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"FLY-AWAY" SYSTEM

SY-1034

GENERAL

INSTRUCTIONS

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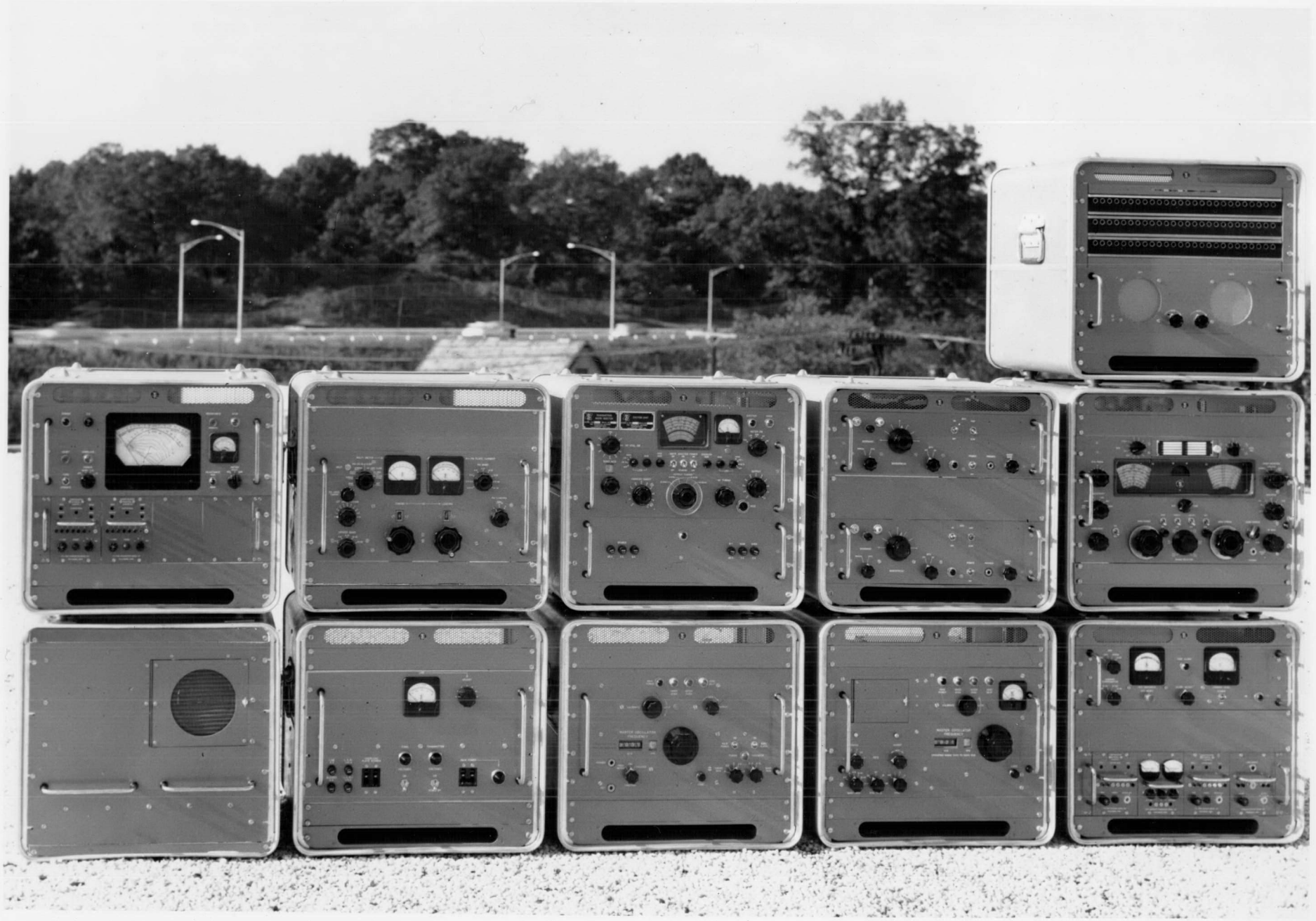

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SECTION I

INTRODUCTION

The new TMC "Fly-Away" transmit/receive stations have been designed primarily to answer the need for readily transportable, quick reaction communications systems. The systems are physically rugged and electrically reliable. This has been achieved by using thoroughly field proven, modern TMC equipments.

The equipment, cables, and spare parts are housed in sturdy, splash-proof fiberglass cases which, in certain instances, may also be used as shipping containers without additional packing. The transmitter's high voltage power supply, TMC Model PS-5 is fitted into a specially designed heavy duty fiberglass case.

See Table I for list of equipments furnished.

Particular care has been exercised in the fabrication of the interconnecting cables to insure long life with repeated use, and to simplify installation and minimize installation time. Only a 115/230 volt primary power source and antenna transmission lines are necessary for the system to operate. Teletypewriter operation is available with the addition of a send-receive teletypewriter unit.

SECTION II

SYSTEM CAPABILITY

This system, composed of 11 operating cases, is in the truest sense, a complete communication station with both transmitting and receiving facilities (see figures 1 and 11 for suggested layouts). The transmitter will deliver 1000 watts PEP output. While designed primarily for independent sideband (ISB) operation, it should be pointed out that the individual receiving and transmitting equipments are capable of single sideband(SSB), double sideband(DSB), amplitude modulation(AM), carrier wave(CW), frequency shift keying(FSK) or audio frequency shift keying(AFSK). When using ISB, DSB or SSB modes, the carrier may be reinserted at will to any degree required for the transmission involved. As supplied, the "Fly-Away" station is capable of SSB, ISB, DSB, AM or AFSK. The normal mode of operation will be ISB with a command voice channel on one sideband and a tone diversity teletypewriter channel on the other sideband. If additional teletypewriter channels become necessary for future requirements, additional tone equipment may be added to the system.

The system operates in the H.F. spectrum between the frequencies of 2 and 31.5 megacycles. With the advent of suppressed carrier sideband communications, the H.F. band has been given a new impetus as a result of the field proven ability and efficiency of SSB on short and long haul circuits. SSB has proven its inherent advantages as compared to AM, by demonstrating its reliability in high noise or auroral absorption areas. With the sunspot cycle declining and consequently, the higher end of the H.F. band becoming less useable in the years to come, SSB will become even more useful in the more crowded lower segment of the H.F. band. Therefore, considering the wide band coverage and efficient mode of operation, these systems will provide continuing

reliable service under adverse conditions for both short and long haul circuits on a quick reaction basis.

The antennas included with the station are compatible with this objective. A quickly erectable vertical transmitting and a separate vertical receiving antenna are included for immediate operation upon arrival at the station site. As time permits, higher gain, sloping "V" antennas may be erected to operate more efficiently on long haul point to point circuits.

The system has been designed for full duplex operation wherein the transmitting and receiving functions are on different frequencies. This will permit simultaneity of transmitting and receiving.

System flexibility has been extended by including an audio and dc patching facility. This not only involves interconnection of units in the system, but also may be used to enter a telephone circuit.

SECTION III

THEORY OF OPERATION

(Refer to Block Diagram Drawing Figure 12 (SY-1034-15)

A. TRANSMITTING SECTION.

Operationally, the heart of the transmitting section is the TMC Model SBE-2, Transmitting Mode Selector, which is basically a filter type sideband exciter. This unit generates the signal for one of the various modes of operation, and in this system, provides the inputs and controls for the microphone or RTTY tone transmitter. In addition, the SBE-2 provides such transmitting controls as carrier insertion, voice control(with antitrip features), adjustable gain, and squelch.

A stable variable master oscillator, Model PMO-5 is used as the basic frequency determining element. The PMO-5 is connected directly into the Model SBE-2.

The model SBE-2 feeds the TMC Model PAL-1K, class AB-1 linear power amplifier. This unit will deliver 1000 watts output PEP for sideband and 1000 watts CW or FS. The amplifier operates continuously from 2 to 32 megacycles. Transmitting power supplies, Models PS-4 and PS-5, are heavy duty units with an adequate safety factor. The output of the linear amplifier Model RFD-1 is a pi network which will match any unbalanced load from 50 to 600 ohms at $\pm$45 degrees. The output of this pi-network is fed, via a 50 ohm coaxial cable, type RG-8/U to the TMC Antenna Tuning System, Model ATS-2.

The Model ATS-2 couples the output of the 1000 watt amplifier to a 35 foot vertical whip antenna. The antenna system covers the 2-32 mc frequency range with minimum insertion loss. The Model ATS-2 provides the necessary inductance and capacitance to resonate the antenna at the operating frequency.

When the "V" antenna is us d, the pi-network output of the amplifier is fed via a 70 ohm coaxial cable, type RG-11/U, to a broadband

transmitting antenna coupler Model TRC-3500, (supplied), and thence to the antenna.

Both the transmitting and receiving "V" antennas are packed in kit form, complete with balanced transmission line, terminating resistors, ground rods, radial systems and all necessary hardware.

B. RECEIVING SECTION

Two receiving antennas are provided; a vertical whip, TMC Model VRA-2, with a built-in broadband impedance matching transformer, for fast installation, and a sloping "V" for a more permanent installation. The sloping "V", when used, is connected to a broadband antenna transformer, TMC Model RAC-30A, also supplied as part of the overall station. The receiver, TMC Model GPR-90RXD, is fed by a 70 ohm coaxial line (RG-11/U). This receiver provides the R.F. circuitry for tuning the desired signal.

The first conversion oscillator of the GPR-90RXD may be crystal controlled by selecting any one of the ten crystal positions for r gular net operation. This oscillator may also be controlled by an extrem ly stable Variable Master Oscillator, TMC Model VOX-3. For maximum stability the VOX-3 contains three (3) oven controlled crystal positions. The VOX-3 also provides the second conversion injection voltage at 3.500 mc. The signal is then taken from the receiver at the second I.F. frequency of 455 Kcs and paralleled to two (2) receiving mode selectors (TMC Models MSR-6). These units provide for selection of the desired sideband, detection and amplification of the signal to drive a speaker or teletypewriter tone receiver. The Tone Receivers separate and select the strongest diversity tone and provide keying for the teletypewriter receiver.

An automatic frequency control unit, TMC Model AFC-1 is supplied to control the frequency of the receiving mode selector that is used for detection of the narrow shift teletypewriter signal Model MSR-6 and AVC of the receiver GPR-90RXD. The AFC-1 provides automatic frequency control of less than ± 4 cycles frequency error for reception of narrow shift RTTY.

The Model AFC-1 will correct for up to ± 1000 cps drift at a drift rate of up to 50 cps per second. If the carrier signal fades during the operating period, a built-in memory circuit retains the drift information for approximately 30 seconds, thus holding the receiving system at the corrected frequency. The AFC-1 features an automatic gain control derived from the carrier. A front panel switch allows for various time constants, FAST, MEDIUM and SLOW depending upon the circuit conditions. A fourth position, MANUAL, allows the AVC circuit of the receiver to take over.

To extend the flexibility of the entire system, an audio/dc patching panel, TMC Model CPP-4, has been included. This panel will permit complete interconnection of necessary audio or dc inputs and outputs. This unit will also permit patching telephone lines into the equipment in almost any manner desired.

A TMC Model LSP-7, Loudspeaker Panel has been included for monitoring purposes.

Operating spare parts (tubes, lamps and fuses) are shipped with the station and are packaged in a separate fiberglass carrying and storage case. (See Figures 2 and 3).

SECTION IV

PACKING

A. DESCRIPTION

The TMC "Fly-Away" transmit/receive station is packaged for transit in 18 cases. The cases are numbered consecutively from one to eighteen and are of two types. (See Table I). Cases numbered one (1) through twelve (12) are splash proof fibreglass carrying and operating cases. Cases numbered thirteen (13) through eighteen (18) are of sturdy wood construction and have been designed to be reuseable for transit and storage after a communications mission has been completed.

The fibreglass cases are of three (3) types. Case number one (1), TMC Model TOC-1, is of exceptional heavy duty construction and was designed specifically to contain the high voltage power supply Model PS-5. In addition, the TOC-1 has two (2) handles on each side of the case to facilitate handling.

The TOC-1 has a steel structure on the interior of the case that distributes the load across the bottom and up the sidewalls of the case. Across the bottom and along the exterior sidewalls, a molded aluminum band has been utilized to distribute the load. The fibreglass is sandwiched between these layers of metal. The handles are attached to the metal reinforcing members and consequently, the load of the equipment is carried entirely by the metal "cradle." The fibreglass is, in effect, acting only as a water and dust resistant cover.

Cases number two (2) through eleven (11), TMC Model TOC contain the rest of the station operating equipment. These are also splash proof fibreglass cases and are designed to house the equipment in operation as well as in transit and storage.

Case number twelve (12), TMC Model TOC-2 is also of fibreglass construction and contains the operating spare tubes, lamps and fuses.

For convenience, a list of the spare parts is located on the inside of the cover of this case.

Case number thirteen (13) contains the sloping "V" transmitting antenna, Model SVA 7.5T, and all the necessary accessories for installation. Each of the various antennas for the station have been packaged separately to facilitate installation and minimize the possibility of not having a specific component after arriving at the location for erecting the antenna. This case is of sturdy wooden construction and is designed to be reuseable.

Similarly, case number fourteen (14) contains the sloping "V" receiving antenna, Model SVA-7.5R, and all necessary hardware. This case is also constructed of wood and is intended for reuse.

Case number fifteen (15) contains the vertical receiving antenna TMC Model VRA-2, base and transformer and case number sixteen (16) contains the vertical receiving whip. Both of these cases are of the reuseable wood construction.

Case number seventeen (17) contains the 35 foot vertical transmitting antenna and is part of the antenna tuning system Model ATS-2. The case also contains 100 feet of control cable, TMC CA-541-100, with appropriate connectors.

Following is a summary list in tabular form of the equipment contained in each case. Each case is marked with its number, description of articles contained, and federal designation number FSC-5820-NL1000, prominently displayed.

TABLE 1

SY-1034 "Fly-Away" Transmit/Receive Station Packing Schedule

CASE NUMBER	CASE TYPE	CONTENTS	QUAN.	DIMENSIONS L x H x W in.	CUBAGE CU.FT.	WT. LBS.
1.	TOC-1	High Voltage Power Supply TMC Model PS-5.	1 each	29-1/4 x 24-1/2 x 22	9.1	275
2.	TOC	Low Voltage Power Supply TMC Model PS-4.	1 each	29-1/4 x 24-1/2 x 22	9.1	153
3.	TOC	Portable Master Oscillator TMC Model PMO-5.	1 each	29-1/4 x 24-1/2 x 22	9.1	131
4.	TOC	Variable Master Oscillator TMC Model VOX-3.	1 each	29-1/4 x 24-1/2 x 22	9.1	141
5.	TOC	a. Automatic Frequency Control TMC Model AFC-1	1 each	29-1/4 x 24-1/2 x 22	9.1	147
		b. Diversity Tone Receiver Shelf containing Tele-Signal Corp. Model 102 Tone Receiver	2 each			
		Model 110 Comparator	1 each			
		Model 109 Switch	1 each			
		Model 139 Shelf	1 each			
6.	TOC	a. Antenna Tuning System Model ATS-MCU-2	1 each	29-1/4 x 24-1/2 x 22	9.1	103
		b. Tone Transmitter Shelf containing Tele-Signal Corp.	2 each			
		Model 101 Tone Transmitter	2 each			
		Masking Panels	2 each			
7.	TOC	Linear Power Amplifier TMC Model RFD.	1 each	29-1/4 x 24-1/2 x 22	9.1	128
8.	TOC	a. Sideband Exciter TMC Model SBE-2	1 each	29-1/4 x 24-1/2 x 22	9.1	165

CASE NUMBER	CASE TYPE	CONTENTS	QUAN.	DIMENSIONS L x H x W in.	CUBAGE CU.FT.	WT. LBS.
		b. Sideband Exciter Power Supply TMC Model SBE-PS.	1 each			
		c. Microphone TMC Model MK103	1 each			
9.	TOC	Mode Selector, Receiving TMC Model MSR-6.	2 each	29-1/4 x 24-1/2 x 22	9.1	145
10.	TOC	Communications Receiver TMC Model GPR-90RXD.	1 each	29-1/4 x 24-1/2 x 22	9.1	116
11.	TOC	a. AC & DC Patching Panel TMC Model CPP-4.	1 each	29-1/4 x 24-1/2 x 22	9.1	105
		b. Patch Cords	6 each			
12.	TOC-2	Operating Spares-Tubes, Lamps & Fuses (See separate packing list SY-1034-2 & SY-1034-3.	1 set	29-1/4 x 24-1/2 x 22	9.1	135
13.	Reuseable Wooden	Sloping "V" Transmitting Antenna Kit Model SVA-7.5T including:		97 x 18 x 12	12.1	420
		a. Hardware (See separate bill of materials SY-1034-13).	1 set			
		b. Transmitting Antenna Coupler TMC Model TRC-3500.	1 each			
		c. Sloping "V" terminating resistor Model TER-250(300) & Mounting Plate.	2 each			
14.	Reuseable Wooden	Sloping "V" Receivint Antenna Kit Model SVA-7.5R including:		96 x 18 x 12	12.0	365
		a. Hardware (See separate bill of materials SY-1034-13).	1 set			
		b. Rh mbic Antenna Coupler TMC Model RAC-30A.	1 each			

CASE NUMBER	CASE TYPE	CONTENTS	QUAN.	DIMENSIONS L x H x W in.	CUBAGE CU.FT.	WT. LBS.
15.	Reuseable Wooden	Vertical Receiving Antenna TMC Model VRA-2. Base and Transformer.	1 each	24-1/4 x 18 x 12	3.0	60
16.	Reuseable Wooden	Vertical Receiving Antenna TMC Model VRA-2, 18 foot Aluminum Whip.	1 each	77 x 3-1/4 x 2-1/4	3.3	20
17.	Reuseable Wooden	a. 35 foot Transmitting Whip Antenna TMC Model A-1486	1 each	79 x 8 x 12-1/4	4.5	120
		b. 60 foot 1/8 inch nylon guy line.	3 each			
		c. Guy Stake	3 each			
		d. Guy Ring	1 each			
18.	Reuseable Wooden	a. Antenna Tuning Unit TMC Model ATS-50TU-2.	1 each	27-3/4 x 23-1/2 x 29½	11	160
		b. 100 ft. Control Cable TMC Number CA-541-100.	1 each			
		c. 100 ft. RG-8/U Coaxial Transmission line.	1 each			

SECTION V

INSTALLATION

A. PRELIMINARY CONSIDERATIONS

1. POWER AND GROUNDING

Several criteria should be kept in mind when locating the "Fly-Away" station for operation. First, an adequate power source is required. The power necessary for full operation at the rated power output is 30 amperes at 115 volts 50/60 cycles, single phase, 3450 watts. The AC power distribution circuit of the system contains a ground wire and it is , therefore, desirable that a three wire (one ground) power source be employed. In addition, the system should be grounded at the station. This may be accomplished by using a ground strap with one end connected to one of the anchor bolts at the rear of the PS-5 and the other end connected to a ground rod or other earth ground such as an extensive cold water pipe system. The system may also be operated with 220 v by restrapping of the power transformers in the various units. CONSULT THE INDIVIDUAL INSTRUCTION MANUALS FOR DETAILS.

The system AC distribution system uses the compatible type power sockets with two parallel blades and separate ground pin. Therefore, either the standard two blade plug or the newer three wire grounding plug may be used. If an individual piece of equipment is not directly grounded by way of a three wire plug, it is interconnected with another unit which is grounded.

2. ANTENNAS

In addition to adequate power and grounding requirements, sufficient room for maximum displacement of the transmitting and receiving antennas is important. One hundred (100) feet of RG-8/U coaxial transmission line has been included for the transmitting whip antenna. This length should be fully utilized. The receiving antenna transmission line

should be as long as possible commensurate with line losses and space availability. For RG-8,9,10,11 or 12/U the loss is .65 db/100 feet.

