TF-12AH
AND
TF-12AH-P

SUPERTURNSTILE ANTENNAS

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RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N. J.

IB-36129

TF-12AH and TF-12AH-P
SUPERTURNSTILE ANTENNAS
ES-19296 ES-19296-H

INSTRUCTIONS

Manufactured by
RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DEPARTMENT
Camden, New Jersey, U.S.A.

Printed in U.S.A.

IB-36129

FIRST AID

WARNING!

Operation of electronic equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside the equipment with voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors, etc. To avoid casualties, always discharge and ground circuits prior to touching them.

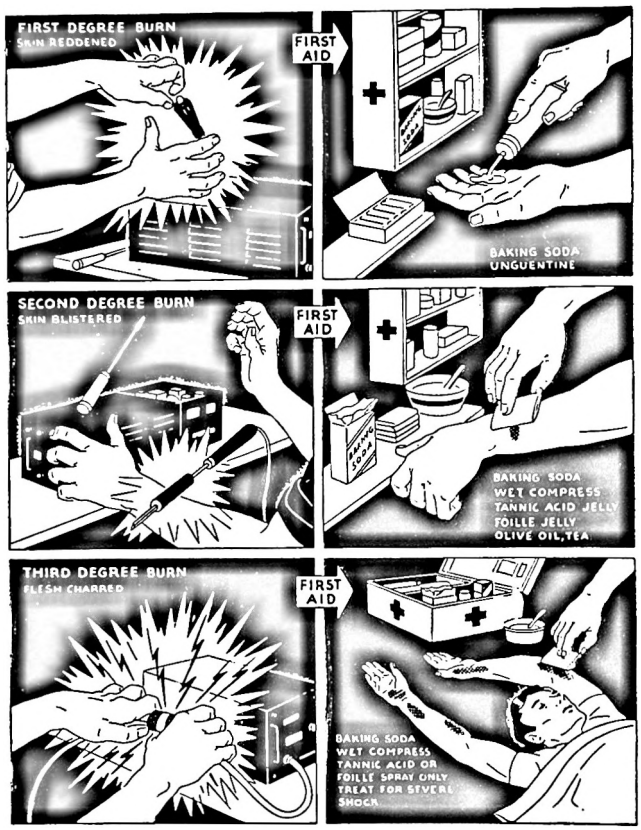
ABOUT FIRST AID

Personnel engaged in the installation, operation and maintenance of this equipment or similar equipment are urged to become familiar with the following rules both **in theory and in the practical application thereof.** It is the duty of every radioman to be prepared to give adequate First Aid and thereby prevent avoidable loss of life.

PRONE-PRESSURE METHOD OF RESUSCITATION

1. PROTECT YOURSELF with dry insulating material.
2. BREAK THE CIRCUIT by opening the power switch or by pulling the victim free of the live conductor.

DON'T TOUCH VICTIM WITH YOUR BARE HANDS UNTIL THE CIRCUIT IS BROKEN.



(A) (B) (C)

3. LAY PATIENT ON STOMACH, one arm extended, the other arm bent at elbow. Turn face outward resting on hand or forearm.
4. REMOVE FALSE TEETH, TOBACCO OR GUM from patient's mouth.
5. KNEEL STRADDLING PATIENTS THIGHS. See (A).
6. PLACE PALMS OF YOUR HANDS ON PATIENT'S BACK with little fingers just touching the lowest ribs.
7. WITH ARMS STRAIGHT, SWING FORWARD gradually bringing the weight of your body to bear upon the patient. See (B).
8. SWING BACKWARD IMMEDIATELY to relieve the pressure. See (C).
9. AFTER TWO SECONDS, SWING FORWARD AGAIN. Repeat twelve to fifteen times per minute.
10. WHILE ARTIFICIAL RESPIRATION IS CONTINUED HAVE SOMEONE ELSE:
    (a) Loosen patient's clothing.
    (b) Send for doctor.
    (c) Keep patient warm.
11. IF PATIENT STOPS BREATHING, CONTINUE ARTIFICIAL RESPIRATION. Four hours or more may be required.
12. DO NOT GIVE LIQUIDS UNTIL PATIENT IS CONSCIOUS.

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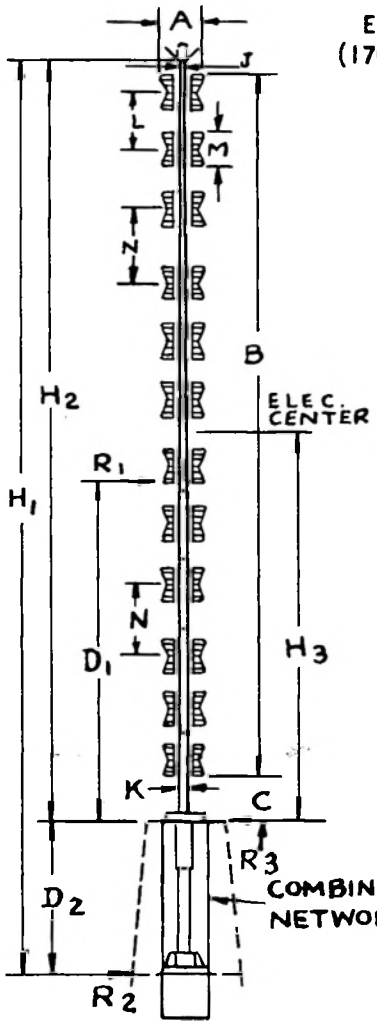


GUIDE FLANGE DWG: 745166-501
POLE SOCKET DWG: 745167-504

ENGINEERING DATA FOR TF-12AH TOWER MOUNTED (174-216 MC) SUPERTURNSTILE TELEVISION ANTENNA

MECHANICAL SPECIFICATIONS

WEIGHT	8000#	H_2	72'-11"
A	3'-2"	H_3*	44'-9 3/16"
B	68'-5 3/8"	J	5" O.D.
C	3'-0 1/4"	K	12 3/4" O.D.
D_1	32'-2"	L	5'-8"
D_2	11'-6"	M	3'-7 3/8"
H_1	84'-5"	N	6'-11" (AT CENTER)

SHIPPING LENGTHS: (26'-8") (23'-9") (17'-8") (21'-10")
SHIPPING WEIGHTS: (4918) (1226#) (1749#) (2213#)
TRANS. LINE CONN.: 2'-0" ABOVE TOWER TOP FOR TF-12AH & TF-12AH-E OTHER TYPES, PER COMBINING NETWORK DWG. FLANGES, MI-19113 TYPE

LOADING (NO ICE)

	50 psf	30 psf
R_1	3954	2636
R_2	11071	7317
R_3	15025	9953
$R_1 \times D_1$	126200 FT.#	84800 FT.#

SUGGESTED BASE STABILITY: 1°
MAX. LOADING 50/30 psf

DESIGN ASSUMPTIONS

WIND VELOCITY: MAX. WIND VELOCITY (1" RAD. ICE) 80 mph
MAX. WIND VELOCITY (NO ICE) 110 mph
WIND VELOCITIES ARE TRUE, NOT INDICATED
DESIGN STRESSES: A.I.S.C. 20,000 psi (IN BENDING)

ELECTRICAL SPECIFICATIONS

POWER RATING: 50 KW (35 KW EACH HALF)
CIRCULARITY: ± 2 DB
INPUT IMPEDANCE: 51 1/2 OHMS (ACTUAL) (V.S.W.R. 1.1 OR BETTER) FOR MI-19113 LINE USE MI-MI-19113B-48 TRANSFORMERS.

GAIN (AT VISUAL CARRIER)

CHANNEL	7	8	9	10	11	12	13
GAIN **	11.5	11.7	12.1	12.4	12.1	11.8	11.7

ACCESSORIES

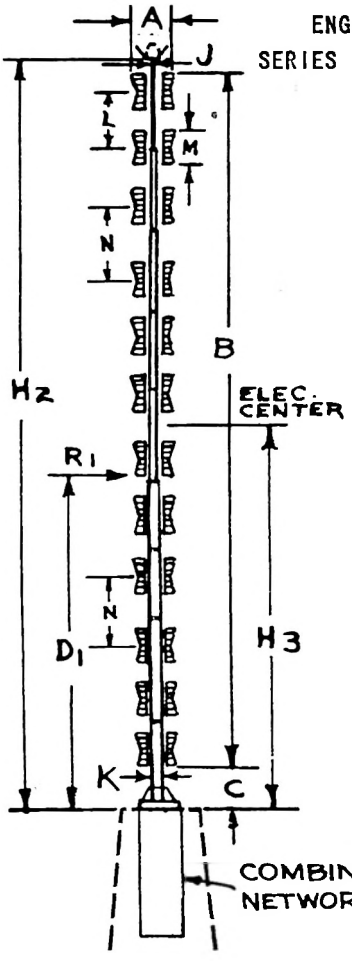
SLEET MELTERS: 12 OF MI-19009-J. POWER REQUIRED: 12 KW 230 VOLTS 3Ø, OR 460 VOLTS 1Ø OR 3Ø
BEAM TILTING SECTIONS: FOR 1°, 1 OF MI-19395-A
FOR ½°, 1 OF MI-19395

TRANSMISSION LINE CONNECTIONS

TYPE NO.	LINES	DIPLEXER	DWG. AND TYPE	COMBINING NETWORK DWG.
TF-12AH	TWO-3 1/8	BRIDGE	B-464592-A	627844
TF-12AH-A	FOUR-3 1/8	BRIDGE	B-464592-B	627844
TF-12AH-B	TWO-3 1/8	NOTCH	B-464592-D	
TF-12AH-C	ONE-3 1/8	NOTCH	B-464592-C	
TF-12AH-D	TWO-6 1/8	BRIDGE	B-464592-A	627844
TF-12AH-E	FOUR-6 1/8	BRIDGE	B-464592-B	627844
TF-12AH-F	TWO-6 1/8	NOTCH	B-464592-D	
TF-12AH-G	ONE-6 1/8	NOTCH	B-464592-C	

* H_3 IS FOR 70-30 POWER DIVISION (STANDARD ANTENNA). H_3 FOR 50-50 POWER DIVISION IS 37'-2 13/16".
** GAIN FIGURES ARE FOR 70-30 POWER DIVISION. GAINS FOR 50-50 POWER DIVISION ARE 4% HIGHER.

B-466344-3



ENGINEERING DATA FOR TF-12AH-P PEDESTAL MOUNTED SERIES (174-216 MC) SUPERTURNSTILE TELEVISION ANTENNAS

MECHANICAL SPECIFICATIONS

WEIGHT	7675#	* H_3	44'-3 1/8"
A	3'-2"	J	5" O.D.
B	68'-5 3/8"	K	12 3/4" O.D.
C	5'-5 7/8"	L	5'-8"
D_1	34'-0"	M	3'-7 3/8"
H_2	75'-4 5/8"	N	6'-11" (AT CENTER)

SHIPPING LENGTHS: (26'-8") (23'-9") (17'-8") (10'-9 5/8")
SHIPPING WEIGHTS: (491#) (1226#) (1749#) (1112#)
TRANS. LINE CONN.: 4'-3" ABOVE TOWER TOP (MI-19113 TYPE)

LOADING (NO ICE)
30/20 psf (MAX. LOAD.)**

R_1	2700
$R_1 \times D_1$	92800 ft. #

SUGGESTED BASE STABILITY: 1°

DESIGN ASSUMPTIONS

WIND VELOCITY: MAX. WIND VELOCITY (1" RAD. ICE) 80 mph
MAX. WIND VELOCITY (NO ICE)110 mph
WIND VELOCITIES ARE TRUE, NOT INDICATED
DESIGN STRESSES: A.I.S.C 20,000 psi (IN BENDING)

ELECTRICAL SPECIFICATIONS

POWER RATING: 50 KW (35 KW EACH HALF)
CIRCULARITY: ± 2 DB
INPUT IMPEDANCE: 51½ OHMS ACTUAL. (VSWR 1.1 OR BETTER). FOR MI-19113 LINE USE MI-19113B-48 TRANSFORMERS.

GAIN (AT VISUAL CARRIER)

CHANNEL	7	8	9	10	11	12	13
GAIN ***	11.5	11.7	12.1	12.4	12.1	11.8	11.3

PEDESTAL DWG: 463057-501

ACCESSORIES

SLEET MELTERS: 12 OF MI-19009-J. POWER REQUIRED: 12 KW 230 VOLTS 3Ø, OR 460 VOLTS 1Ø OR 3Ø
BEAM TILTING SECTIONS: FOR 1°, 1 OF MI-19395-A.
FOR ½°, 1 OF MI-19395

TYPE NO.	TRANSMISSION LINE CONNECTION. LINES	DIPLEXER	DWG AND TYPE	COMBINING NETWORK DWG.
TF-12AH-P	TWO-3 1/8	BRIDGE	B-464592-A	
TF-12AH-PA	FOUR-3 1/8	BRIDGE	B-464592-B	
TF-12AH-PB	TWO-3 1/8	NOTCH	B-464592-D	
TF-12AH-PC	ONE-3 1/8	NOTCH	B-464592-C	
TF-12AH-PD	TWO-6 1/8	BRIDGE	B-464592-A	
TF-12AH-PE	FOUR 6 1/8	BRIDGE	B-464592-B	
TF-12AH-PF	TWO-6 1/8	NOTCH	B-464592-D	
TF-12AH-PG	ONE-6 1/8	NOTCH	B-464592-C	

* H_3 FOR 70-30 POWER DIVISION. H_3 FOR 50-50 POWER DIVISION IS 39'-8 9/16".
** SUBJECT TO PEDESTAL DESIGN FOR HIGHER LOADING.
*** GAINS ARE FOR 70-30 POWER DIVISION (STANDARD ANTENNA). GAINS ARE 4% HIGHER FOR 50-50 POWER DIVISION.
FOR VERTICAL PATTERN DATA SEE B-466344

B-466362-2

EQUIPMENT

The components of the TF-12AH Superturnstile Antenna are listed in the following table:

TF-12AH SUPERTURNSTILE ANTENNA, ES-19296-*

Item	Quan.	Description	RCA Reference
1	1	Antenna Pole and Accessories	MI-19096
2	1	Pole and Supports	MI-19192-E
3	1	Feed Lines and Accessories	MI-19177-**
4*	1	Combining Network	MI-19345

*The ES-number may have a suffix letter added to it to indicate the use of a different combining network than that listed. The combining network used will be dependent on the requirements of the station.

**A suffix number is added to the MI number to indicate the channel.

The previous table lists the equipment supplied for tower mounting of the antenna. When the antenna is ordered for pedestal mounting, equipment is supplied in accordance with the following table:

TF-12AH-P SUPERTURNSTILE ANTENNA, ES-19296-H

Item	Quan.	Description	RCA Reference
1	1	Antenna Pole and Accessories	MI-19096
2	1	Pole and Supports	MI-19192-F
3	1	Feed Lines and Accessories	MI-19177-**
4	1	Combining Network	MI-19345-H

**A suffix number is added to the MI number to indicate the channel.

The MI sheets for the equipment listed in the preceding tables are located on pages 45 to 53.

ACCESSORY EQUIPMENT

The equipment described in the following table is an accessory item and is available on separate order.

SLEET MELTING EQUIPMENT FOR SUPERTURNSTILE ANTENNAS

RCA Reference	Description	Rating of One Heater Element
MI-19009-J	Sleet Melting Equipment, 174-216 mc. TV Antenna	115 Volts, 2.2 Amps., 250 Watts

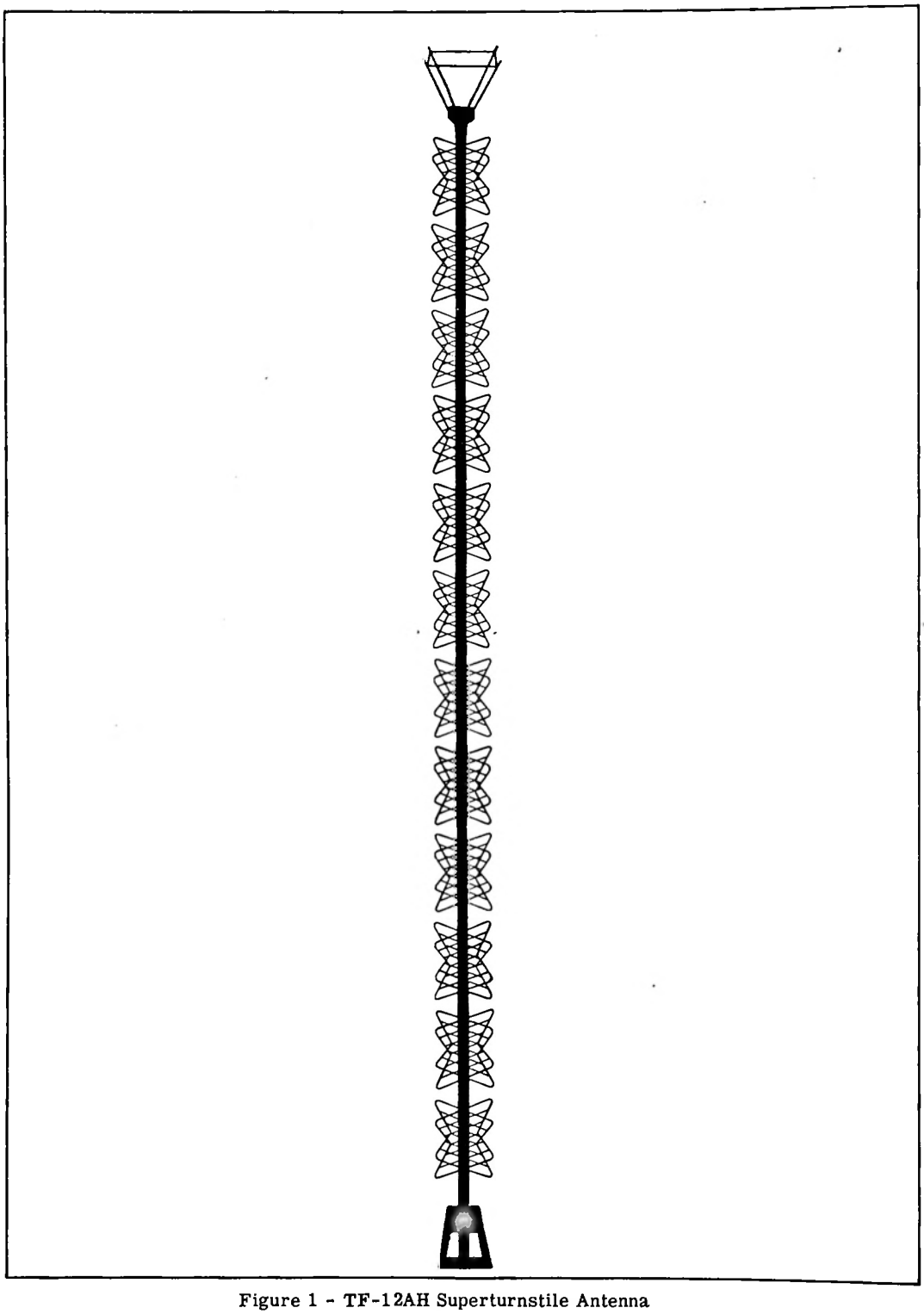


Figure 1 - TF-12AH Superturnstile Antenna

The MI-19009-J kit contains four enclosed heater elements, together with the necessary connector material for a single section of a Superturnstile Antenna. Thus, twelve MI kits are required for the TF-12AH.

