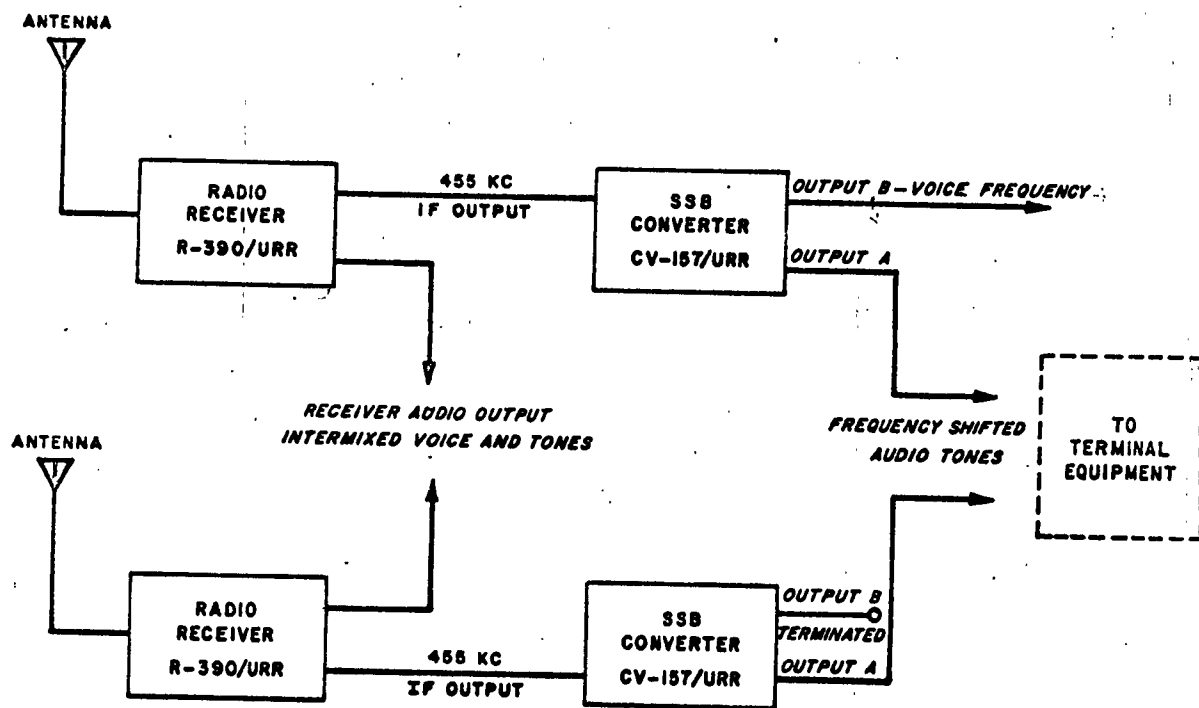
Audio Output Frequency Range: With low-pass filter out, 125 cps to 6 kc;  
with low-pass filter in, 125 cps to 3.5 kc

Audio Output Level (Channel A & B) 0 to 100 mv with minimum 5,000 microvolts from IF Receiver

Output Impedance: 600 ohms

**OTHER:**

Primary Power: 105 to 125 or 210 to 250 VAC,  
50/60 cps, single phase, 250 watts



AN/FRR-41, BLOCK DIAGRAM

### 5.1.2 AN/FRR-40 Receiver

FUNCTION: Radio Receiving Set AN/FRR-40 is used for the reception of single sideband or independent sideband radio signals that carry multiplex teletypewriter, facsimile, and/or voice intelligence. It is composed of one R-390 or R-390A Receiver and one CV-157 Converter. This equipment is primarily used in long range applications between installations that have a heavy flow of message traffic. This equipment requires that carrier suppression be no greater than -20 db to provide sufficient pilot carrier to activate AFC circuits in the converter.

MANUFACTURER: Hoffman Laboratories, Inc.

FEDERAL STOCK NO: 5820-545-7325

REFERENCE(S): T.O. 31R2-2FRR40-6

ESTIMATED COST: \$7,100

STATUS:

PHYSICAL CHARACTERISTICS:

Dimensions: 20-1/2" wide, 21-27/32" deep, 76" high  
Weight: 409 lbs.  
Volume: 19.6 cu. ft.  
Floor Space: 5.5 sq. ft. (approx.)

TECHNICAL CHARACTERISTICS:

INPUT

Frequency Range: 0.5 to 32 mc

OUTPUT

Audio Frequency Range: With low-pass filter out, 125 cps to 6 kc;  
with low-pass filter in, 125 cps to 3.5 kc

Audio Output Level  
(Channel A&B): 0 to 100 mw with minimum 5,000 microvolts  
from IF Receiver

Output Impedance: 600 ohms

OTHER:

Type of Modulation: AM (single or double sideband)  
Power Requirements: 520 watts, 105-125-210/250 volts,  
50/60 cps, single phase ac

NOTE: For individual equipment characteristics, see section on AN/FRR-41.

### 5.1.3 R-388/URR Receiver

**FUNCTION:** Radio Receiver R-388/URR is an HF communications receiver covering the frequency range from .5 to 30.5 mc in 30 bands

**MANUFACTURER:** Collins Radio  
Cedar Rapids, Iowa

**FEDERAL STOCK NO:** 5820-644-0990  
5820-537-3895

**REFERENCE:** 31R1-2URR-121

**APPROXIMATE PRICE:** \$743.00

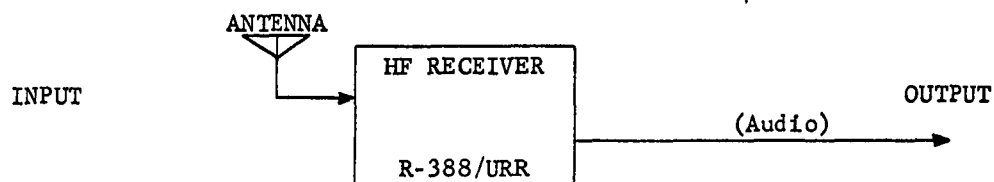
**STATUS:** No longer manufactured.

**COMMERCIAL NAME:** 51J3

**PHYSICAL CHARACTERISTICS:**

**Dimensions:** 19" wide, 10" high, 13.69" deep  
**Weight:** 35 pounds

**TECHNICAL CHARACTERISTICS:**



**INPUT**

**Frequency Range:** .5 to 30.5 mc

**Types of Reception:** Voice, MCW, CW and FSK

**Tuning:** Linear, divided into thirty 1-mc tuning steps

**Calibration:** Direct reading in mc and kc

**Method of Calibration:** Built-in 100 kc crystal oscillator

**Calibration Points:** Every 100 kc

**Frequency Stability:** Over-all stability within 1 kc for average conditions; within 2 kc for extreme conditions

**Sensitivity:** A-M signal input of 5 microvolts maximum to produce 500 milliwatts power output at a signal-plus-noise-to-noise ratio of 10 to 1.

**Selectivity:** Approximately 6 kc at 6 db down, and not greater than 20 kc at 60 db down (total bandwidth) from resonant frequency. With crystal filter in operation at 6 db down, the bandwidth may be varied from approximately .2 kc to 2.0 kc.

**Spurious Signal Responses:** Down at least 50 db

**Antenna Input Impedance:** Unbalanced to match short whip antenna (50 ohms, 100 micromicrofarads).



R-388/URR RECEIVER (Continued)

OUTPUT

Output Impedances:

4 and 600 ohms

AVC:

Less than 4 db increase in audio power output with an increase in r-f signal from 5 to 125,000 microvolts

Audio Frequency Response:

With 1000 cps reference, response down not more than 3 db at 200 cps and not more than 7 db at 2500 cps

OTHER TECHNICAL CHARACTERISTICS:

Power Requirements:

115 or 230 volts AC, 45 to 70 cps, 85 watts

5.1.4 VFCT Terminal Equipment

FUNCTION: AN/TSC-16 provides VFCT equipment to transmit and receive 16 teletype channels. This equipment is similar to the AN/FCG-61 except certain ancillary units are not provided. Units making up this modified terminal are listed below:

<u>Equipment Nomenclature</u>	<u>Function</u>	<u>Quantity</u>	<u>Price (ea)</u>	<u>Federal Stock No.</u>
Type 212 M2	Tone Conv.	32	\$281.	5815-732-0897
Type 211 M1	Tone Keyer	16	171.	5815-732-0896
Type 228 M1	Line Batt. Supply	2	264.*	---
Type 227 M1	Panel	1	*	---
Type 223 M1	Power Supply	14	86.	---
Type 234 M1	Div. Comb.	16	153.	---

MANUFACTURER: Northern Radio Company  
New York, New York

REFERENCE(S): TM11-5805-325-12  
TM11-5805-325-35

STATUS: Presently available

PHYSICAL CHARACTERISTICS:

Share one rack panel with other equipment.  
Width: 22-3/8 inches  
Depth: 24 inches  
Weight: 650 pounds (approx.)

TECHNICAL CHARACTERISTICS: (For the Overall Terminal)

Telegraph Channels:

Number: 16 full duplex  
Maximum Speed: 100 wpm (nominal)  
Maximum Modulation Rate: 90 baud  
Channel Center Frequencies: 425 to 2975 cps  
Channel Spacing: 170 cps  
Type of Modulation: Frequency shift, audio  
Frequency Deviation: ±42.5 cps  
Diversity Options: Frequency or space  
Diversity Combining Options: 2 channel or 4 channel

\*This price includes the two battery supplies and panel Type 227M1.

VFCT TERMINAL EQUIPMENT (Continued)

Telegraph Loops:

Number: 16 send, 16 receive  
Type of Signals: Neutral  
Loop Current: 20 ma or 60 ma  
Maximum Loop Resistance: 6000 or 2000 ohms

Local Battery Options:

Transmitting Loops: Battery from equipment for "contact" keying;  
battery from loops for "current" or "voltage"  
keying.

Receiving Loops: Battery from equipment, 120 VDC

Impedance:

Output, Transmitting Terminal: 600 ohms  
Input, Receiving Terminal: 600 ohms

Power Requirements: 115/230 VAC, 50/60 cps  
±10%, 250 watts (approx.)

<u>Channel No.</u>	<u>Spacing (cps)</u>	<u>Center (cps)</u>	<u>Marking (cps)</u>
1	1,742.5	1,785	1,827.5
2	467.5	425	382.5
3	1,912.5	1,955	1,997.5
4	637.5	595	552.5
5	2,082.5	2,125	2,167.5
6	807.5	765	722.5
7	2,252.5	2,295	2,337.5
8	977.5	935	892.5
9	2,422.5	2,465	2,507.5
10	1,147.5	1,105	1,062.5
11	2,592.5	2,635	2,677.5
12	1,317.5	1,275	1,232.5
13	2,762.5	2,805	2,847.5
14	1,487.5	1,445	1,402.5
15	2,932.5	2,975	3,017.5
16	1,675.5	1,615	1,572.5

### 5.1.5 TD-97/FGT-2 (Multiplexer)

**FUNCTION:** Multiplexer, TD-97/FGT-2 combines signals from two independent 3 kc Voice Frequency Circuits for transmission over the 6 kc bandwidth of an associated radio system.

**MANUFACTURER:** Western Union Telegraph Co., New York, N.Y.

**FEDERAL STOCK NO:** 5805-503-1038

**REFERENCE(S):** TM 11-2265

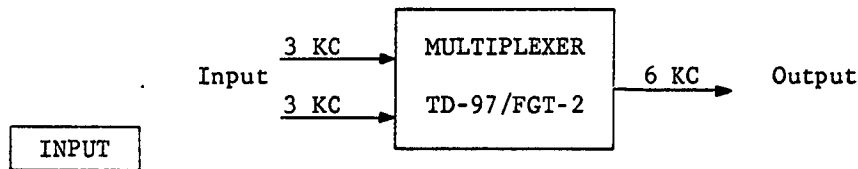
**ESTIMATED COST:** \$1,932.00

**STATUS:** No longer manufactured.

#### PHYSICAL CHARACTERISTICS:

**Dimensions:** 19" wide, 18" deep, 7" high  
**Weight:** 53 lbs.  
**Volume:** 1.3 cu. ft.  
**Floor Space:** Mounted on 19" rack

#### TECHNICAL CHARACTERISTICS:



#### Normal Operating Levels:

Telephone: -4 db (referred to 0 db level point)  
Facsimile: 0 dbm  
Telegraph (16 channels): -10 dbm per channel  
Impedance: 600 ohms

#### Maximum Permissible Levels:

Single Frequency: +13 dbm  
Multichannel Telegraph: +3 dbm (rms)  
Telegraph: -9 dbm per channel

#### Transmission Circuits:

Number: 2  
Bandwidth: 375 to 3025 cps each

TD-97/FGT-2 (Continued)

**OUTPUT**

Normal Operating Levels:

Telephone: -4 db (referred to 0 db level point)  
Facsimile: 0 dbm  
Telegraph (16 channels): -10 dbm per channel  
Impedance: 600 ohms

Maximum Permissible Levels:

Single Frequency: +22 dbm  
Multichannel Telegraph: +12 dbm (rms)  
Telegraph: -3 dbm per channel

Transmission Circuits:

Number: 1  
Bandwidth: 375 to 5915 cps each

OTHER:

Power Requirements: 110 to 230 VAC, 50 or 60 cps,  
1 phase, 47 watts  
Gain: 24 db maximum in 1 db steps

### 5.1.6 TD-98/FGR-3 Demultiplexer

**FUNCTION:** The Demultiplexer TD-98/FGR-3 separates the combined signals of two VF circuits that have been received over the 6 kc bandwidth of an associated radio system.

**MANUFACTURER:** Western Union Telegraph Company

**FEDERAL STOCK NO.:** 5805-503-1307

**REFERENCE(S):** T.M. 11-2265

**ESTIMATED COST:** \$1,125.00

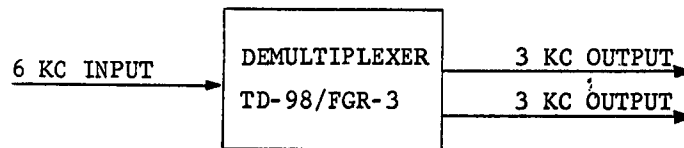
**PHYSICAL CHARACTERISTICS:**

Dimensions: 19" wide, 7" high, 18" deep

Weight: 56 lbs.