Good foreground clearance and ground conductivity for the antenna field is desirable. Receiving antennas and open wire transmission lines should not be placed in the magnetic or electric field of power lines or transformers if it is avoidable.

3. INTERCONNECTION

The interconnect cables, indluding the AC power cables, have been made sufficiently long to permit stacking the eleven operating cases in either of two configurations. The basic stacking method(see drawing figure 1 (SY-1034-1) employs five (5) cases along the bottom row. The alternate method(see drawing figure 11(SY-1034-1) has only four (4)cases along the bottom and consequently requires less floor space for locating equipment. If sufficient floor space is available, it need not be considered as an installation criteria; personal preference based on operational ease will indicate which stacking method is to be used.

4. USE OUT-OF-DOORS

When installing the station out-of-doors, a small platform or waterproof ground covering should be placed under the operating cases to reduce the possibility of equipment damage from water or heavy dew. An easily removable waterproof top covering such as a canvas tarpaulin is desirable if the station is to be unattended for any period of time out-of-doors, even if located under a larger covering such as a tent.

5. SUMMARY

The entire station can be installed in a short period of time. Preliminary planning will save time in the long run. The exact location of the antennas, transmission line and transmission line building exits, and power outlets, should be determined and sufficient lengths of the various cables should be on hand.

B. INSTALLATION OF OPERATING EQUIPMENT

1. STACKING METHODS AND AC POWER

After the preliminary planning is complete and any forseeable problems have been solved, actual on-the-sight installation should begin. Start installation by removing the covers on the operating cases and stacking the cases according to the desired method, using th stacking feet on the tops and bottoms of the cases.

Next, the interconnecting cabling should be installed. (Note that top cover of PS-4 must be removed to install interconnect cable. Fanning strip is color keyed to terminal strip for proper positioning. Replace cover before installing point-to-point cables.) Plug in all power connections including the main power cable but be sure that the other end of the main power cable is left disconnected or the power switch open until all wiring is completed. Refer to drawing figure 7 (SY-1034-10) or drawing figure 8 (SY-1034-11) to locate the appropriate power socket for each power cable.

2. AUDIO AND RF WIRING

After connecting all AC power cables within the station itself, proceed to the audio and RF wiring. For your convenience and to facilitate assembly, all audio wiring has been incorporated within one harness. This harness is termed CA-1 and constitutes the next step in assembly. The harness is packed in case number eleven (11) with three fanning strips attached to the CPP-4, audio and DC patching panel, and one fanning strip attached to the LSP-7 speaker panel. Simply uncoil CA-1 and xtend the various cable breakouts to the appropriate terminal strips as indicated by the color code. In addition, figure 5 (SY-1034-7A) is a complete wiring diagram for the entire system and should be referred to if in doubt. All cables are cataloged in table A .

3. COLOR CODE

Three (3) colors are employed in the color code. The first two colors indicate the case into which the particular cable connector or fanning strip is to be attached. Each case is correspondingly coded with two color dots on the rear lower aluminum reinforcing band, approximately in the center. The third color of the code indicates the specific connector concerned within the particular case. When reading the colors, the widest band is to be noted first and then read as normal from left to right. Remember that all horizontal fanning strips are attached from the bottom and all vertical strips are attached from the right side of the terminal strip. The manner in which the wiring is arranged within the cases will, for the most part, indicate how the fanning strips and connectors are attached. Again, refer to tabl 4 for an enumeration of all cables, color codes, and their location within the system.

As an example of the use of the color coding, consider CA-1. One breakout of CA-1 attaches to the patching panel CPP-4 at terminal strip E109 or system terminal strip TS-8, which is the same point. Since this cable terminates in case number eleven (11) which is color coded blue and white the first and widest band on the cable is blue and the s cond is white. The third color on E109 or TS-8 is green. Consequently, the third color on FS-8 which attaches to TS-8 is also green.

After the audio harness CA-1 is installed, the remainder of the cabling may be completed. The color code will again be helpful and the system wiring diagram drawing figure 5 (SY-1034-7A) may be referenced for additional help. There is no particular order in which the remainder of the cables must be installed, but rather it is a matter of convenience and is left to the discretion of the individual operator.

4. OSCILLATOR OVENS

TURN ALL EQUIPMENT POWER SWITCHES TO OFF POSITION.

When all cables are in place, the main power cable should be plugged into an appropriate 115 v, 50/60 cps outlet or the main power switch thrown and the system energized. The power to the VOX-3, PMO-5 SBE-2, MSR-6 and AFC-1 should be switched on immediately. This will allow the oven controlled oscillators in these units to start their warm-up period. By the time the station is ready for operation, the oscillators within these units will be sufficiently stabilized for phon operation. It should be pointed out, however, that only the main power switch on each of these units must be closed for the ovens to be operative.

These units are highly stable precision instruments and require an initial warm-up period of at least forty-eight (48) hours of continuous duty for maximum stability. Thereafter, the unit should never be turned off, unless detailed repairs become necessary.

For narrow-shift RTTY, as employed in the "Fly-Away" Station, extr me frequency stability is required. Although the oscillators require approximately forty-eight (48) hours for maximum stability, they will be sufficiently stabilized in four (4) to five (5) hours for RTTY operation at somewhat reduced performance.

5. TELETYPEWRITER TERMINAL EQUIPMENT

When radio teletypewriter (RTTY) is to be used, the terminal equipment may be connected into the system at the rear of the patching panel CPP-4. The teletype send unit should be connected across pins one (1) and two (2) on E107 (TS-10) and the receive unit should be connected across pins three (3) and four (4) of E108 (TS9). Pin number one (1) on E107 is positive and pin number three (3) on E108 is positive. This polarity should be observed when connecting the current supplies of the

teletype equipment which are used for the 60 miliamp loop current. This method of keying is termed contact keying.

Remember that the "Fly-Away" station as shipped from the manufacturer's plant is wired for using external current supplies that are normally part of the teletypewriter terminal equipment. The Mod 1 109 (Tele-Signal Corporation) transistor switch has a built-in current supply that may be utilized if desired. To use the internal current supply, it is only necessary to turn the screwdriver operated switch on the front panel of the Model 109 to the internal (INT) position. When this is done, the polarity of the terminal equipment must be reversed. This may be accomplished by reversing the leads on pins three (3) and four (4) on E108 (TS-9) at the rear of the CPP-4. This change should not be attempted while the unit is in operation.

The loop current may be adjusted for either an external or the internal current supply by varying the potentiometer (R13) behind the screwdriver adjustment on the front panel (Marked "Current Adjust") of the Model 109 transistor switch. This pot is in series with the keying loop and, hence by changing the resistance, the current in the loop can be regulated.

A milliammeter can be inserted in J1 on the front panel of the switch to monitor the current while adjusting R13 for 60 ma.

C. INSTALLATION OF ANTENNAS

1. TRANSMITTING WHIP

Assuming that it is desirable to come up on frequency in the shortest period of time, the installation and interconnection of the whip antennas must be accomplished first.

The 35 foot transmitting whip antenna, TMC Model A-1486, is mounted on a porclain base insulator which is packed with the antenna in case number seventeen (17). The A-1486 is used with the ATS-2 antenna tuning

system. The ATS-2 is composed of several separate items and is used to tune the whip antenna to resonance at the desired operating frequency. All tuning is accomplished by the ATS-2 MCU, Monitor Control Unit, which is located in operating case number six (6). A 100 foot length of multi-conductor control cable TMC CA-541-100, has been included to interconnect the ATS-MCU-2 and the ATS-50TU-2, tuning unit, which should be located at the base of the 35 foot transmitting whip. (See ATS-2 Instruction Manual).

The ATS-50TU-2 contains two (2) motors that are controlled at the ATS-MCU via the control cables. These motors operate a continuously tuneable inductor and a stepped resistor/capacitor combination for tuning the antenna. In addition, to the control cable, the RF coaxial transmission line (RG-8/U) terminates in the ATS-50TU-2. The other end of the transmission line is connected to J302 on the ATS-50CU-2. The RF output of the linear amplifier model RFD-1 in case number seven (7) was connected into the coupling unit as part of the operating case installation .

The base of the transmitting whip is drilled for vertical mounting to a rigid horizontal surface with three (3) mounting bolts. If the antenna is properly and securely mounted, it is not necessary to guy it. If operation is anticipated for any period of time, it is recommended that this mehtod of mounting be used.

However, if temporary or emergency operation is necessary, the transmitting whip may be mounted on the top of the ATS-50TU-2 packing crate (case number eighteen (18). The appropriate mounting holes have been provided in the cover of the case for this purpose.

When this configuration is used, it is recommended that the antenna be guyed. For this purpose, a guy ring, three (3) guy lines and stakes are included with the transmitting whip.

It should be remembered that using the packing case for a mounting base is only a temporary measure and if long term operation is contemplated, a more secure mount should be used.

For complete details of setting up the transmitting whip antenna and the ATS-2 system, refer to figure 3-1 on page 3-2 of the ATS-2 instruction manual. It is only necessary that the tuning unit be removed from its packing case along with the control cable (CA-541-100), coaxial transmission line (RG-8/U), and antenna feed wire (number eight (8) stranded wire with teflon sleeve). Set the tuning unit beside the packing case so that the bowl insulator is on the side next to the packing case. Connect one end of the 27 inch feed wire to the bolt insulator on the tuning unit and the other end to the bottom of the two mounting bolts on the side of the antenna. The coaxial transmission line and control cable have already been connected to the appropriate places inside the tuning unit. (If these should be removed for any reason, installation instruction will be found in the ATS-2 instruction manual). Run these cables to the station. The transmission line,CA-18 drawing figure 5 (SY-1034-7A), should be attached to the coupling unit (ATS-50CU-2) at J302 (Marked Tuning Unit). The connector is on the cable. The control cable (CA-15) should be attached to J101 on the Monitor Control Unit (ATS-MCU-2). Again, the connector is already mounted on the cable.

The performance of a vertical antenna will be improved if a well grounded counterpoise is installed under the antenna. This is particularly true if the ground upon which the antenna is erected is of low conductivity or the antenna is mounted above ground, such as on a roof. The counterpoise may be constructed of a well grounded wire screen mesh or a radial system as described on page 3-5 of the ATS-2 instruction manual.

2. VERTICAL RECEIVING ANTENNA, TMC MODEL VRA-2

The vertical receiving antenna Model VRA-2 is packaged in case numbers fifteen (15) and sixteen (16). The weather resistant cast aluminum base which contains a broadband matching transformer and the mounting plate are in case number fifteen (15). The 18 foot aluminum receiving whip is packed separately in case number sixteen (16). To install this antenna, it is only necessary to attach the whip to the mounting stud on top of the base and connect the coaxial transmission line (not supplied) by means of the N type connector on the base, see figure 15 (drawing ID-160). The other end of the transmission line is connected to the GPR-90RXD receiver in operating case number ten (10). UHG to BNC adapters (UG-255/U) for making this connection are provided.

The transmission line should be of 70 ohm coax such as RG-11/U unless an armored cable such as RG-12/U is desired. As has been stated earlier, the transmitting and receiving antennas should be separated as far as possible to limit the possibility of overloading the receiver.

The mounting plate for the VRA-2(BM-255) is designed for vertical or horizontal mounting, such as on a wall or pole. The mounting plate is of the universal type and is adaptable to mounting in either plane. Refer to figure 15 (ID-160) for details.

3. SLOPING "V" ANTENNAS

A. GENERAL

If extended operation is planned in one location or if propagation or circuit conditions dictate the use of a higher gain more directive antenna, the sloping "V" antennas should be used. The sloping "V"'s may be erected while the station is operating on the vertical antenna and then switched over to the "V"'s with a minimum down time.

These antennas are somewhat more complex than the vertical antennas and consequently the drawings should be closely followed. Refer to figures

9 and 10, (SY-1034-12 and SY-1034-13). A copy of the antenna construction drawing and bill of materials is packed with each of these antennas.

The sloping "V" antennas are of two (2) types; the SVA-7.5T transmitting the SVA-7.5R for receiving. These are packed in case numbers thirteen (13) and fourteen (14) respectively.

All components of each antenna, including the terminating resistors and balanced to unbalanced impedance matching transformers, are pack d in the same case to minimize the possibility of arriving on site and missing a particular component.

The transmitting and receiving sloping "V" are quite similar; the only differences are in the accessories. The impedance matching transformer for the receiving antenna is the RAC-30A. The TRC-3500 is used for the transmitting antenna. The SVA-7.5R uses low wattage terminating resistors that simply clamp onto the insulators at the bottom of each leg of the antenna. Because of the higher power that is necessary to dissipate in the SVA-7.5T, the terminating resistor (TER-250(300)) are larger 250 watt units and are mounted on a supporting pole. Referring to drawing SY-1034-12 and 13, figures 9 and 10, it will be noticed that every part of the antenna is called off by a number and this same number identifies the item by a description and quantity on the bill of materials.

Generally speaking, the higher the apex of the antenna above ground, the better the performance. The height will, however, vary from installation to installation depending on the structure used for the mast. If an existing tower is available, it will, of course, be perfect for the job. If on the other hand, a tower or regular antenna mast is not available, a suitable structure will have to be improvised. Such things as a locally procured wooden pole, or possibly a large tree with as little foliage as possible will be adequate.

A. ORIENTATION

Since the sloping "V" is a directional antenna, it is necessary to properly orient the antenna in the direction of the station with which communication is desired. The antenna radiates in the direction of the open end and similarly, is sensitive to signals received from the direction of the open end. To orient the antenna, first determine the great circle azimuth to the other station. This may be done from world propagation charts published by the National Bureau of Standards or from any accurate large scale map such as a World Air Chart. Scribe a line on the map between the points to be communicated with and measure the true azimuth from the grid lines.

When orienting the antenna in the field, lay the center line of the antenna along the True Bearing just determined. That is to say, the magnetic bearing determined with a compass in the field must be corrected for the magnetic declination in the geographical area in which you are located to coincide with the true bearing measured on the map. If the magnetic declination is East, subtract the declination from the true bearing to obtain the correct magnetic azimuth. Similarly, if the magnetic declination is West, the declination must be added to the true bearing to obtain the correct magnetic azimuth. For example, if it is determined by examining a World Air Chart that the true bearing from point A to point B is thirty (30) degrees and the magnetic declination shown on the map at A is 15^{o}W, the correct magnetic bearing upon which to lay the center line of the antenna is 45^{o}.

C. CONSTRUCTION

The antenna and balanced feed line should be laid out and constructed on the ground before the antenna is raised into place. For the legs of the antenna, take the roll of number ten (10) AWG copperweld wire and

attach insulator number fourteen (14) for the receiving antenna or number nine (9)for the transmitting antenna to one end. Pull the wire through the insulator to attach either to the "glo-bar" resistor on the insulator for the receiving antenna or to the TER-250(300) for the transmitting antenna. Fasten the wire to itself at the insulator with two (2) split-bolt connectors. Unroll the coil of number ten (10) AWG copperweld wire and measure out a length for the curtain of the antenna plus a length for one side of the balanced feed line. This should be all one piece. This will, of course, depend upon the height of the apex above ground. Allow enough slack for attaching the TRC-3500 or RAC-30A as the case may be. Now measure 330 feet (use a long steel tape measure preferably a 100 foot rule) from the bottom insulator that was previously attached and thread another insulator (number nine(9)) onto the wire and firmly attach it at the point just determined with two (2) split-bolt connectors. When measuring, be sure that the wire is pulled tight and that the tape and curtain wire are parallel and in the same plane.

Repeat the same procedure for laying out the other leg of the antenna. When the other leg is completed, the two (2) insulators at the apex may be joined with the insulator shackle (part number eight (8)) and the hoisting cable (part number (7)). The spreader insulators (part number twelve (12)) should be evenly distributed along the length of the feed line and fixed in place with the serving wire (part number three (3)). Th antenna is now ready for raising into position.

Attach the prefabricated sling to the tower or mast as shown on the drawing and feed the hoisting cable through the pulley. By pulling on the hoisting cable raise the antenna and secure it in place by firmly attaching the hoisting cable at the base of the tower.

Extend the legs of the antenna into place. The apex angle should be approximately 60°. This angle may be determined by measuring a length of wire 170 feet long and laying it across the bottom end of the legs of the antenna.

Attach a short length (12 to 18 inches) of antenna wire to the open end of the bottom insulator and fasten it with two (2) split-bolt connectors. To locate the positions for the terminating posts, apply tension to the legs until an angle with the horizontal of about 13 degrees is formed with the legs still spread 170 feet. Mark the spot directly under the end of each leg of the antenna with the preceeding conditions existing for the terminating post. Measure back from the post in the directions of the projections of each leg a distance of four and one-half ($4\frac{1}{2}$) feet and mark this point. This is the point where the screw anchor (part number eighteen (18)) should be started into the ground. With the screw anchor fully sunk into place, drive the terminal post into the ground half its length (three (3) feet). Now place the eye bolt on the end of the guy attachment (part number sevent en (17)) through the hole in the top of the terminal post and secure on the other side with the eye nut (Part number sixteen (16)). Run the guy attachment wire rope through the screw anchor and pull tight so that the post is vertical and the guy attachment tight. Fasten in place with two (2) fist grips (part number sixteen (16)). After having done this, on both legs of the antenna, pull the antennas' legs into place. That is, pull the antenna wire extending from the end of the bottom insulators (part number nine (9) or fourteen (14)) through the eye nut on the post until the 13 degree angle with the horizontal is formed. Fasten the legs with two (2) split-bolt connectors. For the receiving sloping "V" SVA-7.5R, snap a resistor(part number fifteen (15)) into

place on the bottom insulator and connect the curtain wire to it underneath the resistor. For the transmitting sloping "V" SVA-7.5T the terminating resistor TER-250(300) should be mounted on the post. The TER-250 (300) should be mounted so that the air vent holes are on the side and to the bottom. Use the mounting plate and"U" bolts for attaching it to the post. Connect the curtain wire that extends from the bottom insulator to the bowl insulator on the TER-250(300).

At the feed end of the antenna, mount the RAC-30A for the SVA-7.5R or the TRC-3500 for the SVA-7.5T to the base of the mast or other good mount and connect the balanced feed line to the bowl insulators. On the input side of the transformer, connect the coaxial transmission lin with the connectors supplied (see figure 14 for a list of loose connectors).

The antenna is now complete except for the grounding system. From the remainder of the roll of AWG number ten (10) wire cut six (6) lengths approximately 130 feet each for radials. Drive a ground rod into the ground (part number nineteen (19)) at the end of each leg and attach one end of three of the radials to each. Extend one radial along th ground under each leg of the antenna and fix it to a ground rod at its end. Extend each of the other radials approximately thirty (30) degrees on either side of the first two and also terminate each of these with a ground rod. Also, attach the 170 foot length of wire that runs between the ends of the legs to the ground rod at the end of each leg. Run a length of antenna wire from the low side of the terminator resistor on the bottom insulator in the case of the receiving antenna and from the aluminum case of the TER-250(300). (Use one of the mounting bolts in the case of the transmitting "V", to the ground rod at the end of each leg.)

This completes the construction of the sloping "V" antennas. Check all connections for mechanical strength and electrical conductivity. As a final check, measure the resistance of the entire antenna.

This may be done by temporarily disconnecting the feed line from the unbalanced to balanced transformers and connecting an ohmmeter across the feed line. The resistance of the receiving antenna should be about 800 ohms and the resistance of the transmitting antenna should be about 600 ohms.

The RG-11 coaxial transmission line (not supplied) for the SVA-7.5T should be carried to the station and connected to the coupling unit output marked "tuning unit"(J302) in operating case number six(6). The coaxial transmission line (RG-11) for the SVA-7.5R should be connected to the antenna input on the GPR-90RXD via the adapter in operating case number ten (10). (Refer to figure 5, SY-1034-7A).