Material furnished in one kit:

4 - heater elements, with permanently attached heater cords.
1 - heater junction box.
4 - 1/2 inch weather-proof connectors for heater cords.
2 - 1 inch weather-proof connectors for riser bus cables.
1 - mounting bracket, for junction box.
1 - set of cable clamps and hardware for attaching bracket, junction box, and riser bus.
1 - set of setscrews for holding heater elements in place.
1 - No. 10 allen wrench for setscrews.
1 - 1-inch pipe plug for capping off uppermost junction box.
1 - length of 3-10 riser cable to be cut as per requirements.

Material not Supplied:

The necessary solder, rubber tape, and friction tape for the heater junction box connections are not supplied. The power cable, thermoswitch, humidistat switch and other control equipment are not supplied as part of the MI kit.

DESCRIPTION

The TF-12AH Superturnstile Antenna is a twelve-section antenna developed especially for the simultaneous radiation of aural and visual television signals. The Superturnstile Antenna features a broad-band operating characteristic, simplified feed system, and durable construction.

NOTE

When referring to antennas, the words, "bay, layer, and section", are used rather loosely and interchangeably by engineers and technicians. Restricting the use of these words to television antennas, we may define them as meaning a group of radiators or radiating elements of an antenna, laying in the same horizontal plane. The word "section" will be used throughout this text with this definition in mind. This point is mentioned so that if reference is made to drawings associated with this equipment, confusion will not exist if words other than "section" are encountered.

Each antenna is furnished complete with pole, base socket and guide flange, r-f junction boxes, radiator assemblies, clamps, and antenna feed system (as required) for operation in any one of the VHF television channels from channel 7 to channel 13 (174 to 216 mc).

The pole is equipped with a lightning protector which incorporates a mounting flange for a 300-millimeter beacon. The beacon is available on separate order from the RCA Sales Department.

Electrically, the TF-12AH Antenna consists of 48 radiators, arranged in twelve "sections" of four radiators each. See Figure 1. For identification purposes, the radiator sections are numbered from one to twelve counting downward from the top of the antenna. The radiators that are mounted vertically in line with the letter "N" stencilled on the top and bottom pole sections, are designated as NORTH radiators. Looking from the top of the pole toward the bottom and counting clockwise from the NORTH radiator, the three remaining radiators in each section are designated EAST, SOUTH, and WEST in that order. This method of designation does not refer

to the geographical direction of the radiators at the place of installation, but is used for reference purposes only, to facilitate assembly of the antenna.

Four junction boxes are used to feed the 48 radiators. Two junction boxes feed the NORTH and SOUTH radiators. These boxes are identified as N-S HI and N-S LO. The other two junction boxes feed the EAST and WEST radiators and are identified as E-W HI and E-W LO. A simplified schematic diagram of the feed system is shown in Figure 19.

The NORTH radiators are fed by the center conductors of their feed lines, while the SOUTH radiators are fed by the outer conductors of feed lines, going to the same junction boxes. In a similar manner, the EAST radiators are fed by the center conductors of their feed lines, and the WEST radiators by the outer conductors of their associated feed lines. The result of this method of feed is that the NORTH radiators are 180 degrees out of phase with the SOUTH radiators; and the EAST radiators are 180 degrees out of phase with the WEST radiators.

In order to feed four junction boxes from the two transmission lines coming up the tower, a combining network is used. See Figure 20. Each half of the combining network is fed by one of the transmission lines and in turn feeds two junction boxes.

One of the two transmission lines from the diplexer to the combining network is made one quarter-wavelength (90 electrical degrees) longer than the other. Thus the r-f energy fed to the N-S radiators is 90 degrees out of phase with the energy fed to the E-W radiators. The end result of this quadrature feed is to produce a radiation pattern which is very nearly circular. Either the NORTH-SOUTH radiators, or the EAST-WEST radiators alone would produce a figure-eight pattern as described under ORIENTATION.

COMBINING NETWORK

The combining network, Figure 20, performs the following functions:

a. Feeds the four junction boxes from one, two, or four transmission lines as desired. See Figure 18.

b. Provides the required power division to obtain the desired vertical radiation characteristic.

c. Provides a means of tilting the main beam to secure a more effective concentration of signal in specific areas.

d. Provides an accessible means of changing the feed to the antenna to permit emergency operation. See Figure 18.

The high gain of multiple-section transmitting antennas is realized because the r-f energy is concentrated into a relatively narrow main beam (or lobe) in the vertical plane. To secure even more efficient radiation of energy in areas close to the antenna, the input power to the standard TF-12AH Antenna is divided so that 70 percent of the power is fed to the upper six radiator sections, and the remaining 30 percent is fed to the lower six sections. A 50/50 power division is optional with a 4% increase in power gain.

Under certain conditions of terrain, it may be desirable to tilt (raise or lower) the main beam. Beam tilting is accomplished by changing the relative phasing of the r-f energy radiated from the upper and lower halves of the antenna. The effect of this is to raise or lower the beam uniformly around the antenna, thus expanding or contracting the cone of radiated power, umbrella fashion.

Figure 19, a simplified schematic diagram of the TF-12AH feed system, will aid in understanding the following explanation.

The r-f energy from the diplexer travels up the two transmission lines to the "combining tees", where the power is divided. Part of the power goes to the upper junction boxes (HI), and the remainder to the lower junction boxes (LO). Since the upper and lower junction boxes are essentially in parallel, the amount of power fed to each junction box will depend on the impedance that the junction box, with its associated transmission line, presents to the combining tee. (The lower the impedance of a branch, the more power it will absorb, providing the combined impedance of the two branches equals the impedance of the input leg.) Thus, a convenient means of controlling the power distribution to the upper and lower junction boxes is provided by inserting power-dividing transformers in each branch of the combining tees. Since the power-dividing transformers consist of replaceable stepped sections of inner conductor in the combining tees, they may be readily changed to provide a different division of power if desired. The 70/30 division is supplied unless otherwise specified.

In the standard TF-12AH Antenna, the lengths of transmission line D and D' are equal. Since there is no phase difference between the energy radiated from the upper and lower halves of the antenna, the main beam from the antenna will be in a horizontal direction. Downward tilting of the beam may be obtained by delaying the phase of the r-f energy fed to the lower six sections of the antenna. A convenient means of accomplishing this is to lengthen the transmission lines D' feeding the lower junction boxes. It should be noted that the increased length of D' in electrical degrees is not the same as the beam tilt. The increased length for one degree of beam tilt, for example, will approximate 40 electrical degrees. Special sections of transmission line are available, from RCA, for insertion at the points marked "X" to provide the desired degree of beam tilt.

The TF-12AH Antenna is normally supplied with 70/30 power division, and zero beam tilt. It is realized that the requirements of some installations may be such that particular radiation characteristics will be required. The desired charactersitics may be obtained by changing the power distribution or by varying the relative phase of the currents feeding the individual radiators. For recommendations on specific requirements, contact your local RCA Broadcast Equipment Sales Office.

In the event of failure of one transmission line or part of the antenna, the combining network provides an accessible means of changing the antenna feed to permit emergency operation. Figure 18, which shows the four systems used for feeding antennas of more than six sections, also lists emergency operating characteristics. In general, for emergency operation of an antenna, disconnect the defective transmission line, or the line feeding the defective portion of an antenna, and in its place connect an r-f load. Be certain the r-f load has the same impedance as the line it replaces, and has a power rating which is high enough to dissipate the power that will be fed to it. A coaxial switch to permit rapid changeover of transmission lines and loads is available from RCA. For information on this item, contact your local RCA Broadcast Equipment Sales Office.

Most of the preceding discussion described the type "A" feed system of Figure 18 which is the most commonly used type. Since the other types are modified versions of this system, their operation is similar, and should present no difficulty.

ORIENTATION

The orientation of antenna radiators should be determined with the following two considerations in mind:

1. The normal pattern is nearly circular, the variation in field intensity being within plus or minus 2 db. The directions of the maximums are in the planes of the radiators, hence there is a slight advantage in rotating the antenna so that the planes of the radiators are in the general directions of greatest desired coverage.

2. The other important consideration is the pattern which results if one of the two transmission lines fails, and thus prevents radiation from one set of radiators. The resulting field pattern is a figure-eight with the maximums at 90 degrees to the radiators which are energized. The minima under these conditions, will be in the plane of the energized radiators. Since the minima are quite narrow the coverage area lost through the failure of one transmission line is small.

The orientation of the antenna should be such as to take some advantage of the normal coverage pattern shape, while providing for emergency operation on either of the two possible figure-eight patterns. The most important areas to be covered should be so located, with regard to the antenna, that a line drawn from each such area to the antenna will form an angle of approximately 30 degrees with the planes of either the N-S or E-W radiators. For example, if we assume that the direction of the NORTH radiators is 0 degrees, then the antenna should be oriented so that the more important coverage areas lie at an angle of 30, 60, 120, 150, 210, 240, 300, or 330 degrees to the NORTH radiators. The more important areas should not lie in the planes of either set of radiators.

NOTE

The pedestal or pole guide flange and pole socket for this antenna each have four holes 90 degrees apart to permit passage of the transmission lines from the antenna. Since the transmission lines are located on the NORTHEAST, SOUTHEAST, SOUTHWEST, and NORTHWEST sides of the pole, the orientation of the antenna is controlled by the orientation of the pedestal or pole guide flange and pole socket. The tower manufacturer should drill the holes in the tower to provide correct orientation of these parts. (Orientation information should be supplied to the tower manufacturer when the tower is ordered.) However, the orientation of the pedestal or guide flange and pole socket should be checked before the antenna is hoisted, to be certain it is correct.

INSTALLATION

A thorough knowledge of the contents of this instruction book is vital to the correct and efficient installation of the Superturnstile Antenna. All personnel dealing with the receiving, inspection, testing, or erection of the antenna should carefully study the sections of the book pertaining to their jobs and become familiar with the mechanical details of the antenna, the sequence of assembly, and the precautions to be observed.

The electrical characteristics of the antenna require assembly and adjustment procedures which are much more precise and critical than would be required if only the mechanical requirements were involved. Damage which would not appear to matter mechanically, may prevent satisfactory operation of the antenna and cost thousands of dollars to discover and repair. Even a bit of rust or corrosion at some point of contact between two parts, for example, may change the operation of the antenna.

All parts should therefore be inspected carefully as they are installed, in addition to the inspection made when the equipment is received. Damage, however slight, should be reported to the chief engineer of the station. If at any point in the installation there is a detail which does not appear entirely correct, it should also be reported. For example, a flange which will not draw down tight, a jumper which must be pulled taut without slack, a feed line which is wrinkled, etc.

In the installation and assembly of the antenna, the following points should be emphasized:

1. Use the proper tools for each job. For example, don't use an 18-inch wrench to tighten a 1/4-inch bolt.

2. Make certain that all mating surfaces are clean and free from rust and paint (unless otherwise noted), so that good electrical contact will be obtained.

3. To avoid electrolysis, use the proper lockwashers and hardware where specified.

4. Tighten all nuts and bolts securely.

5. Do not force any part into position. If difficulty is experienced in mounting or securing any part, report it to the station chief engineer.

6. Handle the feed lines carefully, so that they will not have kinks or wrinkles in them.

7. Make certain that the proper radiator mounting plates are used in the correct radiator sections.

8. When installing the transmission lines, be certain the inner conductors and connectors are clean and mate properly; and that the "O" ring gaskets are properly seated.

9. Be certain the transmission line flanges mate evenly, and that the line is not dented when tightening the flange bolts.

10. Finally, if any detail in the installation does not appear to be correct, or if there is any doubt about any item, consult the chief engineer of the station.

WARNING

NEVER CLIMB OR WORK ON THE SUPERTURNSTILE ANTENNA WHILE R-F POWER IS BEING FED TO IT. ARRANGEMENTS SHOULD BE MADE WHICH WILL GUARANTEE THAT R-F POWER WILL NOT BE APPLIED WITHOUT SPECIFIC INSTRUCTIONS FROM PERSONNEL ON THE TOWER. FAILURE TO COMPLY WITH THESE INSTRUCTIONS MAY RESULT IN A SERIOUS (PERHAPS FATAL) ACCIDENT.

The TF-12AH Superturnstile Antenna is designed for mounting on various types of support. For mounting by burying the butt end of the pole in the top of a steel tower, or in the roof of a tall building, Antenna Bottom Section MI-19192-E is used. If it is desired to mount the antenna on top of a steel tower or when it is impractical to bury the butt end of the pole, then Antenna Bottom Section, MI-19192-F (pedestal mounting) should be used. See EQUIPMENT.

If the TF-12AH is to be mounted on a steel RCA FM Pylon Antenna, a special pedestal and mounting assembly must be used. Contact your local RCA Broadcast Equipment Office.

It is desirable that the Superturnstile Antenna be mounted at the same time the tower is erected, as the services of the same rigging crew may be employed. An RCA Service Company engineer should be present to supervise the installation of the antenna. This engineering service (up to a maximum of 18 consecutive days) is included in the antenna contract.

Complete assembly details are shown in the antenna assembly drawing (No. 311389) supplied with the equipment. This drawing is packed with the set of R-F Feed Lines and Accessories (MI-19177) and is, therefore, not included in this book.

Note that when the butt of the pole is buried (using bottom section MI-19192-E) the dead weight load of the entire antenna is supported by the pole base socket mounted below the tower top. The pole guide flange takes only the horizontal force caused by wind pressure. When the pole is pedestal mounted (bottom section MI-19192-F), the dead weight load of the antenna and the horizontal force produced by the wind are both carried by the pedestal.

The antenna components have been carefully inspected and tested at the factory before shipment. Any damage caused by shipping or uncrating can usually be detected by careful inspection of the component parts before assembly. The transmission lines and r-f feed lines should be examined for dents, longitudinal or circumferential cracks, especially in the vicinity of the flanges, and loose end seals. See UNPACKING INSTRUCTIONS.

The transmission lines should be completely assembled on the ground and carefully tested for leaks. Supply dehydrated compressed air or nitrogen to the lines at fifteen pounds pressure, and leave the line in this condition for one hour. If any drop in pressure is noted, the lines should be checked, the leak located, and corrective measures taken.

CAUTION

THE TRANSMISSION LINES SHOULD BE CAREFULLY HANDLED AT ALL TIMES. MECHANICAL STRAINS OR JOLTS AND JARS MUST BE AVOIDED.

The transmission and feed lines should be kept in a dry place prior to installation. During erection, the open ends of the line sections should be covered to prevent the entrance of rain, loose dirt, paint chips, etc. Threads should be protected from damage. Immediately after erection, the line should be gassed then bled from the junction boxes. See TRANSMISSION LINES. Pressurize the line with dehydrated compressed air or nitrogen at a pressure of fifteen pounds per square inch. NEVER ALLOW THE LINE TO STAND UNGASSED AFTER ERECTION.

UNPACKING INSTRUCTIONS

The recommended method of unpacking the equipment is as follows:

1. Inspect the shipment upon arrival to make certain that the number of pieces agrees with the shipping ticket. Examine the crates and cartons for any indication of damage. If damage is visible, notify the carrier immediately.

If the equipment is not to be unpacked immediately, it should be stored in a cool, dry place. Do not delay unpacking too long, as most carriers have a time limit on responsibility for concealed damage.

2. Separate the shipment into groups, having all the pieces in each MI (Master Item) in one group. Each carton or crate is stencilled with the MI number of which it is a part, and each part (or container of the same parts) is tagged or stencilled with the item number under which it is listed on the MI sheet. Whenever possible, all the items from one MI are packed in one crate. The MI sheet (packing list) for each MI is packed in the crate that contains item No. of that MI.