Volume: 1.3 cubic feet

Floor Space Required: 19" rack mounted



#### TECHNICAL CHARACTERISTICS:

##### INPUT

Normal Operating Levels:

Telephone: -9 db (referred to 0 db level point)

Facsimile: -5 dbm

Telegraph (16 channels): -15 dbm per channel

Impedance: 600 ohms

Maximum Permissible Levels:

Single Frequency: +13 dbm

\* Multichannel Telegraph: +6dbm (rms)

Telegraph: -9 dbm per channel

Transmission Circuits:

Number: 1

Bandwidth: 375 to 5915 cps

- \* The maximum multichannel telegraph level of +6 dbm is permissible only when the input signals are divided between the two output paths of the demultiplexer. Multichannel telegraph signals intended for one output patch should not exceed a level of +3 dbm. An input level control is provided to reduce the incoming signal level when it exceeds the correct input level for the demultiplexer.

TD-98/FGR-3 (Continued)

OUTPUT

Normal Operating Levels:

Telephone: +1 db (referred to 0 db level point)

Facsimile: 0 dbm

Telegraph (16 channel system): 0 dbm per channel

Impedance: 600 ohms

Maximum Permissible Levels:

Single Frequency: +22 dbm

Multichannel Telegraph: +12 dbm (rms)

Telegraph: 0 dbm per channel

Transmission Circuits:

Number: 2

Bandwidth, each: 375 to 3025 cps

Gain: 24 db maximum in 1 db steps

OTHER:

Power Requirements: 60 watts, 115 or 230 VAC,  
50-60 cps, single phase

### 5.1.7 CV-2C/TX Facsimile Converter

**FUNCTION:** The CV-2C/TX is an AM to FM and FM to AM converter used with a FAX transceiver and a radio transmitter or receiver. Provisions are made for plugging in a microphone and/or headsets.

**MANUFACTURER:** Times Facsimile Corporation  
Wilcox-Gay Corporation

**FEDERAL STOCK NO.:** 5815-503-2598

**REFERENCE:** 31S2-2TX-111

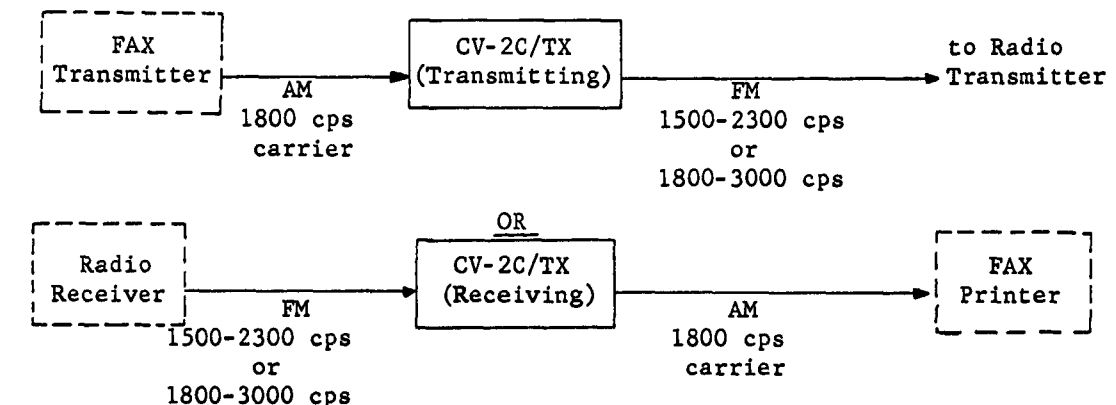
**ESTIMATED COST:** \$642

**STATUS:** No longer manufactured

**PHYSICAL CHARACTERISTICS:**

**Dimensions:** 13-5/8" wide, 11-9/16" deep, 9-1/2" high  
**Volume:** 0.82 cu. ft. (approx.)  
**Weight:** 32 lbs.  
**Mounting:** Shelf or table type

**TECHNICAL CHARACTERISTICS:**



**INPUT**

**Number:** 2  
**Mode:** 1 FM (Radio Rcvr.); 1 AM (FAX Transmitter)  
**Frequency:** 1500-2300 cps or 1800-3000 cps (Radio Side)  
1800 cps carrier (FAX Side)  
**Impedance:** 5000 ohms (Radio Side)  
600 ohms (FAX Transceiver Side)  
**Levels:** -40 dbm min. (Radio Side)



CV-2C/TX (Continued)

OUTPUT

Number:	2
Mode:	1 AM (FAX Printer); 1 FM (Radio Transmitter)
Frequency:	1800 cps carrier (FAX Side) 1500-2300 cps or 1800-3000 cps (Radio Side)
Impedance:	100-600 ohms (FAX Side) 100 ohms (Radio Side)
Levels:	+2 dbm (FAX Side) +10 dbm max. (Radio Side)

OTHER TECHNICAL CHARACTERISTICS:

Contrast Range:	8 to 15 db (FAX Side)
Frequency Response:	900-2700 cps (FAX Side)
Primary Power:	50 w, 155 VAC, 50-70 cps, single phase

## 5.2 TERMINAL END USER EQUIPMENT

### 5.2.1 AN/TXC-1F Facsimile Transceiver

**FUNCTION:** The Facsimile Set AN/TXC-1F is an electro-mechanical facsimile set of the revolving drum type for the transmission and reception of page copy. Although colored copy may be transmitted, the reproduction is always in black, white, and intermediate shades of gray. Received copy is recorded either directly on chemically coated paper or photographically in either negative or positive form. The equipment will transmit or receive a page of copy 12 by 18 inches in 20 minutes. This set has provision for transmitting or receiving copy at half speed.

**MANUFACTURER:** Times Facsimile Corporation

**FEDERAL STOCK NO.:**

**REFERENCE:** T.O. 31S2-TXC1-1

**STATUS:** No longer manufactured

**PHYSICAL CHARACTERISTICS:**

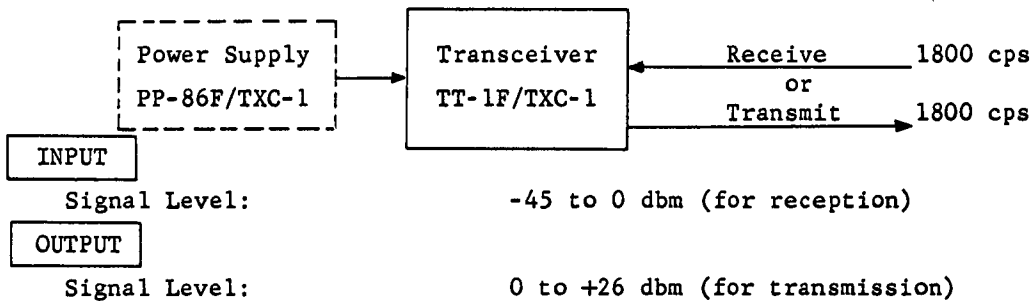
Dimensions: 37" wide, 22" deep, 42-3/4" high

Weight: 320 lbs.

Volume: 20.2 cu. ft. (approx.)

Floor Space: 5.7 sq. ft.

#### TECHNICAL CHARACTERISTICS:



#### OTHER TECHNICAL CHARACTERISTICS:

##### Facsimile Transceiver

Type of Equipment:	TT-1F/TXC-1
Functions:	Rotating drum type
Type of Copy:	Transmitting or receiving signals
Maximum Size of Copy:	Page
Size of Scanning Spot:	12 by 18-11/16 inches
Type of Recording:	1/96 inch
	Direct, or photographic positive or negative

AN/TXC-1F (Continued)

OTHER TECHNICAL CHARACTERISTICS: (Continued)

Drum Diameter:	6 inches
Speed of Drum (Rotation):	1/2 or 1 revolution per second
Lateral Movement:	12 inches in 20 minutes or 40 minutes
Scanning Lines per Inch:	96
Index of Cooperation:	576
Audio Carrier Frequency:	1800 cps
Type of Modulation:	AM
Frequency Bandwidth:	1800 cps maximum
Frequency Band Limits:	900-2700 cps
Drum Speed Control:	Synchronous motor controlled by 1800 cps fork oscillator, or 900 cps multivibrator (or external radio source)

Rectifier Power Unit

PP-86F/TXC-1

Input Power Source:	100-130 volts, 50-65 cps 250 watts at 115 volts
Signal Source:	1800 cps from fork oscillator
Output:	
Unregulated Plate Supply:	450 volts at 270 ma
Filament Supply:	6.5 VAC at 6.25 amperes
Start Motor Supply:	115 VAC at 0.5 amperes
Exciter Lamp Supply:	Regulated 6 volts, 1800 cps at 2.74 amperes, $\pm 0.1$ v

### 5.2.2 Teletype Equipment AN/FGC-20X

**FUNCTION:** Teletypewriter set AN/FGC-20X is a page printer with keyboard sending capability. Either neutral or polar signals can be applied to its selector magnets without the use of relays or other signal conversion equipment.

**MANUFACTURER:** Kleinschmidt Laboratories, Division of Smith-Corona, Marchant, Inc., Deerfield, Ill.

**FEDERAL STOCK NUMBER:** 5815-392-7743

**REFERENCES:** Technical Orders 31W4-2FGC20-11 and 31W4-2FGC20-22

**ESTIMATED PRICE:** \$2,100.00

**STATUS:** Presently available

#### PHYSICAL CHARACTERISTICS:

Qty.	Item	Height (in.)	Depth (in.)	Width (in.)	Unit Weight (lb.)
1	Teletypewriter TT-98/FG, TT-98A/FG, or TT-98B/FG	11-1/4	20-9/16	17-1/8	54
1	Power Supply PP-978/FG	4	4	9	7
1	Worm Gear (100 wpm)				

#### TECHNICAL CHARACTERISTICS:

**Keyboard Symbols:**  
Standard:

**Type of Character:** English

**Characters Per Line:** Standard - 72

**Type of Paper Feed:** Friction or sprocket

**Signaling Code:** 5 Unit start-stop

**Type of Signals:** Neutral (20 or 60 ma); polar (20 or 30 ma)

**Speed:**

**Operations Per Minute (send and receive):** 368.1, 404, 460, or 600 wpm

**Words Per Minute (send and receive):** 60, 66, 75 or 100 wpm

**Power Requirements:**

**Series-governed Motor:** Approx. 150 watts

**Motor Type:** Series governed

**Motor Speed:** 3600 rpm

**Motor Voltage Requirements:** 105 to 125 VAC, regulated or unregulated

**Paper Capacity:** Adjustable to accommodate standard 1 through 6 copy roll, fanfold paper, or sprocket fed forms 8 1/2 inches wide

**Total Weight of Installed Equipment With Full Roll of Paper:**

**AN/FGC-20X:** Approximately 87 lbs.

AN/FGC-20X (Continued)

TECHNICAL CHARACTERISTICS: (Continued)

Signal Bias Tolerances:	
Transmitted Signals:	5 percent maximum
Received Signals:	
368.1 or 404 opm:	40 percent marking or spacing bias
600 opm:	35 percent marking or spacing bias
End Distortion Tolerance (Received signals):	
368.1 or 404 opm:	35 percent marking or spacing end distortion
600 opm:	30 percent marking or spacing end distortion
Range Adjustment:	Scale calibrated 0 to 120; 100 scale units equal width of one unit signal pulse (22 milliseconds at 368.1 opm)

5.2.3 AN/FGC-25X Teletypewriter Set

**FUNCTION:** Teletypewriter Set AN/FGC-25X is a fixed-station unit designed for the transmission monitoring and reception of messages in communication center. The set is capable of receiving messages, cutting tape locally, sending a message, and making page or tape copy or both. Messages can be sent either from the keyboard or from previously punched tape through the transmitter-distributor. The set is equipped to make page copy of either the tape message sent to the distant station or the copy from the keyboard transmitting unit. Both methods of transmission may be used and the station connected to two independent lines. The set is capable of receiving the messages in either punched and printed tape or page copy form, or in both forms simultaneously. The set is also capable of punching and printing tape for future transmission.

**MANUFACTURER:** Kleinschmidt Laboratories, Inc.,  
Deerfield, Illinois

**FEDERAL STOCK NO.:** 5815-519-5644

**REFERENCES:** T.O. 31W4-2FGC-221  
31W4-2FGC-232

**ESTIMATED COST:** \$2,000

**STATUS:**

**PHYSICAL CHARACTERISTICS:**

Qty.	Component	Height (Inches)	Width (Inches)	Depth (Inches)	Volume (Cu.Ft.)	Net Weight (lbs.)
1	TT-119A/FG (Page Printer)	13-3/32	17-1/2	22-3/16	2.9	79
1	TT-178A/FG (Perforator)	11-1/4	17-1/8	20-9/16	2.3	58
1	FN-65/F6 (Table)	27	23-1/2	40	14.7	52
1	Running spares	----	----	----	----	12.5

AN/FGC-25X (Continued)

TECHNICAL CHARACTERISTICS:

Type of Installation:	Fixed station; sending and receiving; direct wire or radio circuit
Symbols:	Standard communications
Type of Characters:	English
Input Requirements:	95-250 v, 60 cycle ac
Signaling Code:	5 unit, start-stop. Stop impulse length equals start impulse length multiplied by 1.42
Type of Signals (Send):	Neutral (20 or 60 ma)
Type of Signals (Receive):	Neutral (20 or 60 ma) or polar (30 ma)
Speed:	
Operations per Minute	
(opm): (send and receive):	368.1, 404, 460, or 600
Words per Minute (wpm):	
(send and receive):	60, 66, 75 or 100
Power Demand:	150 watts
Motor Type:	Series governed
Motor Speed:	3600 revolutions per minute
Signal Bias Tolerances:	
Transmitted Signals:	5 percent maximum
Received Signals:	
368.1 opm:	40 percent maximum
600 opm:	35 percent maximum
Loop Resistance:	
120 volt battery (neutral):	2000 ohms
60 volt battery (polar):	3000 ohms
End Distortion Tolerance:	
(Received signals only)	
368.1 opm:	Maximum 35 percent spacing end distortion
600 opm:	Maximum 30 percent spacing end distortion
Range Adjustment:	Scale calibrated 0-120, 100 scale units equal width of one unit signal pulse (22 milliseconds at 368.1 opm)
Total Weight of Installed Equipment with Full Roll of Paper and Tape:	192-1/2 lbs. approx.