This completes the installation of the station but all connections should be checked before the station is operated.

SECTION VI

OPERATION

A. THE TRANSMITTING SECTION

1. GENERAL

The transmitting section of the "Fly-Away" station is located in cases 1,2,3,6,7 and 8. Refer to figures 1 and 11 (SY-1034-1 or SY-1034-14) for the location of these cases in the system.

To achieve maximum performance from the station, the operator should thoroughly familiarize himself with each unit. Manuals on each piece of equipment are included with these overall systems instructions for this purpose. As a manner of introduction to these manuals a brief outline of the purpose of each unit is given here.

Refer to the block diagram of the system, figure 12 (SY-1034-15). The basic frequency determining element of the system is the portable master oscillator, TMC Model PMO-5. As pointed out in the installation section, since this unit is the basic frequency standard, it should be allowed to thoroughly warm up before operation. The PMO-5 generates the medium frequency for the sideband exciter, TMC Model SBE-2 (Case number eighteen (18). It is continuously variable within the frequency range of 2 to 8 mcs. The basic oscillator operates between 2 and 4 mcs and a multiplier is used for the 4 to 8 mc band. With this frequency coverage, the SBE-2 can generate a signal anywhere in the range of 2-32 mcs. Readout is by means of an accurate mechanical counter-dial system.

The PMO-5 generated signal is fed into the SBE-2 MF modulator stage (Case number eight (8). It is modulated by the SBE-2 depending on the audio intelligence fed into the SBE-2. The SBE-2 has three (3) audio channels; channel 1, channel 2 and mike. Any two (2) of these sources may be used simultaneously. Channel 1 and channel 2 are 600 ohm, low level inputs for use with RTTY terminal equipment or telephone lin s.

These inputs are switchable from the front panel to interchange the upper and lower sidebands. Each channel has an independent gain control so that the power level in each sideband may be regulated from zero to 100% modulation. Refer to the SBE-2 instruction book for complete theory and operational data.

In addition to the variable oscillator input from the PMO-5, the SBE-2 has provisions for up to ten (10) crystals for the MF injection. These crystals are located in a temperature compensated oven. If operating frequencies are known before a mission is started, it is recommended that the appropriate crystals be obtained. This will permit somewhat faster frequency change and also tend to eliminate tuning errors.

After the signal is modulated in the MF stage of the SBE-2, it is hetrodyned up to the operating frequency and fed to the linear amplifier, TMC Model RFD-1 (Case number seven (7)). The RFD-1 has two (2) external power supplies. The PS-4, located in case number two, supplies the low voltage, bias, and interlock voltages for the transmitter. The PS-5, located in case number one, supplies the high voltage for the plate of the final tube in the RFD-1. The RFD-1 takes the signal from the SBE-2 at the operating frequency and raises the power level to 1 KW PEP f r radiation. The signal from the RFD-1 is sampled in the ATS-CU-2 coupling unit which displays simultaneously, forward and reflected power and the VSWR. The Monitor Control unit (Case number six (6)) also remotely controls the ATS-TU-2 tuning unit when using the 35 foot vertical antenna for transmitting.

When using the sloping "V" antenna, the RFD-1 is also connected to the coupling unit and, therefore, the monitoring function of the control unit is still available. The antenna in both cases is connected to the output of the tuning unit.

2. TUNING

A. PMO-5

When tuning the transmitter to a particular frequency, the PMO-5 should be calibrated at the nearest 50Kc check point above the PMO-5 basic oscillator frequency if it is to be used for the MF injection for the SBE-2 (See page 3-3 of the PMO instruction manual). The formula for calculating the oscillator frequency is explained in detail on page 5-1 of the SBE-2 instruction manual. Briefly, the formula is:

F_{xtal} of VMO = 2.000(N) - F output +.270

where
Frequency is in Mcs.
N is the bottom number in the bandswitch window on the left side of the SBE-2 front panel.

F output is the frequency of the (transmitted or suppressed) output carrier.

3. SBE-2

After the PMO-5 is calibrated and set to the proper frequency or a crystal in the SBE-2 is switched into the circuit, the MF of the SBE-2 should be tuned. With the power ON and the meter switch in the MF position, turn the MF tuning knob until the crystal or PMO-5 frequency appears under the hairline on the dial. Increase the carrier insert control and carefully tune around the MF frequency until a peak is reached on the meter. Reduce the carrier as a peak is reached to keep the meter needle on scale. If you tune to other places on the dial, other peaks may be found but these will be incorrect. Therefore, depend upon the dial reading. Set the carrier for 100% on the MF meter scale. Now set the band switch and output tuning bandswitch to the desired output frequency . Put the exciter On/Standby switch in the On position and the meter switch in the RF position. Turn the output control about one-half($\frac{1}{2}$) turn clockwise and tune the output tuning for a peak on the meter with the dial approximately indicating the output frequnecy.

Again, false peaks may appear at other than the desired output frequency so depend on the dial reading. This completes the tuning of the exciter with carrier only and the Linear Amplifier RFD-1 should now be tuned and loaded before the SBE-2 is modulated.

C. RFD-1 AND MCU

Before applying power make sure that the RFD-1 is connected to an antenna or load. Also, be sure that the exciter output control is fully counter-clockwise. Initially, set the line adjust switch on the PS-4 to position 4 from fully counter-clockwise. The final voltage, transmitter voltage, and plate and screen overload breakers should be OFF.

On the Monitor Control Unit, turn the power switch to the X1 position and the TUNE/OPERATE switch to TUNE. Set the resistance tap to the position suggested on page 4-4 of the ATS-2 instruction book for the particular frequency of operation and moisture conditions.

To tune the Linear Amplifier RFD-1, first select the range to be used by turning the Driver Band switch and PA band switch to the position that includes the desired operating frequency. Throw the Main Power Breaker located on the PS-4, to ON; the main power indicator should light. If not, check all power connections and the bulb in the pilot light. If the indicator still does not come on, refer to the maintenance section of the PAL-1K instruction manual. Check the line meter for a reading of 115 volts. Use the line adjust switch for correction if necessary. Throw the Plate and Screen overload breakers to ON.

D. STEP-BY-STEP FINAL TUNING

1. If you have made a tuning chart for your location and antenna, turn the tuning and loading controls on the RFD-1 to the positions indicated. Remember that these settings will not be the same for different antennas.

2. If such a tuning chart is not available, set the tuning and loading controls to zero.

3. Set the loading switch to position 1.

4. Turn the transmitter voltages switch ON; the indicator will light after the main power breaker has been ON for about two (2) minutes. By throwing this breaker all voltages except the final plate voltage is applied to the transmitter. Wait until the indicator lights before proceeding.

5. Turn the Multimeter switch to the 1st ampl. Ep position.

6. Increase the output control on the SBE-2 until a useable reading is obtained on the Multimeter of the RFD-1.

7. Rotate the 1st ampl. tuning control observing the multimeter for a peak reading.

8. Turn the Multimeter switch to the PA Eg position.

9. Rotate the PA Grid tuning control, observing the multimeter for a peak reading. Keep the needle on scale by varying the output from the SBE-2.

10. Rotate the output control of the SBE-2 fully counter-clockwise and place the Meter Switch in the PA Isg position.

11. Turn the Final Voltage switch ON.

12. Rotate the output control of the SBE-2 until a reading on the Plat Current Meter of about 250 ma is obtained.

13. Rotate the Tuning Knob on the RFD-1 until a dip in the final plate current is obtained.

14. Adjust the resistance and reactance controls on the Monitor Control Unit for a minimum Standing Wave Ratio. It may be necessary to increase or decrease the drive into the RFD-1 to obtain a useful reading on the Monitor Control Unit scale.

15. When a minimum SWR is obtained, cut the drive from the SBE-2 OFF and put the the Tune/Operate switch on the Monitor Control Unit in the OPERATE position. Also, put the Power Switch in the X10 Position.

16. Increase the output of the exciter until the Plate Current meter on the RFD-1 indicator about 300 ma.

17. Adjust the PA Tuning Control observing the Plate Current meter for a dip.

18. Increase the PA Loading Control until the plate current rises.

19. Adjust the PA Tuning Control for a Plate Current dip.

20. Repeat PA Tuning and Loading adjustments until the desired power output is reached with minimum plate and screen current as determin d from observing the PA Plate Current Meter and the Multi-Meter in the PA Isg position. The PA Plate current should not exceed 650 ma. and the PA Screen current should not exceed full scale. The screen current should not exceed full scale. The screen current will, with a resistive load, usually be less than 35 ma. If the plate current exc eds 650 ma. and the plate overload breaker opens the circuit, it is an indication that the final of the RFD-1 is loaded too heavily and should be reduced and re-dipped. Conversely, if the screen current go s off scale and the screen overload relay opens the circuit, it is an indication that the plate of the final is too lightly loaded and the loading should be increased and the final tank circuit redipped. That is to say, the plate circuit is directly proportional to the plate loading while the screen current is inversely proportional to the plate loading.

21. If it is impossible to obtain 1000 watts PEP or 500 watts average power by manipulating the loading and tuning controls, the loading switch should be switched to position 2 and the process repeated. If position 2 fails to yield the desired results, the loading switch should be placed in position 3.

22. There are three (3) protective overloads on the transmitter. Thes are the screen grid, plate, and the ATS-2 power overloads. The scr en overload is set to open the interlock circuit if the screen current exceeds 50 ma , which is full scale on the multimeter. This overload, howev r, has a delay feature to prevent instantaneous voice peaks from knocking the breaker off. The delay is approximately one second. The plate overload is set to open the interlock circuit if 650 ma. of plate circuit is exceeded. The power overload on the ATS-2 is set for a maximum of 100 watts in the tune position and 1 Kw in the operate position. Should any of these parameters be exceeded and the overload relays are opened, the power from the exciter should be reduced and the particular overload that was kicked off should be closed again and the tuning and loading adjusted to correct for the fault.

E. SETTING MODULATION LEVELS

After the transmitter is completely tuned with only carrier, the modulation may be set for the particular service or mode of operation desired. This will usually be Independent Sideband (ISB)with voice on the lower sideband and diversity tones for AFSK on the upper sideband. As has been pointed out, the SBE- 2 exciter is a flexible unit and will allow switching the intelligence to either sideband or dividing the power between the sidebands and the carrier in any proportion desired. Usually, the sidebands will be weighted equally, but this does not hav to be the case. If, for instance, the voice channel is not to be used, it is only necessary to transmit a pilot carrier for the AFC in the receiver to lock onto and the rest of the power may be put into the voice sideband.

Conversely, if the teletype channel is not to be used, all the power should be put into the voice sideband and the carrier completely

suppressed. This will be single sideband operation. In addition, if the intelligence being transmitt d on the RTTY channel is of particular importance, more power may be diverted to this channel.

The automatic frequency control unit (AFC-1) of the receive section of the "Fly-Away" station includes a limiter. The function of the limit r is to restrict the amplitude of the received carrier to a predetermined setting. This provides a near-constant level and also removes noise puls s. These predetermined levels of carrier suppression from PEP are 0db, 10db, 20db and 30db. The multimeter on the SBE-2 or the power output meter on the ATS-2 Monitor Control Unit may be used to set up the transmitter for these carrier levels.

Following is a tabulation of the power and percentages of the various components of an ISB signal for the different carrier suppression levels.

These are referenced to the Peak Envelope and Average power of the PAL-1K.

TABLE 2

MODULATION SETTINGS

CARRIER SUPPRESSION FROM PEP OR AVG. POWER	PEP POWER DIVISION	AVG. POWER DIVISION	CUMULATIVE AVG. POWER	%FULL SCALE SBE MF	CUMULATIVE FULL SCALE PERCENTAGE SBE MF
30 db	Carrier 1.0 watts	.5 watts	.5 watts	.10	.10
	USB 499.5 watts	249.75 watts	250.25 watts	49.95	50.05
	LSB 499.5 watts	249.75 watts	500.00 watts	49.95	100.00
20 db	Carrier 10 watts	5 watts	5.0 watts	1.0	1.0
	USB 495 watts	247.5 watts	252.5 watts	49.5	50.5
	LSB 495 watts	247.5 watts	500.0 watts	49.5	100.00
10 db	Carrier 100 watts	50 watts	50 watts	10.0	10.0
	USB 450 watts	225 watts	275 watts	45.0	55.0
	LSB 450 watts	225 watts	500 watts	45.0	100.0
0 db	Carrier 1000 watts	500 watts		100.0	100.0
	USB 0 watts			0.0	0.0
	LSB 0 watts			0.0	0.0

From the foregoing table, and by observing th SBE-2 Multim ter, it will be evident that only the case for 10 db suppression of the carrier can readily be set with the MF meter. In the other cases, the carrier is too low to be readable on the meter. Whereas, the method for using the SBE-2 multimeter for establishing modulation levels is outlined below for information purposes, it is recommended that the Monitor Control Unit be used for this purpose. The Monitor Control Unit method will be found to be more straight forward and simple. To use th SBE-2 meter for 10 db suppression, place the meter in the MF position and the RF output control fully counter-clockwise. Set the carri r control for 10% deflection on the meter. Turn the function switch on both tone transmitters to the "M" (Mark) position and set the USB channel selector on the SBE-2 to channel 1. This will place steady audio ton s on the channel 1 input of the exciter.

Adjust the USB gain control until the multimeter (in MF position) increases by 45% or reaches a total of carrier plus USB of 55%. Similarly, plac the voice modulation from the microphone on the LSB by sp aking normally into the microphone while adjusting the LSB gain control until the meter (MF Position) and audio peaks reads 100%.

With the transmitter and final voltages applied to the linear amplifier (assuming the amplifier has already been tuned) turn up the output of the SBE-2 until the meter on the monitor control unit reads 275 watts of forward power with only the carrier and tones. With this power lev l set, when you speak into the microphone the power output will peak up to 500 watts average which is equal to 1000 watts PEP. Remember that the power meter on the Monitor Control Unit reads average power, and not peak envelope power, and consequently when 500 watts is indicated it is equivalent to 1000 watts PEP. Also, the meter has a certain amount of inherent drag and if the meter do s not reach 500 watts on voice peaks,

it does not mean that the power output is not reaching its full rated power of 1000 watts PEP.

To set the transmitter using the recommended method, refer directly to the power meter on the Monitor Control Unit. For example, in the case of 30 db suppression, tune the linear amplifier and set the exciter output for 500 watts output with the carrier control set for 100% deflection on the exciter multimeter(MF Position). Do not change the RF output control on the SBE-2 but reduce the carrier with the carrier control on the exciter until the power output indicated on the Monitor Control Unit meter is .5 watt. The meter multiplier switch should be placed in the X1 position for this reading. After the carrier level is set, switch the meter multiplier back to the X10 position and put the tone transmitter function switches in the Mark (M) position. With the USB in the channel 1 position, increase the USB gain control until about 250 watts output is obtained. Increase the power in the LSB by speaking into the microphone at a level that is indicative of the levels that will be used in operation and increase the LSB gain control until the power output peaks up to 500 watts.

Put the function switch on the tone transmitters in the line position ("L"). The tone transmitters will now be keyed by the teletypewriter. The transmitting section is now ready for operation.

F. CPP-4

In addition to being able to switch sidebands by switching the channel selectors on the front panel of the SBE-2, the audio and DC patching panel (Model CPP-4) in case number eleven (11) may be used to reroute signals as desired.

Equipment outputs are connected to the top row of jacks on the CPP-4 and inputs are connected to the bottom row. This is done by the harness CA-1. Telephone and teletypewriter inputs and outputs are similarly

connected to the rear of the patching panel. The center row of jacks are monitoring positions. This function may be utilized by plugging a set of headphones into the center jack. This does not disturb the connection or signal flow through the other jacks.

The CPP-4 is wired for "normally through" operation. That is, without a patch cord being inserted into either the top or bottom jack in a particular column, the signal flows straight through the jacks in that column and out again. This keeps the number of patch cords utilized at a particular time to a minimum. When a patch cord is plugged into a jack, the signal that appears across that jack at the rear now flows into the patch cord. The other jack in that column is disconnected and the jack into which the other end of the patch cord is plugged is connected into the circuit. Refer to figure 5 (SY-1034-7A) and figure A-4 on page A-9-A-10 in the appendix of the receiving section manual. A composite list of the outputs and inputs of the patching panel follows.

F. PHONE PATCH

To run a phone patch, the telephone lines must be terminated at the rear of the CPP-4. The appropriate connections are shown on the system wiring diagram Figure 5 (SY-1034-7A). A local telephone (Not Supplied) is necessary for communications with the telephone switchboard. When the switchboard operator advises the radio operator that he has a call that would like to be patched into the radio circuit, the radio operator should take a patch cord and plug one end into the appropriate receive telephone pair and the other end into SBE-2 channel 2 input which is J18. For the party at the other end of the radio circuit to be able to speak into the local telephone line, it is necessary that the 600 ohm output of the MSR-6#2 be patched into the telephone send pair. This may be done by patching between J11 and J21.

TABLE 3

CPP-4 PATCHING PANEL JACK DESIGNATION

RECEIVING

J1	MSR #1 - 8 ohms - RTTY Monitor	Output
J2	Loudspeaker #1 - LS - 1	Input
J3	MSR #2 - 8 ohms - Voice	Output
J4	Loudspeaker #2 - LS - 2	Input
J5	MSR #1 - 600 ohms - RTTY	Output
J6	Tone Receiver	Input
J7	Tone Receiver	Output
J8	Teletype - TT	Input
J9	No Connection	
J10	Telephone - TP	Input
J11	MSR #2 - 600 ohms - Voice	Output
J12	No Connection	Input

TRANSMITTING

J13	Teletype - TT	Output
J14	Tone Transmitter & SBE-2-Channel #1	Input
J15	Telephone - TP	Output
J16	No Connection	
J17	No Connection	
J18	SBE-2-Exciter-Channel #2	Input
J19	No Connection	
J20	Telephone - TP	Output
J21	Telephone - TP	Input
J22	No Connection	

The radio operator should then monitor the call in order to break the patch when the conversation is completed, or to aid the telephone operator by adjusting levels. If continual use is to be made of the phone patching facilities, the patch may be left connected. Pattching TTY tones, or dc pulses into telephone lines for remote use, may also be accomplished by properly operating the patch panel.

B. THE RECEIVING SECTION

1. GENERAL

The receiving section of the "Fly-Away" station is composed of cases 4,5,9,10 and 11. Refer to figures 1 and 11 (SY-1034-1 or SY-1034-14) for location of these cases in the system.

To achieve maximum performance from the station, the operator should thoroughly familiarize himself with each unit. The receiver used in the system is the highly sensitive dual conversion receiver Model GPR-90RXD. The RF and IF stages of the receiver are used for frequency selection and conversion. The signal is then paralleled to two (2) mode selectors (Model MSR-6) for detection and audio amplification. (refer to the system block diagram figure 12 (SY-1034-15)).

Although basically stable in design, the frequency stability of the GPR-90RXD is further enhanced by using the extremely stable HFO and IFO outputs of the VOX-3. The VOX-3 contains a variable master oscillator and also has provisions for up to three (3) oven controlled crystals. The IFO output of the VOX-3 is also controlled by a temperature compensated crystal.

One of the MSR-6's (number one (1) in the top of case number nine (9)) is intended for sideband selection, tuning, detection and audio amplification of the sideband that contains the RTTY information. The other MSR-6(#2) is intended for use on the voice sideband.

MSR-6-#1 is frequency controlled by the automatic frequency control

unit AFC-1 in case number five (5).

This is necessary because of the stringent stability requirements of the narrow shift AFSK used in this system. The RTTY sideband, after detection and amplification in MSR-6-#1, is paralleled to two (2) tone receivers (Tele-Signal Model 102) in case number five (5). A comparator unit (Tele-Signal Model 110) compares the tones in each receiver and selects the stronger signal. The Transistor Switch(Tele-Signal Model 109), located in the same case, provides contact keying for the teletypewriter. The proper Tele-Signal Corporation instruction manual should be referred to for particulars.