3. Unpack one MI at a time, checking the contents of the crates against the MI sheet. This is also a good time to check for concealed damage. If damage is noted, inform the carrier immediately. Smaller items, such as nuts and bolts, are packed in individual containers, and are tagged with their item number. After checking the quantities of these items against the MI sheet, leave them in their containers. This will facilitate assembly of the equipment.

4. Do not destroy any packing material until the MI's have been checked against the MI sheets and are found to be complete. A small part may be mixed with the packing material and overlooked if this is not done. If any items are missing from the shipment, notify RCA.

ASSEMBLY PROCEDURE

Before starting the assembly of the TF-12AH Antenna, prepare three mounting trestles as shown in Figure 17. The construction of the three trestles is identical except for the plates used to support the pole. Make one pair of plates for each trestle in accordance with the table on this drawing. Different plates are required for each trestle, so that the radius on the top of the plate will correspond to the radius of the pole at the point of support. These trestles are used to support the antenna in a horizontal position above the ground in order to facilitate assembly of the component parts.

NOTE

In the following procedure, the numbers within parentheses (part numbers) correspond to the same numbers enclosed in circles on the assembly drawing No. 311389, and also listed in the first column of the list of parts, drawing No. 8892182. These drawings are supplied packed with the set of R-F Feed Lines and Accessories (MI-19177) and must be used in conjunction with each other. Constant reference should be made to these drawings throughout assembly. Drawing No. 467392, which is supplied with the assembly drawing, should also be consulted during radiator mounting.

Since the TF-12AH Antenna consists of a large number of parts, especially hardware items, care should be exercised to insure using the right part in the right place. To aid in identifying the various parts, Table I correlates the numbers indicated on the assembly drawing and list of parts with the item numbers on the MI sheets. The numbers on the assembly drawing and list of parts are also used throughout this text.

The following explanation of Table I should prove helpful.

Excluding the combining networks, which are treated separately in this book, the TF-12AH Antenna consists of three MI's. If the equipment has been unpacked as suggested under UNPACKING INSTRUCTIONS, there will be three groups of parts, each part being tagged or stencilled with an identifying item number. The first column of Table I indicates the part number on the assembly drawing and list of parts. The second column lists the item number and also indicates which MI (group of parts) in which the item will be found. A brief description of the item is given in the third column.

To illustrate the use of this table, suppose it is desired to locate part number 10 (taken from the assembly drawing or the text). Look down the first column until you come to 10. Moving across to the "Item Number" column, we find 8. So all we must do is go to the group of parts indicated, pick up item 8, and we have the part. A glance at the item in question is enough to show that it agrees with the description "pole step", in the third column.

If desired, the cross-reference table may be removed from the book, so that reference may be made to both it and the text at the same time.

POLE ASSEMBLY

The TF-12AH (or 12AH-P) antenna pole is supplied in four sections. For tower mounting with a buried butt (TF-12AH), telescope the four pole sections (2), (3), (4), and (5) together being certain that they are seated to their full depth, and that the arrow marks at the joints coincide. The joints should telescope with a smooth sliding fit. Use grease if necessary.

CAUTION

THERE IS ONLY 1/32-INCH CLEARANCE BETWEEN THE POLE SECTIONS AND SOCKETS AT THE TELESCOPE JOINTS

AND BETWEEN THE POLE AND BASE SOCKET. EXTREME CARE SHOULD BE EXERCISED IN FITTING THE POLE AT THESE POINTS AND ALSO DURING LIFTING TO MAKE CERTAIN THE POLE IS NOT MARRED. THE POLE MUST SEAT TO THE FULL DEPTH OF THE VARIOUS SOCKETS FOR PERFECT ALIGNMENT. FAILURE TO OBSERVE CAUTION IN THESE OPERATIONS WILL RESULT IN BINDING AND MISALIGNMENT.

Align the axes of the pole sections, then insert and tighten the 5/8-11 x 3/4-inch setscrews (17) at each joint. Make certain the pole is absolutely straight. Weld the joints with the pole in this position. After the joints have been welded, remove the setscrews, and plug weld the setscrew holes.

NOTE

All welding on this antenna should be performed by a certified welder, working under close supervision. For welding rod, use Fleetweld No. 5 or equivalent.

The procedure is the same for the TF-12AH-P (pedestal mounted) antenna except that the pole sections used are part numbers 26, 27, 28, and 29.

CAUTION

THE POLE MUST BE SUPPORTED AT SEVERAL POINTS IN THE HORIZONTAL POSITION, AND CAREFULLY ALIGNED AXIALLY TO PREVENT BENDING WHILE THE JOINTS ARE BEING WELDED. FAILURE TO COMPLY WITH THESE PRECAUTIONS MAY RESULT IN MISALIGNMENT BETWEEN THE POLE SECTIONS.

Grind the welds only enough to remove irregularities which might lead to strain cracks.

After carefully inspecting the welds, paint each weld with one coat of red lead to prevent rusting.

Support the pole on the mounting trestles to prevent interference with the radiators and feed lines when assembling them to the pole. The top of the pole should be supported about one foot from the end, using the trestle with the 2-9/16-inch radius plates. Support the bottom of the pole approximately 10 feet from the end using the trestle with the 6-7/16-inch radius plates. The third trestle, with the 4-3/8-inch radius plates should support the pole at a point midway between the welded lugs for sections 6 and 7 (approximately at section "F-F" on the assembly drawing).

The antenna pole has the directions N, E, S, and W stencilled on it on both the top section and the largest diameter section. When positioning the pole on the trestles, the pole should be rotated so that the WEST side of the pole will be toward the ground.

With the pole in this position, install the feed lines to the EAST and WEST radiators. Dress and clamp these lines along the SOUTHEAST side of the pole. Then rotate the pole 90 degrees, so that the SOUTH side is toward the ground. Install, dress, and clamp the feed lines to the NORTH and SOUTH radiators along the NORTHWEST side of the pole.

NOTE

The directions NORTH, EAST, SOUTH, and WEST used in this book, are arbitrarily assigned directions used for reference purposes only, to facilitate assembly of the antenna. These directions have no bearing whatever upon the geographical orientation of the antenna when it is mounted on the tower. The directions N, E, S, and W stencilled on the

antenna do not indicate the geographical directions at the place of installation. The orientation of the antenna should be determined as explained under ORIENTATION.

If it should be impractical to hoist and mount the completely assembled antenna upon the tower as a single unit, the four sections of the pole may be assembled on the tower. The method of assembly used will depend upon the rigging equipment available. The recommended procedure is to assemble the antenna on the ground, and hoist it as one unit. If the antenna must be assembled on the tower, the following procedure is suggested:

Assemble the antenna completely, on the trestles, following the standard assembly procedure except for one step. Do not weld the sections of pole together.

Test the antenna for continuity and freedom from gas leaks as described in the text. Then, carefully disassemble the antenna, being particularly careful not to damage or change the bends in the feed lines. Do not remove the pole steps. After disassembly, the antenna should be mounted on the tower as described in the following paragraphs.

Mount the bottom section on the tower using the pole guide flange and base socket for the TF-12AH (or pedestal for the TF-12AH-P). Orient the bottom section using the letters N, E, S, and W stencilled on the pole, as a guide. Vertically align this section then tighten the bolts and setscrews, and weld the joints as described under TOWER MOUNTING or PEDESTAL MOUNTING.

Hoist the next higher section of pole to the tower top. Telescope the lower end of this section into the top of the pole section previously mounted. Be certain that the arrow markings at the joints coincide. Vertically align this pole section. Tighten the joint setscrews, then weld the joint.

Hoist and mount the two remaining pole sections in the same manner. Reassemble the rest of the antenna to the pole in the same manner as assembly on the ground.

RADIATOR MOUNTING

In the following instructions, for the purpose of identification, the antenna radiator sections are numbered from one to twelve counting downward from the top of the antenna. Where reference is made to parts located in clockwise or counterclockwise directions, it is assumed the observer is looking from the top of the pole toward the base. The twelve radiators that are mounted in line with the top pole step and the "N" stencilled on the pole are arbitrarily designated as NORTH radiators. Counting clockwise from the NORTH radiator, the three remaining radiators in each section are designated EAST, SOUTH, and WEST respectively.

Before mounting the radiators, peel off any protective coating that may be on the radiator mounting lugs and radiators. Thoroughly wipe clean all mating surfaces of radiator mounting plates, lugs, and radiators to assure good electrical contact. DO NOT USE ABRASIVES ON THESE SURFACES.

If radiator sleet melting equipment is to be used, insert a heater element into the open end of each of the 48 radiator vertical tubes. Secure the heaters in position using the 10-32 cup-point Allen setscrews furnished with the sleet melting equipment.

Refer to drawing No. 467392, which shows details of radiator mounting for all channels, and assemble four mounting plates (stamped with radiator section numbers and indicated in tabulation on drawing No. 467392) to each radiator (6) then fasten the radiators to the mounting lugs on the pole. Use bolts and nuts (18) and lockwashers (20). Make certain all hardware is securely tightened and that the arrow marking on each radiator is pointed toward the top end of the pole.

POLE STEPS

Screw twelve pole steps (10) into the 5/8-11 tapped holes located below each radiator on the EAST side of the pole. The turned-up ends of the steps must point toward the top end of the antenna pole. A nut (19) should be mounted on each pole step first, then when the pole is properly positioned, tighten the nut against the pole to serve as a lock nut.

BEACON CABLE

Install the beacon cable inside the pole. Installation is not difficult, since only one support (at the top of the pole) is required. Rubber washers, mounted on the cable at the factory, protect the cable from contact with the inside wall of the pole.

Installation should begin by feeding a 100-foot electrician's fish tape through the pole from the top. When the tape reaches the bottom, secure one end of the beacon cable to it, and pull the cable back up through the pole. On the NORTH side of the pole, above the radiator in section one, a hole is located for the goose-neck beacon cable support assembly. Pass the cable through this hole, from the inside, until about three feet protrude. Slide the cable support assembly (215) on the beacon cable, goose-neck end first. Pull about two feet of cable through the support assembly, then tighten the connector on the outside of the support assembly to clamp the cable securely in place. Insert the support assembly into the hole, with the bend in the goose neck pointing downward inside the pole. Secure the support assembly to the pole using four 5/16-18 x 3/4-inch bolts and lock-washers, (122) and (127). Pull the slack in the cable through from the bottom of the pole, then form a coil with the surplus cable, to keep it from dangling while hoisting the antenna. See view "XB" on the assembly drawing.

When the antenna is assembled on the tower, the beacon cable may be installed by feeding it into the pole from the top of the antenna before the lightning protector is mounted.

LIGHTNING PROTECTOR AND BEACON

The lightning protector (9) is shipped disassembled and must be assembled before mounting it on the pole. The parts for the protector (illustrated on Figure 16) consist of the following items:

1 - base assembly
4 - vertical rods (grooved on one end)
4 - tie rods (grooved on both ends)
16 - 3/8 x 1-1/4-inch setscrews
4 - 5/8 x 3/4-inch setscrews

Slide the grooved ends of the four vertical rods through the holes in the beacon support plate and into the four sleeves on the base. Insert both ends of each of the four tie rods into the sleeves on the vertical rods. Insert and tighten the 3/8-inch setscrews. Two setscrews hold each vertical rod to the base assembly. One fits into the groove on the vertical rod. One setscrew holds each end of the tie rods to the vertical rods. This setscrew must fit in the groove. Since the lightning protector is used as a support by the person servicing the beacon lamp, the setscrews must fit in the grooves where specified, or an accident might result. The assembly drawing shows views of the complete protector.

After the lightning protector has been assembled, it should be mounted on the top end of the antenna pole. See Figure 2. Position the protector so that the vertical rods line up with the radiators, then insert and tighten the four 5/8-inch setscrews that hold the protector to the pole.

WARNING

MAKE CERTAIN SETSCREWS ARE TIGHT AND THAT THE ASSEMBLY IS FIRMLY ATTACHED TO THE POLE BEFORE RELYING ON IT FOR SUPPORT. FAILURE TO DO SO MAY RESULT IN A SERIOUS (PERHAPS FATAL) ACCIDENT.

Mount the beacon on the lightning protector using the hardware supplied with the beacon. Connect the beacon cable to the beacon. The beacon is available on separate order from the RCA Sales Department.

TRANSMISSION LINE HANGERS

All the transmission line support hangers except parts No. 48 should now be installed in accordance with the following table. The flat flange should be toward the top of the pole. Use two 5/16-18 x 3/4-inch bolts (121) and lockwashers (128) to secure each hanger to the pole.

Quantity		Part No.	Location	Orientation of Holes
Tower Mounting	Pedestal Mounting			
2	2	45	Below radiator section 4	NW and SE
2	2	47	Below radiator section 5	NW and SE
2	2	47	Below radiator section 6	NW and SE
2	2	47	Below radiator section 7	NE and SW
2	2	47	Below radiator section 8	NE and SW
2	2	47	Below radiator section 9	NE and SW
4	4	47	Below radiator section 10	NE, SE, SW, and NW
4	4	47	Below radiator section 11	NE, SE, SW, and NW
4	4	46	Below radiator section 12	NE, SE, SW, and NW
4	Not Used	48	Above pole socket	NE, SE, SW, and NW

JUNCTION BOXES

Mount two junction box brackets, (7) and (8), on the pole. Position the brackets so that the ears on the clamp rings are on the NORTHEAST and SOUTHWEST sides of the pole, and the flat flanges are toward the top of the pole. The bottom edge of the clamp ring on the upper bracket (7) should be located 12-3/4 inches above the top of the upper radiator mounting lugs for section four; and the bottom edge of the clamp ring on the lower bracket (8) should be located 12-3/4 inches above the top of the upper radiator mounting lugs for section ten. Use the bolts, nuts, and lockwashers supplied with the brackets. Make certain the flange on each bracket is square with the pole, then tighten the brackets securely.

CAUTION

CARE MUST BE EXERCISED WHEN HANDLING THE JUNCTION BOX AND TRANSFORMER ASSEMBLIES TO PREVENT DAMAGE TO THE TRANSFORMER OUTER CONDUCTORS.

Fasten two transformer assemblies (39) on each bracket using bolts and nuts (16), and lockwashers (21). The transformer assembly (39) is composed of a junction box and an impedance-matching transformer. The transformer is the length of transmission line attached to the bottom of the junction box. Mount the junction boxes on the top sides of the junction box brackets, with the transformers pointing toward the bottom of the pole. See Figures 5 and 11.

Attach a marker plate to each junction box in accordance with the following schedule. Use two 6-32 x 3/8-inch machine screws (125) and lockwashers (130) for each plate. These plates identify the junction boxes to facilitate feed line installation.

Marker Plate	Part No.	Location
N-S HI	58	Upper junction box, on NORTHWEST side of pole.
E-W HI	60	Upper junction box, on SOUTHEAST side of pole.
N-S LO	59	Lower junction box, on NORTHWEST side of pole.
E-W LO	61	Lower junction box, on SOUTHEAST side of pole.

END-SEAL SUPPORTS

Mount 24 end-seal supports (49) using 5/16-18 x 3/4-inch capscrews (122) and lockwashers (127). The holes for mounting these supports are located on the pole in line with the centers of the NORTH and EAST radiators. Do not confuse these holes with the pairs of holes on the opposite sides of the pole for the jumpers. The free ends of these supports should point toward the NORTHEAST side of the pole and hence, toward each other. See assembly drawing, section "A-A".

Mount a radiator end-seal support (146) on each WEST and SOUTH radiator. Each support should be fastened to the center of the radiator vertical tube with two 1-3/4-inch strap clamps (133). One of the strap clamps should be on each side of the center horizontal rod of the radiator. The free ends of these supports should point toward the SOUTHWEST side of the pole. See assembly drawing, section "A-A".

FEED LINE INSTALLATION

CAUTION

THE FEED LINES USED ON THE TF-12AH ANTENNA HAVE ALUMINUM OUTER CONDUCTORS WHICH MUST BE BENT SLOWLY BY APPLYING A STEADY, EVEN PRESSURE. EXTREME CARE MUST BE EXERCISED WHEN HANDLING THESE FEED LINES TO AVOID BUCKLING OR COLLAPSING OF THE OUTER CONDUCTORS. SCRAP SECTIONS OF FEED LINE ARE SUPPLIED ON WHICH BENDING OPERATIONS MAY BE PRACTICED.

Two spring-type tube benders (111) are supplied with the antenna to facilitate any bending of the feed lines that may be necessary. To use a tube bender, just slide it on the feed line to the point where the bend is to be made. Make the bend, and remove the tube bender. ALL BENDS MUST HAVE A RADIUS OF SIX INCHES OR MORE, UNLESS A BENDING FIXTURE IS USED, IN WHICH CASE A 3-INCH RADIUS BEND IS PERMITTED.

All the feed lines (including 2 spares) are shipped as straight lengths having pre-formed bends at the ends that connect to the junction boxes. DO NOT ATTEMPT TO STRAIGHTEN THESE BENDS.

In order to facilitate the installation of the feed lines, all the feed lines are marked at both ends with identifying labels. An explanation of these labels will be given. The junction boxes have been previously marked as the N-S HI and N-S LO, or E-W HI and E-W LO junction boxes. The terminals on each junction box are numbered from 1 to 6 on the bottom side, and from 7 to 12 on the top side. The labels on a feed line indicate from which terminal on a junction box to which radiator in a given section (or bay) the feed line is connected. For example, if the marking on the label is:

N-S HI-4 (junction box, terminal) to B6-S (antenna bay, radiator)

This indicates that the feed line goes from No. 4 terminal on the N-S HI junction box to the SOUTH radiator in bay 6 (section 6).