COMPONENTS

CHARACTERISTICS:

Teletypewriter

TT-119A/FG

Characters Per Line:  
Type of Paper Feed:  
Paper Capacity:

72  
Friction of Sprocket  
Adjustable to accommodate standard 1-  
through 5-copy roll, fanfold paper, or  
sprocket-fed forms 18-1/2 inches wide

Functions:

Carriage Return:  
(Car. Ret. Key or  
automatic):  
Line Feed (Line Feed Key  
or automatic):  
Figure Shift (Figs. Key):  
Letters Shift (Ltrs. Key):  
Motor Stop (Upper Case  
"H" Key):

Returns carriage to left margin  
Feeds paper one or two lines  
Raises platen to upper case, (figures) position  
Lowers platen to lower case (letters) position  
Stops motor of all interconnected tele-  
typewriters equipped with motor stop  
features

Signal Bell (Upper Case  
"S" Key):  
Space (spacebar)

Rings signal bell  
Moves carriage to right without printing

Reperforator-Transmitter

TT-178A/FG

Type of Tape Feed:  
Tape Capacity:

Sprocket  
Enough for approximately 5 hours 20 minutes  
at 60 wpm operation; 3 hours 10 minutes  
at 100 wpm operation

Power Supply:

Operates between 95 and 250 volts, 50-60  
cycles, single phase, ac input

Patch Panel:

Provides convenient circuit interconnections

OTHER TECHNICAL CHARACTERISTICS:

Primary Power Requirements  
for AN/FGC-25X:

440 watts (approx.), 95-250 VAC, 50-60  
cps, single phase



#### 5.2.4 TT-21/FG, TT-21A/FG Transmitter-Distributors

**FUNCTION:** TT-21/FG and TT-21A/FG are transmitter-distributors used with cryptographic equipment. These transmitter-distributors translate code combinations from fully perforated or chadless tape into electrical impulses which are set up locally and then combined with impulses from an external source. The combined signals, then, are used in teletypewriter transmitting and receiving circuits in which cryptographic equipment is installed.

Both transmitter-distributor models use series-governed motors with contact filters. The major difference between models is that the TT-21A/FG has a torn tape stop feature included.

**MANUFACTURER:** Teletype Corporation  
Skokie, Illinois

**FEDERAL STOCK NO.:** TT-21/FG: 5815-222-4294  
TT-21A/FG: 5815-543-1317

**REFERENCE:** T.O. 31W4-2-101

**ESTIMATED COST:** \$538

**STATUS:** No longer manufactured

**COMMERCIAL DESIGNATIONS:** TT-21/FG: XD228 (XD100GW)  
TT-21A/FG: XD224

**PHYSICAL CHARACTERISTICS:**

Dimensions: 9" wide, 15-1/2" deep, 8-3/4" high  
Volume: 0.68 cu. ft.  
Weight: 35 lbs.  
Mounting: Table or shelf type

**TECHNICAL CHARACTERISTICS:**

Type of Tape: Chad or chadless (7/8 or 11/16 inches wide)  
Type Tape Feed: Mechanical  
Signaling Code: 5 unit start-stop  
Type of Signals: 60 ma neutral  
Speed (sending): 368.1 or 404 opm  
Type of Motor: Series-governed  
Speed (Motor): 2,102 rpm (368.1 opm) or 2,308 rpm (404 opm)  
Tuning Forks: Stroboscopic; 87.6 vps (vibrations per second) for 368.1 opm and 96.19 vps for 404 opm

**OTHER TECHNICAL CHARACTERISTICS:**

Primary Power Requirements: 90 watts, 105-125 VAC, 20-60 cps, single phase

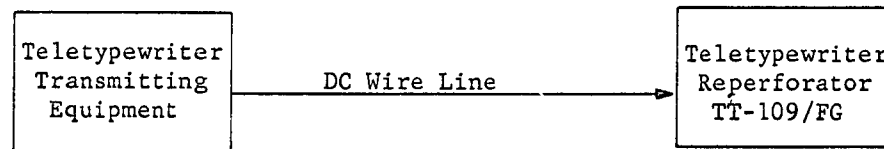
### 5.2.5 TT-109/FG Reperforator

FUNCTION:

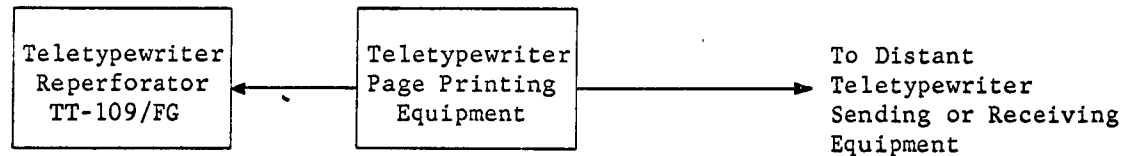
Teletypewriter-Reperforator TT-109/FG is a receive only, lightweight reperforator which prints and perforates on a 7/8 inch wide paper tape.

Accepting start-stop 5 unit code impulses, the reperforator may be used as follows:

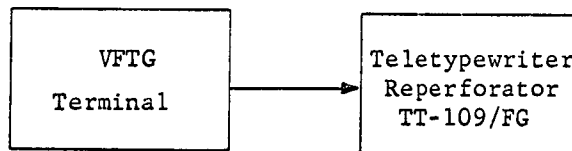
- a) As line terminating equipment for dc signal line.
- b) With teletypewriter page printing equipment when either monitor or tape copy is required.
- c) Directly from carrier or radio telegraph systems with appropriate VFCT systems or carrier terminals.



a) Direct Wire Line



b) Monitoring Page Printing Equipment



c) VF Carrier or Radio Equipment

MANUFACTURER:	Kleinschmidt Laboratories Division of Smith-Corona Marchant, Inc.
FEDERAL STOCK NO.:	5815-543-0658
REFERENCE:	T.O. 31W4-2FG-181
ESTIMATED COST:	\$1,200

TT-109/FG (Continued)

PHYSICAL CHARACTERISTICS:

Dimensions: 12-1/16" wide, 12-7/8" deep, 13-1/2" high  
 Volume: 1.2 cu. ft. (approx.)  
 Weight: 37.5 lbs.  
 Mounting: Table or shelf type mount

TECHNICAL CHARACTERISTICS:

Type of Characters: English, standard communication symbols  
 Method of Recording: Message printed and perforated on 7/8 inch wide paper tape  
 Type of Feed: Sprocket  
 Signaling Code: 5-unit, start-stop; stop impulses equals 1.42 unit interval  
 Speed:

Words Per Minute (wpm)	Operations Per Minute (opm)	Baud/Sec.
60	368.1	45.5
66	404	50.0
75	460	57
100	600	75

Line Current Requirements: 60 or 20 ma neutral  
 not more than 30 ma polar  
 Distortion Tolerances:  
 Bias: 45 baud . . . . 40% maximum  
 75 baud . . . . 35% maximum  
 End Distortion: 45 baud . . . . 35% marking or spacing  
 75 baud . . . . 30% marking or spacing  
 Tape Capacity: Enough tape for 5 hours 20 minutes at 368.1 opm  
 Enough tape for 3 hours 10 minutes at 600 opm

OTHER TECHNICAL CHARACTERISTICS:

Motor Type: Series-governed  
 Motor Power Requirements: 150 watts, 105-125 VAC, 50-60 cps, single phase  
 Range Adjustment: Scale calibrated 0-120; 100 scale units equal 1 unit pulse (22 milliseconds at 45 baud)  
 (For received signal bias and end distortion)  
 Bias Potentiometer: Adjusts current flow in selector magnet bias windings  
 Radio Frequency Suppression: Teletypewriter does not interfere with radio reception at frequencies between .35 and 150 mc when located 2 feet or more from radio antenna  
 Temperature Limits:  
 Equipment in Use: +32°F (0°C) to +132°F (55.6°C)  
 -80°F (-62.2°C) to +160°F (+71.1°C)

5.2.6 TA-182/U Telegraph-Telephone Signal Converter

FUNCTION:

Telegraph-Telephone Signal Converter TA-182/U is an 8-tube frequency-shift carrier modulator and demodulator. It modulates outgoing 20 cycles per second ringing frequency into either 1,225 cycles per second for teletypewriter signaling or 1,600 cycles per second for telephone signaling; conversely, it demodulates incoming 1,225 or 1,600 cycles per second signals into 20 cycles per second ringing frequency to activate the signaling device in local telegraph or telephone equipment. The TA-182/U will handle signals from either telegraph equipment or telephone equipment, but it will not handle signals from both types of equipment simultaneously. This converter is used only in circuits wherein the associated line equipment will not pass 20 cycles per second ringing current.

MANUFACTURER:

Stromberg-Carlson Telephone and Mfg. Co.

FEDERAL STOCK NO.:

5805-263-3326

ESTIMATED COST:

\$234

REFERENCE:

31W4-2U-101

STATUS:

Production lead time of 9 months required

PHYSICAL CHARACTERISTICS:

Dimensions:

11" high, 7.5" wide, 10.5" deep

Weight:

15 pounds

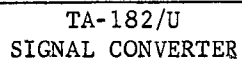
TECHNICAL CHARACTERISTICS:

Landline Side

Voice + 20 cps  
ringing current

Radio Side

Voice + 1225 cps  
or 1600 cps signaling



Frequency of Telegraph Signaling: 1225 cps

Frequency of Telephone Signaling: 1600 cps

Frequency Limits for Satisfactory Operation:

Telegraph: 1108 to 1278 cps

Telephone: 1396 to 1684 cps

TA-182/U (Continued)

TECHNICAL CHARACTERISTICS: (Continued)

Low Frequency Signal Input:	20 cps
Output Level to Line:	0 dbm $\pm$ 2 db
Receiver Sensitivity on Line Side:	
Low Sensitivity Position:	-31 dbm
High Sensitivity Position:	-58 dbm
Sensitivity on Loop Side:	25 volts
Impedance:	5000 ohms
Power Requirements:	115 volts $\pm$ 10% AC, 50-60 cps, 40 watts

### 5.3 UHF INTERSITE RADIO SYSTEM

#### 5.3.1 Type 141A/BW-2 Transmitter

**FUNCTION:** The type 141A/BW-2 is a direct crystal-controlled, phase-modulated transmitter operating in the 890 to 960 mc band. It will accept for modulation a baseband from 2 to 110 kc.

**MANUFACTURER:** Budelman Electronics Corporation  
375 Fairfield Avenue  
Stamford, Connecticut

**FEDERAL STOCK NO.:** Not Issued

**REFERENCE:** Commercial Instruction Book

**ESTIMATED COST:**

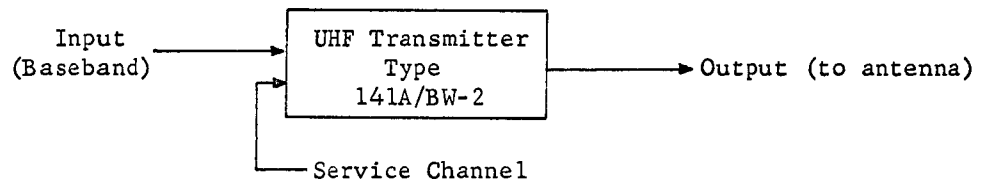
**STATUS:** Presently available

**PHYSICAL CHARACTERISTICS:**

Dimensions: 19" wide, 10.5" high, 7" deep (projects 4" from front panel)

Weight: 27 pounds

**TECHNICAL CHARACTERISTICS:**



#### INPUT

Modulation Frequency Range: 300 to 110,000 cps  
Baseband: 2,000 to 110,000  
Service Channel: 300 to 3,000 cps  
Baseband Input Level: 0 dbm for full rated deviation (adjustable)  
Baseband Input Impedance: 600 ohms unbalanced  
Service Channel Input Level: -20 dbm  
Service Channel Input Impedance: 150/600 ohms. When connected for 150 ohms, local battery is supplied for hand-set microphone.

#### OUTPUT

Carrier Frequency Range: 890 to 960 mc (supplied with crystal and tuned to specified frequency)  
Carrier Frequency Stability:  $5 \times 10^{-6}$ ; maintained by temperature-controlled AT cut crystal  
Crystal Frequency Range: Approximately 4.1 to 4.5 mc  
Total Frequency Multiplication: 216 times  
RF Output Impedance: 50 ohms, coaxial (Type "N" fitting)  
Type of Modulation: FM,  $\pm 200$  kc maximum deviation  
Spurious Radiations: More than 60 db below carrier

Type 141A/BW-2 (Continued)

OTHER TECHNICAL CHARACTERISTICS:

Power Requirements: 115 volts, AC, 90 watts

### 5.3.2 Type 142A/BW Receiver

FUNCTION: The Type 142A/BW Receiver is a double-conversion superheterodyne employing a single temperature-controlled quartz crystal to establish its operating frequency between 890 and 960 mc.

MANUFACTURER: Budelman Electronics Corporation  
Stamford, Connecticut

FEDERAL STOCK NO: Not Issued

REFERENCES: Commercial Instruction Manual

COST:

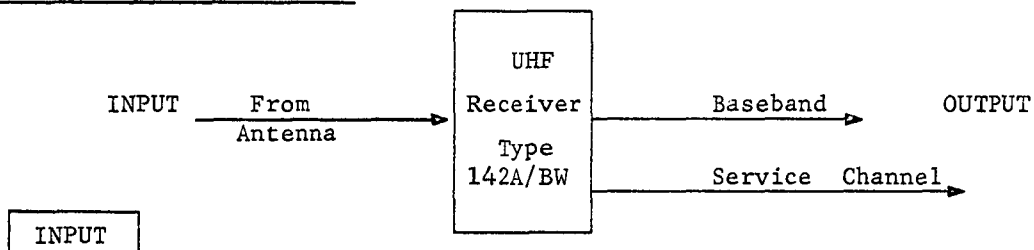
STATUS: Presently Available

#### PHYSICAL CHARACTERISTICS:

Dimensions: 10.5 inches high (rack space required),  
19 inches long and 9 inches deep (4 inches projecting from front of rack).