MSR-6-#2 output is connected through the patch panel to a speaker. In addition, a 600 ohm low level output is connected to the patch panel for use with telephone lines.

2. TUNING

The primary instructions and equipment details for the receiving section are included in another volume entitled "Frequency Controlled Receiver Terminal." The equipment described in the other manual is identical with the units used in the "Fly-Away" station. There are only two differences and these involve interconnection.

The system described in the other manual utilizes the dual space or frequency diversity principle. This concept is not included in the "Fly-Away" station and consequently only one receiver is included. The other difference is that only one MSR-6 employs AFC in the "Fly-Away" system; whereas, both MSR-6's in the other system are interconnected with an AFC-1. These differences will be readily observed when the other manual is referenced.

SECTION VII

STEP-BY-STEP SYSTEM TUNING PROCEDURE

A. GENERAL

In order to provide a central reference for complete system tuning, a hypothetical communications problem utilizing specific frequencies has been assumed and is presented in this section. Since the "Fly-Away" station is designed for full duplex operation and the normal mode of op ration will be ISB with diversity tones for RTTY on the USB and voice on the LSB the tuning details for this configuration will be given.

PROBLEM: It is desired to communicate from point A to point B. You are the radio operator of the station at point A. The following information has been made available to you.

a.	Assigned Transmit Frequency	6.738 Mc
b.	Assigned Receive Frequency	13.201 Mc
c.	USB Single Channel (Diversity) RTTY	
d.	LSB Single Voice Channel	
e.	Transmitting Antenna	Vertical Whip
f.	Receiving Antenna	Vertical Whip
g.	PEP 1Kw	
h.	Sideband Power	Equal

After reviewing the foregoing information, you have decided to use the 35 foot vertical whip (A-1486) together with the ATS-2 tuning system for transmitting, and the 18 foot vertical whip VRA-2 for receiving. (The tuning differences when using the sloping "V" antennas will be explained later). After surveying the propagation conditions, it is determined that conditions are only fair. Therefore, carrier suppression of 20 db is selected. If conditions are good, the carrier should be suppressed 30 db; and if conditions are poor, 10 db carrier suppression is used.

After making the foregoing basic decision, tuning should commence. It is assumed that the ovens in the VOX-3, PMO-5 and SBE-2 have been on sufficiently long for the oscillators to become stabilized. (See Section V-4 Oscillator Ovens).

B. RECEIVER TUNING

The tuning of the receiving section will be considered first. The initial operation when tuning to a new frequency is to calibrate the VOX-3. For maximum accuracy the VOX-3, must always be calibrated as close as practical to the frequency desired, before use. For this purpose, the VOX is provided with a calibrating circuit. Located within the VOX's oven is a VMO and crystal controlled calibrating oscillator. At numerous check points, harmonics of the VMO and the 100 Kc oscillator correspond; consequently, at these check points, a zero-beat indication will be obtained. A zero-beat indicating neon lamp is provided on the VOX-3 to adjust the VMO to its proper frequency. The 100 Kc check points automatically cover 50 and 25 Kc check points. This is true, because a 100 Kc crystal will generate not only harmonics of the 100 Kc fundamental but also harmonics of the 50 and 25 Kc subtones.

For operation on the assigned receiving frequency the VOX-3 output frequency should be calculated as follows:

$F_{out(VOX)} = F_r - 3.955$

where:

$F_{out(VOX)}$ is the VOX-3 output frequency.

F_r is the frequency of the GPR-90RXD.

Therefore, to receive 13.201 Mcs.

$F_{out(VOX)} = 13.201 + 3.955$

$F_{out(VOX)} = 17.156$

Since the basic oscillator in the VOX-3 operates between 2 and 4 mcs, the desired VOX-3 output frequency must be divided by either 1,2,4 or 8, depending on the output frequency, to bring the output frequency of the VOX-3 to between 2 and 4 Mcs.

Therefore, the VOX-3 dial setting may be determined as follows:

$$\text{VOX Dial} = \frac{F_{out(VOX)}}{M}$$

Where:

M is the appropriate multiplier.

In this case;

$$\text{VOX Dial} = \frac{17.156}{8} = 2,144,500 \text{ Cps.}$$

Since the VOX-3 basic oscillator will be operating on 2,144,500 cps, it should be calibrated at the closest check point which is, in this case, 2,150,000 cps.

C. VOX-3 CALIBRATION

To calibrate follow this procedure on the VOX-3.

STEP	OPERATION
1	Set POWER switch to the ON position, (This should have already been performed but is repeated here for clarity).
2.	Set BEAT ON-OFF switch to ON position.
3.	Turn band-Mcs switch to 16-32 position.
4.	Turn XTAL switch to VMO position.
5.	Release Master Oscillator Frequency LOCK. Turn the MASTER OSCILLATOR FREQUENCY dial to indicate 2,150,000 cps.
6.	Release CALIBRATE control LOCK.
7.	Rotate the CALIBRATE control knob until the ZERO beat neon lamp indicator blinks on and off very slowly or extinguishes. (Note that if the CALIBRATE control is considerably removed from ZERO BEAT, the indicator will go off. Therefore, it is important that the blinking condition be established first, and then by carefully tuning, slow the rate of blinking down as much as possible, If this is done very carefully, the light will go off and the MASTER OSCILLATOR will be exactly on frequency). The VOX has now been properly corrected for the dial region to be used and should be returned to the required frequency of 2,144,500 cps. Be sure to approach this from a lower frequency.

STEP	OPERATION
8.	When the calibration procedure has been concluded, the operator must be certain that he sets BEAT/ON switch to BEAT position. At the same time, METER switch should be turned to HFO and HFO switch set to the ON position.
9.	The VOX has now been calibrated.

I. SYSTEM OPERATION

STEP	UNIT	OPERATION	PURPOSE
1.	GPR-90RXD	Set HFO switch to EXT.	Selects VOX-3 on the local oscillator.
2.		Set RF SELECTIVITY switch to NON XTAL.	Selects widest IF response.
3.		Set AUDIO GAIN fully counter-clockwise.	Disables Receiv r Audio.
4.		Set CAL switch to OFF.	Disables 100 Kc oscillator.
5.		Set MANUAL-AVC switch to AVC	Permits AVC Operation.
6.		Set LIMITER switch to OFF.	Disables noise limiter.
7.		Set BFO switch to OFF	Disables BFO
8.		Set BANDSPREAD control 100	Maintains main tuning dial calibration.
9.		Lock BANDSPREAD control.	Prevents accidental detuning.
10.		Set SEND - REC switch to REC.	Applies B+ to unit.
11.		Set XTAL PHASE control to 0	Sets crystal filter to nominal center frequency.
12.		Set MAIN TUNING to 13.201 Mc	Tune receiver to desired signal frequency.
13.		Set RANGE SELECTOR to band 9.4-17.8	Selects appropriate tuning range.
14.		AUDIO SPREAD control, BFO PITCH CONTROL, AUDIO SELECTOR and XTAL ADJ may be left in any position.	
15.		Adjust RF GAIN control full clockwise.	Applies primary power to the receiver and adjust RF gain to maximum.
16.	LSP-7	Adjust VOLUME CONTROL LS-1 & LS-2 fully clockwise.	

STEP	UNIT	OPERATION	PURPOSE
17.	MSR-6 #1(Upper)	Set SIDEBAND switch to MANUAL position.	Permits MANUAL tuning of oscillator.
18.		Set SIDEBAND switch to U(Upper sideband).	Selects d sired sideband for detection.
19.		Set AVC switches to OFF and SLOW.	Disables AVC control of first MSR-6 amplifier
20.		Set BFO switch to ON position.	Permits second oscillator of MSR-6 to reinsert carrier for suppressed carri r operation.
21.		Set AUDIO GAIN control fully clockwise.	Adjusts audio output level.
22.		Make sure POWER switch is ON Position.	Ascertain that AC power is being applied to MSR-6.
23.		The BANDSPREAD control should be set at zero position.	Preliminary adjustment.
24.	AFC-1	Turn CARRIER COMPENSATOR to 20 db.	Provides proper amount of carrier attenuation for optimum AFC-1 operation.
25.		Set AGC SELECTOR to SLOW.	Selects prop r amount of AGC attack for the GPR-90RXD during SSB reception.
26.		Make sure POWER switch is ON position.	Applies primary power to the AFC-1.
27.		Set "ALARM ADJUST" $\frac{1}{4}$ turn from fully counter-clockwise.	Adjusts level at which alarm operates.
28.		While depressing "AFC RESET" SWITCH, tune BANDSPREAD control on MSR-6(#1) for maximum deflection on AFC-1 CARRIER LEVEL meter.	

STEP	UNIT	OPERATION	PURPOSE
29.		After tuning for maximum deflection on AFC-1 CARRIER LEVEL meter, release AFC RESET button.	
30.	LSP-1	Adjust "VOLUME CONTROL" on LS-1 for comfortable level.	
31.	Tone Receiver Model 102	Make sure that the neon lamps are on.	Ascertains that primary power is being applied to the unit.
32.	Tone RX Transistor Switch Model 109	Make sure that BATTERY "Screw" is in EXT position.	
33.	Tone RX Dual Diversity Comparator Model 110.	Make sure that SENSE switch is on minus position.	Selects Polarity.
34.		Adjust CHANNEL A and CHANNEL B INPUT so that needle on scale will indicate 50 microamperes.	Balance and set input levels.
35.	MSR-6 #2 (lower)	Set SIDEBAND switch to MANUAL position.	Permits manual tuning of oscillator.
36.		Set SIDEBAND switch to L (Lower Sideband).	Selects desired sideband for detection.
37.		Set AVC switches to OFF and SLOW.	Disables AVC control of first MSR-6 amplifier.
38.		Set BFO switch to ON position.	Permits second oscillator of MSR-6 to reinsert carrier for suppressed carrier operation.
39.		Set AUDIO GAIN Control fully clockwise.	Adjusts audio output level.
40.		Make sure that POWER switch is in ON position.	Ascertains that AC power is being applied to MSR-6.

STEP	UNIT	OPERATION	PURPOSE
41.		Tune BANDSPREAD control on MSR-6 #2 for intelligibility.	
42.	LSP-7	Adjust LS-2 VOLUME CONTROL for comfortable level.	

E. TRANSMITTER TUNING

Tuning the transmitting section is done on a step-by-step basis dealing with the PMO-5, SBE-2 and PAL-1K in this order.

PMO

1. If not already switched turn the MAIN POWER switch to ON. Ch ck to see that MAIN POWER indicator is lighted.

2. For on frequency operation, the PMO-5 must be calibrated.

3. Unlock MASTER OSCILLATOR FREQUENCY DIAL. Adjust MASTER OSCILLATOR to 3500.000 Kc approaching from lower frequency. Turn function selector to CAL.

4. Release CALIBRATE lock control. Turn Calibrate Control until the ZERO BEAT indicator begins to blink. Adjust this control very carefully until the blinking occurs very slowly. Sufficient accuracy will be obtained if the blinking rate is less than once every second. This completes calibration.

5. Turn MASTER OSCILLATOR FREQUENCY to 3532.000 Kc; do not turn past this frequency. If this does happen, go down to 3522 Kc and try again. Lock the LOCK control next to the nameplate.

6. Turn OUTPUT control fully clockwise. Turn FUNCTION to EXCITER position. Switch AMPL PLATE to ON. Select 2-4 BAND Mcs switch. Rotate the TUNING Mcs control for maximum brightness of TUNING indicator. This should occur near the 3.5 mark. An indication at another point may cause operation on the wrong frequency.

7. The PMO-5 is now tuned. Reduce the OUTPUT control to about 9 O'clock position

8. Correct SBE-2 operation requires that the PMO-5 be properly tuned before operation.

9. If not already switched, turn the POWER switch to ON. The indicator light on the A-1397 power supply should light.

10. Turn MF XTAL SW to VMO, BAND MCS to 5(6.27-8.27) CARRIER INSERT fully clockwise, LSB gain fully counter-clockwise, USB gain fully counter-clockwise, LSB selector to OFF, VOX GAIN fully counter-clockwise, XMTR switch OFF, OUTPUT TUNING switch to 4-8, SQUELCH GAIN fully counter-clockwise, USB selector OFF, OUTPUT control fully clockwise, and METER SW to MF.

11. Rotate the OUTPUT TUNING control to read about 6.7 on the illuminated dial, and rotate the MF TUNING control to read about 3.5 on its illuminated dial.

12. Tune the MF TUNING control for peak indication on the meter. This should occur near 3.5 on the illuminated dial. Other positions are fals and should be avoided. The CARRIER INSERT control may be reduced to prevent pining the meter.

13. Switch METER SW to RF. Tune OUTPUT TUNING control for peak indication on the meter. This should occur near 6.7 on the illuminated dial. Other positions are false and should be avoided. The OUTPUT control may be reduced to prevent pinning the meter.

14. Rotate the CARRIER INSERT control fully clockwise; the OUTPUT control fully counter-clockwise.

15. This completes the tuning of the exciter with carrier only and the Linear Amplifier RFD-1 should now be tuned and loaded before the SBE-2 is modulated.

16. Before applying power, make sure that the RFD-1 is connected to the ATS-2 Antenna System. Also, be sure that the SBE-2 output control is fully counter-clockwise. Initially, set the line adjust switch on the PS-4 to position 4 from fully counter-clockwise. The final voltage, transmitter voltage, and plate and screen overload breakers should be OFF.

17. To tune the Linear Amplifier RFD-1, first select the range to be used by tuning the DRIVER BAND switch and PA BAND switch to 4-8 and 6-8

respectively. Throw the MAIN POWER Breaker located on the PS-4, to ON; the MAIN POWER indicator should light. Check the LINE meter for a reading of 115 volts. Use the LINE ADJUST switch for correction if necessary. Throw the PLATE and SCREEN OVERLOAD breakers to ON.

19. Turn the TRANSMITTER VOLTAGES switch ON, the indicator will light after the main power breaker has been ON for about two (2) minutes. By throwing this breaker all voltages except the final plate voltage is applied to the transmitter. Wait until the indicator lights before proceeding.

20. Turn the MULTIMETER switch to 1st AMPL position.

21. Increase the OUTPUT control on the SBE-2 until a useable reading is obtained on the MULTIMETER of the RFD-1.

22. Rotate the 1st AMP TUNING control observing the MULTIMETER for a peak reading. Keep the needle on scale by varying the output of the SBE. This will occur for this frequency at a setting of about 7.

23. Turn the MULTIMETER switch to the PA GRID position.

24. Rotate the PA GRID tuning control, observing the MULTIMETER for a peak reading. Keep the needle on Scale by varying the output from the SBE-2. For the problem under consideration, this peak will occur between 6 and 8.

25. Rotate the OUTPUT control of the SBE-2 fully counter-clockwise and place the MULTIMETER switch in the PA screen position.

26. Turn the TUNING and LOADING CONTROL and the LOADING switch in th ir indicated position on the chart. In the problem under consideration, the following conditions prevail: TUNING and LOADING control to position 090 and 073 respectively, and LOADING switch to position 1. (For other frequencies refer to the table.)

27. Turn the FINAL VOLTAGES switch ON.

28. Turn the OUTPUT of the SBE-2 until a reading of about 300 ma is

obtained on the PA PLATE CURRENT meter.

29. Rotate the TUNING knob on the RFD-1 until a dip in the PA PLATE CURRENT is obtained.

30. Put the SBE-2 output fully counter-clockwise.

31. Put the TUNE/OPERATE switch on the MCU in the TUNE position, and the POWER switch in the X1 position.

32. Adjust SBE-2 OUTPUT for a convenient reading on the VSWR meter. This control may have to be readjusted throughout the procedure.

33. Turn the Monitor Control Unit METER switch to RES. Press RESISTANCE OPERATE switch until the meter indicates position 4.

34. Operate the REACTANCE control for a minimum VSWR on the large meter. Try the complete range.

NOTE: When the antenna installation is not ideal or perfect, or when a dummy load replaces the 35 foot whip, the tuning may occur at different control settings. Table 4-2 of the ATS-2 instruction manual shows some typical ideal installation settings . When conditions are not ideal, the operator should:

a. Try recommended RESISTANCE position and tune the REACTANCE control for a minimum VSWR.

b. If a reasonable VSWR (3 or better) cannot be obtained, tune REACTANCE throughout its fange on each RESISTANCE setting. Use the values which give the lowest VSWR.

35. Switch TUNE/OPERATE switch to OPERATE; POWER switch to X10.

36. Adjust SBE-2 OUTPUT for 500 forward watts on VSWR meter.

NOTE: The PA Plate current should not exceed 650 ma. and the PA Screen current should not exceed full scale. If the plate current exceeds 650 ma, and the plate overload breaker opens the circuit, it is an indication that the final of the RFD-1 is loaded too heavily and should be reduced and re-dipped. Conversely, if the screen current goes off scale

and the screen overload relay opens the circuit, it is an indication that the plate of the final is too lightly loaded and the loading should be increased and the final tank circuit re-dipped. It must also be noted that these values are affected by the setting of the OUTPUT control of the SBE-2.

37. Retouch PA TUNING control for dip; Check REACTANCE control on MCU for minimum VSWR.

38. Finally redip PA TUNING.

39. Turn CARRIER INSERT control on SBE-2 counter-clockwise until the VSWR meter reads 5 forward POWER.

40. Switch USB selector to CH 1. Turn FS TONE TRANSMITTER, Model 101, to L(ine).

41. Switch LSB selector to MIKE.-Speak into microphone continuously. Turn LSB GAIN clockwise until VSWR meter reads 500 watts on peaks.

The system is now on the air. The voice and teletype channels are available for use.