The feed lines that are connected to the N-S junction boxes are dressed to the pole on the NORTHWEST side, and the feed lines that are connected to the E-W junction boxes are dressed on the SOUTHEAST side of the pole.

All the feed lines are shipped with a protective cap on the end that fits into the junction box. To remove the cap, hold the nut with a wrench, then unscrew the cap.

Before installing the feed lines, measure their length. A metal band is attached to each feed line showing the line length in inches. The line length may also be checked against the tabulation following this paragraph. Remove the protective cap on the end of each cable. Using a tape measure, ascertain that each feed line is the proper length. The overall feed-line lengths, measured from the tip of the inner conductor to the brass tip of the end seal, for the various channels are:

Channels 7, 8, 10, 11, and 12= 198-1/4" ± 1/4"
Channels 9 and 13= 186-3/4" ± 1/4"

All of the feed lines for any one channel are of equal length. UNDER NO CIRCUMSTANCES MAY ANY FEED LINE BE SHORTENED.

The protective cap for each feed line should be replaced after the line has been measured. Leave the protective caps on the feed lines until just before the line is inserted in its junction box.

The feed line drawings (Figures 26 and 27) will prove helpful in connecting the feed lines and jumpers. These drawings are arranged to extend beyond the pages of the book, so that reference may be made to the drawings and the text at the same time.

When connecting a feed line to the junction box, the following procedure is recommended:

Refer to assembly drawing, section "Z-Z".

1. Remove the cap from the junction box terminal.

2. Remove the protective cap from the feed line.

3. Slide the Parker nut and follower ring a few inches away from the end of the feed line.

4. Insert the feed line into the junction box, making certain that the center conductor (stinger) mates with the contact in the junction box, and that the flare in the outer conductor is properly seated against the junction box fitting.

5. Slide the follower ring and Parker nut down to the fitting and tighten the nut securely.

NOTE

The Parker nuts on the feed lines should be tightened at the time of initial installation, and then retightened 24 hours later. This procedure is necessitated by the fact that the feed line outer conductors are made of aluminum, and aluminum flows when subjected to pressure.

CAUTION

THE THREADS ON THE FEED-LINE NUT AND THE JUNCTION BOX MUST BE PROPERLY ENGAGED OR DAMAGE TO THE JUNCTION BOX AND GAS LEAKAGE MAY RESULT. DO NOT REMOVE THE KNURLED CAPS ATTACHED TO EACH JUNCTION BOX TERMINAL. SEE FIGURE 10.

Before starting the installation of the feed lines, make certain the pole is supported on the trestles so the WEST side of the pole is toward the ground. If sleet melting equipment is to be installed, mount 12 heater junction boxes on the NORTH side of the pole as described under SLEET MELTING EQUIPMENT. Do not connect the sleet melting equipment wiring at this time. The following steps list the sequence of operations in installing the feed lines.

1. Install and dress the feed lines to the EAST and WEST radiators.

2. Rotate the pole 90 degrees, so that the SOUTH radiator will be toward the ground. This will place the hoisting lug in a convenient position for raising the antenna.

3. Install and dress the feed lines to the NORTH and SOUTH radiators.

4. Install the jumpers, then bleed and test the feed system.

The foregoing procedure is described in detail in the following paragraphs. Reference should be made to feed line drawings (Figures 26 and 27) during feed line installation.

E-W HI JUNCTION BOX CONNECTIONS

Select the feed line marked EW-HI-10 to B1-E. Insert the junction box end into terminal No. 10 of the EW-HI junction box using the procedure previously described. Dress the feed line along the pole on the SOUTHEAST side, using the tube bender, where necessary, to bend the line. Continue the line upward to a point approximately midway between radiator sections one and two. At this point form a single-turn coil in the line, and continue it upward along the NORTHEAST side of the pole parallel to the EAST radiator. The end seal on this feed line should terminate at the end-seal support mounted on the EAST side of the pole in section one. Clamp the end seal in this support. Using a 1/4-20 x 1-inch capscrew (145) an lockwasher (129), so that only the insulator portion of the end seal protrudes beyond the support. See assembly drawing, section "A-A". Any slack existing in this feed line should be absorbed in the loop indicated between radiator sections one and two. Using two feed-line clamps (141) and 5/16-18 x 1-inch capscrews (119), washers (143), and lockwashers (127), secure the feed line to the NORTHEAST side of the pole parallel to the EAST radiator in section one. See assembly drawing, section "A-A". Below the loop, this feed line should be dressed against the SOUTHEAST side of the pole, down to the junction box.

Insert the EW-HI-9 to B1-W feed line into the No. 9 terminal on the EW-HI junction box. Run this feed line parallel to the line previously installed up to the point midway between sections one and two. At this point form a one-turn coil in the line, and bend the line toward the WEST radiator in section one. Bend the feed line away from the pole near the bottom end of this radiator, and continue it upward dressed against the SOUTH side of the radiator vertical tube. Clamp the end seal in the radiator end-seal support using a 1/4-20 x 1-inch capscrew (145) and lockwasher (129). Clamp the feed line to the radiator vertical tube at two points, as shown on assembly drawing, section "A-A", using saddles (50) and 2-1/4-inch adjustable clamps (132).

CAUTION

AVOID PLACING THE ADJUSTMENT MECHANISM OF THE ADJUSTABLE CLAMPS DIRECTLY ON THE FEED LINE. IF THIS PRECAUTION IS NOT OBSERVED, THE SHARP PROJECTING EDGE OF THE MECHANISM WILL CUT THROUGH THE OUTER CONDUCTOR, CAUSING A GAS LEAK, AND POSSIBLY ALLOWING MOISTURE TO SEEP INTO THE FEED LINE.

Insert the EW-HI-11 to B2-E feed line into the No. 11 terminal on the EW-HI junction box. Run this feed line parallel to the lines previously installed up to the point midway between radiator sections one and two. At this point, form a loop in the feed line, and return the line down the NORTHEAST side of the pole to the end-seal support mounted on the EAST side of the pole in section two. Clamp the end seal in this support, using a capscrew (145) and lockwasher (129). Secure the feed line to the pole parallel to the radiator, using two clamps (141), capscrews (119), washers (143), and lockwashers (127).

Connect one end of the EW-HI-8 to B2-W feed line to the No. 8 terminal on the EW-HI junction box. Run this feed line upward along the pole adjacent to the lines previously installed, to a point midway between radiator sections one and two. At this point form a loop in the feed line and return it downward toward the WEST radiator in section two. Bend the feed line away from the pole just above this radiator, and dress the line along the radiator vertical tube. Clamp the end seal and the feed line to the radiator in the same manner as for the WEST radiator in section one.

Connect one end of the EW-HI-12 to B3-E feed line to the No. 12 terminal on the EW-HI junction box. Run this line upward on top of the lines previously installed (section "M-M", assembly drawing), to a point midway between sections two and three. At this point, form a loop in the feed line, and return it down the NORTHEAST side of the pole until it is below the radiator in section three, then form a loop and return it upward again along the NORTHEAST side of the pole to the end-seal support mounted on the EAST side of the pole in section three. Clamp the end seal and feed line as previously described.

Connect one end of the EW-HI-7 to B3-W feed line to the No. 7 terminal on the EW-HI junction box. Run this line upward on top of the lines previously installed (section "M-M", assembly drawing) to a point midway between sections two and three. Form a loop and return the line down the SOUTHWEST side of the pole until it is below the radiators in section three, then form another loop and return it upward on the SOUTHWEST side of the pole. Just below the WEST radiator in section three, bend the feed line away from the pole and dress it along the WEST radiator vertical tube. Clamp the end seal and feed line to the radiator in the same manner as the feed lines to the other WEST radiators.

Using the procedure just described for connecting the feed lines from the top of the EW-HI junction box, connect the six feed lines from the bottom of the EW-HI junction box to the EAST and WEST radiators in sections four, five, and six. Refer to Figure 26. The following schedule should be adhered to:

Connect EW-HI-4 to B6-E from terminal No. 4 to the end-seal support mounted on the pole adjacent to the EAST radiator in section six. Clamp and dress this feed line in a manner similar to the line feeding the EAST radiator in section one, except for one step. Just above section six, form an "S" bend in the line instead of the one-turn coil to absorb the slack.

Connect EW-HI-3 to B6-W from terminal No. 3 to the WEST radiator in section six. Clamp and dress the feed line in a manner similar to the feed line to the WEST radiator in section one, except make the "S" bend rather than the one-turn coil.

Connect EW-HI-5 to B5-E from terminal No. 5 to the end-seal support mounted on the pole adjacent to the EAST radiator in section five.

Connect EW-HI-2 to B5-W from terminal No. 2 to the WEST radiator in section five.

Connect EW-HI-6 to B4-E from terminal No. 6 to the end-seal support mounted on the pole adjacent to the EAST radiator in section four.

Connect EW-HI-1 to B4-W from terminal No. 1 to the WEST radiator in section four.

E-W LO JUNCTION BOX CONNECTIONS

The feed lines from the E-W LO junction box to the EAST and WEST radiators in the lower six sections should be connected and dressed in a manner similar to that used for the feed lines from the EW-HI junction box. The feed lines to the radiators in section seven should have an "S" bend below the radiator section to absorb the slack rather than a single-turn coil as used in section one. Other than this the feed line dress is similar. Reference should be made to Figure 27. The following schedule should be adhered to:

Feed Line	EW-LO Terminal No.	To
EW-LO-10 to B7-E	10	End-seal support adjacent to EAST radiator in section 7.
EW-LO-9 to B7-W	9	WEST radiator in section 7.
EW-LO-11 to B8-E	11	End-seal support adjacent to EAST radiator in section 8.
EW-LO-8 to B8-W	8	WEST radiator in section 8.
EW-LO-12 to B9-E	12	End-seal support adjacent to EAST radiator in section 9.
EW-LO-7 to B9-W	7	WEST radiator in section 9.
EW-LO-6 to B10-E	6	End-seal support adjacent to EAST radiator in section 10.
EW-LO-1 to B10-W	1	WEST radiator in section 10.
EW-LO-5 to B11-E	5	End-seal support adjacent to EAST radiator in section 11.
EW-LO-2 to B11-W	2	WEST radiator in section 11.
EW-LO-4 to B12-E	4	End-seal support adjacent to the EAST radiator in section 12.
EW-LO-3 to B12-W	3	WEST radiator in section 12.

Dress the feed lines that have been installed, evenly and smoothly along the SOUTHEAST side of the pole. Fasten the lines to the pole with feed-line clamps. The locations of the clamps are shown on the feed-line arrangement diagram on the assembly drawing. Details of the installation of these clamps are shown in sections "L-L", "M-M", and "Q-Q" on the assembly drawing. A handy tool for use in dressing the feed lines may be made of a block of wood with a groove along one end to fit the feed line. To use, place the grooved end on a feed line, tap the block of wood with a hammer or mallet to straighten minor bends, and bed the feed line against the other lines or against the pole.

Section "V-V", on the assembly drawing shows the method of dressing the feed lines around the transmission line support hangers.

The following procedure is recommended in mounting the feed-line clamps:

Mount two feed-line clamps (53) on the pole on either side of the feed lines, using 5/16-18 x 1/2-inch capscrews (150), washers (143), and lockwashers (127). Tapped holes are provided in the pole at the required locations. Insert a shoulder screw (54) in each of these clamps (from the top), and thread a 1/4-20 nut (126) on each screw. Two sizes of straps are provided. Use part number 55 if six feed lines are to be fastened, and part number 56 for four feed lines. Insert the end of the strap into the slot on the shoulder screw, and rotate the screw away from the feed lines until the strap is locked on the shoulder screw (about 1 1/2 turns). Tighten the nut on the shoulder screw to lock the screw in place. Repeat this operation on the other shoulder screw, but rotate this screw until the strap is snug, then tighten the lock nut. Tension should be maintained on the strap with the fingers, to keep it from unwinding during installation.

Install all the feed-line clamps and straps for the lines from the E-W junction boxes. Note that the feed lines to sections three and four are dressed on top of the other feed lines. See assembly drawing, sections "M-M" and "XA-XA".

After the feed lines are secured, rotate the pole 90 degrees on the trestles, so that the SOUTH side of the pole is toward the ground.

Install and dress the feed lines from the NS-HI and NS-LO junction boxes. The feed lines should be dressed on the NORTHWEST side of the pole to the points at which bends are made.

The lines feeding the NORTH radiators should be dressed and clamped in a manner similar to that used for the EAST radiators; and the lines feeding the SOUTH radiators should be dressed and clamped in a manner similar to the lines feeding the WEST radiators. Refer to Figures 26 and 27.

Note that some loops and coils will fall directly on top of loops previously installed. Keep the loops dressed as close to the pole as possible to minimize the effects of the feed lines upon the antenna field. Typical arrangements of the feed lines in the radiator sections are shown on Figures 2 through 15.

N-S HI JUNCTION BOX CONNECTIONS

Install the feed lines from the N-S HI junction box in accordance with the following schedule:

Feed Line	N-S HI Terminal No.	To
NS-HI-9 to B1-N	9	End-seal support adjacent to NORTH radiator in section 1.
NS-HI-10 to B1-S	10	SOUTH radiator in section 1.
NS-HI-8 to B2-N	8	End-seal support adjacent to NORTH radiator in section 2.
NS-HI-11 to B2-S	11	SOUTH radiator in section 2.
NS-HI-7 to B3-N	7	End-seal support adjacent to NORTH radiator in section 3.
NS-HI-12 to B3-S	12	SOUTH radiator in section 3.
NS-HI-3 to B6-N	3	End-seal support adjacent to NORTH radiator in section 6.
NS-HI-4 to B6-S	4	SOUTH radiator in section 6.
NS-HI-2 to B5-N	2	End-seal support adjacent to NORTH radiator in section 5.
NS-HI-5 to B5-S	5	SOUTH radiator in section 5.
NS-HI-1 to B4-N	1	End-seal support adjacent to NORTH radiator in section 4.
NS-HI-6 to B4-S	6	SOUTH radiator in section 4.

N-S LO JUNCTION BOX CONNECTIONS

Install the feed lines from the N-S LO junction box in accordance with the following schedule:

Feed Line	N-S LO Terminal No.	To
NS-LO-9 to B7-N	9	End-seal support adjacent to NORTH radiator in section 7.
NS-LO-10 to B7-S	10	SOUTH radiator in section 7.
NS-LO-8 to B8-N	8	End-seal support adjacent to NORTH radiator in section 8.
NS-LO-11 to B8-S	11	SOUTH radiator in section 8.
NS-LO-7 to B9-N	7	End-seal support adjacent to NORTH radiator in section 9.
NS-LO-12 to B9-S	12	SOUTH radiator in section 9.
NS-LO-3 to B12-N	3	End-seal support adjacent to NORTH radiator in section 12.
NS-LO-4 to B12-S	4	SOUTH radiator in section 12.
NS-LO-2 to B11-N	2	End-seal support adjacent to NORTH radiator in section 11.
NS-LO-5 to B11-S	5	SOUTH radiator in section 11.
NS-LO-1 to B10-N	1	End-seal support adjacent to NORTH radiator in section 10.
NS-LO-6 to B10-S	6	SOUTH radiator in section 10.

Dress the feed lines just installed, evenly and smoothly along the NORTHWEST side of the pole. Fasten the lines to the pole with feed-line clamps in the same manner as the lines on the SOUTHEAST side of the pole.

SLEET MELTING EQUIPMENT

In the following procedure, the numbers in parentheses correspond to the item numbers of the parts on the MI sheet for the MI-19009-J.

Assemble the connectors (3A) and (3B) to all the junction boxes (2). On the top side of the uppermost junction box use a pipe plug (3C) instead of a connector. Remove the cover from each junction box, taking care not to lose the gasket or hardware. Assemble the junction box to the bracket (5) using two screws and lockwashers, (3H) and (3G). Attach the junction box and bracket assemblies to the NORTH side of the pole below each radiator section using machine screws and lockwashers, (3F) and (3G). Tapped holes are provided in the pole at the proper locations.

Insert the heater cords (the heaters were installed during radiator mounting) in the 1/2-inch junction box connectors, making sure no slack exists, and no loops of cord remain for accumulation of ice. To keep the cords from whipping in the wind, secure them at intermediate points as necessary. In locations where extreme icing conditions and heavy winds exist, it is recommended that the heater cords be reinforced by inserting them in a metal tubing that is anchored at both ends of the cord. If this problem must be considered, additional information may be obtained from the RCA Broadcast Engineering Section, Camden, N. J.

The riser cable is supplied in one piece on the basis of eight feet for each MI-kit ordered.

Measure the lengths of riser cable required between junction boxes, allowing enough extra for splicing at each end, and cut to size. Attach the riser cable to the pole using cable clamps (3D), machine screws (3F), and lockwashers (3G). Tapped holes are provided in the pole at the proper locations.

Make the electrical connections in the junction boxes. Connections for 208/240 volt and 440/480 volt supplies are shown on Figure 24. Other power connections (such as 3-phase) can be made provided a nominal voltage of 115 volts is maintained on the heater elements. It may be necessary to substitute a different riser cable for some power connections.