Weight: 25 pounds

#### TECHNICAL CHARACTERISTICS:



Frequency Range: 890-960 mc. Supplied with crystal and tuned to specified operating frequency.

RF Input Impedance: 50 ohms, coaxial (Type "N" connector, UG-58/U)

Sensitivity: 3.0 microvolts for 20 db noise quieting.

Selectivity: ±300 kc at 3 DB  
±1200 kc at 60 DB

Receiver Carrier Frequency Stability: Better than  $1 \times 10^{-4}$



### 5.3.2 Type 142A/BW Receiver (Continued)

OUTPUT
--------

Baseband Output Level:	-10 dbm
Service Channel Output Level:	+10 dbm (adjustable)
Baseband Output Impedance:	600 ohms unbalanced
Service Channel Output Impedance:	6/150/600 ohms, balanced in 600 ohms

#### OTHER TECHNICAL CHARACTERISTICS:

Crystal Frequency Range:	43.425 to 46.925 mc
First IF Frequency Range:	108.350 to 115.350 mc
Second IF Frequency:	20.5 to 21.5 mc
Noise Figure:	Better than 12.0 DB
Power Requirements:	115 volts AC, 70 watts

### 5.3.3 AN/TCC-3 Carrier Telephone Terminal

FUNCTION:

Telephone Terminal AN/TCC-3 is a four-channel carrier telephone terminal. Its primary purpose is to provide either four duplex 2-wire or 4-wire VF telephone channels or one channel for the transmission and reception of wide-band signals. The AN/TCC-3 operates on the principle of frequency division multiplexing and employs single sideband suppressed carrier amplitude modulation.

MANUFACTURER:

Western Electric Company

FEDERAL STOCK NO:

5805-503-2648

REFERENCE:

TO 31W1-2TCC3-1

ESTIMATED PRICE:

\$3,500

PHYSICAL CHARACTERISTICS:

AN/TCC-3 consisting of:

TA-219/U (Telephone Modem):

Dimensions: 9.12 inches high, 18.06 inches deep, 20.60 inches wide

Volume: 2.0 cubic feet

Weight: 73 pounds

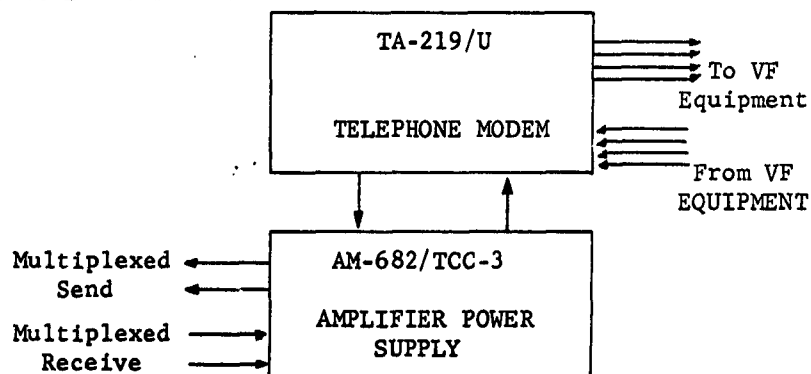
AM-682/TCC-3 (Amplifier Power Supply):

Dimensions: 17.06 inches high, 18.06 inches deep, 20.60 inches wide

Volume: 3.7 cubic feet

Weight: 103 pounds

TECHNICAL CHARACTERISTICS:



### 5.3.3 AN/TCC-3 Carrier Telephone Terminal (Continued)

Number of channels operated over loaded spiral four-cable or four-wire transmission circuit:	Four traffic channels plus order wire channel, or 1 wide-band special service channel.
Carrier Frequencies:	
Channel 1:	8 kc $\pm$ .01%
2:	12 kc $\pm$ .01%
3:	16 kc $\pm$ .01%
4:	20 kc $\pm$ .01%
Frequency Bands Allocated to Channels:	
Order Wire	300 to 3,100 cps
Channel 1:	4,500 to 7,700 cps
2:	8,500 to 11,700 cps
3:	12,500 to 15,700 cps
4:	16,500 to 19,700 cps ?
Frequency of Order Wire Signaling Circuit:	1600 cps
Frequency of System Alarm Signal:	4000 cps
Transmission Range, Maximum:	Dependent on characteristics of transmission medium. About 100 miles with loaded spiral-four Cable Assemblies CX-1065/G equipped with Telephone Repeaters AN/TCC-5
Type of Modulation:	Amplitude, single sideband, suppressed carrier
Monitoring and Talking:	Monitoring and talking facilities on each channel and on order wire. Switch controlled.
Test Facilities:	Self-contained and capable of coordination with other standard test facilities.
Operating Levels:	
VF side:	
Input, 2-wire:	0 dbm
Output, 2-wire	-3 dbm
Input, 4-wire	-4 dbm
Output, 4-wire	+1 dbm
Transmitting into line:	
Normal line section	0 dbm
Long line section	+10 dbm

### 5.3.3 AN/TCC-3 Carrier Telephone Terminal (Continued)

#### System Performance:

Noise on channels at 0-db level point, 100-mile system (except during periods of heavy static or with strong power exposures) 32 dba

Far-end crosstalk loss between output of disturbing channel and output to disturbed channel should be expected to exceed. 50 db

Near-end, or echo, crosstalk loss should be expected to exceed 25 db

Power Requirements: 115 or 230 volts ac  $\pm 10\%$ ; 50 to 65 cps

Power Consumption: 125 watts (approximately)

6.0 BREAKDOWN OF MAJOR COMPONENTS (by van)

6.1 RECEIVER-COMCENTER VAN

<u>ITEM NAME</u>	<u>JCENS NOMENCLATURE</u>	<u>FSN</u>	<u>QUANTITY</u>
Air Conditioner RA3-B3	---	---	2
Antenna Coupler RAC-30	---	---	4
Antenna Erection Kit	---	---	1
Antenna Kit	MX-743/FRR	5820-404-2570	2
Converter	CV-2C/TX	5815-503-2598	1
Indicator	ID-176/GX	5815-355-7822	1
Cousino Audio Repeater			
Type U-300	---	---	1
Demultiplexer	TD-98/FGR-3	5805-503-1307	3
Dissipator RTB-5	---	---	1
Diversity Combiner Type 234			
Model 1	---	---	16
Electronic Multimeter	TS-505D/U	6625-243-0562	1
Facsimile Set	AN/TXC-1F	5815-	
Facsimile Transceiver	TT-1D/TXC-1	5815-396-3412	1
Rect. Pwr. Unit	PP-86/TXC-1	6130-255-0171	1
Table	MT-252-TXC-1	5815-244-4359	1
Frequency Meter	AN/USM-26	6625-	
Freq. Conv. Unit	MX-1637/U	---	1
Freq. Meter	FR-38/U	6625-810-9051	1
Time Interval Unit	MX-1636/U	---	1
Frequency Shift			
Tone Conv. Type 212 Mod. 2	---	5815-732-0897	32
Shelf for Tone Conv.	---	---	6
Frequency Shift Tone			
Keyer Type 211 Model 1	---	5815-732-0896	16
Shelf for Tone Keyer	---	---	1
Generator Set Series 2-71 (dual)	---	---	1
Hybrid Circuit Network	---	---	4
Line Battery Power			
Supply Type 227 Model 1	---	---	2
Panel Type 227 Model 1			
(for line battery supply)	---	---	1
Monitor Ampl. CHA-10	---	---	2
Parabolic Antenna	---	---	2
Photo Equipment	PH-549/TXC-1	---	1
Pneumatic Tower			
36 ft.	---	---	1
50 ft.	---	---	4
Pump, 3 inch, double acting	---	---	3
Power Supply	PP-1209/FG	---	5
Power Supply Type 223 Model 1	---	---	14
RF Oscillator	O-330/FRR	---	1
Radio Receiving Set	AN/FRR-40	5820-545-7325	1
Radio Receiving Set (Mod.)	AN/FRR-41	5820-503-1513	1
Radio Receiver	R-388/URR	5820-644-0990	1

6.1 RECEIVER-COMCENTER VAN (Continued)

<u>ITEM NAME</u>	<u>JCENS NOMENCLATURE</u>	<u>FSN</u>	<u>QUANTITY</u>
Radio Set 14A/W Coordination			
Panel Type 147A	---	---	1
Receiver Type 142A/BW	---	---	2
Transmitter Type 141A/BW	---	---	2
Terminal Panel Type 146D	---	---	1
Receiving Transmitter			
Distributor	TT-21/FG	5815-222-4294	8
Tape Recorder	---	---	1
Tape Splicer Kit	---	---	1
Telegraph-Telephone Signal Conv.	TA-182/U	5805-263-3326	2
Telephone Set	TA-312/PT	5805-543-0012	4
Telephone Terminal	AN/TCC-3	5805-503-2648	1
Teletypewriter Mixer	SSM-33	---	4
Teletypewriter Set	AN/FGC-20X	5815-392-7743	1
Teletypewriter Set	AN/FGC-25X	5815-519-5644	4
Teletypewriter Test Set	TS-659/UG	6625-635-9735	1
Teletypewriter Test Set	TS-1060/GG	6625-542-6106	1
Test Set I-93A,C	---	6625-229-1045	1
Test Set	TS-2B/TG	6625-243-5173	1
Test Set	TS-140/PCM	6625-243-4888	1
Tool Equipment	TE-50B	5180-356-4602	1
Tool Equipment	TE-113	5180-448-7478	3
Tractor	M-48	---	1

6.2 TRANSMITTER VAN

Air Conditioner 1-1/2 ton	---	---	2
Antenna Erection Kit	---	---	1
Carbon Microphone	M-48/U	5965-280-3602	1
Dissipator TER-5000/600	---	---	1
Dissipator TER-5000/650	---	---	1
Frequency Meter	AN/USM-26	---	1
Generator Set Series 2-71	---	---	1
Headset (crystal)	---	5965-184-0849	2
Headset, Magnetic RHS-33	---	---	2
Monitor Amplifier CHA-10	---	---	1
Multiplexer	TD-97/FGT-2	5805-503-1038	2
Parabolic Antenna	---	---	2
Pneumatic Tower			
36 ft.	---	---	1
50 ft.	---	---	1
Pump, 3 inch double acting for pneumatic tower	---	---	2
RF Oscillator	O-330/FRR	---	1
Radio Receiver	R-488/URR	5820-644-0990	1
Radio Set 14A/W Coordination			
Panel Type 147A	---	---	1
Receiver Type 142A/BW	---	---	2
Transmitter Type 141A/BW	---	---	2
Terminal Panel Type 146D	---	---	1
Rhombic Transmitting Antenna			
3 wire curtain	---	---	1
Semi-trailer Van	V-51	---	1
Telephone Terminal	AN/TCC-3	5805-503-2648	1

6.2 TRANSMITTER VAN (Continued)

<u>ITEM NAME</u>	<u>JCENS NOMENCLATURE</u>	<u>FSN</u>	<u>QUANTITY</u>
Terminated Folded Dipole Antenna	---	---	1
Tractor	M-48	---	1
Transmission Line Coupler 512B-2	---	---	2
Transmitter GPT-10KB1 (Mod.)	---	---	1
Relay Assembly	RE-121/UG	5945-384-8097	4
Safe CH76	---	5895-497-9801	1
Shunt Device	HWX-1/TSEC	---	4
Signal Generator Model 184-TV	---	---	2
Single Wire Rhombic Receiving Antenna	---	---	2

7.0 EQUIPMENT MANUFACTURER AND INSTRUCTION BOOK INFORMATION (by van)

7.1 RECEIVER-COMCENTER VAN

<u>ITEM NAME</u>	<u>MANUFACTURER</u>	<u>INSTRUCTION BOOK</u>
Air conditioner RA3-B3	---	---
Antenna Coupler RAC-30	---	---
Antenna Erection Kit	---	31R2-2FRR-184
Antenna Kit MX-743/FRR	---	---
Converter CV-2C/TX	Wilcox-Gay Corp.	31S2-2TX-111
Indicator ID-176-GX	---	---
Cousino Audio Repeater Type U-300	---	---
Demultiplexer TD-98/FGR-3	Western Union Tel.	---
Dissipator RTB-5	Technical Materiel Corp.	---
Diversity Combiner Type 234 Model 1	Northern Radio	---
Electronic Multimeter TS-505D/U	Anton Electronics	---
Facsimile Set AN/TXC-1F	Times Facsimile Corp.	31S2-2TCX1-1
Facsimile Transceiver TT-1D/TXC-1	Times Facsimile Corp.	31S2-2TCX1-1
Rect. Pwr. Unit PP-86/TXC-1	Times Facsimile Corp.	31S2-2TCX1-1
Table	---	---
Frequency Meter AN/USM-26	Hewlett-Packard	33A1-5-5-1
Freq. Conv. Unit MX-1637/U	Hewlett-Packard	
Freq. Meter FR-38/U	Hewlett-Packard	
Time Interval Unit MX-1636/U	Hewlett-Packard	
Frequency Shift Tone Conv. Type 212 Model 2	Northern Radio	TM 11-5805-325-12
Shelf for Tone Conv.	Northern Radio	TM 11-5805-325-12
Frequency Shift Tone Keyer Type 211 Model 1	Northern Radio	TM 11-5805-325-12
Shelf for Tone Keyer	Northern Radio	
Generator Set Series 2-71 (dual)	---	---
Hybrid Circuit Network	---	---
Line Battery Power Supply Type 227 Model 1	Northern Radio	TM 11-5805-325-12
Panel Type 227 Model 1 (for line battery supply)	Northern Radio	TM 11-5805-325-12
Monitor Ampl. CHA-10	---	---
Parabolic Antenna PH-549/TXC-1	---	---
Photo Equipment	---	---
Pneumatic Tower 36 ft.	---	---
50 ft.	---	---
Pump, 3 inch double acting	---	---
Power Supply PP-1209/FG	---	---
Power Supply Type 223 Model 1	Northern Radio	TM 11-5805-325-12
RF Oscillator O-330/FRR	---	31R2-2FRR-221
Radio Receiving Set AN/FRR-40	Hoffman Labs	31R2-2FRR-221
Radio Receiving Set (Mod.) AN/FRR-41	Hoffman Labs	31R2-2FRR-221