TABLE 4 CHART OF CABLE DESIGNATION AND COLOR CODES

CABLE NO.	FROM					TO					Type of Cable	Length of Cable	Remarks
	Case No.	Case Color Code	Unit	Cable Color Code	Connector	Case No.	Case Color Code	Unit	Cable Color Code	Connector			
1.													See Figure-13 (SY-1034-16)
2.	6	Blu/Blk	Tone Xmtr	None	None	2	Brn/Wht	Power Strip	None	AC Power Plug	2 Wire Power Cable	2 1/2 feet	
3.	4	Grn/Blk	VOX-3	Grn/Blk/Red	UG-260/U	10	Yel/Wht	GRO-90 RXD	Yel/Wht/Grn	UG-260/U	Coax RG-59/U	5 Feet	
4.	4	Grn/Blk	VOX-3	Grn/Blk/Grn	UG-260/U	10	Yel/Wht	GPR-90 RXD	Yel/Wht/Blu	UG-260/U	Coax RG-59/U	3 Ft. 10 In.	
5.	9	Grn/Wht	MSR-6#1	Grn/Wht/Brn	UG-260/U	10	Yel/Wht	GPR-90 RXD	Yel/Wht/Yel	Phono Plug JJ-144	Coax RG-59/U	4 feet	
6.	9	Grn/Wht	MSR-6#1	Grn/Wht/Brn	UG-260/U	9	Grn/Wht	MSR-6#2	Grn/Wht/Wht	UG-260/U	Coax RG-59/U	1 1/2 ft.	
7.	9	Grn/Wht	MSR-6#1	Grn/Wht/Blu	UG-260/U	5	Yel/Blk	AFC-1	Yel/Blk/Grn	UG-260/U	Coax RG-59/U	5 feet	
8.	9	Grn/Wht	MSR-6#1	Grn/Wht/Yel	UG-260/U	5	Yel/Blk	AFC-1	Yel/Blk/Yel	UG-260/U	Coax RG-59/U	6 feet	
9.	8.	Red/Wht	SBE-PS	Red/Wht/Brn	MS-3106B 20-27P(C)	8	Red/Wht	SBE-2	Red/Wht/Blk	MS-3106 B-20-27S(C)	Cable Interconnect	3 ft. 3 in.	
10.	9	Red/Wht	SBE-2	Red/Wht/Blu	UG-260/U	3	Red/Blk	PMO-5	Red/Blk/Red	UG-260/U	Coax RG-59/U	4 ft. 8 in.	
11.	8	Red/Wht	SBE-2	Red/Wht/Grn	UG-260/U	7	Brn/Blk	RFD	Brn/Blk/Grn	UG-176/U	Coax RG-59/U	3 ft. 10 in.	
12.	2	Brn/Wht	PS-4	Brn/Wht/Red	MS-3106 B32-7P	7	Brn/Blk	RFD	None	None	Power Cable	4 Feet	
13.	1	Blk/Wht	PS-5	Blk/Wht/Red	MS-3106 B-18-16P	7	Brn/Blk	RFD	None	None	H volt B+ Cable	7 Feet	
14.	2	Brn/Wht	PS-4	Brn/Wht/Grn	MS-3106B 28-11P	1	Blk/Wht	PS-5	None	None	Interlock Power	6 Feet	
15.	6	Blu/Blk	ATS-MCU2	Blu/Blk/Blu	MS-3106A 20-27P	None	None	ATS-50 TU-2	None		Control Cable CA-541-100	100 Feet	
16.	7	Brn/Blk	RFD	Brn/Blk/Red	UG-59B/U	6	Blu/Blk	ATS-50 CU-2	Blu/Blk/Blk	UG-59B/U	Coax RG-8/U	2 1/2 Ft.	
17.	6	Blu/Blk	ATS-MCU2	Blu/Blk/Grn	MS-3106 A-14S-2P	6	Blu/Blk	ATS-50 CU-2	Blu/Blk/Yel	MS-3106-A 14S-2S	4 Wire Cable TMC CA-499	2 1/2 Ft.	
18.	6	Blu/Blk	ATS-50-TU2	Blu/Blk/Wht	UG-59B/U	None	None	ATS-50 TU-2	None		Coax RG-8/U		

TABLE 4 CHART OF CABLE DESIGNATION AND COLOR CODES (Continued)

	FROM					TO							
CABLE NO	Case No	Case Color Code	Unit	Cable Color Code	Connector	Case No.	Case Color Code	Unit	Cable Color Code	Connector	Type of Cable	Length of Cable	Remarks
19.	None	None	ATS-50 TU-2	None		None	None	A-1486 35 Whip Antenna	None		#28 Standard Wire	27 in.	
20.	9	Grn/Wht	MSR-6#1	None	MS-3106 A-16S-5S(C)	None	None	Power Strip	None	AC Power Plug	AC Power Cord 3W	3 ft. 3 in.	For Power Connection see Fig. 7 or 8.
21.	9	Grn/Wht	MSR-6#2	None	MS-3106 A-16S-5S(C)	None	None	Power Strip	None	AC Power Plug	AC Power Cord 3W	2 ft. 3 in	
22.	4	Grn/Blk	VOX-3	None	None	None	None	Power Strip	None	AC Power Plug	AC Power Cord 2W	1 ft.	
23.	5	Yel/Blk	AFC-1	None	MS-3106 A-16S-5S(C)	None	None	Power Strip	None	AC Power Plug	AC Power Cord 3W	1 ft. 5 in.	
24.	10	Yel/Wht	GPR-90 RXD	None	None	None	None	Power Strip	None	AC Power Plug	AC Power Cord 2W	3 ft.	
25.	5	Yel/Blk	Tone RX	None	None	None	None	Power Strip	None	AC Power Plug	AC Power Cord 2W	1 ft. 8 in.	
26.	3	Red/Blk	PMO-5	None	None	None	None	Power Strip	None	AC Power Plug	AC Power Cord 2W	2 Ft.	
27.	8	Red/Wht	SBE-PS	None	AC Power Turn Lock	None	None	Power Strip	None	AC Power Plug	AC Power Cord 2W	4 ft.	
28.	2	Brn/Wht	PS-4	None	AC Power Plug;3 way twist lock	2	None	Power Junc. Box	None	None	AC Power Cord 3W	2 ft.	
29.	2	Brn/Wht	Power Junc. Box	None	None	2	Brn/Wht	Power Strip	None	AC Power Plug	AC Power Cable 3W	1 1/2 ft.	
30.	None	None	Power Strip	None	AC Power Connector	None	None	Power Strip	None	None	AC Power Jumper Cord	2 ft. 5 in.	
31.	None	None	Power Strip	None	AC Power Connector	None	None	Power Strip	None	None	AC Power Jumper Cord	2 ft. 5 in.	
32.	None	None	Power Strip	None	AC Power Connector	None	None	Power Strip	None	None	AC Power Cable 2W	2 ft. 5 in.	
33.	None	None	Power Strip	None	AC Power Plug Tune Lock	None	None	Power Strip	None	AC Power Connector	AC Power Cord	6 ft.	

TABLE 4 CHART OF CABLE DESIGNATION AND COLOR CODES (Continued)

FROM						TO							
CABLE NO	Case No.	Case Color Code	Unit	Cable Color Code	Connector	Case No	Case Color Code	Unit	Cable Color Code	Connector	Type of Cable	Length of Cable	Remarks
						3	Red/Blk	PMO	Red/Blk/Blu	UG-260/U	RG-59/U		Part of PMO
						4	Grn/Blk	VOX-3	Grn/Blk/Blu	UG-260/U	RG-59/U		Part of VOX
						4	Grn/Blk	VOX-3	Grn/Blk/Blu	UG-260/U	RG-59/U		Part of VOX

NOTE: For Connection

See Fig. 5, Interconnecting Diagram

NOTE: 2W is 2 Wire
3W is 3 Wire
Blk is Black
Wht is White
Grn is Green
Yel is Yellow
Blu is Blue
Brn is Brown

NOTE:

1. MODEL TOC CASE NUMBERS 2 THROUGH 11
2. MODEL TOC-1 CASE NO. 1
3. MODEL TOC-2 CASE NO. 12 FOR SPARE PARTS (NOT SHOWN)

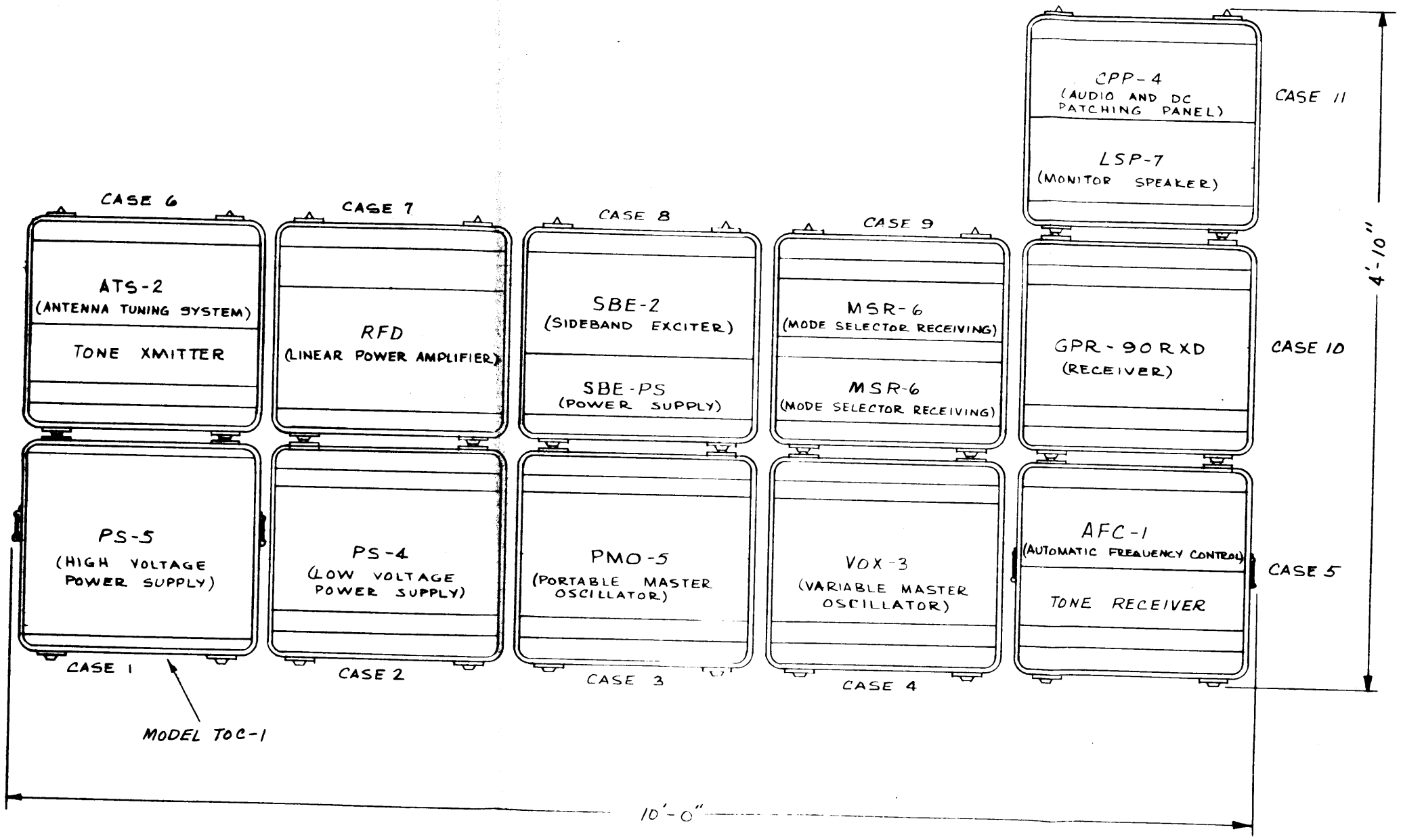


FIGURE 1

STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT		
MATERIAL	SALES ORDER NUMBER 10843	PROPOSAL NUMBER 1034	OR NUMBER 3472
TYPE & TEMPER HEAT TREAT SPEC	TITLE: OPERATING CONFIGURATION (EXHIBIT A) LOW POWER FLY AWAY TRANSMIT/ RECEIVE STATION (AF-30[635]-10991)		
FINISH & SPEC NO	MJT / DRAWN BY	7-20-60 / DATE	FINAL APPROVAL
	SY-1034-1	SYSTEM DWG NO	

FORM 104

TUBE COMPLEMENT

	6AB4	6CB6	6AU6	6BE6	6BA6	6AL5	12AX7	6V6	6AG5	5U4G	OA2	12AT7	5Y3G	6J6	12AU7A		RR-109	5Y3GT	6AH6	6AQ5	12AU7	872A	OB2	5R4GY	6X4	1N67	1N303	PL-172	6146	6CL6	1N34	5V4G	6C4	6U8	5R4	CK711	OC2
GPR-90RXD	1	2	1	1	4	1	1	1	3	1	1																									
MSR-6				4	2	2			2		2	2	2	2	4																					
PMO-6	1			1							1						1	1	1	1	2															
PAL-1K											3											2	2	1	1	2	3	1	1	1						
VOX-3	1			1							1									6	3										1	1				
SBE-2	3					1					2	4							2		2							1	2				2	1	1	
ATS-2												1																								1
AFC-1	1		2			1	2		1		2										1												1			
Total	7	2	3	7	6	5	3	1	6	1	12	7	2	2	4		1	1	3	7	8	2	2	1	1	2	3	1	2	3	4	1	1	3	1	1	1
90 Day Spares	3	1	1	3	2	1	1	1	2	1	4	3	1	1	2		1	1	1	3	3	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1

FIGURE 2

STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT			
	SALES ORDER NUMBER 10843	PROPOSAL NUMBER 1034	QR NUMBER 3472	
MATERIAL	TITLE: TUBE COMPLEMENT FOR LOW POWER FLY AWAY TRANSMIT/RECEIVE STATION (AF-30 (635)-18971)			
TYPE & TEMPER / HEAT TREAT & SPEC				
FINISH & SPEC. NO.	DRAWN BY	DATE 7-21-60	FINAL APPROVAL	SY-1034-2 / SYSTEM DWG. NO. / NO. OF SH.

SY-1034-3 | SYSTEM DWG. NO | NO. OF SH.

FUSE AND LAMP COMPLEMENT

	BI-101-44AF	BI-101-44	BI-101-47	BI-100-51	BI-102-3	FU-100-1	FU-100-2	FU-100-3	FU-100-250	FU-102-1	FU-102-1.5	FU-102-.1	FU-102-2	FU-102-3	FU-102-250
GPR-9[illegible]RXD	2	1					1								
MSR-6			6					2							
VOX-3		1		3			1	1							
ATS-2			1	2			1								
AFC-1			2							1					
SBE-2			1	2						2	2		2	2	2
PAL-1[illegible]					3	1		1	1			1			
PMO-5		1		4				3	2						
Total	2	3	10	11	3	1	3	7	3	3	2	1	2	2	2
90 Da[illegible] Spare	2	3	10	11	3	1	3	7	3	3	2	1	2	2	2

FIGURE 3

STOCK SIZE

MATERIAL

TYPE & TEMPER | HEAT TREAT SPEC.

FINISH & SPEC NO.

FORM 162

REMARKS:

THE TECHNICAL MATERIEL CORP.
MAMARONECK, NEW YORK
SYSTEMS DEPARTMENT

SALES ORDER NUMBER	PROPOSAL NUMBER	QR NUMBER
10843	1034	3472

TITLE: FUSE AND LAMPS FOR LOW POWER FLY AWAY TRANSMIT RECEIVE STATION (AF-30(635)-18791)

DRAWN BY	DATE	FINAL APPROVAL	SYSTEM DWG. NO.	NO. OF SH.
	7-21-60	[illegible]	SY-1034-3	

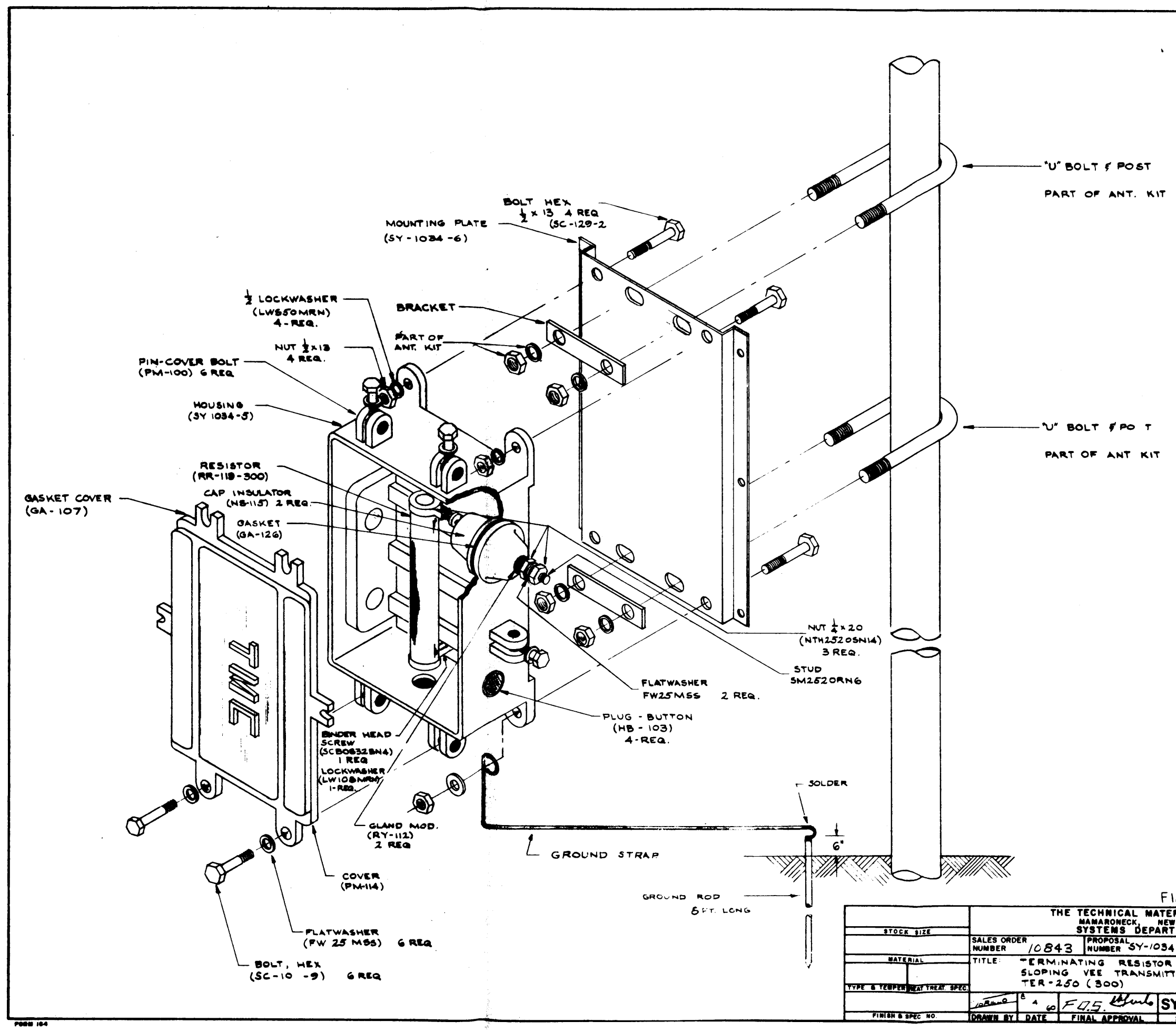
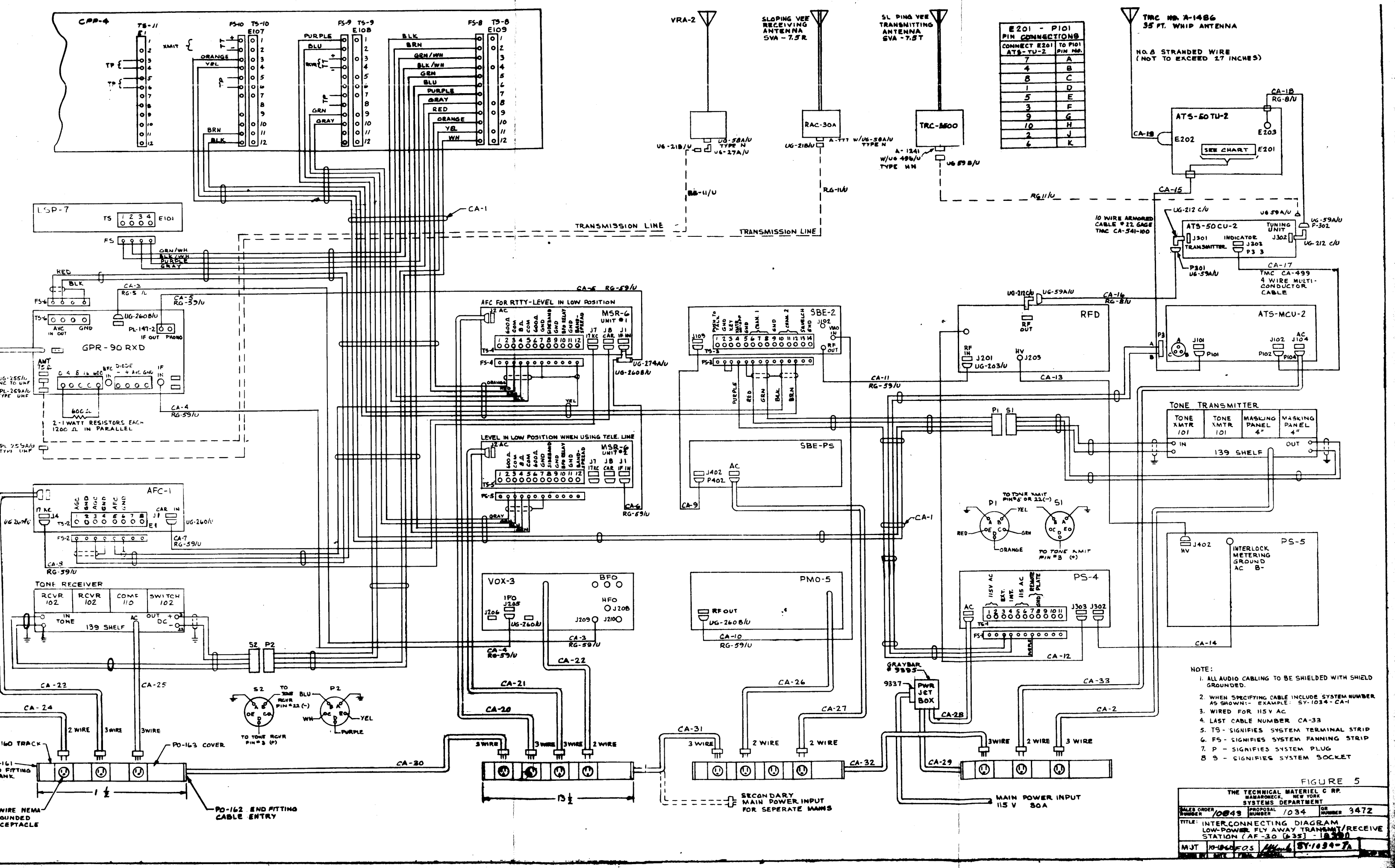