After all the power connections have been made, apply power and check the heater elements to make certain they are all working. To do this, feel the individual radiator vertical tubes to see if they get warm. Do not leave the power on too long for this test since overheating of the elements or damage to the feed lines may result.

If the foregoing test proves satisfactory, replace the rubber gasket and cover on each junction box, and secure with the hardware previously removed.

After the antenna is mounted on the tower, the control equipment and associated wiring should be connected.

CAUTION

BE CERTAIN THE CONTROL EQUIPMENT IS FUNCTIONING PROPERLY, OPERATION OF THE HEATERS IN WARM WEATHER MAY OVERHEAT AND DAMAGE THE ELEMENTS AND THE FEED LINES.

JUMPER INSTALLATION

Four types of jumper assemblies (51), (52), (116), and (117) are provided. Jumpers (51) and (52) are similar except that one is right-hand and the other is left-hand. Jumpers (116) and (117) are likewise similar to each other except that one is right-hand, and the other left-hand. For this reason, the instructions for installing the jumpers should be carefully followed. Figures 26 and 27, which show the feed line arrangement, also indicates the various jumpers, to insure their correct installation. Section "A-A" on the assembly drawing shows jumper installation details.

Sort the four types of jumpers into four piles, and either mark the individual jumpers with their part numbers, or put them in four marked containers to facilitate installation.

Mount a jumper (116) on the vertical tube of the NORTH radiator in section one using two 1-3/4-inch strap clamps (133). This jumper should be positioned at the center of the radiator, with a strap clamp located on either side of the center horizontal rod of the radiator. The free end of the jumper should point toward the center conductor of the end seal. Do not clamp it to the end seal at present. The d-c tests that will be made on the antenna require that the jumpers be disconnected from the end seal. Note that the slope of the jumper points in the same direction as the free end of its associated feed line. This relationship between the jumper and the feed line holds true for all the jumpers.

In the same manner, mount jumpers (116) on the NORTH radiators in sections three, five, seven, nine, and eleven; and on the EAST radiators in sections two, four, six, eight, ten, and twelve.

Mount jumpers (117) on the NORTH radiators in sections two, four, six, eight, ten and twelve; and on the EAST radiators in sections one, three, five, seven, nine, and eleven.

Mount a jumper (51) on the pole adjacent to the center of the SOUTH radiator in section one, using two 5/16-18 x 1/2-inch bolts (123) and lockwashers (128). The free end should point toward the center conductor of the end seal mounted on the radiator. Do not clamp the jumper to the end seal at this time.

Mount jumpers (51) on the pole adjacent to the SOUTH radiators in sections three, five, seven, nine, and eleven; and on the pole adjacent to the WEST radiators in sections two, four, six, eight, ten, and twelve in the same manner.

Mount jumpers (52) on the pole adjacent to the SOUTH radiators in sections two, four, six, eight, ten, and twelve; and on the pole adjacent to the WEST radiators in sections one, three, five, seven, nine, and eleven.

ELECTRICAL TESTS

The following electrical tests should be supervised by an RCA Service Company engineer.

The bottom ends of the transformers (transmission line sections) attached to the junction boxes are sealed by cover plates. In order to perform the following electrical tests on the feed-line system, it will first be necessary to remove these cover plates. A Wheatstone bridge and a Megger will be required for the tests.

1. Connect the Megger to the input of a junction box. With all the jumpers disconnected from the end seals, the shunt resistance should exceed 200 megohms. If the resistance is some what less than this, it probably indicates moisture in the feed system. In this case clear the system of moisture as described under Pre-Erection Gassing, then recheck the shunt resistance.

If the shunt resistance is extremely low (less than one megohm) it probably indicates a faulty feed line. Isolate the faulty line by removing the lines one at a time from the junction box. Be certain one of the jumpers is not touching the center conductor at an end seal.

2. Connect the Wheatstone bridge to the input of a junction box. Measure the closed-circuit resistance of each feed line connected to this junction box, by touching each jumper in turn to the center conductor of its associated feed line. The resistance should be between 0.010 and 0.015 ohm. If any line deviates from these limits, it is probably a faulty feed line, a feed line of incorrect length, or the jumper is making poor contact. If the resistance values of all the lines are approximately equal and all exceed the limits previously mentioned, it is probable that a poor connection exists between the transformer and junction box.

Repeat this test on the remaining three junction boxes, then replace the cover plates on the bottoms of the transmission line sections attached to the junction boxes. Be certain the "O" ring gaskets are properly seated.

After all electrical tests have been accomplished connect all 48 jumpers to their corresponding end seals. The jumpers should be installed as taut as possible. Because of the various distances between the pole and vertical radiator tubes, an adjustment may be necessary on some jumper assemblies. To adjust the NORTH and EAST jumper assemblies, rotate the jumper assembly on the vertical tubes of the radiators. To adjust the SOUTH and WEST jumper assemblies, rotate the end-seal supports mounted on the radiator vertical tubes.

PRE-ERECTION GASSING

Connect a source of dehydrated compressed air or nitrogen, at 15 pounds pressure, to the bleeder valve on each junction box. The four junction boxes may be gassed simultaneously or individually depending on how many fittings are available for connection from the bleeder valves to the gas supply line. The bottom end of the matching section of transmission line attached to the junction box is closed by a cover plate which is equipped with a bleeder valve. Open this bleeder valve, to permit the moist air in this section of the line to escape slowly. When this portion of the line is clear of moisture (after approximately half an hour), close the bleeder valve.

The center conductor of each feed line is equipped with a bleeder plug at the end seal. Open all the plugs on the feed lines connected to the junction boxes that have gas pressure applied and let the moist air blow out. Use the correct size wrench and exercise extreme care when opening or closing these plugs. Due to their small size, they are easily damaged by too much force.

When using compressed air, let the air blow through the feed lines for three or four hours. Then you may be sure they are dry. If nitrogen is used, the gas escaping from the bleeder plugs may be tested, as described under TRANSMISSION LINES, to determine when the lines are clear of air. If in doubt, allow the compressed gas to blow through the lines a little longer. Be certain that the air is bled from every feed line, not just a few.

When the feed lines have been cleared of moist air, close the bleeder plugs, and, with the gas pressure at 15 pounds, close the gas supply valve. Allow the lines to remain in this condition for an hour. If there is a drop in gas pressure, it indicates a leak which must be located and corrected.

Close the junction box bleeder valves, with 15 pounds of pressure in the feed lines, and disconnect the gas supply lines. A slight positive pressure should be maintained in the feed-line system to prevent moisture from entering the system during erection.

PAINTING THE ANTENNA

Mask the junction-box bleeder valves and the end-seal insulators to keep these parts free from paint. Apply a coat of "Paladin" (available in gallons from the Interchemical Company, Newark, N. J.) or equivalent to the antenna before painting. This will insure proper adhesion of the paint to the various metal surfaces. After the "Paladin" is dry, paint the entire antenna in accordance with CAA regulations. DO NOT UNDER ANY CIRCUMSTANCES PAINT THE END SEALS. REMOVE MASKING MATERIAL WHEN PAINTING HAS BEEN COMPLETED.

TOWER MOUNTING

Before mounting the base socket (13), try it on the bottom of the pole for size. Since only 1/32-inch clearance is provided between the pole and base socket, these areas must be clean and free of nicks or dents. The pole and socket should mate with a free sliding fit. Use grease, if necessary.

The pole guide flange and pole base socket must each be so mounted with respect to the antenna assembly, that the transmission lines running vertically downward from the junction boxes will pass through the openings in the flanges without interference.

Bolt the pole base socket (13) into position 11 feet, 6 inches below the tower top. See assembly drawing. Bolt the pole guide flange (12) to the tower top with the wedges up.

Raise the completely assembled antenna to the top of the tower by means of the hoisting lug provided. Carefully lower the bottom end of the antenna pole through the guide flange and into the base socket previously mounted on the tower. As the antenna is lowered into position, guide the beacon cable through the hole in the bottom of the base socket.

Adjust the orientation of the antenna and align the pole vertically, then tighten the base-socket setscrews (17) to hold the pole in this position. Tighten the four guide-flange centering wedges against the pole, then tighten the bolts to hold the wedges securely. Weld each wedge in place along all three sides after the pole is properly positioned. Do not weld the wedges to the pole. Weld the pole to the base socket.

The four lower transmission line hangers (48) may now be mounted using 5/16-18 x 3/4-inch bolts (121) and lockwashers (128).

PEDESTAL MOUNTING

Before mounting the pedestal (30), try it for size on the bottom end of the pole, while the antenna is still on the trestles. Since only 1/32-inch clearance is provided at the telescoping portion of the pole and pedestal, these areas must be clean and free of dents or nicks. This joint should telescope with a smooth sliding fit. Use grease if necessary.

Bolt the pedestal (30) to the top of the tower. If desired, the pedestal may be attached to the pole and the two hoisted together.

It is imperative that all spaces between the bodies of the mounting bolts and the walls of the holes through which they pass, are filled with caulking compound to prevent the entry of moisture. Any good grade of caulking compound is satisfactory, but if local sources fail, "Alumilastic, consistency C" (RCA Stock No. 58490) is approved and can be obtained from the Parr Paint and Color Company, 18312 Syracuse Avenue, Cleveland 10, Ohio. Painting the bodies of the bolts with primer, even though they are supplied plated or galvanized, will aid in preventing corrosion.

Hoist the assembled antenna to the top of the tower and lower the base of the antenna pole into the pedestal. Guide the beacon cable through the hole in the bottom of the pedestal as the antenna is lowered into position.

NOTE

If the antenna is to be mounted on top of a steel pylon antenna, a special pedestal and adapter will be required. Since this is a specialized installation, contact your local RCA Broadcast Equipment Sales Office for detailed information.

Orient the antenna and align it vertically, then tighten the six pedestal screws to hold the antenna firmly in this position. Weld the beveled top edge of the pedestal to the pole all the way around. Remove the six setscrews, and plug weld the setscrew holes.

COMBINING NETWORK

The reasons for using a combining network have been covered previously under DESCRIPTION. From the standpoint of installation personnel, the combining network is primarily a means of connecting four junction boxes to the transmission lines. By reference to drawings No. 627884 and No. 8828547, both of which are included with the combining network, assembly should present no problems.

Figure 18 shows the four transmission line systems that may be used for feeding the TF-12 AH Antenna. Since type A is the most commonly used system, it will be discussed in the following paragraphs. The other systems are modified versions of the type A system so the same information may be applied to all types.

The combining network should be installed after the antenna has been mounted and oriented. In the installation the following points should be kept in mind:

1. Since the combining network consists of lengths of transmission line, the methods and precautions observed in installing transmission line should be followed.

2. On the combining network assembly drawing No. 627884, the various sections of line used are identified by encircled numbers. These numbers correspond to the numbers in the first column on the list of parts No. 8828547. The list of parts identifies the section of line by length, so it is a simple matter to pick out the correct section.

3. The portions of line 4 feet 8-23/64 inches long, shown dotted on drawing No. 627884, are the transformers which are permanently attached to the junction boxes.

4. Some sections of line may have a rolled bead near one end, to support the inner conductor assembly. The end with the bead must be toward the bottom.

Installation should start at the HI junction boxes. Install the first sections of line on the NORTHWEST and SOUTHEAST sides of the pole, securing them to the transmission line hangers with 3-1/2-inch adjustable clamps (131).

Mount two miter elbows on each line between radiator sections six and seven, to offset the lines coming down from the upper junction boxes. See drawing No. 627884 and drawing No. 311389, section F-F. The elbows should be positioned so that the line from the N-S HI junction box (on the NORTHWEST side of the pole) will be transposed to the SOUTHWEST side of the pole; and the line from the E-W HI junction box (on the SOUTHEAST side of the pole) will be transposed to the NORTHEAST side of the pole.

NOTE

BE CERTAIN THE PROPER MITER ELBOWS ARE USED AT THIS POINT, AND THAT THEY ARE CORRECTLY POSITIONED.

Continue these two lines downward along the NORTHEAST and SOUTHWEST sides of the pole, passing through the holes in the guide flange and base socket, to the point at which the combining tees are to be installed. Secure the lines to the support hangers with 3-1/2-inch adjustable clamps (131).

The combining tees used with the TF-12AH Antenna are marked on either end with the designations "OUTPUT 70% POWER," and "OUTPUT 30% POWER." The remaining leg on each tee is marked "INPUT". Install the combining tees so that the ends marked "OUTPUT 70% POWER" are connected

to the lines from the upper junction boxes, and the "INPUT" legs are properly oriented. From the "OUTPUT 30% POWER", terminals, connect two lines downward to the point where the bottom miter elbows are connected.

Install the lines from the two lower junction boxes. Dress the line from the N-S LO junction box along the NORTHWEST side of the pole, and the line from the E-W LO junction box along the SOUTHEAST side of the pole. Run these lines through the holes in the guide flange and base socket down to the point at which the lower miter elbows will be installed. Secure these lines to the support hangers using 3-1/2-inch adjustable clamps.

Install one spring-type hanger (item No. 15) on each of the four lines, at a point approximately eight feet below the bottom of the pole.

Install the miter elbows on the bottom of the lines as shown on drawing No. 627884. Be certain the correct lines are connected together. The line on the NORTHEAST side of the pole must connect to the line on the SOUTHEAST side, and the line on the NORTHWEST side of the pole must connect to the line on the SOUTHWEST side. This should connect both N-S junction boxes to one combining tee, and both E-W junction boxes to the other combining tee.

NOTE

The foregoing procedure described installation of the combining network for a tower mounted antenna. The installation on a pedestal mounted antenna is essentially the same as shown in the lower two sections of drawing No. 627884.

TRANSMISSION LINES

In a Superturnstile Antenna System the two sets of radiators are fed in quadrature (90-degree phase difference). This is accomplished by making one of the transmission lines one-quarter wavelength (90 electrical degrees) longer than the other at the center frequency of the television channel. Figure 22. The quarter-wavelength phasing section of line may be routed as required to obtain this condition. Figure 21.

In order to fully utilize the advantages of a diplexed antenna system, the input impedances of the two transmis sion lines from the two sets of radiators must be identical before addition of the quarter-wave phasing section. To insure this, all elements in the transmission lines such as elbows, reducers, couplings, etc., are used in pairs down to the point where the quarter-wavelength section is added. This quarter-wavelength section is inserted in one of the lines as close to the diplexer as possible. Figure 22. Beyond this point the lines must be identical and run parallel to each other all the way to the antenna. Where it is necessary to use elbows or adapters etc., they must be used at corresponding points on each line. Thus, after diplexing, all of the reflections produced by the fittings cancel out.

The following table lists the dimensions for the quarter-wavelength section of line for channels 7 to 13.

QUARTER-WAVELENGTH PHASING LINE DIMENSIONS

Chan.	Frequency (mc)	Electrical Quarter Wavelength (in.)	Physical Length of Teflon Line MI-19313 3-1/8" dia. (in.)
7	174 to 180	16-5/8	15-1/8
8	180 to 186	16-1/8	14-5/8
9	186 to 192	15-5/8	14-1/4

(Continued)

QUARTER-WAVELENGTH PHASING LINE DIMENSIONS (Continued)

Chan.	Frequency (mc)	Electrical Quarter Wavelength (in.)	Physical Length of Teflon Line MI-19313 3-1/8" dia. (in.)
10	192 to 198	15-1/8	13-3/4
11	198 to 204	14-3/8	13-3/8
12	204 to 210	14-1/4	13
13	210 to 216	13-7/8	12-5/8

Note: Quarter-wave sections of line, with flanges on both ends, may be ordered from RCA for any channel desired.

The MI-19313 Transmission Line is supplied in standard lengths of 20 feet and may be obtained with flanges on both ends, with a flange on one end, or with no flanges. The outer conductor has a bead rolled in it approximately six inches from one end. This end of the line must be used as the lower end on vertical runs, so that the bead will support the inner conductor assembly.

WARNING

IF THE LINE IS TURNED OVER WHILE HOISTING, THE INNER CONDUCTOR ASSEMBLY WILL FALL OUT RESULTING IN DAMAGE TO THE LINE AND PERHAPS AN INJURY TO PERSONNEL ON THE GROUND.

The inner conductor assembly consists of a copper tube supported by Teflon insulators. During installation, connection between the inner conductors is effected by means of spring-type male connector plugs (bullets), that slide into the inner conductors of adjoining sections of line, thus aligning and making good electrical contact between the inner conductors. The outer conductors are joined by means of the end flanges, or by an adapter on unflanged line, which are held securely together by six bolts and nuts at each joint. Each joint is equipped with an "O" ring gasket to provide a gas-tight seal at all joints.

The foregoing discussion applies to the gassed-type line. Sections of unflanged line may be used ungassed inside the station, in which case they are joined by ungassed couplings.

When the transmission line is delivered, each section should be individually inspected. Remove the "upper" cover disc, and withdraw the inner conductor assembly. Examine the inner conductor for any dents, and the Teflon insulators for signs of any foreign matter. If any damage is noted, a new inner conductor assembly should be obtained. After each section has been inspected, replace the inner conductor assembly and the end cover disc.

When mounting the TF-12AH Superturnstile Antenna on a base-fed AM tower, it is necessary to isolate the television transmission line from the tower.

One method of accomplishing this, is to insulate the television lines from the AM antenna for a distance of approximately one-quarter wavelength (at the AM frequency) from the base of the tower. The television transmission lines should be supported by insulating support brackets to a point one-quarter wavelength up from the base, at which point, the outer conductors should be connected to the tower. From this point to the television antenna, the lines may remain in contact with the tower. For detailed information on a particular installation, contact RCA Engineering Products Department, Camden, N. J.