7.1 RECEIVER-COMCENTER VAN (Continued)

<u>ITEM NAME</u>	<u>MANUFACTURER</u>	<u>INSTRUCTION BOOK</u>
Radio Receiver R-388/URR	Collins Radio	31R1-2URR-121
Radio Set 14A/W	Budelman	---
Coordination Panel	Budelman	---
Type 147A	Budelman	---
Receiver Type 142A/BW	Budelman	---
Transmitter Type 141A/BW	Budelman	---
Terminal Panel Type 146D	---	---
Receiving Transmitter		
Distributor TT-21/FG	Teletype Corp.	31W4-2-101
Relay Assembly RE-121/UG	---	31W4-2UG-84
Reperforator Teletypewriter		
TT-109/FG	Kleinschmidt	31W4-2FG-181
Safe CH76	---	---
Shunt Device HWX-1/TSEC	---	---
Signal Generator Model 184-TRV	---	---
Single Wire Rhombic		
Receiving Antenna	---	---
Tape Recorder	---	---
Tape Splicer Kit	---	---
Telegraph-Telephone Signal		
Converter TA-182/U	Stromberg Carlson	31W-1-22
Telephone Set TA-312/PT	Kellogg Switchboard	31W-1-22
Telephone Terminal AN/TCC-3	---	31W1-2TCC3-1
Teletypewriter Mixer SSM-33	---	31W4-4-18-11
Teletypewriter Set AN/FGC-20X	Kleinschmidt Labs	31W4-2FGC20-11
Teletypewriter Set AN/FGC-25X	Kleinschmidt Labs	31W4-2FGC-221
Teletypewriter Test Set TS-659/UG	---	---
Teletypewriter Test Set TS-1060/GG	Bridge Electronics	---
Test Set I-93A, C	---	---
Test Set TS-2B/TG	Warren Mfg. Co.	33A1-8-55
Test Set TS-140/PCM	---	---
Tool Equipment TE-50B	---	---
Tool Equipment TE-113	---	---
Tractor M-48	Reo (motor)	TM-9-8023-1 TM-9-8022

7.2 TRANSMITTER VAN

Air Conditioner 1-1/2 ton	---	---
Antenna Erection Kit	---	---
Carbon Microphone M-48/U	---	---
Dissipator TER-5000/600	Technical Materiel Corp.	---
Dissipator TER-5000/650	Technical Materiel Corp.	---
Frequency Meter AN/USM-26	Hewlett-Packard	33A1-5-5-1
Generator Set Series 2-71	---	---
Headset (crystal)	---	---
Headset, Magnetic RHS-33	---	---
Monitor Amplifier CHA-10	---	---
Multiplexer TD-97/FGT-2	Western Union	---

7.2 TRANSMITTER VAN (Continued)

<u>ITEM NAME</u>	<u>MANUFACTURER</u>	<u>INSTRUCTION BOOK</u>
Parabolic Antenna	---	---
Pneumatic Tower	---	---
36 ft.	---	---
50 ft.	---	---
Pump, 3 inch	---	---
double acting for		
pneumatic tower	---	---
RF Oscillator O-330/FRR	Technical Materiel Corp.	---
Radio Receiver R-388/URR	Collins Radio Co.	31R1-2URR-121
Radio Set 14A/W	Budelman	---
Coordination Panel	Budelman	---
Type 147A	Budelman	---
Receiver Type 142A/BW	Budelman	---
Transmitter Type 141A/BW	Budelman	---
Terminal Panel Type 146D	---	---
Rhombic Transmitting Antenna		
3-wire curtain	---	---
Semi-trailer Van V-51	---	---
Telephone Terminal AN/TCC-3	Western Electric	31W1-2TCC3-1
Terminated Folded Dipole		
Antenna	---	---
Tractor M-48	Reo (motor)	TM-9-8023-1, TM-9-8022
Transmission Line Coupler		
512B-2	---	---
Transmitter GPT-10KB1 (Mod.)	Technical Materiel Corp.	---

AN/FRR-60

FUNCTION:

The Radio Receiving Set, AN/FRR-60 is a continuous tuned, dual diversity synthesized receiver with automatic frequency control and will receive single side-band signals in dual frequency or space diversity over the frequency range of 2-32 mc. The signals may be single side-band (ISB, SSB, DSB with carrier suppressed), AM, FS, or CW.

MANUFACTURER:

The Technical Materiel Corporation  
Mamaroneck, New York

FEDERAL STOCK NO:

F5820-810-1052

REFERENCE:

TMC 3001, TMC Technical Manual, 15 Sept. 1962

ESTIMATED COST:

\$37,500

STATUS:

120 days lead time required

**ENGINEERING DRAFT**

AN/FRR-60 (Cont.)

**CHARACTERISTICS:**

**Physical:**

Dimensions:	46" wide, 30" deep, 69" high
Weight:	1100 lbs.
Volume:	55.1 cu. ft.
Floor Space:	60 sq. ft.

**Technical:**

**INPUT:**

Frequency Range:	2 to 32 mc (in 8 bands)
Input Impedance:	Nominal 50 ohms, unbalanced
Type of Reception:	A1, CW; A2, MCW; A3, Voice; A9, SSB; F1, FSK
Sensitivity:	Minimum of 1 microvolt per meter in the frequency range of 2-32 mc (useable output over a 150 db dynamic range)

**OUTPUT:**

Audio Output:	0 to 1 watt (adjustable), $\pm 1.5$ db 20 cps to 20,000 cps. Bandpass dependent on the filter selected
---------------	--

**OTHER:**

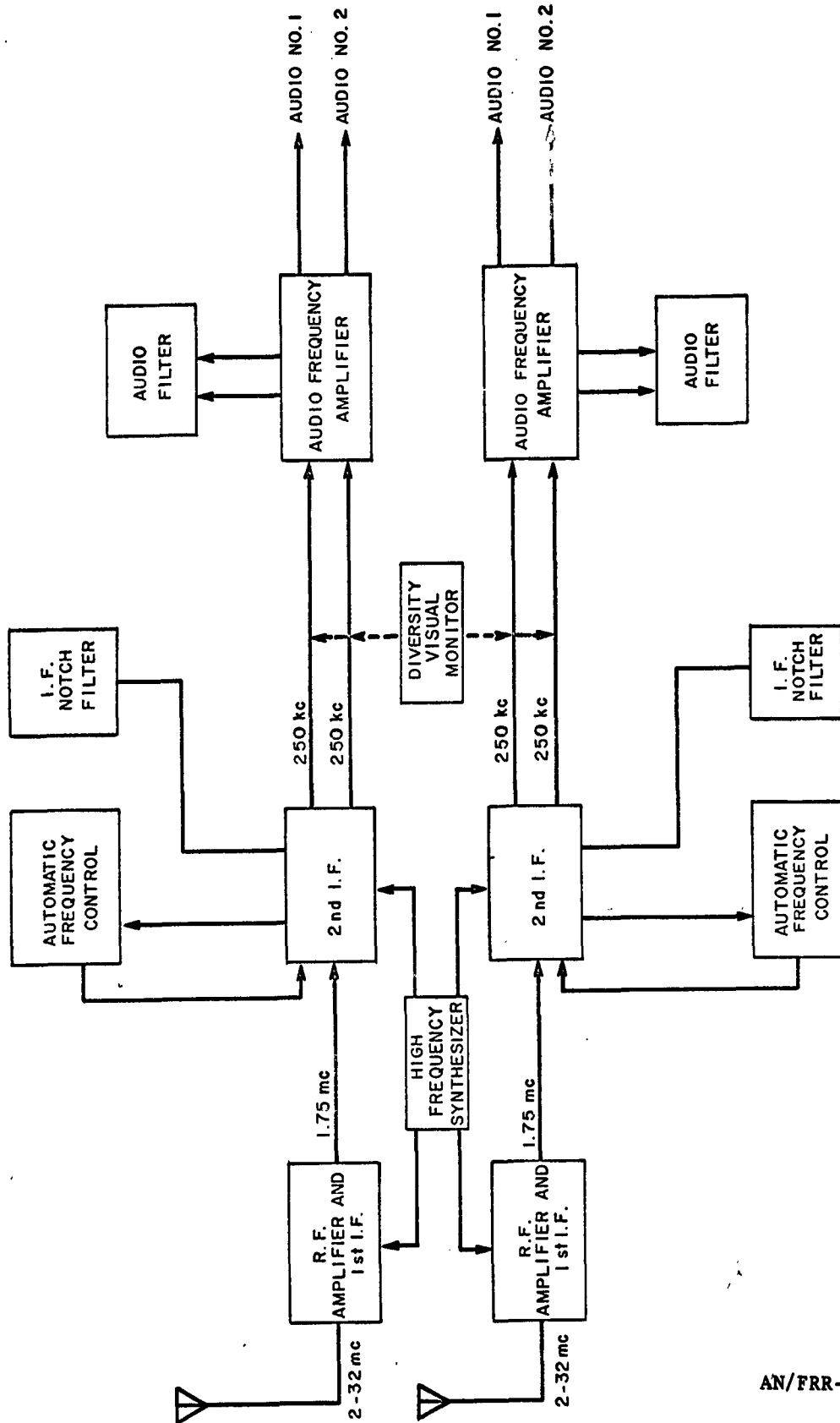
Power Requirements:	115/230 volts at 48 to 62 cps, single phase, 1500 watts (approximate)
Stability:	Synthesized stability of 1 part in $10^8$ for 24 hours for a change in ambient of 15°C within the limits of 0 to 50°C
Tuning:	1. Synthesizer tuning is accomplished by means of 5 detected switches. The RF frequency is displayed on the front by means of digital illuminated numerals 1" high. 2. The frequency that the receiver is tuned to is displayed on a 14" slide rule dial in any one of the 8 bands of the 2-32 mc frequency range.
Image Ratio:	80 db referenced to 1 microvolt input signal
Spurious Response: (as defined by CCIR)	Better than 120 db referenced to 1 $\mu$ v (for synthesized operation, all spurious will be no greater than .01 $\mu$ v when referred to the antenna)

## CY- 3567

RECEIVER 1	RECEIVER 2
RF AMPLIFIER (TN-376/UR)	RF AMPLIFIER (TN-376/UR)
CONTROL SYNTHESIZER AND STANDARD (O-941/UR)	DIVERSITY VISUAL MONITOR
	BLANK PANEL
AUTOMATIC FREQUENCY CONTROL (C-4099/FRR-60)	AUTOMATIC FREQUENCY CONTROL (C-4099/FRR-60)
RADIO SIGNAL DISTRIBUTION PANEL	BLANK PANEL
IF AMPLIFIER AND MIXER (AM-3295/FRR-60)	IF AMPLIFIER AND MIXER (AM-3295/FRR-60)
IF NOTCH FILTER (F-711/FRR-60)	IF NOTCH FILTER (F-711/FRR-60)
AUDIO AMPLIFIER (AM-3296/FRR-60)	AUDIO AMPLIFIER (AM-3296/FRR-60)
AUDIO FILTER (F-712/FRR-60)	AUDIO FILTER (F-712/FRR-60)
POWER SUPPLY (PP-3341/FRR-60)	POWER SUPPLY (PP-3341/FRR-60)
SPEAKERS	
AUXILIARY POWER PANEL	BLOWER

AN/FRR-60 CHASSIS LOCATIONS

FIGURE 1



AN/FRR-60, BLOCK DIAGRAM, RADIO RECEIVING SET AN/FRR-60

FIGURE 2

AN/FRR-60 (Cont.)

OTHER:

IF Rejection: Better than 80 db average  
Calibration: An internally generated alignment signal is provided for routine receiver sensitivity checks and field alignment

Peak Noise Limiter: An improved "Lamb" type noise limiter which mutes the receiver during impulse type of noise

AFC Characteristics: Automatically synchronizes to a received signal  $\pm 50$  cps and suppressed 30 db at 1 microvolt above noise threshold and will remain synchronized for  $\pm 1000$  cps of drift at a maximum drift rate of 10 cps/per second. Memory circuit will maintain tuning position during signal fades or momentary outages. Several optional bandwidths selected from the following:

1. 250 to 7500 cps USB  $\pm 1.5$  db
2. 250 to 7500 cps LSB  $\pm 1.5$  db
3. 250 to 3500 cps USB  $\pm 1.5$  db
4. 250 to 3500 cps LSB  $\pm 1.5$  db
5. 250 to 6000 cps USB  $\pm 1.5$  db
6. 250 to 6000 cps LSB  $\pm 1.5$  db
7. 1 kc symmetrical  $\pm 1.5$  db
8. 6 kc symmetrical  $\pm 1.5$  db
9. 15 kc symmetrical  $\pm 1.5$  db

Tunable IF Rejection Filter: Notch rejection with  $\pm 82$  cycles at the 1 db points,  $\pm 10$  cycles at the 60 db points and tunable across the complete IF of 15 kc

AGC: Output remains within  $\pm 1.5$  db for 100 db change in input within the input voltage range of 1 microvolt to .1 volt. The AGC circuit has a fast attack time and a front panel adjustable decay time from 1 to 10 seconds. The AGC voltage is derived from the strongest of 2 IF channel signals.

Phase Distortion: System is capable of receiving pulse or phase information without seriously degrading intelligence when the 15 kc IF amplifier is used in a synthesized receiver.

AF Distortion: Intermodulation products are down at least 40 db through the audio channels.

Adjustable Audio Filters: Passive audio filters provide adjustable low pass and high pass cut-off points at:

100 cycles	2.5 kc
250 cycles	5 kc
500 cycles	10 kc
1000 cycles	

AN/FRR-60 (Cont.)

OTHER:

Output:

Separate filtering is provided for each audio channel.

1. Four 600 ohm balanced and centertapped output terminals per receiver channel.
  - a. Two independent 0-1 milliwatt outputs.
  - b. Two independent 0-1 watt outputs.
  - c. Two 4, 8 or 16 ohm 1 watt outputs.
2. Two IF outputs (unbalanced 50 ohms)

Hum Level:

Minus 50 db at 1 watt of audio output.

Metering:

Input signal to the receiver and all audio outputs are metered. Other meters are: AFC drift, carrier level, IF output and sync lock. (Sync lock meter for synthesized models only).