FIGURE 4

STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT			
	SALES ORDER NUMBER 10843	PROPOSAL NUMBER SY-1034-4	GR NUMBER 3472	
MATERIAL	TITLE: TERMINATING RESISTOR ASSEMBLY FOR SLOPING VEE TRANSMITTING ANTENNA TER-250 (300)			
TYPE & TEMPER / HEAT TREAT. SPEC.				
FINISH & SPEC NO.	DRAWN BY	DATE 4/6	FINAL APPROVAL F.O.S.	SYSTEM DWG. NO. SY-1034-4



NOTE:

1. ALL AUDIO CABLING TO BE SHIELDED WITH SHIELD GROUNDED.
2. WHEN SPECIFYING CABLE INCLUDE SYSTEM NUMBER AS SHOWN:- EXAMPLE: SY-1034-CA-1
3. WIRED FOR 115 V AC
4. LAST CABLE NUMBER CA-33
5. TS - SIGNIFIES SYSTEM TERMINAL STRIP
6. FS - SIGNIFIES SYSTEM FANNING STRIP
7. P - SIGNIFIES SYSTEM PLUG
8. S - SIGNIFIES SYSTEM SOCKET

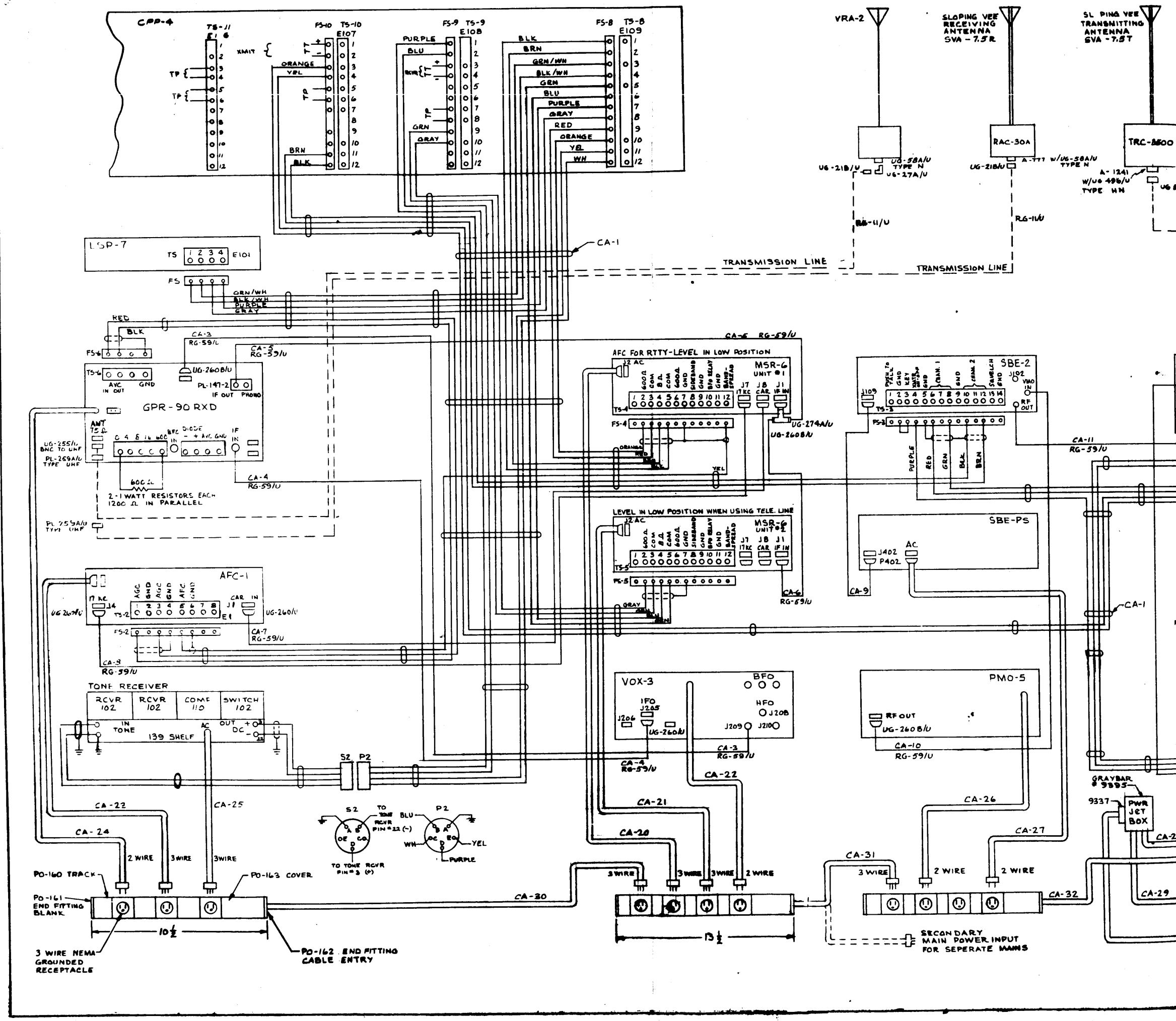
FIGURE 5

THE TECHNICAL MATERIEL C RP.
MAMARONECK, NEW YORK
SYSTEMS DEPARTMENT

SALES ORDER NUMBER	PROPOSAL NUMBER	GR NUMBER
10849	1034	3472

TITLE: INTERCONNECTING DIAGRAM LOW-POWER FLY AWAY TRANSMIT/RECEIVE STATION (AF-30 (G35) - [illegible]

DRAWN BY	DATE	PROJ. ENGR.	APPROVED	DRAWING NO.
M.J.T	10-18-60	F.O.S.	[illegible]	SY-1034-7A


CPD-4
TS-11
E106
TP
XMIT
FS-10
TS-10
E107
ORANGE
YEL
BRN
BLK
FS-9
TS-9
E108
PURPLE
BLU
GRN
GRAY
FS-8
TS-8
E109
BLK
BRN
GRN/WH
BLK/WH
GRN
BLU
PURPLE
GRAY
RED
ORANGE
YEL
WH
VRA-2
SLOPING VEE RECEIVING ANTENNA SVA - 7.5 R
SL PING VEE TRANSMITTING ANTENNA SVA - 7.5 T
RAC-30A
TRC-8500
UG-218/U
UG-58A/U TYPE N
UG-27A/U
A-777 W/UG-58A/U TYPE N
A-1241 W/UG 496/U TYPE HN
RG-11/U
TRANSMISSION LINE
LSP-7
TS 1 2 3 4 E101
FS
CA-1
RED
BLK
CA-2 RG-59/U
CA-3 RG-59/U
CA-5 RG-59/U
FS-6
TS-6
AVC IN OUT
GND
UG-260B/U
PL-147-2
IF OUT
PHONO
GPR-90 RXD
ANT 75Ω
UG-255/U BNC TO UHF
PL-259A/U TYPE UHF
C 4 8 16 MFC
BFO IN
DIODE - + AVC GND
IF IN
600Ω
2-1 WATT RESISTORS EACH 1200 Ω IN PARALLEL
CA-4 RG-59/U
CA-6 RG-59/U
AFC FOR RTTY-LEVEL IN LOW POSITION
MSR-6 UNIT #1
J2 AC
600Ω COM
B.L. COM
600Ω GND
SHIELD GND
RLY RELAY GND
BAND-SPREAD GND
J7 17KC
J8 CAR
J1 IF IN
TS-4
FS-4
UG-274A/U
UG-260B/U
SBE-2
J102
VIBO OUT
R.F. OUT
PUSH TO TALK GND
KEY JACK
CHAN 1
CHAN 2
SAMELCH GND
J109
TS-3
FS-3
CA-11 RG-59/U
LEVEL IN LOW POSITION WHEN USING TELE. LINE
MSR-6 UNIT #2
TS-5
FS-5
CA-6 RG-59/U
SBE-PS
J402
P402
AC
CA-9
CA-1
AFC-1
17 KC
J4
AGC
GND
AGC
GND
AFC
GND
CAR IN
J1
E1
TS-2
UG-260/U
FS-2
CA-7 RG-59/U
CA-8 RG-59/U
TONE RECEIVER
RCVR 102
RCVR 102
COMB 110
SWITCH 102
IN TONE
139 SHELF
AC
OUT DC +
DC -
S2
P2
S2 TO TONE RCVR PIN #22 (-)
TO TONE RCVR PIN #3 (+)
BLU
WH
YEL
PURPLE
VOX-3
IFO J2A5
J206
UG-260B/U
BFO
HFO J208
J209
J210
CA-3 RG-59/U
CA-4 RG-59/U
PMO-5
RF OUT
UG-260B/U
CA-10 RG-59/U
CA-22
CA-21
CA-26
CA-27
CA-24
CA-25
CA-20
CA-31
CA-32
CA-30
CA-29
2 WIRE
3 WIRE
PO-160 TRACK
PO-161 END FITTING BLANK
PO-162 END FITTING CABLE ENTRY
PO-163 COVER
10½
13½
3 WIRE NEMA GROUNDED RECEPTACLE
SECONDARY MAIN POWER INPUT FOR SEPERATE MAINS
GRAYBAR # 9395
9337
PWR JCT BOX

SY-1034-8	
SYSTEM DWG NO	NO OF SH

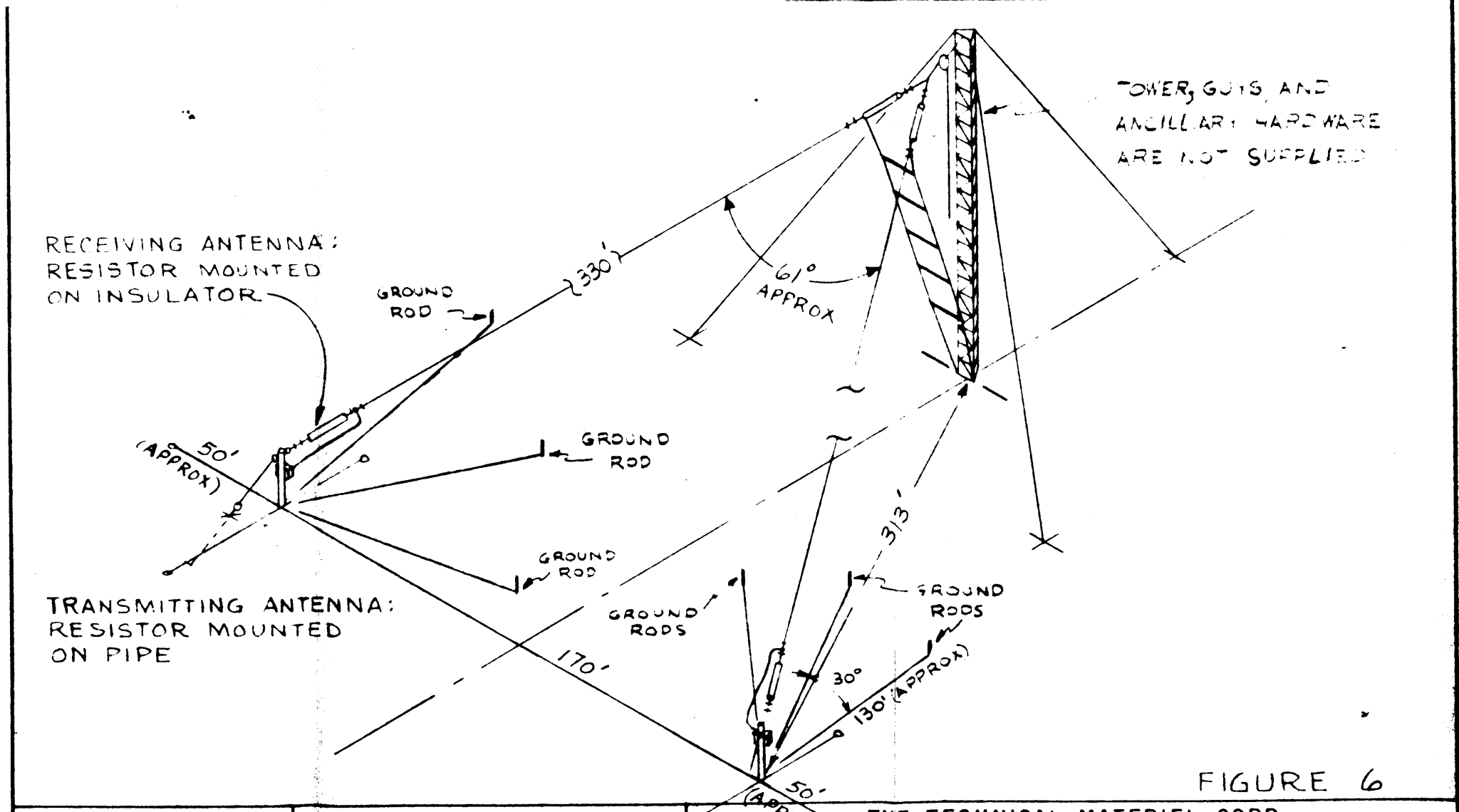


FIGURE 6

STOCK SIZE		REMARKS:
MATERIAL		
TYPE & TEMPER	HEAT TREAT SPEC	
FINISH & SPEC NO		

FORM 162

THE TECHNICAL MATERIEL CORP.
MAMARONECK, NEW YORK
SYSTEMS DEPARTMENT

SALES ORDER NUMBER	PROPOSAL NUMBER	QR NUMBER
10843	1034	3472

TITLE: MODEL SVA 7.5 "V" ANTENNA RECEIVING OR TRANSMITTING

DRAWN BY	DATE	FINAL APPROVAL	SYSTEM DWG. NO	NO. OF SH.
MJT	9-6-60		SY-1034-8	

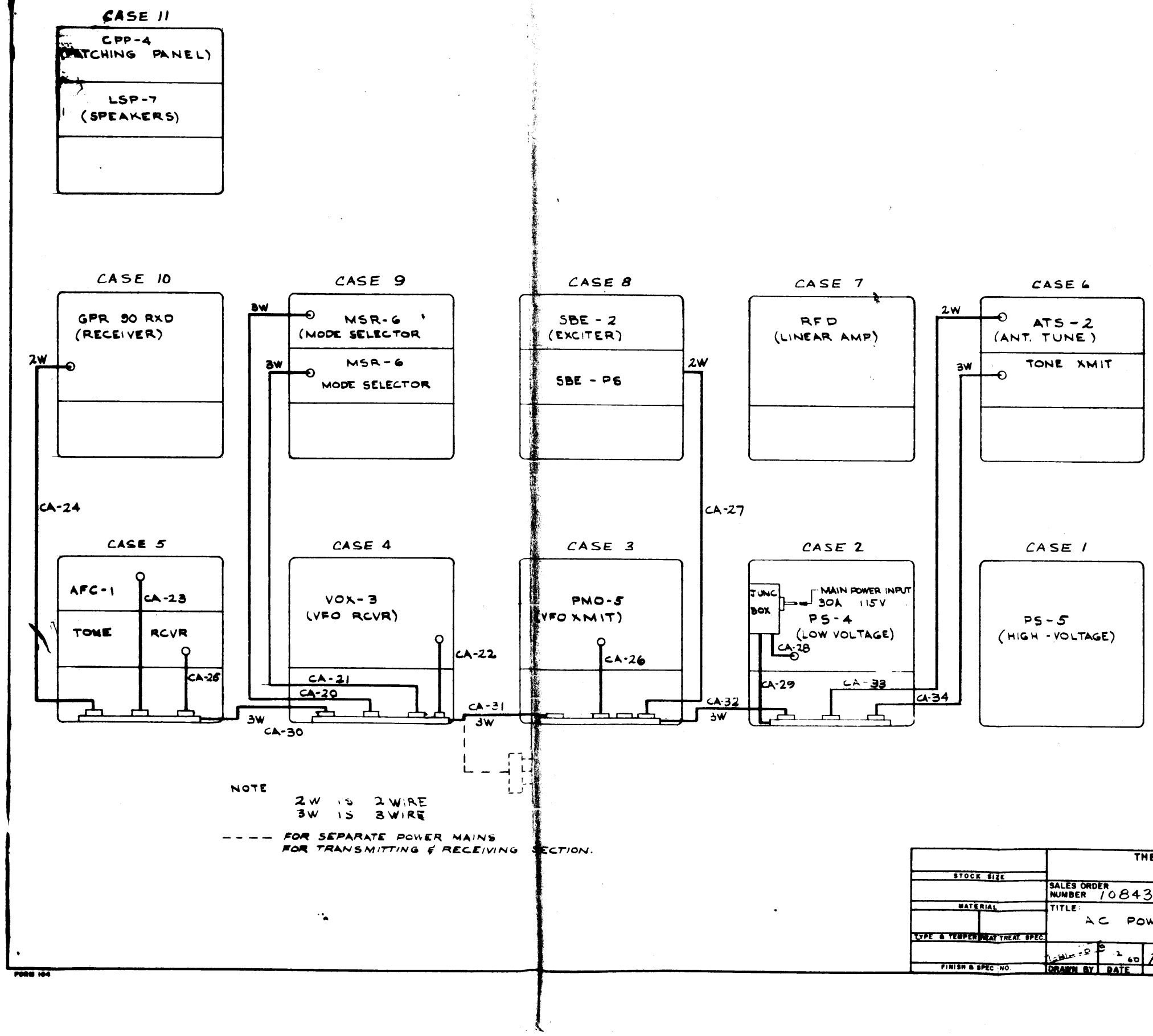
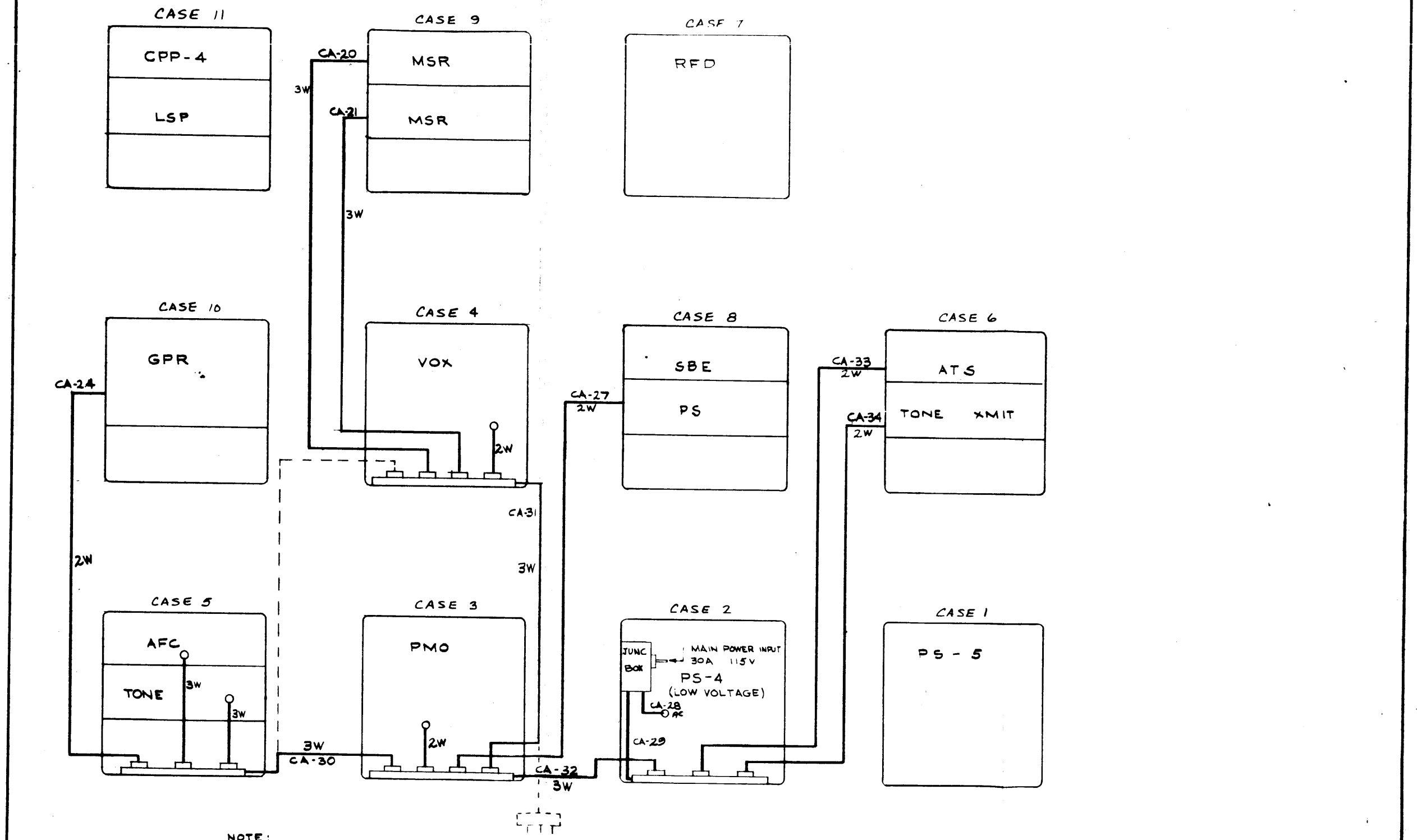