When laying out the transmission line run, it should be made as short and direct as possible, have a minimum of bends, and be arranged for a minimum of cutting.

NOTE

Although MI-19313 transmission line is specifically referred to in this instruction book, since it is the most commonly used, there are three other types of transmission line that may be employed. The MI-19113-B is a 3-1/8-inch, 51.5-ohm transmission line; the MI-19089 is a 3-1/8-inch, 50-ohm line; and the MI-19314-B is a 6-1/8-inch, 51.5-ohm line. It is suggested that your local RCA Broadcast Equipment Sales Office be contacted to determine the type of line best suited to the individual requirements of the station.

The actual input impedance of each combining tee is 51.5 ohms. To insure the proper impedance match to the transmission line if MI-19313 line is not used, and also to match the flange on the combining tee to the flange on the transmission line, a transformer must be connected to the combining tee input terminal. The transmission line may then be connected to the transformer, and routed down the tower. Three types of transformers are available depending on the type of transmission line used. Since the length of the transformer will vary, in accordance with the channel and the type of transformer, the transformer length is not included in this book. For specific information on a particular installation, consult your local RCA Broadcast Equipment Sales Office.

The following table lists the MI numbers of the three types of transformers, and indicates their application. One transformer is required for each combining tee:

RCA Reference	Purpose
MI-19113-B-48	To match combining tee to MI-19113-B (Steatite, 3-1/8-inch) transmission line.
MI-19089-9	To match combining tee to MI-19089 (Teflon, 3-1/8-inch) transmission line.
MI-19314-B-4	To match combining tee to MI-19314 (6-1/8-inch, 51.5-ohm) transmission line.

The installation of the transmission lines should begin at the transformers and proceed downward. Hoist and connect one section of line at a time, to reduce the possibility of damage to the line. Do not remove the cover discs from the ends until ready to install the section. Save the bolts from the cover discs to be used as flange bolts. Insert an inner conductor connector into one of the sections to be joined. Place an "O" ring gasket in the groove of the face of the flange. Join the sections, pulling up evenly on the flange bolts.

CAUTION

BE CERTAIN THE BULLETS ENTER THE INNER CONDUCTOR BEFORE PULLING UP ON THE FLANGES.

Connect full length (20-foot) sections of transmission line to each adapter and fasten them to the hanger supports with 3-1/2-inch strap clamps (131). Continue the lines downward, using full sections of line and fittings as needed.

The upper section of each line, that is fastened to the tower, should be supported by two fixed hangers. The balance of the transmission line run should be supported by means of spring-type hangers spaced at intervals of ten feet. When installing spring hangers, they should be adjusted in accordance with the chart that accompanies them.

If it is necessary to cut a section of transmission line, the following procedure should be used:

NOTE

THE FOLLOWING METHOD OF JOINING CUT SECTIONS OF MI-19313 LINE SHOULD ONLY BE USED INSIDE THE STATION WHERE THE LINE IS WELL SUPPORTED. IF IT IS NECESSARY TO INSERT A SHORT SECTION IN THE OUTSIDE RUN, A SECTION OF LINE CUT TO THE LENGTH REQUIRED SHOULD BE ORDERED FROM RCA.

1. Measure accurately the length of outer conductor required and mark it at this point for sawing.

2. Cut the outer conductor at this point using a hack saw and miter box.

NOTE

If desired, a cut-off gauge may be ordered from RCA to insure an absolutely square cut. These gauges are available as MI-19113-B-50 for 3.125" and MI-19113-B-51 for 1.282" line.

3. Cut the inner conductor so that it is 1/16-inch shorter than the outer conductor at both ends. BE CERTAIN THAT THE INNER CONDUCTOR ASSEMBLY IS SEATED AGAINST THE BEAD IN THE OUTER CONDUCTOR WHEN MARKING IT.

4. Remove the burrs from both the inner and outer conductors with a file and scraper.

5. Insert an inner conductor connector, mount an adapter (MI-19313-4) on the outer conductor, and join the cut section of line, to the last section installed.

A typical installation of transmission line on a tower is shown in Figure 23. Note particularly the positions of the rolled grooves (beads).

Gas stops should be installed in both transmission lines near the bottom terminations, before they are connected to the diplexer. This will leave an ungassed portion of line connected between the diplexer and the transmission line gas stops. This ungassed portion of line may be readily disconnected from either the diplexer or the line to the antenna, to permit tests and adjustments to be made to either the transmitter or antenna. See Figure 22.

When installing gas stops, their thickness must be kept in mind when cutting a section of line to size. The gas stops are inserted between the two flanges that form a joint in the line, using the bolts that are supplied with the gas stop instead of the regular flange bolts. (A gas stop may also be inserted between an adapter and a flange.) Be sure the opening on the gas stop is in the right direction. The pipe plug in the gas stop should be toward the section of line to be gassed.

The transmission line should be arranged so that the ungassed portion of line may be disconnected from either the diplexer or the transmission line gas stop without disturbing the joints in which the gas stops are inserted. Have either a fitting or a piece of transmission line between the gas-stopped joints and the points where the ungassed line will be disconnected.

The two transmission lines should be symmetrical all the way down, with joints and bends occurring at similar points in each line down to the point at which the quarter-wave phasing section is inserted.

After completing the transmission line run, a d-c continuity check should be made from the bottom of each line as described under MAINTENANCE.

The foregoing information described 3-1/8-inch line (MI-19313). For more efficient transmission of power, 6-1/8-inch line (MI-19114) may be used.

Connect a source of dehydrated compressed-air or nitrogen to the gas stops, as shown in Figure 22. Feed the gas at 15 pounds pressure to the lines. Climb the tower, and open the bleeder valves on the junction boxes so that the air in the lines may escape slowly. The bleeder valves should be left open until the moist air in the lines has been replaced by the gas being supplied to the line. This will ordinarily take from four to eight hours, depending on the transmission line run.

When using nitrogen to gas the lines, a convenient test to determine when the air has been expelled from the line, is to hold a lighted match in the stream of gas escaping from the bleeder valve. If the match is extinguished by the gas (not blown out) it may be assumed that nitrogen is escaping, thus indicating the line is clear of air. If the match continues to burn, the bleeder valve should remain open, since this indicates that air is still in the line.

When using dehydrated compressed air, this test cannot be made. The bleeder valve should remain open for the time it is estimated will be required to clear the line, and then left open for two hours longer. It may then be reasonably assumed that the line is clear of moist air.

A more positive indication may be obtained by disconnecting all the jumpers from the end seals and connecting a Megger across the bottom end of a transmission line. Leave the bleeder valve open until the shunt resistance of the line exceeds 100 megohms. This indicates a very dry line. When both lines test dry, reconnect the jumpers.

After the bleeder valves have been closed, adjust the gas pressure in the line to 15 pounds, and close the gas supply valves. The pressure in the lines should be checked an hour later. If the pressure is less than 15 pounds, it indicates that a leak exists in the system which must be located and corrected. If the pressure remains constant, the line is gas-tight.

The beacon light wiring should be completed and the beacon energized to determine that it is functioning properly. The antenna is now ready for the application of power.

OPERATION

The TF-12AH Antenna, when assembled in accordance with the procedure described in this book, requires no tuning or adjustment at the time of installation.

The information in this section relates primarily to the type A feed system of Figure 18, since this is the most commonly used type. Much of this information, however, will be applicable to the other types of feed systems.

The following notes on the operation of the Superturnstile Antenna will be helpful in diagnosing and locating faults in the system.

EMERGENCY OPERATION

To operate with one side of the antenna dead, it is necessary to keep both diplexer output lines properly loaded. The station r-f load and wattmeter provides a convenient method of doing this.

Disconnect the defective antenna transmission line from the diplexer and connect the r-f load unit to the output terminal in place of the defective transmission line. Half of the power will go to the r-f load thereby maintaining the balance of power division.

In line with the previous paragraphs and as a move toward improving public relations on the part of the station, the following suggestion is offered. If, at any time, the antenna system, or the transmitter, become partially disabled, so that it is necessary to continue operation on reduced power or with an altered radiation pattern, have an announcer state the fact, several times daily, that adjustments are being made at the station. Failure to do this, may result in many unnecessary service

calls to TV receiver service personnel in your area. If, on the other hand, station personnel cooperate with TV receiver service personnel, the end result will be beneficial to all concerned.

THE SUPERTURNSTILE ANTENNA SYSTEM AS A WHEATSTONE BRIDGE

Figure 25A shows that the two sides of the antenna, the transmission lines, and the diplexer combine to form a balanced bridge network. It will be seen that as long as the bridge is balanced (N-S equal to E-W) there can be no crosstalk between the visual and aural inputs. This is true at all frequencies. Consequently, any abnormal cross coupling between visual and aural is probably a sign of transmission line trouble.

PHYSICAL ANTENNA SYSTEM

Figure 25B shows how the actual antenna system is evolved from Figure 25A. The two transmission lines to the two sides of the antenna become the upper two arms of the bridge. The circuits of the diplexer become the two lower arms. The visual and aural signals are converted within the diplexer so that at the output of the diplexer, the visual signal is push-pull and the aural signal is push-push.

QUADRATURE FEED TO THE ANTENNA

The Superturnstile Antenna requires that a 90-degree phase difference must exist between the NORTH-SOUTH and EAST-WEST radiators. To obtain this condition one transmission line is made a quarter-wavelength longer than the other, at the center frequency of the channel.

The two visual signals are 180 degrees out of phase at the output of the diplexer. One signal is retarded 90 degrees in the quarter-wavelength line section, therefore, these two signals will be 90 degrees out of phase at the antenna. The two aural signals are in phase at the output of the diplexer. One signal is retarded 90 degrees, therefore these two signals will be 270 degrees out of phase at the antenna.

EFFECT OF BALANCED MISMATCH IN THE ANTENNA

If the impedances of the two sides of the antenna are equal but not perfectly matched to the transmission lines, reflections will exist on the two transmission lines. If the two lines were of equal length, the reflected waves would arrive back at the diplexer in the same phase relationship with which they started. Thus, the visual waves which started "plus" on one side and "minus" on the other (180 degrees out of phase), would return "plus" and "minus". The quarter-wavelength phasing section changes this condition. The wave on the right-hand line which started "minus" will go through an additional 90-degree delay on the return. Thus, it will have a "plus" phase upon its return, just as does the wave on the left-hand line.

The visual reflection will therefore be of such phase that it cannot return to the visual input and will instead go to the aural input. Likewise, a reflection from the aural input will go to the visual input.

ECHO PATHS

Even though visual modulation is non-sinusoidal, the effect of a balanced mismatch is to send equal echoes back down the two lines. The visual echoes return to the aural transmitter for the reasons previously described. If the aural transmitter matches the transmission line to the diplexer over the visual frequency band, the echo will be absorbed. If the aural transmitter should be a bad match at the visual frequency, the echo will again be reflected back to the antenna and most of it will be radiated. The displacement of this echo on a kinescope would correspond to two complete round trips on the transmission line.

The aural transmitter is usually a fairly good match, so that small echoes do not survive the two round trips and the absorption by the aural transmitter.

TESTS FOR BALANCED MISMATCH

This test can readily be made on the aural input to the diplexer because, as previously described, the visual echoes return to the aural transmitter. Disconnect the aural transmitter input to the diplexer. An observer at a distant receiver, or at the master monitor in the station, will see a change in the character or intensity of the echo when the aural input to the diplexer is successively disconnected and connected. An echo due to a balanced mismatch will disappear when the aural input to the diplexer is correctly terminated, such as with a dummy load resistor. The station r-f load can be used for this purpose.

LOCALIZING OF MISMATCH

A mismatch of impedance may originate in the antenna. For example, incorrect connections of feed lines may be made in an identical manner on both sides of the antenna, thus resulting in an equal mismatch on each side. A mismatch may also occur in the transmission line installation.

The distance along the transmission line from the transmitter to the point where the mismatch exists can be estimated if it is possible to observe the distance the echo is displaced from the main image on either a receiver or a station monitor. The horizontal movement of the beam across the picture tube takes place in 53.3 microseconds. During this time, a radio wave can make a round trip to and from a point located at a distance of approximately 26,150 feet along an ideal transmission line. Thus, if the picture is ten inches wide, and the echo is displaced one-tenth inch, the distance to the fault from the transmitter is approximately 262 feet. The "RMA" lines have a velocity of propagation of from 91 per cent to 100 per cent. For such lines, the distance is reduced in proportion.

The displacement of the echo will be the same on either the station monitor or a distant receiver.

Diminishing multiple echoes will exist if the mismatch is severe, however, only one echo can usually be seen because the successive repeats are partially radiated during each round trip and thereby become so low in amplitude that they are lost in the noise.

REFLECTION DUE TO OTHER CAUSES

A reflection on both the station monitor and on distant receivers usually is indicative of a mismatch in either the transmission line or the antenna. It is possible, however, for a fault in the transmitter to give a false indication of antenna trouble. If the video modulation characteristic of the transmitter system has a discontinuity, a "ringing" phenomenon may occur. This ringing results in either a single repeat, or a decaying series of repeats. The repetition rate of these repeats is dependent only on the video frequency of the ringing. For instance, if the video characteristic has a discontinuity or change in amplification for a video frequency of one megacycle, the ringing will occur at a one-megacycle rate, and the separation between echoes would be 1/53 of the distance across the picture tube screen. This could lead to a false conclusion that a fault existed in the transmission line at a distance of 490 feet from the transmitter. See previous paragraph.

A ringing phenomenon can also be caused by r-f feedback from the antenna to the video input equipment. This feedback may cause an abrupt change in the video characteristic at one or more discrete frequencies, so that an echo apparently occurs from the transmission line. Changing the transmitter output to a dummy load may eliminate the feedback, so that a completely erroneous conclusion may be reached. For this reason, the picture from the modulator output should be observed for presence of an echo, when this condition is being checked. This observation of the modulator signal output should be made with the complete system, including antenna, in operation.

UNBALANCED MISMATCH

If a fault exists in one transmission line or one side of the antenna, the cancelling-out action will not occur. The echo will be reflected back along the line into the visual and aural inputs from which it will probably be again reflected and radiated from both sides of the antenna. Thus, the echo is likely to be apparent to observers in the whole service area, including those in the direction end-on to the radiators connected to the side having the fault. Figure 25C.

For a test, each of the output lines from the diplexer can be successively terminated in the R-F Load and Wattmeter. Observations on the station master monitor and at receiving locations should show loss of the echo when the faulty side is dead.

D-C AND A-C CHECKS FOR FAULTS

In many cases, a considerable amount of information can be obtained with a resistance bridge and with an a-c hi-pot test. The d-c resistance of the transmission line and antenna system can be measured with an accurate bridge. The two readings of inner conductor to ground on each of the two transmission lines can be compared; these should be almost exactly alike.

The Superturnstile Antennas have no parallel stub connections of any sort, therefore a continuous d-c circuit exists on the inner conductor of each transmission line to the end-seals of the feed lines. A comparison can be made between the two resistance measurements and the data taken at the time of installation, to see if one line has increased in resistance. This comparison also provides a method of testing for feed line faults.

If an appreciable difference exists between the resistances of the two transmission lines, it indicates a high resistance connection in one side. This can be localized, by disconnecting all the jumpers from the radiators or pole and then touching each jumper in turn to its feed point (the pole or radiator). If any of the jumpers show a higher resistance than the others, it is probably the faulty section (either a high resistance joint or defective feed line). If all the lines connected to one junction box show higher readings than the lines on the other box, it indicates a poor connection in the transmission line or junction box.

The end-seal straps at the ends of the feed lines can be disconnected to provide a test for grounds on the inner conductors of the entire system. A hi-pot test can also be made by applying 1000 or 2000 volts of d-c or peak a-c voltage between the transmission line inner and outer conductors through a suitable high resistance. The r-f potential in service is of the order of 500 volts. Therefore, this hi-pot voltage insures a factor of safety.

MAINTENANCE

It is recommended that a weekly check be made by measuring the d-c resistance looking into each of the transmission lines from within the station. This maintenance schedule will aid in finding poor contact conditions before a transmission line or antenna failure occurs. This measurement can be made by the regular maintenance personnel.

A Wheatstone bridge capable of measuring to 0.001 ohm should be used. The resistance between the inner and outer conductors of each transmission line should be recorded at the time of the initial installation. If RCA Service Company made the initial tests, this information will be available from them.

The following information will serve as a guide in the absence of any recorded data. The d-c resistance of each feed line is between 0.010 and 0.015 ohm. When the 24 feed lines fed by one transmission line are connected to the radiators, they are in parallel for d-c, and will show a net resistance of 0.001 ohm or less. To this must be added 0.0091 ohm for each 100 feet of MI-19313 (3-1/8-inch)

transmission line. As an example, if we have a 1000-foot transmission line run, the resistance of the line (10 x 0.0091) will be 0.091 ohm. Adding the net resistance of the feed lines to this gives 0.092 ohm as the value to be obtained at the bottom end of the line. If the resistance is appreciably higher than this, it indicates a poor connection. It should be especially noted that if the resistance of one line differs markedly from the other, a fault definitely exists.

Inspect the transmission line and antenna system twice a year. This requires the services of riggers, and may be done by qualified antenna maintenance crews who are experienced on television antennas.

The inspection procedure should start with a d-c leakage test made with all end-seal jumpers disconnected. These jumpers connect from the inner conductor of each feed line. The leakage resistance measured from inner conductor to ground within the station, should exceed 100 megohms. A hi-pot voltage of 1000 to 2000 volts may be used. The end-seal straps should then be reconnected and the d-c resistance checked from the station end of the transmission line.