Power Supply Regulation:

1. B+ and B- maintained within 1% from no-load to full-load and within  $\pm 10\%$  Line voltage variation.
2. B+ ripple does not exceed 100 mv  
B- ripple does not exceed 5 mc

All voltage outputs are separately fused using blown fuse indicator type holders.

Temperature & Humidity:

0° to 50°C, 90% humidity.

Special Features:

Electronically shielded cabinet with "Screen-Room" type of line filter gives a minimum attenuation of 70 db from the receiver to the power line.

The Radio Receiving Set AN/FRR-60(V) may be operated by using either a Continuous Tuned RF Amplifier (TN-376/UR) or a Fixed Tuned RF Amplifier (TN-396(P)/FRR).



**AN/FGC-25X**

**FUNCTION:**

Teletypewriter Set AN/FGC-25X is a fixed-station unit designed for the transmission, monitoring and reception of messages in communication centers. The set is capable of receiving messages, cutting tape locally, sending a message, and making page or tape copy or both. Messages can be sent either from the keyboard or from previously punched tape through the transmitter-distributor. The set is equipped to make page copy of either the tape message sent to the distant station or the copy from the keyboard transmitting unit. Both methods of transmission may be used and the station connected to two independent lines. The set is capable of receiving the messages in either punched and printed tape or page copy form, or in both forms simultaneously. The set is also capable of punching and printing tape for future transmission.

**MANUFACTURER:**

Kleinschmidt Laboratories, Inc.  
Deerfield, Illinois

**FEDERAL STOCK NO:**

5815-519-5644

**REFERENCES:**

T. O. 31W4-2FGC-221  
31W4-2FGC-232

**ESTIMATED COST:**

\$2,000.

**STATUS:**

**PHYSICAL CHARACTERISTICS:**

<u>Quantity</u>	<u>Component</u>	<u>Height (Inches)</u>	<u>Width (Inches)</u>	<u>Depth (Inches)</u>	<u>Volume (Cu. Ft.)</u>	<u>Net Weight (lbs.)</u>
1	TT-119A/FG (Page Printer)	13-3/32	17-1/2	22-3/16	2.9	79
1	TT-178A/FG (Perforator)	11-1/4	17-1/8	20-9/16	2.3	58
1	FN-65/F6 (Table)	27	23-1/2	40	14.7	52
1	Running Spares	----	----	-----	----	12.5

**ENGINEERING DRAFT**

AN/FGC-25X

TECHNICAL CHARACTERISTICS:

Type of Installation:	Fixed station; sending and receiving; direct wire or radio circuit
Symbols:	Standard communications
Type of Characters:	English
Input Requirement:	95-250 v, 60 cycle ac
Signaling Code:	5 unit, start-stop, stop impulse length equals start impulse length multiplied by 1.42
Type of Signals (Send):	Neutral (20 or 60 ma)
Type of Signals (Receive):	Neutral (20 or 60 ma) or polar (30 ma)
Speed:	
Operations per Minute (opm): (send and receive)	368.1, 404, 460, or 600
Words per Minute (wpm): (send and receive)	60, 66, 75, or 100
Power Demand:	150 watts
Motor Type:	Series governed
Motor Speed:	3600 revolutions per minute
Signal Bias Tolerances:	
Transmitted Signals:	5 percent maximum
Received Signals:	
368.1 opm:	40 percent maximum
600 opm:	35 percent maximum
Loop Resistance:	
120 volt battery (neutral):	2000 ohms
60 volt battery (polar):	3000 ohms
End Distortion Tolerance: (Received signals only)	
368.1 opm	Maximum 35 percent spacing end distortion
600 opm	Maximum 30 percent spacing end distortion
Range Adjustment:	Scale calibrated 0-120, 100 scale units equal width of one unit signal pulse (22 milliseconds at 368.1 opm)
Total Weight of Installed Equipment with Full Roll of Paper and Tape:	192-1/2 lbs. approx.

AN/FGC-25X (Cont'd.)

COMPONENTS

CHARACTERISTICS:

Teletypewriter

Characters Per Line:  
Type of Paper Feed:  
Paper Capacity:

Functions:

Carriage Return:  
(Car. Ret. Key or  
automatic):  
Line Feed (Line Feed Key  
or automatic):  
Figure Shift (Figs Key):  
Letters Shift (Ltrs. Key):  
Motor Stop (Upper case  
"H" Key):

Signal Bell (Upper case  
"S" Key):  
Space (spacebar):

Reperforator-Transmitter

Type of Tape Feed:  
Tape Capacity:

Power Supply:

Patch Panel:

TT-119A/FG

72  
Friction or Sprocket  
Adjustable to accommodate standard 1-through  
5-copy roll, fanfold paper, or sprocket-fed  
forms 18-1/2 inches wide

Returns carriage to left margin

Feeds paper one or two lines  
Raises platen to upper case (figures) position  
Lowers platen to lower case (letters) position

Stops motor of all interconnected teletype-  
writers equipped with motor stop features

Rings signal bell  
Moves carriage to right without printing

TT-178A/FG

Sprocket  
Enough for approximately 5 hours 20 minutes at  
60 wpm operation; 3 hours 10 minutes at 100 wpm  
operation  
Operates between 95 and 250 volts, 50-60 cycles,  
single phase, ac input  
Provides convenient circuit interconnections

OTHER TECHNICAL CHARACTERISTICS:

Primary Power Requirements  
for AN/FGC-25X:

440 watts (approx.), 95-250 vac,  
50-60 cps, single phase

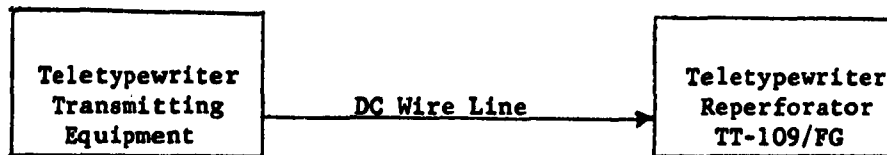
**TT-109/FG**

**FUNCTION:**

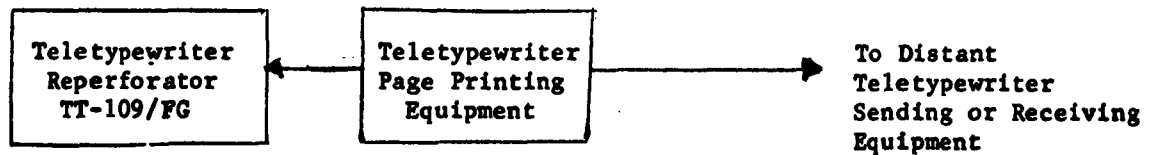
Teletypewriter-Reperforator TT-109/FG is a receive only, lightweight reperforator which prints and perforates on a 7/8 inch wide paper tape.

Accepting start-stop 5 unit code impulses, the reperforator may be used as follows:

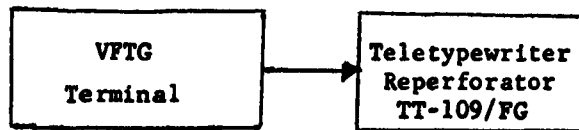
- a) As line terminating equipment for dc signal line.
- b) With teletypewriter page printing equipment when either monitor or tape copy is required.
- c) Directly from carrier or radio telegraph systems with appropriate VFCT systems or carrier terminals.



a) Direct Wire Line



b) Monitoring Page Printing Equipment



c) VF Carrier or Radio Equipment

**ENGINEERING DRAFT**

**TT-109/FG** (Cont'd)

**MANUFACTURER:** Kleinschmidt Laboratories  
Division of Smith-Corona Marchant, Inc.

**FEDERAL STOCK NO:** 5815-543-0658

**REFERENCE:** T.O. 31W4-2FG-181

**ESTIMATED COST:** \$1,200.

**PHYSICAL CHARACTERISTICS:**

**Dimensions:** 12-1/16" wide, 12-7/8" deep, 13-1/2" high  
**Volume:** 1.2 cu. ft. (approx.)  
**Weight:** 37.5 lbs.  
**Mounting:** Table or shelf type mount

**TECHNICAL CHARACTERISTICS:**

**Type of Characters:** English, standard communication symbols  
**Method of Recording:** Message printed and perforated on 7/8 inch wide paper tape  
**Type of Feed:** Sprocket  
**Signaling Code:** 5-unit, start-stop; stop impulses equals 1.42 unit interval  
**Speed:**

Words Per Minute (wpm)	Operations Per Minute (opm)	Baud/Sec.
60	368.1	45.5
66	404	50.0
75	460	57
100	600	75

**Line Current Requirements:** 60 or 20 ma neutral  
Not more than 30 ma polar

**Distortion Tolerances:**

**Bias:** 45 baud . . . . 40% maximum  
75 baud . . . . 35% maximum

**End Distortion:** 45 baud . . . . 35% marking or spacing  
75 baud . . . . 30% marking or spacing

**Tape Capacity:** Enough tape for 5 hours 20 minutes at 368.1 opm  
Enough tape for 3 hours 10 minutes at 600 opm

TT-109/FG (Cont'd.)

OTHER TECHNICAL CHARACTERISTICS:

Motor Type:	Series-governed
Motor Power Requirements:	150 watts, 105-125 vac, 50-60 cps, single phase
Range Adjustment: (For received signal bias and end distortion)	Scale calibrated 0-120; 100 scale units equal 1 unit pulse (22 milliseconds at 45 baud)
Bias Potentiometer:	Adjusts current flow in selector magnet bias windings.
Radio Frequency Suppression:	Teletypewriter does not interfere with radio reception at frequencies between .35 and 150 mc when located 2 feet or more from radio antenna.
Temperature Limits:	
Equipment in Use:	+32°F (0°C) to +132°F (55.6°C)
Equipment in Storage:	-80°F (-62.2°C) to +160°F (+71.1°C)

**TT-21/FG, TT-21A/FG TRANSMITTER-DISTRIBUTORS**

**FUNCTION:**

TT-21/FG and TT-21A/FG are transmitter-distributors used with cryptographic equipment. These transmitter-distributors translate code combinations from fully perforated or chadless tape into electrical impulses which are set up locally and then combined with impulses from an external source. The combined signals, then, are used in teletypewriter transmitting and receiving circuits in which cryptographic equipment is installed.

Both transmitter-distributor models use series-governed motors with contact filters. The major difference between models is that the TT-21A/FG has a torn tape stop feature included.

**MANUFACTURER:**

Teletype Corporation  
Skokie, Illinois

**FEDERAL STOCK NO:**

TT-21/FG: 5815-222-4294  
TT-21A/FG: 5815-543-1317

**REFERENCE:**

T.O. 31W4-2-101

**ESTIMATED COST:**

\$538.

**STATUS:**

No longer manufactured

**COMMERCIAL DESIGNATIONS:**

TT-21/FG: XD228 (XD100GW)  
TT-21A/FG: XD224

**PHYSICAL CHARACTERISTICS:**

**Dimensions:**

9" wide, 15-1/2" deep, 8-3/4" high

**Volume:**

0.68 cu. ft.

**Weight:**

35 lbs.

**Mounting:**

Table or shelf type

**TECHNICAL CHARACTERISTICS:**

**Type of Tape:**

Chad or chadless (7/8 or 11/16 inches wide)

**Type Tape Feed:**

Mechanical

**Signaling Code:**

5 unit start-stop

**Type of Signals:**

60 ma neutral

**Speed (sending):**

368.1 or 404 opm

**ENGINEERING DRAFT**

TT-21/FG, TT-21A/FG (Cont'd)

Type of Motor:  
Speed (Motor):  
Tuning Forks:

Series-governed  
2,102 rpm (368.1 opm) or 2,308 rpm (404 opm)  
Stroboscopic; 87.6 vps (vibrations per second)  
for 368.1 opm and 96.19 vps for 404 opm

OTHER TECHNICAL CHARACTERISTICS:

Primary Power Requirements:

90 watts, 105-125 vac, 20-60 cps, single phase



CV-2C/TX

FUNCTION:

The CV-2C/TX is an AM to FM and FM to AM converter used with a FAX transceiver and a radio transmitter or receiver. Provisions are made for plugging in a microphone and/or headsets.

MANUFACTURER:

Times Facsimile Corporation  
Wilcox-Gay Corporation

FEDERAL STOCK NO:

5815-503-2598

REFERENCE:

3192-2TX-111

ESTIMATED COST:

\$642.

STATUS:

No longer manufactured

PHYSICAL CHARACTERISTICS:

Dimensions:

13-5/8" wide, 11-9/16" deep, 9-1/2" high

Volume:

0.82 cu. ft. (approx.)

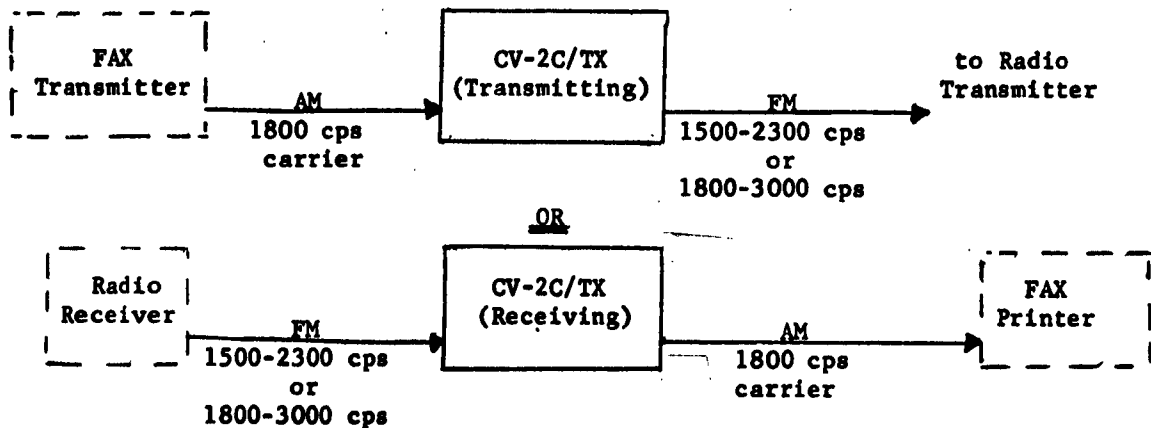
Weight:

32 lbs.