FIGURE 7

STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT			
	SALES ORDER NUMBER 10843	PROPOSAL NUMBER 034	QR NUMBER 3472	
MATERIAL	TITLE: AC POWER CONNECTIONS			
TYPE & TEMPER HEAT TREAT SPEC				
FINISH & SPEC NO	DRAWN BY	DATE 2 60	FINAL APPROVAL F.O.S	SYSTEM DWG. NO. SY-1034-10

FORM 104



NOTE:

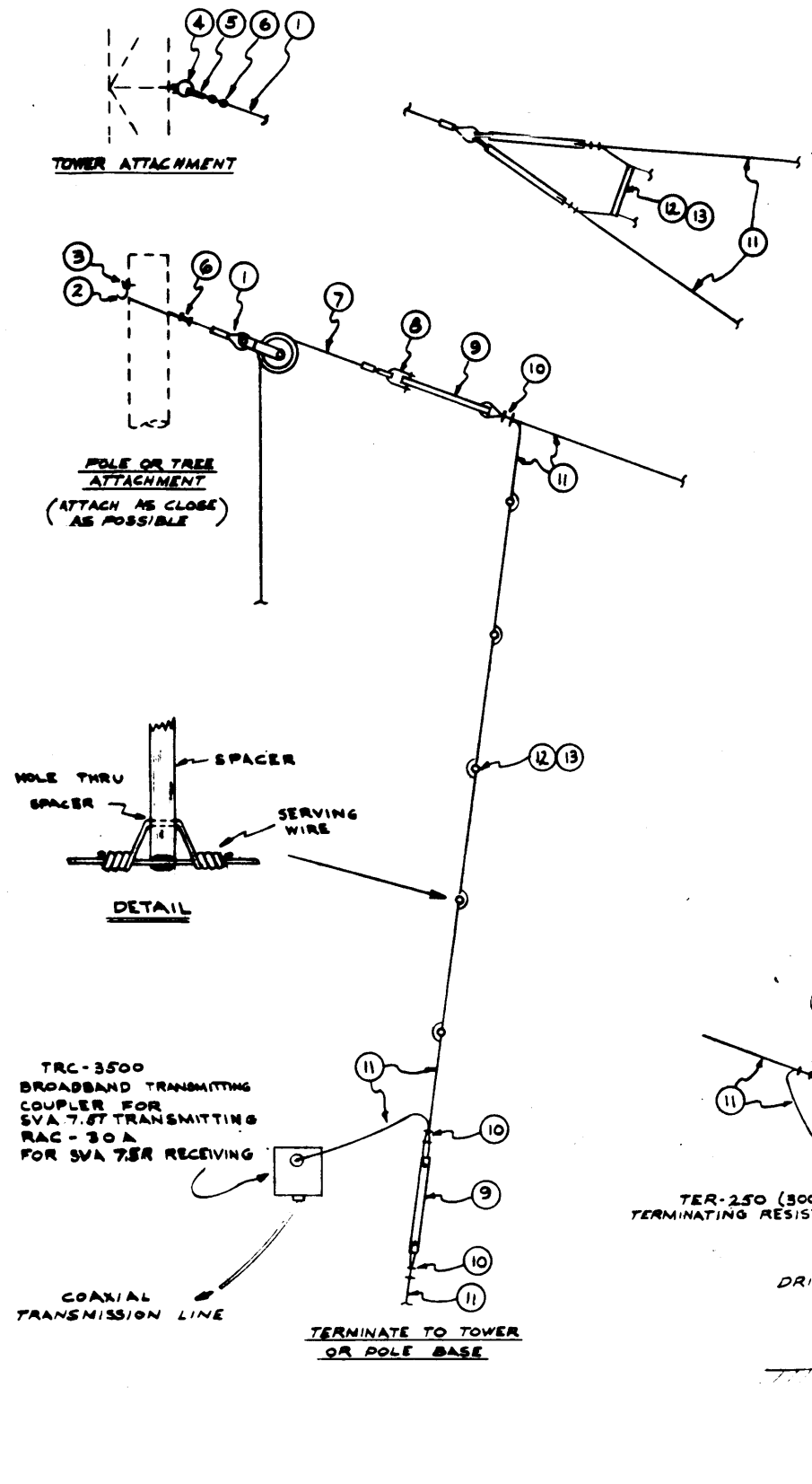
2W IS 2 WIRE
3W IS 3 WIRE

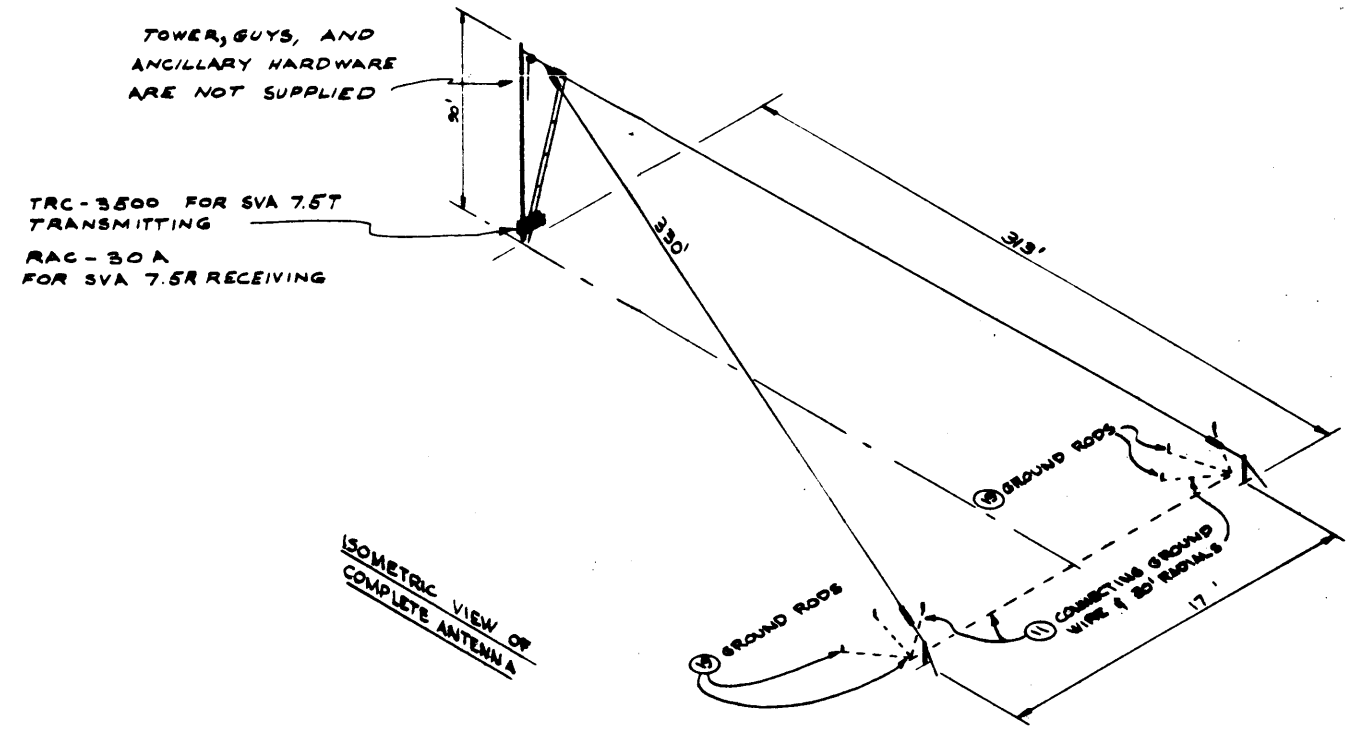
--- FOR SEPARATE POWER MAINS FOR TRANSMITTING & RECEIVING SECTIONS.

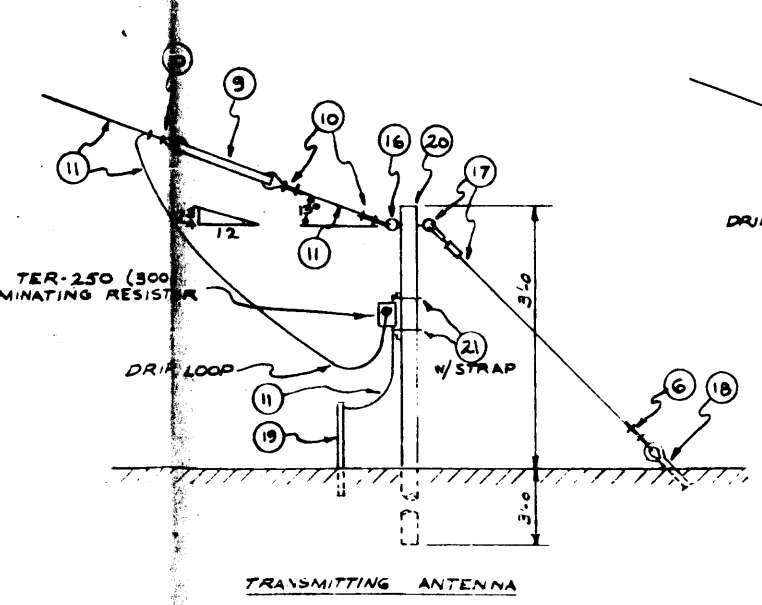
FIGURE 8

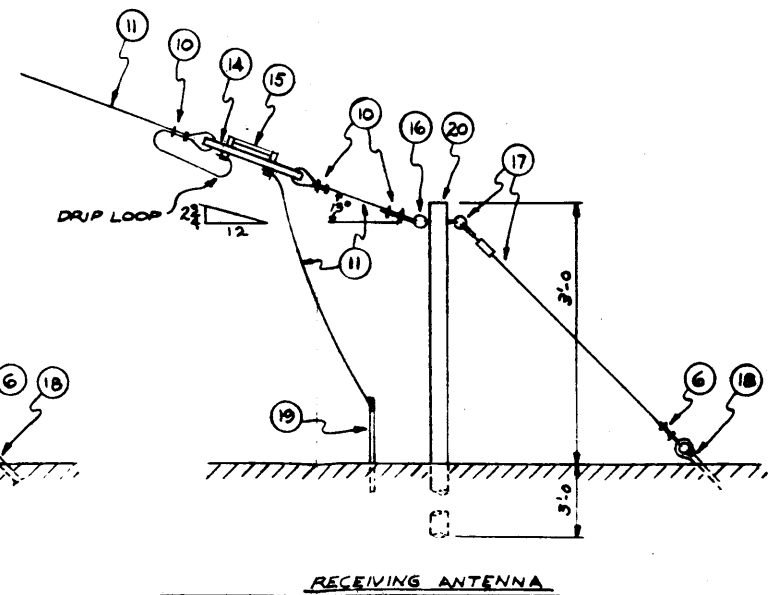
STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT		
MATERIAL	SALES ORDER NUMBER 10843	PROPOSAL NUMBER 1034	GR NUMBER 3472
TYPE & TEMPER / HEAT TRT / SPEC	TITLE: AC POWER CONNECTIONS ALTERNATE METHOD.		
FINISH & SPEC NO.	DRAWN BY: [illegible] DATE: 9-12-60	FINAL APPROVAL: F.O.S	SYSTEM DWG. NO.: SY-1034-11

FORM 104









NOTE:
SLOPE INDICATED AT BOTTOM INSULATOR IS FOR A RECOMMENDED STRINGING TENSION OF 250 LBS PER WIRE @ 60°F

FIGURE 9

STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT		
	SALES ORDER NUMBER 10843	PROPOSAL NUMBER	GR NUMBER 3472
MATERIAL	TITLE E.A. 7.5T TRANSMITTING & SVA 7.5R RECEIVING SLOPING "V" ANTENNAS		
TYPE & TEMPER HEAT TREAT SPEC.			
FINISH & SPEC NO.	DRAWN BY	DATE	FINAL APPROVAL
			SYSTEM DWG. NO. SY-1034-12
			NO. OF SH.

FORM 164

FORM 162

Item No.	Quantity (1) Kit Receiving	Quantity (1) Kit Transmitting	Description
1	1	1	Sling, 3/16 H.S. Strand x 6' lg., Prefab one end to 6" Pulley
2	1	1	J-Hook, for Pole Attachment
3	1	1	Lag Screw, for Pole Attachment, 1/2 x 4-1/2 lg.
4	1	1	Shackle, for Tower Attachment, 5/16
5	1	1	Thimble, for Tower Attachment, 3/16
6	6	6	Fist Grip, 3/16-1/4
7	1	1	Hoisting Cable, 3/16 wire rope x 100' lg., Prefab. one end with 1/4 heavy thimble.
8	2	2	Insulator Shackle
9	5	7	Strain Insulator, 12" w/lead liners (incl. 1 spare)
10	26	26	Split-Bolt Connector, for (2) #10 sol. CW wire (incl. 2 spares)
11	1880 ft.	1880 ft.	#10 AWG Copperweld Wire
12	5	5	Spreader Insulator, 3/4" dia. x 8" lg.
13	14 ft.	14 ft.	Serving wire, #14 Stainless Steel (annealed)
14	2	-	Strain Insulator, 10" w/resistor mounting
15	2 pair	-	Resistor, 400 OHM (incl. 1 spare pair)
16	2	2	Eye Nut, 1/2"
17	2	2	Guy Attachment, 3/16 H.S. x 6' lg one end prefab. to eye of eyebolt 1/2 x 3-1/4 lg.
18	2	2	Screw Anchor, 3/4 dia. x 6'6" lg. thimble or triple-eye
19	8	8	Ground Rod, 1/2" x 6' lg., Galv. or Copperweld
20	2	2	Pipe, 2" std. x 6' lg., Galv.
21	-	4	U-Bolt w/strap, for 2" std. pipe.

FINISH & SPEC NO. | TYPE & TEMPER / HEAT TREAT SPEC | MATERIAL | STOCK SIZE | REMARKS

THE TECHNICAL MATERIEL CORP.
MAMARONECK, NEW YORK
SYSTEMS DEPARTMENT

SALES ORDER NUMBER 10843 | PROPOSAL NUMBER SY-1034 | QR NUMBER 3472

TITLE: Bill of Materials for Drawing SY-1034 - 12
SVA-7.5 T and SVA-7.5 R

DRAWN BY NBP | DATE 7/10/60 | FINAL APPROVAL | SYSTEM DWG. NO. SY- 1034 - 13 | NO. OF SH.

SY- 1034 - 13 | SYSTEM DWG. NO. | NO. OF SH.

FIGURE 10

NOTE:

1. MODEL TOC CASE NUMBERS 2 THRU 11
2. MODEL TOC-1 CASE NO. 1
3. MODEL TOC-2 CASE NO. 12 FOR SPARE PARTS (NOT SHOWN

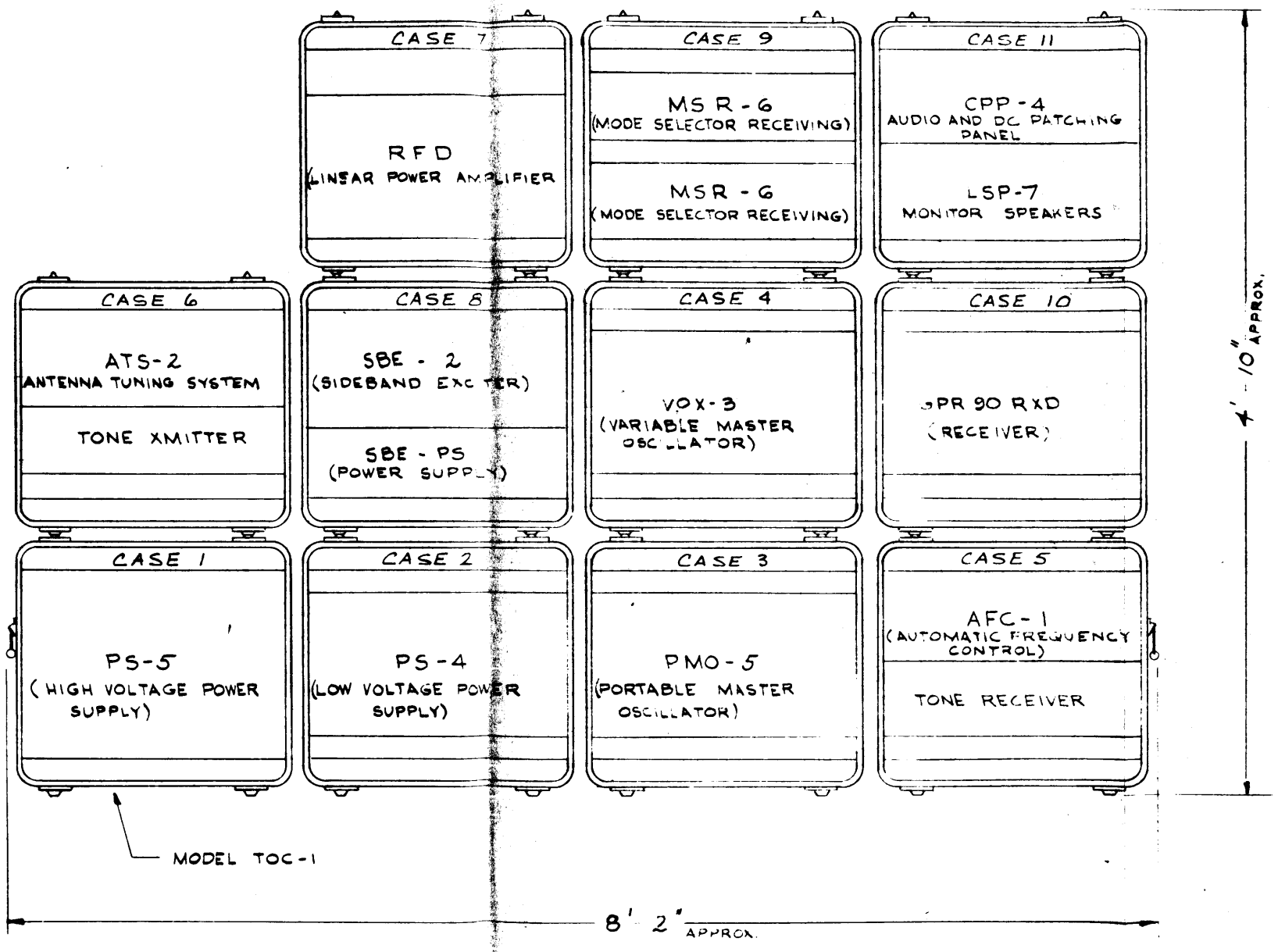


FIGURE 11

STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT				
	SALES ORDER NUMBER C843	PROPOSAL NUMBER 1034		QR NUMBER 3492	
MATERIAL	TITLE: OPERATING CONFIGURATION ALTERNATE LOW POWER FLY AWAY TRANSMIT/ RECEIVE STATION (AF-30[635]-18991)				
TYPE & TEMPER HEAT SPEC.					
FINISH & SPEC. NO.	DRAWN BY: [illegible]	DATE: 10-7-60	FINAL APPROVAL: [illegible] FOS	SYSTEM DWG. NO. SY-1034-14	NO. OF SH.