Check the antenna feed lines for signs of leaks or breaks, evidence of loose clamps, or chafing, etc. Check all nuts for evidence of looseness or corrosion. The end-seal clamps holding the end seals should also be checked for tightness as poor electrical contact will impair the operation of the antenna.

Carefully cover the end-seal insulators, and the bleeder valves with masking tape before painting the complete antenna. DO NOT UNDER ANY CIRCUMSTANCES PAINT THE END SEALS.

Any end seal masking material must be removed before power is applied to the antenna.

The feed lines used in this antenna, employ an outer conductor made of aluminum, which is relatively soft. Consequently, due care should be taken during maintenance operations, to avoid nicking, denting, or otherwise damaging these lines.

If the foregoing maintenance procedure is followed regularly, and small parts replaced when necessary, the antenna will have a long and useful life, and station breakdowns, due to the antenna, will be held to a minimum.

TABLE I

CROSS REFERENCE TABLE

(Assembly Drawing and List of Parts to Associated MI's)

Part No.	Item Number										Description
	MI-19096	MI-19192-E	MI-19192-F	MI-19177-7	MI-19177-8	MI-19177-9	MI-19177-10	MI-19177-11	MI-19177-12	MI-19177-13	
2	1	-	-	-	-	-	-	-	-	-	Pole, Top Section
3	2	-	-	-	-	-	-	-	-	-	Pole, Second Section
4	3	-	-	-	-	-	-	-	-	-	Pole, Third Section
5	-	1	-	-	-	-	-	-	-	-	Pole, Bottom Section
6	5	-	-	-	-	-	-	-	-	-	Radiator
7	6	-	-	-	-	-	-	-	-	-	Bracket Assembly (Upper Junction Box)
8	7	-	-	-	-	-	-	-	-	-	Bracket Assembly (Lower Junction Box)
9	4	-	-	-	-	-	-	-	-	-	Lightning Protector
10	8	-	-	-	-	-	-	-	-	-	Pole Step
11	-	-	-	-	-	-	-	-	-	-	Not Used
12	-	2	-	-	-	-	-	-	-	-	Pole Guide Flange
13	-	3	-	-	-	-	-	-	-	-	Pole Socket
14	-	-	-	-	-	-	-	-	-	-	Not Used
15	-	-	-	-	-	-	-	-	-	-	Not Used
16	9	-	-	-	-	-	-	-	-	-	Bolt, Hex, 5/8"-11 x 2" (incl. nut)
17	14	-	-	-	-	-	-	-	-	-	Setscrew, 5/8"-11 x 3/4"
18	10	-	-	-	-	-	-	-	-	-	Bolt, Hex, 3/8"-16
19	13	-	-	-	-	-	-	-	-	-	Nut, Hex, 5/8"-11 (half nut)
20	12	-	-	-	-	-	-	-	-	-	Lockwasher, 3/8"
21	11	-	-	-	-	-	-	-	-	-	Lockwasher, 5/8"
22	-	-	-	-	-	-	-	-	-	-	Not Used
23	15	-	-	-	-	-	-	-	-	-	Setscrew, 5/8"-11 x 1"
24	-	-	-	97	100	-	96	97	97	-	Blueprint, List of Parts
25	-	-	-	96	99	96	95	96	96	97	Blueprint, Assembly
26	1	-	-	-	-	-	-	-	-	-	Pole, Top Section
27	2	-	-	-	-	-	-	-	-	-	Pole, Second Section
28	3	-	-	-	-	-	-	-	-	-	Pole, Third Section
29	-	-	1	-	-	-	-	-	-	-	Pole, Bottom Section
30	-	-	2	-	-	-	-	-	-	-	Pedestal
31	-	-	-	-	-	-	-	-	-	-	Not Used
32	-	-	-	-	-	97	-	-	-	98	Blueprint, List of Parts
33 to 38	-	-	-	-	-	-	-	-	-	-	Not Used
39	-	-	-	89	89	87	89	87	87	87	Transformer Assembly
40 to 43	-	-	-	-	-	-	-	-	-	-	Not Used
44	-	-	-	-	-	-	-	-	-	-	Sleet Melting Equipment
45	-	-	-	1	1	1	1	1	1	1	Hanger, Transmission Line Support
46	-	-	-	2	2	2	2	2	2	2	Hanger Assembly, Transmission Line Support
47	-	-	-	3	3	3	3	3	3	3	Hanger Assembly, Transmission Line Support
48	-	-	-	4	4	4	4	4	4	4	Hanger Assembly, Transmission Line Support
49	-	-	-	5	5	5	5	5	5	5	Support, End-seal
50	-	-	-	84	84	84	84	84	84	84	Saddle, Radiator

(Continued)

TABLE I (Continued)

Part No.	Item Number										Description
	MI-19096	MI-19192-E	MI-19192-F	MI-19177-7	MI-19177-8	MI-19177-9	MI-19177-10	MI-19177-11	MI-19177-12	MI-19177-13	
51	-	-	-	7	7	7	7	7	7	7	Jumper Assembly
52	-	-	-	8	8	8	8	8	8	8	Jumper Assembly
53	-	-	-	11	11	11	11	11	11	11	Clamp, Feed-line
54	-	-	-	13	13	13	13	13	13	13	Screw, Shoulder
55	-	-	-	14	14	14	14	14	14	14	Strap, Feed-line Clamp
56	-	-	-	15	15	15	15	15	15	15	Strap, Feed-line Clamp
57	-	-	-	-	-	-	-	-	-	-	Not Used
58	-	-	-	29	29	29	29	29	29	29	Marker Plate (N-S HI)
59	-	-	-	30	30	30	30	30	30	30	Marker Plate (N-S LO)
60	-	-	-	31	31	31	31	31	31	31	Marker Plate (E-W HI)
61	-	-	-	32	32	32	32	32	32	32	Marker Plate (E-W LO)
62	-	-	-	73	73	-	73	73	73	-	Feed Line, NS-HI-1 to B4-N
63	-	-	-	35	35	-	35	35	35	-	Feed Line, NS-HI-2 to B5-N
64	-	-	-	39	39	-	39	39	39	-	Feed Line, NS-HI-3 to B6-N
65	-	-	-	41	41	-	41	41	41	-	Feed Line, NS-HI-4 to B6-S
66	-	-	-	37	37	-	37	37	37	-	Feed Line, NS-HI-5 to B5-S
67	-	-	-	71	71	-	71	71	71	-	Feed Line, NS-HI-6 to B4-S
68	-	-	-	69	69	-	69	69	69	-	Feed Line, NS-HI-7 to B3-N
69	-	-	-	43	43	-	43	43	43	-	Feed Line, NS-HI-8 to B2-N
70	-	-	-	45	45	-	45	45	45	-	Feed Line, NS-HI-9 to B1-N
71	-	-	-	47	47	-	47	47	47	-	Feed Line, NS-HI-10 to B1-S
72	-	-	-	49	49	-	49	49	49	-	Feed Line, NS-HI-11 to B2-S
73	-	-	-	67	67	-	67	67	67	-	Feed Line, NS-HI-12 to B3-S
74	-	-	-	77	77	-	77	77	77	-	Feed Line, NS-LO-1 to B10-N
75	-	-	-	51	51	-	51	51	51	-	Feed Line, NS-LO-2 to B11-N
76	-	-	-	55	55	-	55	55	55	-	Feed Line, NS-LO-3 to B12-N
77	-	-	-	57	57	-	57	57	57	-	Feed Line, NS-LO-4 to B12-S
78	-	-	-	53	53	-	53	53	53	-	Feed Line, NS-LO-5 to B11-S
79	-	-	-	75	75	-	75	75	75	-	Feed Line, NS-LO-6 to B10-S
80	-	-	-	79	79	-	79	79	79	-	Feed Line, NS-LO-7 to B9-N
81	-	-	-	59	59	-	59	59	59	-	Feed Line, NS-LO-8 to B8-N
82	-	-	-	61	61	-	61	61	61	-	Feed Line, NS-LO-9 to B7-N
83	-	-	-	63	63	-	63	63	63	-	Feed Line, NS-LO-10 to B7-S
84	-	-	-	65	65	-	65	65	65	-	Feed Line, NS-LO-11 to B8-S
85	-	-	-	82	82	-	82	82	82	-	Feed Line, NS-LO-12 to B9-S
86	-	-	-	72	72	-	72	72	72	-	Feed Line, EW-HI-1 to B4-W
87	-	-	-	36	36	-	36	36	36	-	Feed Line, EW-HI-2 to B5-W
88	-	-	-	40	40	-	40	40	40	-	Feed Line, EW-HI-3 to B6-W
89	-	-	-	42	42	-	42	42	42	-	Feed Line, EW-HI-4 to B6-E
90	-	-	-	38	38	-	38	38	38	-	Feed Line, EW-HI-5 to B5-E
91	-	-	-	74	74	-	74	74	74	-	Feed Line, EW-HI-6 to B4-E
92	-	-	-	68	68	-	68	68	68	-	Feed Line, EW-HI-7 to B3-W
93	-	-	-	44	44	-	44	44	44	-	Feed Line, EW-HI-8 to B2-W
94	-	-	-	46	46	-	46	46	46	-	Feed Line, EW-HI-9 to B1-W
95	-	-	-	48	48	-	48	48	48	-	Feed Line, EW-HI-10 to B1-E
96	-	-	-	50	50	-	50	50	50	-	Feed Line, EW-HI-11 to B2-E
97	-	-	-	70	70	-	70	70	70	-	Feed Line, EW-HI-12 to B3-E
98	-	-	-	76	76	-	76	76	76	-	Feed Line, EW-LO-1 to B10-W

(Continued)

TABLE I (Continued)

Part No.	Item Number										Description
	MI-19096	MI-19192-E	MI-19192-F	MI-19177-7	MI-19177-8	MI-19177-9	MI-19177-10	MI-19177-11	MI-19177-12	MI-19177-13	
99	-	-	-	52	52	-	52	52	52	-	Feed Line, EW-LO-2 to B11-W
100	-	-	-	56	56	-	56	56	56	-	Feed Line, EW-LO-3 to B12-W
101	-	-	-	58	58	-	58	58	58	-	Feed Line, EW-LO-4 to B12-E
102	-	-	-	54	54	-	54	54	54	-	Feed Line, EW-LO-5 to B11-E
103	-	-	-	78	78	-	78	78	78	-	Feed Line, EW-LO-6 to B10-E
104	-	-	-	81	81	-	81	81	81	-	Feed Line, EW-LO-7 to B9-W
105	-	-	-	60	60	-	60	60	60	-	Feed Line, EW-LO-8 to B8-W
106	-	-	-	62	62	-	62	62	62	-	Feed Line, EW-LO-9 to B7-W
107	-	-	-	64	64	-	64	64	64	-	Feed Line, EW-LO-10 to B7-E
108	-	-	-	66	66	-	66	66	66	-	Feed Line, EW-LO-11 to B8-E
109	-	-	-	80	80	-	80	80	80	-	Feed Line, EW-LO-12 to B9-E
110	-	-	-	83	83	-	83	83	83	-	Feed Line, Spare
111	-	-	-	16	16	16	16	16	16	-	Bender, Tube
112 to 115	-	-	-	-	-	-	-	-	-	-	Not Used
116	-	-	-	9	9	9	9	9	9	9	Jumper Assembly
117	-	-	-	10	10	10	10	10	10	10	Jumper Assembly
118	-	-	-	-	-	-	-	-	-	-	Not Used
119	-	-	-	23	23	23	23	23	23	23	Cap Screw, Hex, 5/16"-18 x 1"
120	-	-	-	-	-	-	-	-	-	-	Not Used
121	-	-	-	22	22	22	22	22	22	22	Bolt, Hex, 5/16"-18 x 3/4"
122	16	-	-	21	21	21	21	21	21	21	Cap Screw, Hex, 5/16"-18 x 3/4"
123	-	-	-	24	24	24	24	24	24	24	Bolt, Hex, 5/16"-18 x 1/2"
124	-	-	-	-	-	-	-	-	-	-	Not Used
125	-	-	-	33	33	33	33	33	33	33	Screw, Round Head, 6-32 x 3/8"
126	-	-	-	28	28	28	28	28	28	28	Nut, Hex, 1/4"-20
127	17	-	-	25	25	25	25	25	25	25	Lockwasher, 5/16"
128	-	-	-	26	26	26	26	26	26	26	Lockwasher, 5/16"
129	-	-	-	27	27	27	27	27	27	27	Lockwasher, 1/4"
130	-	-	-	34	34	34	34	34	34	34	Lockwasher, No. 6
131	-	-	-	18	18	18	18	18	18	18	Clamp, 3-1/2"
132	-	-	-	85	85	85	85	85	85	85	Clamp, 2-1/4"
133	-	-	-	17	17	17	17	17	17	17	Clamp, 1-3/4"
134 to 140	-	-	-	-	-	-	-	-	-	-	Not Used
141	-	-	-	12	12	12	12	12	12	12	Clamp, Feed-line
142	-	-	-	-	-	-	-	-	-	-	Not Used
143	-	-	-	19	19	19	19	19	19	19	Washer, 5/16"
144	-	-	-	-	-	-	-	-	-	-	Not Used
145	-	-	-	20	20	20	20	20	20	20	Cap Screw, Hex, 1/4"-20 x 1"
146	-	-	-	6	6	6	6	6	6	6	Support, End-seal
147 to 149	-	-	-	-	-	-	-	-	-	-	Not Used
150	-	-	-	88	88	86	88	86	86	86	Cap Screw, 5/16"-18 x 1/2"
151	-	-	-	93	92	90	92	90	90	91	Clamp, Feed-line

(Continued)

TABLE I (Continued)

Part No.	Item Number										Description
	MI-19096	MI-19192-E	MI-19192-F	MI-19177-7	MI-19177-8	MI-19177-9	MI-19177-10	MI-19177-11	MI-19177-12	MI-19177-13	
152	-	-	-	94	93	91	93	91	91	92	Clamp, Feed-line, Dual
153	-	-	-	95	94	92	94	92	92	93	Cap Screw, 5/16"-18 x 1-1/2"
154	-	-	-	90	-	-	-	-	-	-	Plate, Radiator Mounting
155	-	-	-	-	-	-	100	-	-	-	Plate, Radiator Mounting
156	-	-	-	92	-	-	-	-	-	-	Plate, Radiator Mounting
157	-	-	-	-	-	-	90	-	-	-	Plate, Radiator Mounting
158	-	-	-	-	-	-	91	-	-	-	Plate, Radiator Mounting
159	-	-	-	-	-	-	-	-	-	-	Not Used
160	-	-	-	-	-	35	-	-	-	35	Feed Line, NS-HI-2 to B5-N
161	-	-	-	-	-	36	-	-	-	36	Feed Line, EW-HI-2 to B5-W
162	-	-	-	-	-	37	-	-	-	37	Feed Line, NS-HI-5 to B5-S
163	-	-	-	-	-	38	-	-	-	38	Feed Line, EW-HI-5 to B5-E
164	-	-	-	-	-	39	-	-	-	39	Feed Line, NS-HI-3 to B6-N
165	-	-	-	-	-	40	-	-	-	40	Feed Line, EW-HI-3 to B6-W
166	-	-	-	-	-	41	-	-	-	41	Feed Line, NS-HI-4 to B6-S
167	-	-	-	-	-	42	-	-	-	42	Feed Line, EW-HI-4 to B6-E
168	-	-	-	-	-	43	-	-	-	43	Feed Line, NS-HI-8 to B2-N
169	-	-	-	-	-	44	-	-	-	44	Feed Line, EW-HI-8 to B2-W
170	-	-	-	-	-	45	-	-	-	45	Feed Line, NS-HI-9 to B1-N
171	-	-	-	-	-	46	-	-	-	46	Feed Line, EW-HI-9 to B1-W
172	-	-	-	-	-	47	-	-	-	47	Feed Line, NS-HI-10 to B1-S
173	-	-	-	-	-	48	-	-	-	48	Feed Line, EW-HI-10 to B1-E
174	-	-	-	-	-	49	-	-	-	49	Feed Line, NS-HI-11 to B2-S
175	-	-	-	-	-	50	-	-	-	50	Feed Line, EW-HI-11 to B2-E
176	-	-	-	-	-	51	-	-	-	51	Fee d Line, NS-LO-2 to B11-N
177	-	-	-	-	-	52	-	-	-	52	Feed Line, EW-LO-2 to B11-W
178	-	-	-	-	-	53	-	-	-	53	Feed Line, NS-LO-5 to B11-S
179	-	-	-	-	-	54	-	-	-	54	Feed Line, EW-LO-5 to B11-E
180	-	-	-	-	-	55	-	-	-	55	Feed Line, NS-LO-3 to B12-N
181	-	-	-	-	-	56	-	-	-	56	Feed Line, EW-LO-3 to B12-W
182	-	-	-	-	-	57	-	-	-	57	Feed Line, NS-LO-4 to B12-S
183	-	-	-	-	-	58	-	-	-	58	Feed Line, EW-LO-4 to B12-E
184	-	-	-	-	-	59	-	-	-	59	Feed Line, NS-LO-8 to B8-N
185	-	-	-	-	-	60	-	-	-	60	Feed Line, EW-LO-8 to B8-W
186	-	-	-	-	-	61	-	-	-	61	Feed Line, NS-LO-9 to B7-N
187	-	-	-	-	-	62	-	-	-	62	Feed Line, EW-LO-9 to B7-W
188	-	-	-	-	-	63	-	-	-	63	Feed Line, NS-LO-10 to B7-S
189	-	-	-	-	-	64	-	-	-	64	Feed Line, EW-LO-10 to B7-E
190	-	-	-	-	-	65	-	-	-	65	Feed Line, NS-LO-11 to B8-S
191	-	-	-	-	-	66	-	-	-	66	Feed Line, EW-LO-11 to B8-E
192	-	-	-	-	-	67	-	-	-	67	Feed Line, NS-HI-12 to B3-S
193	-	-	-	-	-	70	-	-	-	70	Feed Line, EW-HI-12 to B3-E
194	-	-	-	-	-	72	-	-	-	72	Feed Line, EW-HI-1 to B4-W
195	-	-	-	-	-	73	-	-	-	73	Feed Line, NS-HI-1 to B4-N
196	-	-	-	-	-	76	-	-	-	76	Feed Line, EW-LO-1 to B10-W
197	-	-	-	-	-	77	-	-	-	77	Feed Line, NS-LO-1 to B10-N
198	-	-	-	-	-	80	-	-	-	80	Feed Line, EW-LO-12 to B9-E
199	-	-	-	-	-	82	-	-	-	82	Feed Line, NS-LO-12 to B9-S