Mounting:

Shelf or table type

TECHNICAL CHARACTERISTICS:



INPUT

Number:

2

Mode:

1 FM (Radio Rcvr.); 1 AM (FAX Transmitter)

Frequency:

1500-2300 cps or 1800-3000 cps (Radio Side)  
1800 cps carrier (FAX Side)

Impedance:

5000 ohms (Radio Side)

600 ohms (FAX Tranceiver Side)

Levels:

-40 dbm Min. (Radio Side)

**ENGINEERING DRAFT**

CV-2C/TX

FUNCTION:

The CV-2C/TX is an AM to FM and FM to AM converter used with a FAX transceiver and a radio transmitter or receiver. Provisions are made for plugging in a microphone and/or headsets.

MANUFACTURER:

Times Facsimile Corporation  
Wilcox-Gay Corporation

FEDERAL STOCK NO:

5815-503-2598

REFERENCE:

31S2-2TX-111

ESTIMATED COST:

\$642.

STATUS:

No longer manufactured

PHYSICAL CHARACTERISTICS:

Dimensions:

13-5/8" wide, 11-9/16" deep, 9-1/2" high

Volume:

0.82 cu. ft. (approx.)

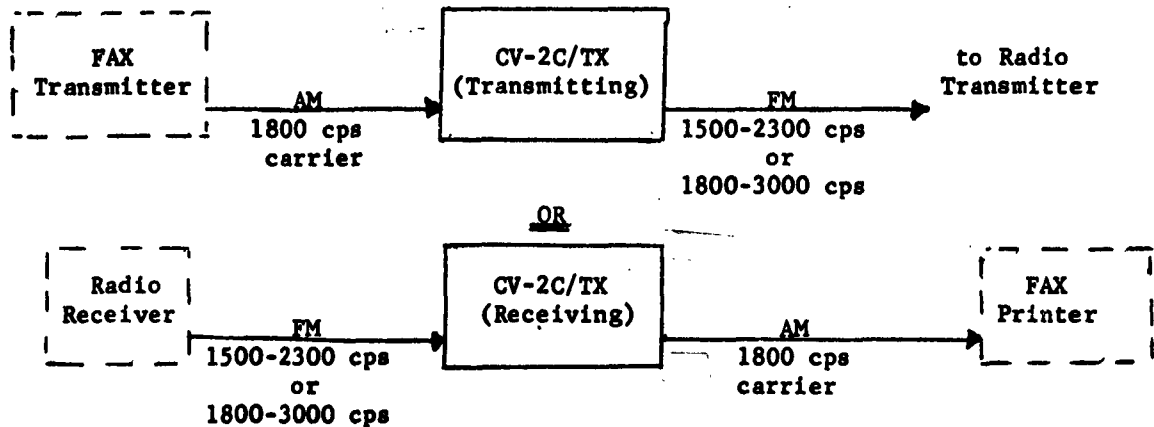
Weight:

32 lbs.

Mounting:

Shelf or table type

TECHNICAL CHARACTERISTICS:



INPUT

Number:

2

Mode:

1 FM (Radio Rcvr.); 1 AM (FAX Transmitter)

Frequency:

1500-2300 cps or 1800-3000 cps (Radio Side)  
1800 cps carrier (FAX Side)

Impedance:

5000 ohms (Radio Side)

600 ohms (FAX Tranceiver Side)

Levels:

-40 dbm Min. (Radio Side)

**ENGINEERING DRAFT**

CV-2C/TX (Cont'd)

**OUTPUT**

Number:	2
Mode:	1 AM (FAX Printer); 1 FM (Radio Transmitter)
Frequency:	1800 cps carrier (FAX Side) 1500-2300 cps or 1800-3000 cps (Radio Side)
Impedance:	100-600 ohms (FAX Side) 100 ohms (Radio Side)
Levels:	+2 dbm (FAX Side) + 10 dbm max. (Radio Side)

OTHER TECHNICAL CHARACTERISTICS:

Contrast Range:	8 to 15 db (FAX Side)
Frequency Response:	900-2700 cps (FAX Side)
Primary Power:	50 w, 155 vac, 50-70 cps, single phase.

AN/TXC-1F

FUNCTION:

The Facsimile Set AN/TXC-1F is an electro-mechanical facsimile set of the revolving drum type for the transmission and reception of page copy. Although colored copy may be transmitted, the reproduction is always in black, white, and intermediate shades of gray. Received copy is recorded either directly on chemically coated paper or photographically in either negative or positive form. The equipment will transmit or receive a page of copy 12 by 18 inches in 20 minutes. This set has provision for transmitting or receiving copy at half speed.

MANUFACTURER:

Times Facsimile Corporation

FEDERAL STOCK NO:

REFERENCE:

T.O. 31S2-TXC1-1 \*

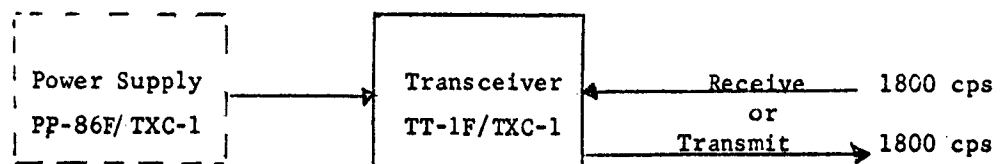
STATUS:

No longer manufactured

PHYSICAL CHARACTERISTICS:

Dimensions: 37" wide, 22" deep, 42-3/4" high  
Weight: 320 lbs.  
Volume: 20.2 cu. ft. (approx.)  
Floor Space: 5.7 sq. ft.

TECHNICAL CHARACTERISTICS:



INPUT

Signal Level: -45 to 0 dbm (for reception)

OUTPUT

Signal Level: 0 to +26 dbm (for transmission)

OTHER TECHNICAL CHARACTERISTICS:

Facsimile Transceiver

TT-1F/TXC-1

Type of Equipment:

Rotating drum type

Functions:

Transmitting or receiving signals

Type of Copy:

Page

**ENGINEERING DRAFT**

AN/TXC-1F (Cont'd.)

OTHER TECHNICAL CHARACTERISTICS: (cont'd.)

Maximum Size of Copy:	12 by 18-11/16 inches
Size of Scanning Spot:	1/96 inch
Type of Recording:	Direct, or photographic positive or negative
Drum Diameter:	6 inches
Speed of Drum (Rotation):	1/2 or 1 revolution per second
Lateral Movement:	12 inches in 20 minutes or 40 minutes
Scanning Lines per Inch:	96
Index of Cooperation:	576
Audio Carrier Frequency:	1800 cps
Type of Modulation:	AM
Frequency Bandwidth:	1800 cps maximum
Frequency Band Limits:	900-2700 cps
Drum Speed Control:	Synchronous motor controlled by 1800 cps fork oscillator, or 900 cps multivibrator (or external radio source)

Rectifier Power Unit

PP-86F/TXC-1

Input Power Source:	100-130 volts, 50-65 cps 250 watts at 115 volts
Signal Source:	1800 cps from fork oscillator
Output:	
Unregulated Plate Supply:	450 volts at 270 ma
Filament Supply:	6.5 vac at 6.25 amperes
Start Motor Supply:	115 vac at 0.5 amperes
Exciter Lamp Supply:	Regulated 6 volts, 1800 cps at 2.74 amperes ±0.1 v

R-388/URR RECEIVER

FUNCTION:

Radio Receiver R-388/URR is an HF communications receiver covering the frequency range from .5 to 30.5 mc in 30 bands

MANUFACTURER:

Collins Radio  
Cedar Rapids, Iowa

FEDERAL STOCK NO:

5820-644-0990  
5820-537-3895

REFERENCE:

31R1-2URR-121

APPROXIMATE PRICE:

\$743.00

STATUS:

No longer manufactured.

COMMERCIAL NAME:

51J3

PHYSICAL CHARACTERISTICS:

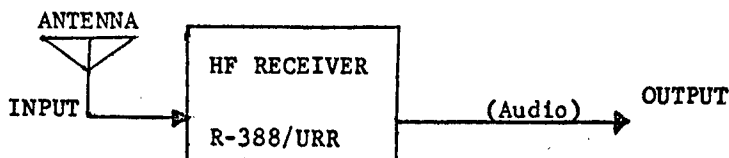
Dimensions:

19" wide, 10" high, 13.69" deep

Weight:

35 pounds

TECHNICAL CHARACTERISTICS:



INPUT

Frequency Range:

.5 to 30.5 mc

Types of Reception:

Voice, MCW, CW and FSK

Tuning:

Linear, divided into thirty 1-mc tuning steps

Calibration:

Direct reading in mc and kc

Method of Calibration:

Built-in 100 kc crystal oscillator

Calibration Points:

Every 100 kc

Frequency Stability:

Over-all stability within 1 kc for average conditions; within 2 kc for extreme conditions

Sensitivity:

A-M signal input of 5 microvolts maximum to produce 500 milliwatts power output at a signal-plus-noise-to-noise ratio of 10 to 1.

Selectivity:

Approximately 6 kc at 6 db down, and not greater than 20 kc at 60 db down (total bandwidth) from resonant frequency. With crystal filter in operation at 6 db down, the bandwidth may be varied from approximately .2 kc to 2.0 kc.

Spurious Signal

Responses:

Down at least 50 db

Antenna Input

Impedance:

Unbalanced to match short whip antenna (50 ohms, 100 micromicrofarads).

**ENGINEERING DRAFT**

R-388/URR RECEIVER (Cont'd)

OUTPUT

Output Impedances:	4 and 600 ohms
AVC:	Less than 4 db increase in audio power output with an increase in r-f signal from 5 to 125,000 microvolts
Audio Frequency Response:	With 1000 cps reference, response down not more than 3 db at 200 cps and not more than 7 db at 2500 cps

OTHER TECHNICAL CHARACTERISTICS:

Power Requirements:	115 or 230 volts AC, 45 to 70 cps, 85 watts
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MODEL 129 REGENERATIVE REPEATER

FUNCTION:

The Tele-Signal Model 129 Regenerative Repeater is a fully transistorized teletypewriter repeater unit which normalizes and re-shapes an input telegraph signal for transmission. The Model 129 is intended for use at standard telegraph speeds of 60, 75 and 100 words per minute. The unit also features start-stop signal speed conversion (non-storage) for speed changes less than 12 percent. The unit is designed to operate with an external time base generator and power supply similar to the Tele-Signal Model 129X Time Base and Power Supply.

MANUFACTURER:

Tele-Signal Corporation  
Hicksville, New York

FEDERAL STOCK NO:

REFERENCE:

Tele-Signal Corporation Regenerative Repeater Model 129 Instruction Book T.O. 31W2-4-11-1

ESTIMATED COST:

\$450.

STATUS:

Presently manufactured

COMMERCIAL DESIGNATION:

Regenerative Repeater Model 129

PHYSICAL CHARACTERISTICS:

Dimensions:

4" wide, 10-3/4" deep, 5-1/4" high

Volume:

0.13 cu. ft. (approx.)

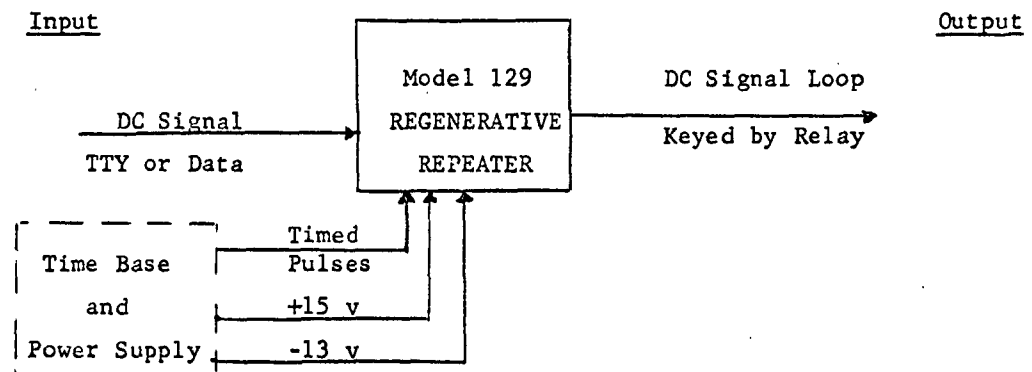
Weight:

4.75 lbs. (approx.)

Mounting:

Rack shelf type mount

TECHNICAL CHARACTERISTICS:



**ENGINEERING DRAFT**



MODEL 129 (Cont.)

INPUT

Signal Input: Neutral or polar, positive or negative, direct or inverted, square wave type or shaped binary signal.

Signal Code: 5 unit code with 1 or 1.42 element stop pulse. Provisions to accept one bit to 16 bit signal.

Signal Input Impedance: 200 ohms (neutral signals)  
1500 ohms (polar signals)  
6800 ohms (voltage keying)

Signal Input Currents:  
Neutral: 30 ma, 60 ma  
Polar: 20 ma

Voltage Keying: -6 volts minimum (across 6800 ohms)

OUTPUT

Signal Output: Output circuit is a plug-in relay, Automatic Electric Model 202

OTHER TECHNICAL CHARACTERISTICS:

Signal Speed: Standard 60, 75, 100 wpm. Provisions for conversion of start-stop telegraph codes from low speeds to higher speeds with conversion changes less than 12 percent.

Distortion: Unit will correct for Mark or Space distortion of 47 percent.

Sustained Signals: Unit will repeat continuous Mark or Space signals.

Monitoring Provisions: Front panel test points for in-service monitoring.

Adjustments:  
(Recessed) Input signal bias corrector  
Output signal bias corrector

Operational Controls:  
a) Speed selector switch  
b) Functional switch  
    1). By Pass  
    2). Regeneration  
    3). Speed Conversion

Ambient Temperature:  
Operating: 0°C (32°F) to 55°C (121°F)  
Storage: -30°C (-22°F) to 65°C (149°F)

Auxiliary Equipment Required: Power Supply  
Time Base Generator  
Stepping Pulse Source (Optional)

Power Consumption: 2.5 watts (approx.)