FORM 164

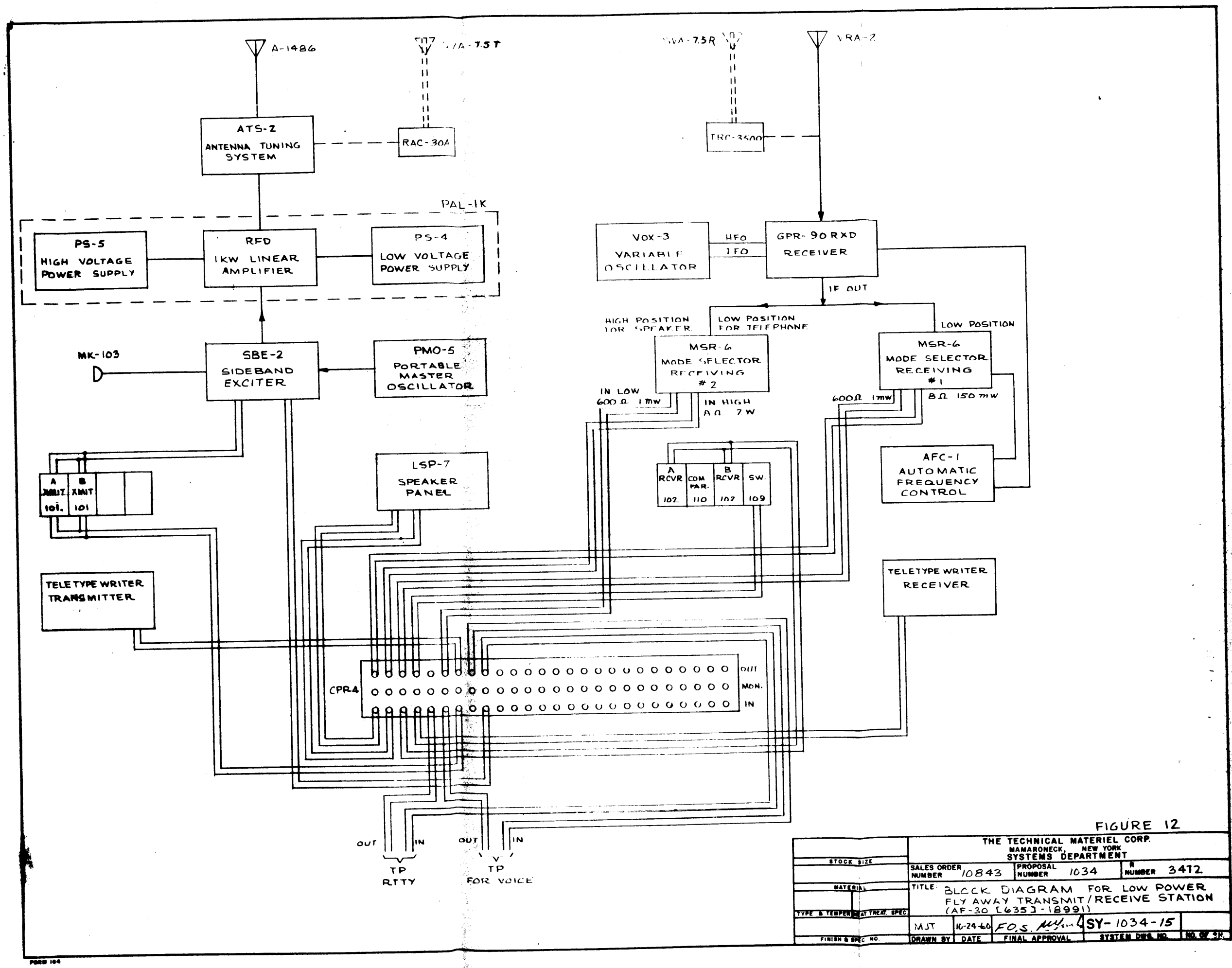


FIGURE 12

STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT			
	SALES ORDER NUMBER 10843	PROPOSAL NUMBER 1034		R NUMBER 3412
MATERIAL	TITLE: BLOCK DIAGRAM FOR LOW POWER FLY AWAY TRANSMIT/RECEIVE STATION (AF-30 [635J-1899])			
TYPE & TEMPER / HEAT TREAT SPEC.				
FINISH & SPEC NO.	DRAWN BY MJT	DATE 10-24-60	FINAL APPROVAL F.O.S.	SYSTEM DWG. NO. SY-1034-15

FORM 104

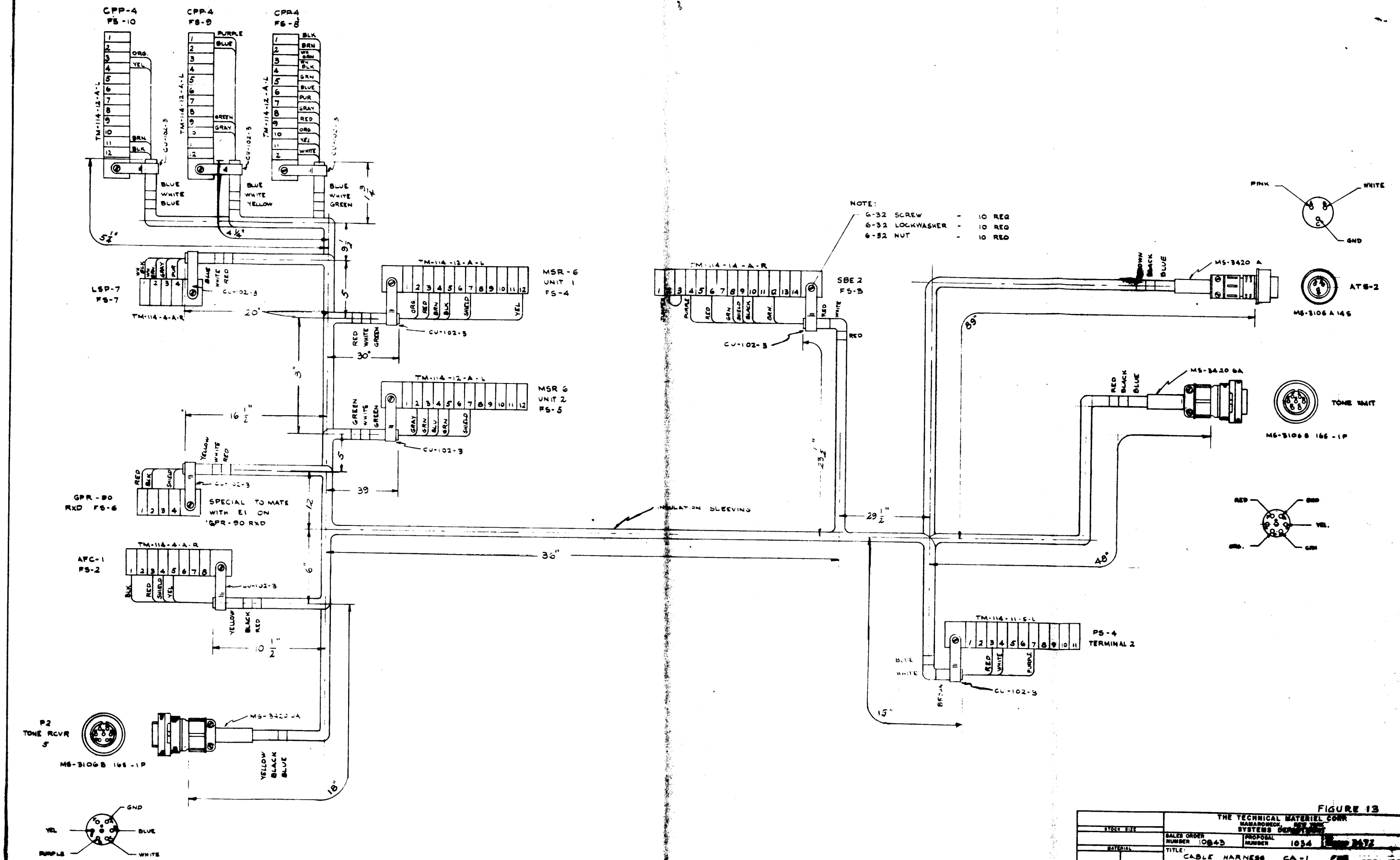


FIGURE 13

STOCK SIZE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DIVISION
MATERIAL	SALES ORDER NUMBER 10843 · PROPOSAL NUMBER 1034 · [illegible] 3472
TYPE & FINISH OR HEAT TREAT SPEC.	TITLE: CABLE HARNESS CA-1 FOR LOW POWER FLY AWAY TRANSMIT/RECEIVE SYSTEM [illegible]
FINISH & SPEC. NO.	SCALE: 1" = 1'-0" · APPD. · DRAWN BY · DATE · SY-1034-16

SY-1034-18	
SYSTEM DWG. NO.	NO. OF SH.

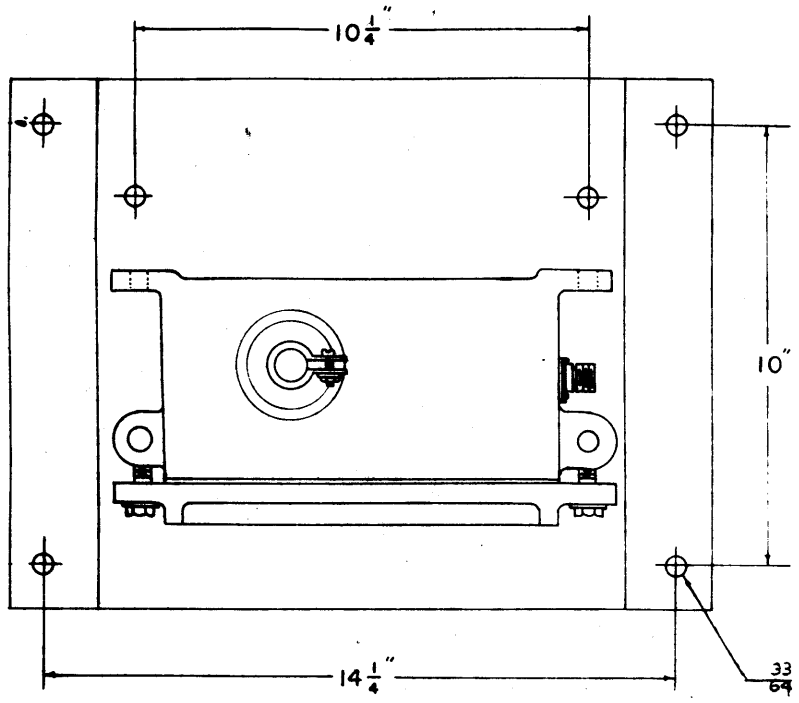
COAXIAL CONNECTORS AND ADAPTERS SUPPLIED AS LOOSE ITEMS.

WHERE USED	QUAN.	TYPE	DESCRIPTION	USE
GPR-90RXD	1	UG-255/U	BNC to UHF Adapter	Ant. Xmission Line
GPR-90RXD	1	UG-259/A/U	UHF For Cable	Ant. Xmission Line
VRA-2	1	UG-27A/U	(N Rt. Angle Part of VRA-2)	Ant. Xmission Line
VRA-2	1	UG-21B/U	(N for Cable Part of VRA-2)	Ant. Xmission Line
RAC-30A	1	UG-21B/U	(N for cable Part of RAC-30AW/A-777	Ant. Xmission Line
TRC-3500	1	UG-59B/U	(HN For cable Part of TRC-3500W/A-1241)	Ant. Xmission Line
RFD	1	UG-59B/U	HN For Cable	Ant. Xmission Line
Total	2	UG-59B/U		
	2	UG-21B/U		
	1	UG-27A/U		
	1	UG-255/U		
	1	UG-259A/U		

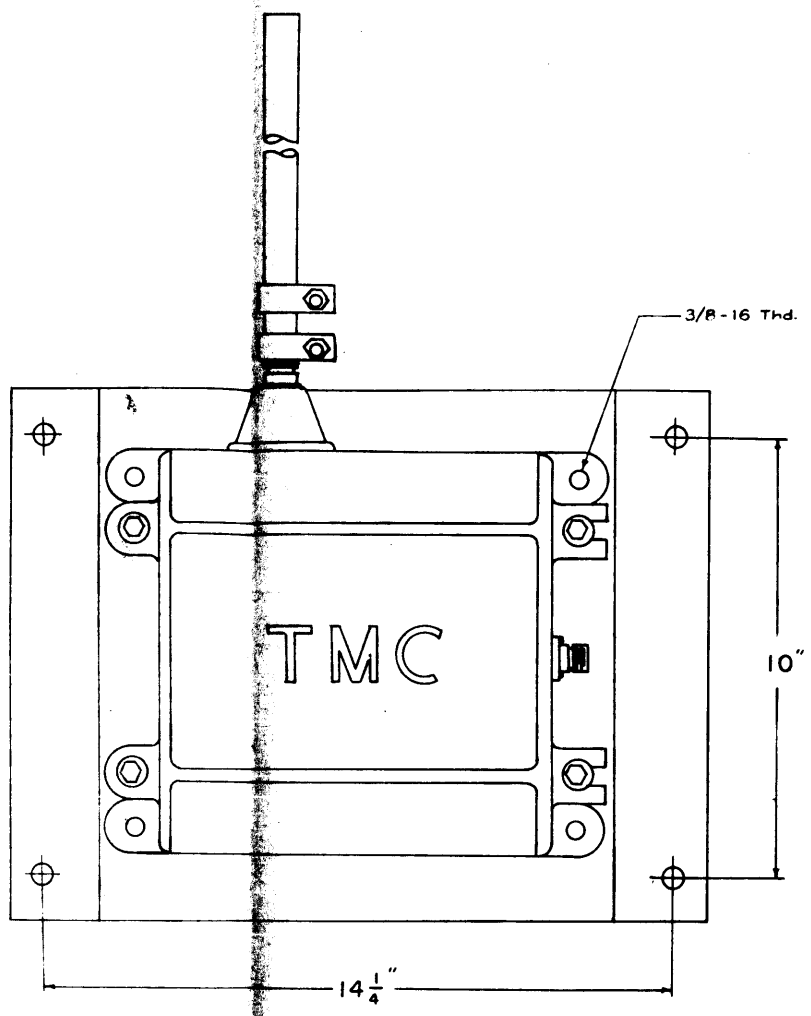
FIGURE 14

STOCK SIZE		REMARKS:	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK SYSTEMS DEPARTMENT			
MATERIAL			SALES ORDER NUMBER 10843	PROPOSAL NUMBER SY-1034	QR NUMBER 3472	
TYPE & TEMPER	HEAT TREAT SPEC.		TITLE: Coaxial Connectors and Adapters (loose)			
FINISH & SPEC NO.			DRAWN BY	DATE: 11-8-60	FINAL APPROVAL: F.C.S.	SYSTEM DWG. NO.: SY-1034-18 / NO. OF SH.

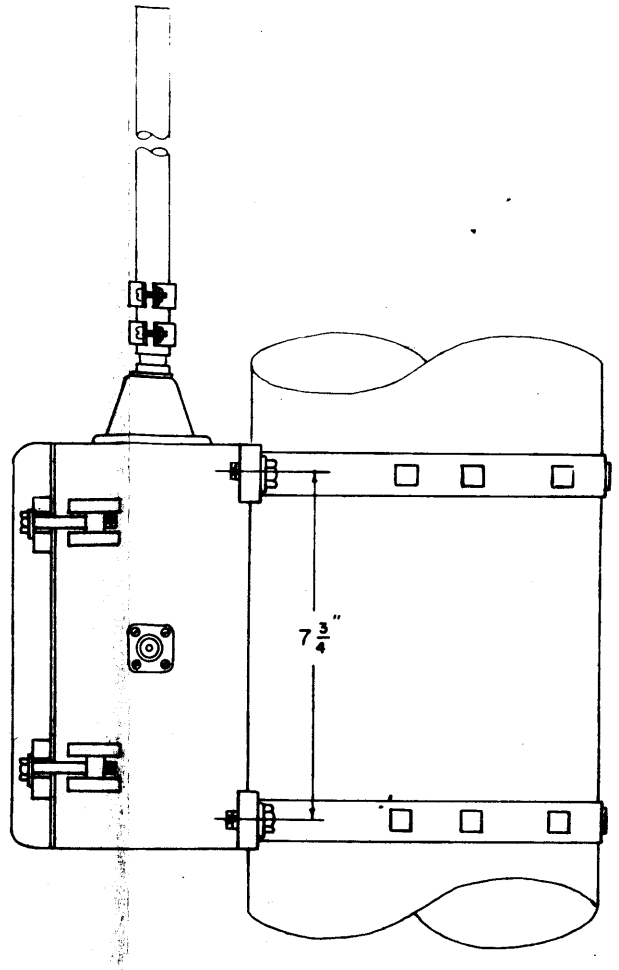
FORM 162



HORIZONTAL PLANE MOUNTING



VERTICAL PLANE MOUNTING



POLE MOUNTING

ID-160 A

A	1	14 1/4 WAS 14 1/2	6115	1	CDD			
ISSUE	ITEM	CHANGED FROM	DATE	CH NO	DRAFTS	CHECKER	ENG APP	

TOLERANCES

SCALE:

ALL DIMENSIONS: DEC. PLACES ±, FRACT. DIMS. ±, ANGULAR DIMS. ±

DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURED TOLERANCES ARE NOT INCLUDED

FIGURE 15

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
STOCK SIZE				
MATERIAL		WEIGHT PER PC		
TYPE & TEMPER				
HEAT TREAT. SPEC.				
FINISH & SPEC. NO.				

THE TECHNICAL MATERIEL CORP.
MAMARONECK, NEW YORK

INSTALLATION
VRA

PB

DRAWN | BLDG. DES. APP. | SPECIAL DES. APP.

CHECKED | FINAL APPROVAL

ID-160 | A

REQ PER UNIT	MODEL	PROJECT NO.	ASSY. NO.	DATE