Voltage Requirements: +15v±10% (B+), -13.5 v ±10% (B-)

General: Unit has strapping provisions for signal input/output adaption

**TD-410/UGC (MODEL 123) MULTIPLEXER**

**FUNCTION:**

The TD-410/UGC Multiplexer or Model 123 is a fully transistorized frequency division multiplexer unit. The unit accepts two independent 375-3075 cps voice frequency (vf) channels. (The 375-3075 cps input channel may carry a facsimile, a 16-channel telegraph, or a voice telephone signal). The two inputs are combined into a 375-5915 cps vf output channel for radio single sideband or independent sideband transmission.

**MANUFACTURER:**

Tele-Signal Corporation  
Hicksville, New York

**FEDERAL STOCK NO:**

5805-863-9653

**REFERENCES:**

T.O. 31W4-4-38-1  
NAVSHIPS 93856A

**ESTIMATED COST:**

\$700.

**STATUS:**

Presently manufactured

**COMMERCIAL DESIGNATION:**

Multiplexer, Model 123

**PHYSICAL CHARACTERISTICS:**

**Dimensions:**

8" wide, 10-3/4" deep, 5-1/4" high

**Volume:**

0.26 cu. ft.

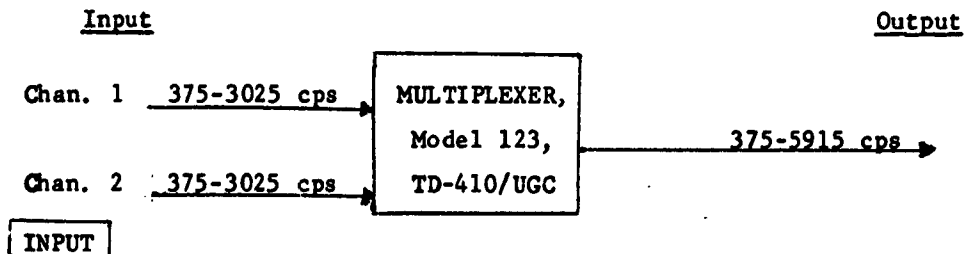
**Weight:**

10 lbs. (approx.)

**Mounting:**

Rack shelf mounting similar to Tele-Signal Model 139 Equipment Shelf

**TECHNICAL CHARACTERISTICS:**



**Number Channels:**

2 independent

**Channel Mode:**

Telephone, Telegraph, Facsimile

**Frequency Bandwidth:**

375-3025 cps

**Impedance:**

600 ohms balanced, each input

**ENGINEERING DRAFT**

TD-410/UGC (Cont'd.)

TECHNICAL CHARACTERISTICS: (Cont'd.)

INPUT

Levels (per input channel):

Telephone:	-15 to +4 dbm
Telegraph:	-25 to +4 dbm (16 channel TTY)
Facsimile:	-15 to +4 dbm

OUTPUT

Number Channels:	1
Mode:	Frequency division multiplex
Frequency Bandwidth:	375-5915 cps
Impedance:	600 ohms balanced
Normal Levels:	
Telephone:	-4 dbm
Telegraph:	-10 dbm per channel
(16 channel TTY)	
Facsimile:	0 dbm
Maximum Level:	
Single Frequency:	+16 dbm

OTHER TECHNICAL CHARACTERISTICS:

Internal Carrier:	
Stability:	1 part per $10^5$
Accuracy:	$\pm 0.1$ cps at 6290 cps
Operating Temperature:	0° to 50°C (32° to 122°F)
Monitoring Facilities:	a) VU meter
	b) 6 front-panel test points
Primary Power Requirements:	4 watts (approx.), 115/230 vac, 50-60 cps, single phase
General:	Transistorized equivalent of TD-97/EC2-2 vacuum tube multiplexer.

TD-411/UGC (Model 124) DEMULTIPLEXER

FUNCTION:

The TD-411/UGC Demultiplexer or Model 124 is a fully transistorized frequency division demultiplexing unit. The unit accepts a 375-5915 cps signal multiplexed by a TD-410/UGC Multiplexer or a similar device, and separates two combined voice frequency (vf) channels into two independent 375-3075 cps vf channels. The unit is a transistorized equivalent of the TD-98/FGR-3 Demultiplexer

MANUFACTURER:

Tele-Signal Corporation  
Hicksville, New York

FEDERAL STOCK NO:

REFERENCE:

NAVSHIPS 93857A

ESTIMATED COST:

STATUS:

Presently manufactured

COMMERCIAL DESIGNATION:

Demultiplexer, Model 124

PHYSICAL CHARACTERISTICS:

Dimensions:

8" wide, 10-3/4" deep, 5-1/4" high

Volume:

0.26 cu. ft.

Weight:

10 lbs. (approx.)

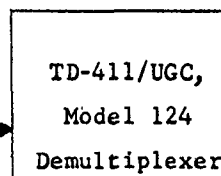
Mounting:

Rack shelf mounting similar to Tele-Signal Model 139 Equipment Shelf

TECHNICAL CHARACTERISTICS:

Input

375-5915 cps



Output

Chan. 1

Chan. 2

INPUT

Number Channels:

1

Channel Mode:

Frequency division multiplex

Frequency Bandwidth:

375-3025 cps

Impedance:

600 ohms balanced

Levels:

Telephone:

-15 to +4 dbm

Facsimile:

-15 to +4 dbm

Telegraph:

-25 to +4 dbm (16 channel TTY)

**ENGINEERING DRAFT**

TD-411/UGC (Cont.)

**OUTPUT**

Number Channels:	2 independent
Channel Mode:	Telephone, Facsimile or Telegraph
Frequency Bandwidth:	375-3025 cps (each output)
Impedance:	600 ohms balanced (each output)
Normal Levels:	
Telephone:	-4 dbm
Facsimile:	0 dbm
Telegraph:	-10 dbm per channel (16 channel TTY)
Maximum Level:	
Single Frequency:	+16 dbm

OTHER TECHNICAL CHARACTERISTICS:

Internal Carrier:	
Stability:	1 part per $10^5$
Accuracy:	$\pm 0.1$ cps at 6290 cps
Operating Temperatures:	0°C to 50°C (32°F to 122°F)
Monitoring:	6 front-panel test points, VU meter, neon "power-on" pilot lamp

MODEL 210A

2 KW KLYSTRON AMPLIFIER

**FUNCTION:**

Model 210A, 2 KW Klystron Amplifier is an r-f power amplifier designed to operate over the frequency range of 7125-7750 mc. It has a 2 kilowatt output and a minimum gain of more than 40 db. Three VA 856 tubes are required to cover this frequency range. Each klystron covers a frequency range of 300 mc (approximately). Only one klystron tube is installed in the equipment at any one time.

**MANUFACTURER:**

Sierra Electronics Corporation  
Division of Philco Corporation

**FEDERAL STOCK NO:**

**REFERENCE:**

T.O. 31R2-4-123-1

**ESTIMATED COST:**

**STATUS:**

**ENGINEERING DRAFT**

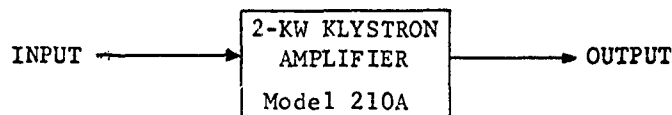
MODEL 210A (cont'd.)

CHARACTERISTICS:

Physical:

Dimensions:	44-1/2" wide, 27" deep, 84" high
Weight:	1800 lbs.
Volume:	58.8 cu. ft.
Floor Space:	32 sq. ft.

Technical:



INPUT:

Required Power:	0.5 to 1.5 watts
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OUTPUT:

Power:	2 KW *
Gain:	40 db minimum

OTHER:

Input Power Requirements:	120/208 volts (±5%), 3 phase, 4 wire, 13 KVA,* 50/60 cps
Frequency Range:	7125-7750 mc *
Frequency Bandwidth	
Stagger Tuned:	15 mc at half-power points *
Sync Tuned:	10 mc at half-power points *
Spurious Radiation:	*
Amplifier Operating Ambient Temperature Range:	-18° to +50°C
Cooling Unit Operating Ambient Temperature Range:	-40° to +50°C
R-F Input Connection:	UG-343A/U
R-F Output Connection:	UG-344A/U
Cooling Unit Dimensions:	25-1/2" wide, 42" deep, 33-1/2" high
Cooling Unit Weight:	500 lbs.
Cooling Unit Volume:	44 cu. ft.

\* Specific performance figures are determined by the individual VA856 tube installed.

CV-472/GXR

FUNCTION:

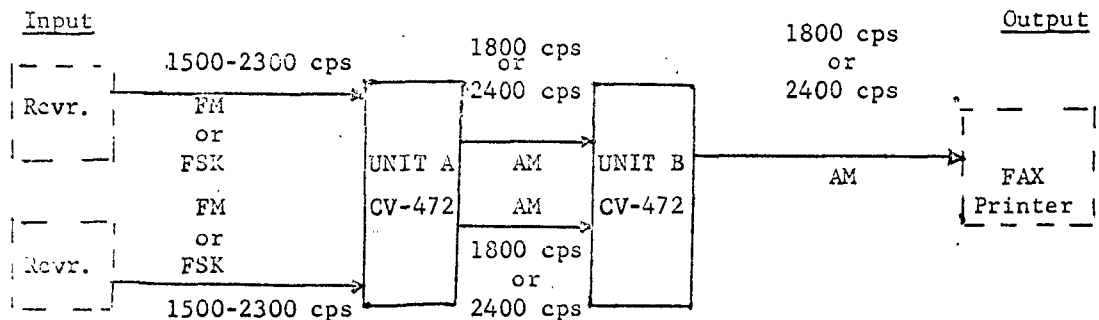
The Facsimile Diversity Receiving Converter/Combiner Type CV-472/GXR is a receiving converter for frequency shift or sub-carrier frequency modulated (SCFM) facsimile transmissions. The set consists of two units. The receiving converter unit, Unit A, accepts audio FM signals from two radio receivers in diversity operation. Each receiver channel is converted to an amplitude modulated signal which is fed into a diversity combiner, Unit B. This unit combines the signals into a single AM carrier signal for either line transmission or direct feed into a facsimile printer.

MANUFACTURER: Mars Electronics, Syosset, New York  
FEDERAL STOCK NO: 5815-776-1608  
REFERENCE: T.O. 31W4-4-27-1  
ESTIMATED COST: \$800.00  
STATUS: Presently available

PHYSICAL CHARACTERISTICS:

Dimensions: 19" wide, 16" deep, 14" high  
Volume: 2.5 cu. ft. (approx.)  
Floor Space: Cabinet rack mounted  
Weight: 77 lbs.

TECHNICAL CHARACTERISTICS:



INPUT

Number: 1 (normal) or 2 (diversity)  
Type: Audio (FM or FSK)  
Frequency: 1500-2300 cps  
Impedance: 600 ohms  
Levels: -45 dbm to +5 dbm

**ENGINEERING DRAFT**



CV-472/GXR (Cont'd.)

OUTPUT

Number:	1
Type:	AM
Frequency:	1800 cps DSB; 2400 cps double or vestigial sideband
Impedance:	600 ohms balanced
Levels:	-30 dbm to +10 dbm
Contrast Range:	Variable from 8 db to 20 db in 5 steps

OTHER:

Picture Signal Bandwidth:	0-900 cps (using supplied plug-in filter)
De-emphasis Time Constant:	1000 microseconds
Reception:	Positive or negative copy (controllable)
Tuning Indicator:	1500 cps or 2300 cps (each within $\pm 10$ cps)
Primary Power:	0.262 KVA, 115 V, 50-60 cps, single phase

CV-473/GXT

FUNCTION:

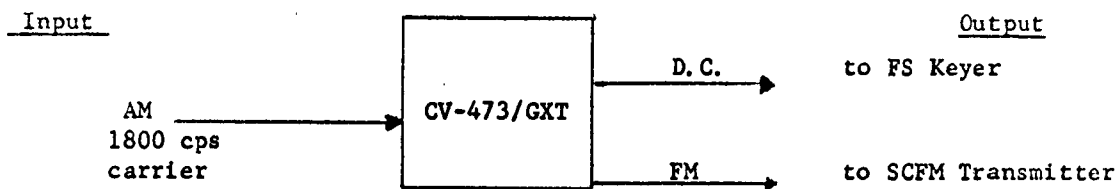
The Facsimile Transmitting Converter, Type CV-473/GXT is a transmitting converter used to convert the 1800 cps amplitude modulated carrier from a facsimile transmitter to a D.C. picture signal for application to a frequency shift radio transmitter or to a frequency modulated sub-carrier for sub-carrier frequency modulation (SCFM) transmission. Included in the converter is provision for the use of pre-emphasis on the picture signal.

MANUFACTURER: Mars Electronics, Syosset, New York  
FEDERAL STOCK NO: 5815-776-9706  
REFERENCE: T.O. 31W4-4-28-1  
ESTIMATED COST: \$800.00  
STATUS: Presently available

PHYSICAL CHARACTERISTICS:

Dimensions: 19" wide, 12" deep, 7" high  
Volume: .93 cubic feet (approx.)  
Floor Space: Cabinet rack mounted  
Weight: 34 lbs.  
Mounting: Rack Type, horizontal chassis

TECHNICAL CHARACTERISTICS:



INPUT

Number: 1  
Type: AM (1800 cps carrier)  
Impedance: 600 ohms balanced  
Levels: -45 dbm to +10 dbm

**ENGINEERING DRAFT**

CY-473/GMT (Cont'd.)

OUTPUT

Number:	2
Type:	1 FM, and 1 D.C.
Frequency:	1500-2300 cps within 1 db
Impedance:	600 ohms balanced (FM) 6500 ohms (D.C.)
Levels:	Variable up to +6 dbm rms for SCFM operation (terminated in 600 ohms)  0 v to 10 v negative, (-10 v max. D.C. level for undistorted operation at maximum signal from FAX transmitter)

OTHER TECHNICAL CHARACTERISTICS:

Signal Bandwidth Filter:	0-900 cps (greater bandwidths may be obtained with appropriate plug-in filters)
SCFM Bandwidth:	1500-2300 cps
Pre-emphasis Time Constant:	1000 microseconds
Tuning Indicator:	1500 cps and 2300 cps (each within $\pm 10$ cps)
Primary Power:	160 watts, 105-125 v, 50-60 cps, single phase