(Continued)

TABLE I (Continued)

Part No.	Item Number										Description
	MI-19096	MI-19192-E	MI-19192-F	MI-19177-7	MI-19177-8	MI-19177-9	MI-19177-10	MI-19177-11	MI-19177-12	MI-19177-13	
200	-	-	-	-	-	68	-	-	-	68	Feed Line, EW-HI-7 to B3-W
201	-	-	-	-	-	69	-	-	-	69	Feed Line, NS-HI-7 to B3-N
202	-	-	-	-	-	71	-	-	-	71	Feed Line, NS-HI-6 to B4-S
203	-	-	-	-	-	74	-	-	-	74	Feed Line, EW-HI-6 to B4-E
204	-	-	-	-	-	75	-	-	-	75	Feed Line, NS-LO-6 to B10-S
205	-	-	-	-	-	78	-	-	-	78	Feed Line, EW-LO-6 to B10-E
206	-	-	-	-	-	79	-	-	-	79	Feed Line, NS-LO-7 to B9-N
207	-	-	-	-	-	81	-	-	-	81	Feed Line, EW-LO-7 to B9-W
208	-	-	-	-	-	83	-	-	-	83	Feed Line, Spare
209	-	-	-	-	98	-	-	-	-	-	Plate, Radiator Mounting
210	-	-	-	-	90	-	-	-	-	-	Plate, Radiator Mounting
211	-	-	-	-	91	-	-	-	-	-	Plate, Radiator Mounting
212	18	-	-	-	-	-	-	-	-	-	Beacon Cable Assembly
213	-	-	-	-	-	-	-	-	-	-	Not Used
214	-	-	-	-	-	-	-	-	-	-	Not Used
215	19	-	-	-	-	-	-	-	-	-	Support Assembly, Beacon Cable
216	-	-	-	99	96	98	98	94	94	95	Blueprint, Radiator Mounting
217	-	-	-	100	97	94	99	95	95	96	Fixture, Feed-line Bending
218	-	-	-	-	-	-	-	89	89	-	Plate, Radiator Mounting
219	-	-	-	-	-	-	-	88	-	-	Plate, Radiator Mounting
220	-	-	-	-	-	-	-	-	88	-	Plate, Radiator Mounting
221	-	-	-	-	-	-	-	-	-	-	Not Used
222	-	-	-	-	-	-	-	-	-	-	Not Used
223	-	-	-	-	-	89	-	-	-	-	Plate, Radiator Mounting
224	-	-	-	-	-	88	-	-	-	-	Plate, Radiator Mounting
225	-	-	-	-	-	95	-	-	-	-	Plate, Radiator Mounting
226	-	-	-	-	-	-	-	-	-	88	Plate, Radiator Mounting
227	-	-	-	-	-	-	-	-	-	89	Plate, Radiator Mounting
228	-	-	-	-	-	-	-	-	-	90	Plate, Radiator Mounting

LIST OF CONTENTS OF SCHEDULE ES-19296

ES-19296 TYPE TF-12AH ANTENNA EQUIP. (CH. 7 - 13) 2 LINE BRIDGE 3 1/8 TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
1	1	ANTENNA POLE & ACCESSORIES	MI-19096	
2	1	POLE & SUPPORTS	MI-19192-E	
3	1	FEED LINE & ACCESSORIES	MI-19177 *	
		[redacted]		
		"(NOTE) PRIOR TO ORDERING, CUSTOMER'S ASSIGNED CHANNEL SHOULD BE ASCERTAINED. IF CHANNEL HAS NOT BEEN ASSIGNED, A KIT OF PARTS MI-19178-TP MAY BE ORDERED FROM WHICH A FINAL EQUIPMENT MAY BE FABRICATED TO MEET CUSTOMER'S REQUIREMENTS. IT IS RECOMMENDED THAT THE MI-19178-TP KIT BE ORDERED FOR THIS CONDITION TO EXPEDITE DELIVERY UPON ASSIGNMENT OF THE CHANNEL (FREQUENCY). IF CHANNEL HAS BEEN ASSIGNED, ORDER I - FEEDLINE& ACCESSORIES, EQUIP. AS MI-19178 FOLLOWED BY A DASH NUMBER CORRESPONDING TO THE ASSIGNED CHANNEL, E.G. MI-19178-8 FOR A CHANNEL 8 FEEDLINE & ACCESSORIES. EQUIPMENT.		
5	1	COMBINING NETWORK	MI-19345	
6	1	INSTRUCTION BOOK (PACKED BY SHIPPING DEPT.)	IB-36129	
		THE FOLLOWING ARE AUXILIARY ITEMS AND SHOULD BE CONSIDERED WHEN ORDERING AN ANTENNA EQUIPMENT.		
	*	SLEET MELTING EQUIPMENT *(NOTE) SUPPLY TWELVE IF & AS SPECIFIED BY SALES ORDER.	MI-19009-MW	

LIST OF CONTENTS OF SCHEDULE ES-19296

ES-19296 TYPE TF-12AH ANTENNA EQUIP. (CH. 7-13) 2 LINE BRIDGE 3 1/8 TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
	*	1/2° BEAM TILTING SECTION *(NOTE) SUPPLY ONE IF & AS SPECIFIED BY SALES ORDER	MI-19395	
	*	1° BEAM TILTING SECTION *(NOTE) SUPPLY ONE IF & AS SPECIFIED BY SALES ORDER	MI-19395-A	

LIST OF CONTENTS OF MASTER ITEM MI-19096

MI-19096 ANTENNA POLE & ACCESSORIES (12 SECTION CH. 7 - 13)

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
1	1	POLE, TOP SECTION	627822	1
2	1	POLE, SECOND SECTION	627822	2
3	1	POLE, THIRD SECTION	627822	3
4	1	LIGHTNING PROTECTOR	745149	501
		(NOTE) PACK LOOSE PARTS IN BOX #1		
5	48	RADIATOR (PACK EIGHT PER BOX #2 INCL. 7)	619081	501
6	1	BRACKET (UPPER JUNCTION BOX)	728238	501
7	1	BRACKET (LOWER JUNCTION BOX)	744498	501
8	13	POLE STEP (1 SPARE)	8861666	1
9	9	BOLT 5/8-11 X 2 INCL. NUT (1 SPARE)	8892149	51
10	408	BOLT 3/8-16 X 2 INCL. NUT (24 SPARES)	8892149	21
11	9	LOCKWASHER 5/8 (1 SPARE)	8867005	35
12	408	LOCKWASHER 3/8 (24 SPARES)	8867005	31
13	18	NUT 5/8-11 HEX HALF (2 SPARES)	8898736	10
14	17	SET SCREW 5/8-11 X 3/4 (1 SPARE)	8824419	46
15	5	SET SCREW 5/8-11 X 1 (1 SPARE)	8824419	47
16	5	CAP SCREW, HEX HD 5/16 X 18X 3/4 STN STL (1 SPARE)	59286	16
17 to 18	5	LOCKWASHER 5/16 STN STL. (1 SPARE)	59048	36

STENCIL MI & ITEM NO PACK IN BOX #1

STENCIL MI & ITEM NO. PACK IN BOX #2

STENCIL MI & ITEM NO PACK IN BOX #3

LIST OF CONTENTS OF MASTER ITEM MI-19096

MI-19096 ANTENNA POLE & ACCESSORIES (12 SECTION CH. 7 -13)

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
18	1	BEACON CABLE ASSEM	467389	501
19	1	SUPPORT ASSEM. (BEACON CABLE)	745554	501
20	1	PACKING LIST	THIS MI	

STENCIL MI & ITEM NO PACK IN BOX #3

LIST OF CONTENTS OF MASTER ITEM MI-19192-E

MI-19192-E POLE & SUPPORTS (ANT. BOTTOM SECTION)(12 SECTION CH. 7 - 13)

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
1	1	POLE (BOTTOM SECTION)	627822	4
2	1	GUIDE FLANGE, POLE	745166	501
3	1	SOCKET, POLE	745167	501

STENCIL MI & ITEM NO.

LIST OF CONTENTS OF MASTER ITEM MI-19177-7

MI-19177-7 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 7) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
1	2	HANGER, TRANSMISSION LINE SUPPORT	8824433	1
2	4	HANGER, TRANSMISSION LINE SUPPORT	465135	501
3	18	HANGER, TRANSMISSION LINE SUPPORT	465135	502
4	4	HANGER, TRANSMISSION LINE SUPPORT	465135	503
5	26	SUPPORT, END SEAL, POLE (2 SPARES)	8822767	1
6	26	SUPPORT, END SEAL, RADIATOR (2 SPARES)	8829359	1
7	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	501
8	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	503
9	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	501
10	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	503
11	154	CLAMP, FEED LINE (14 SPARES)	8826573	1
12	75	CLAMP, FEED LINE (7 SPARES)	8825323	1
13	168	SCREW, SHOULDER (14 SPARES)	8824420	1
14	35	STRAP, FEED LINE (3 SPARES)	8824427	1
15	42	STRAP, FEED LINE (4 SPARES)	8824427	2
16	2	BENDER, FEED LINE	8841557	1
17	104	CLAMP, 1 3/4 DIA. ADJUSTABLE (8 SPARES)	897258	11
18	30	CLAMP, 3 1/2 DIA. ADJUSTABLE (2 SPARES)	897258	1
19	238	WASHER 5/16 STN. STEEL (20 SPARES)	189420	14

PACK IN BOX #4

LIST OF CONTENTS OF MASTER ITEM MI-19177-7

MI-19177-7 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 7) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
20	53	CAP SCREW HEX HD. 1/4-20 X 1 LG. STN.STL (5 SPARES)	59285	18
21	26	CAP SCREW HEX HD. 5/16-18 X 3/4 LG. STN. STEEL (2 SPARES)	59286	16
22	62	BOLT 5/16-18 X 3/4 HEX HD. BRONZE (6 SPARES)	890051	23
23	60	CAP SCREW HEX HD. 5/16-18 X 1 LG. (8 SPARES) STN. STL	59286	18
24	52	BOLT 5/16-18 X 1 1/2 HEX HD. BRONZE (4 SPARES)	890051	27
25	293	LOCKWASHER, 5/16 STN. STEEL (27 SPARES)	59048	36
26	114	LOCKWASHER, 5/16 BRONZE (10 SPARES)	8898153	5
27	53	LOCKWASHER, 1/4 STN. STEEL (5 SPARES)	59048	35
28	154	NUT HEX 1/4-20 X STN. STEEL (14 SPARES)	73103	9
29	1	MARKER PLATE (N-S HI)	8834270	3
30	1	MARKER PLATE (N-S LO)		4
31	1	MARKER PLATE (E-W HI)		5
32	1	MARKER PLATE (E-W LO)	8834270	6
33	10	MACH. SCREW 6-32 X 3/8 LG. RD. HD. BRASS (2 SPARES)	57456	59
34	10	LOCKWASHER #6 BRONZE (2 SPARES)	59048	59
35	1	FEED LINES (NS-HI-2 TO 85-N)	747425	1
36	1	FEED LINES (EW-HI-2 TO 85-W)	747425	2
37	1	FEED LINES (NS-HI-5 TO 85-S)	747425	3

PACK IN BOX #4

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-7

MI-19177-7 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 7) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR SPECIAL
38	1	FEED LINES (EW-HI-5 TO B5-E)	747425	4
39	1	(NS-HI-3 TO B6-N)		5
40	1	(EW-HI-3 TO B6-W)		6
41	1	(NS-HI-4 TO B6-S)		7
42A	1	(EW-HI-4 TO B6-E)		8
43	1	(NS-HI-6 TO B2-N)		9
44	1	(EW-HI-8 TO B2-W)		10
45	1	(NS-HI-9 TO B1-N)		11
46	1	(EW-HI-9 TO B1-W)		12
47	1	(NS-MI-10 TO B1-S)		13
48	1	(EW-MI-10 TO B1-E)		14
49	1	(NS-MI-11 TO B2-S)		15
50	1	(EW-MI-11 TO B2-E)		16
51	1	(NS-LO-2 TO B11-N)		17
52	1	(EW-LO-2 TO B11-W)		18
53	1	(NS-LO-5 TO B11-S)		19
54	1	(EW-LO-5 TO B11-E)		20
55	1	(NS-LO-3 TO B12-N)		21
56	1	FEED LINES (EW-LO-3 TO B12-W)	747425	22

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-7

MI-19177-7 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 7) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR SPECIAL
57	1	FEED LINES (NS-LO-4 TO B12-S)	747425	23
58	1	(EW-LO-4 TO B12-E)		24
59	1	(NS-LO-8 TO B8-N)		25
60	1	(EW-LO-8 TO B8-W)		26
61	1	(NS-LO-9 TO B7-N)		27
62	1	(EW-LO-9 TO B7-W)		28
63	1	(NS-LO-10 TO B7-S)		29
64	1	(EW-LO-10 TO B7-E)		30
65	1	(NS-LO-11 TO B8-S)		31
66	1	(EW-LO-11 TO B8-E)		32
67	1	(NS-HI-12 TO B3-S)		33
68	1	(EW-HI-7 TO B3-W)		41
69	1	(NS-HI-7 TO B3-N)		42
70	1	(EW-HI-12 TO B2-E)		34
71	1	(NS-HI-6 TO B4-S)		43
72	1	(EW-HI-1 TO B4-W)		35
73	1	(NS-HI-1 TO B4-N)		36
74	1	(EW-HI-6 TO B4-E)		44
75	1	FEED LINES (NS-LO-6 TO B10-S)	747425	45

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-7

MI-19177-7 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 7) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR SPECIAL
76	1	FEED LINES (EW-LO-1 TO B10-W)	747425	37
77	1	(NS-LO-1 TO B10-N)		38
78	1	(EW-LO-6 TO B10-E)		46
79	1	(NS-LO-7 TO B9-N)		47
80	1	(EW-LO-12 TO B9-E)		39
81	1	(EW-LO-7 TO B9-W)		48
82	1	(NS-LO-12 TO B9-S)	747425	40
83	2	FEED LINES (SPARES)	745189	505
84	52	SADDLE (4 SPARES) RADIATOR	8127768	1
85	52	CLAMP (2 1/4" DIA. ADJ.) (4 SPARES)	897658	3
[illegible]				
88	154	CAP SCREW HEX HD. 5/16-18 X 1/4 LG. STN. STL. (14 SPARES)	59286	14
89	4	JUNCTION BOX & TRANSFORMER	745123	501
90	98	PLATE, RADIATOR UPPER 6-BAYS (2 SPARES)	8616249	1
[illegible]				
92	98	PLATE, RADIATOR (LOWER 6 BAYS) (2 SPARES)	8614095	1
93	5	CLAMP, FEEDLINE (1 SPARE)	8853e3	2

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-7

MI-19177-7 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 7) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR SPECIAL
94	34	CLAMP, FEED LINE (DUAL) (4 SPARES)	8614052	1
95	34	CAP SCREW HEX HD. 5/16-18 X 1 1/2" LG. STN. STL. (4 SPARES)	59286	20
96	1	BLUEPRINT, ASSEMBLY LATEST ISSUE	311389	
97	1	BLUEPRINT, MTL. PARTS LIST LATEST ISSUE	8692182	
98	1	CLAMP (WRAPLOCK)	8829466	1
99	1	BLUEPRINT - MOUNTING RADIATOR	467392	
100	1	BENDING FIXTURE	467394	501
101	1	PACKING LIST	THIS MI SHT. 1,2, 3,4,5 &6	

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-8

MI-19177-8 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 8) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR SPECIAL
1	2	HANGER, TRANSMISSION LINE SUPPORT	8529833	1
2	4	HANGER, TRANSMISSION LINE SUPPORT	465135	501
3	18	HANGER, TRANSMISSION LINE SUPPORT	465135	502
4	4	HANGER, TRANSMISSION LINE SUPPORT	465135	503
5	26	SUPPORT, END SEAL, POLE (2 SPARES)	8822767	1
6	26	SUPPORT, END SEAL, RADIATOR (2 SPARES)	8829359	1
7	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	501
8	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	503
9	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	501
10	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	503
11	158	CLAMP, FEED LINE (14 SPARES)	8828573	1
12	75	CLAMP, FEED LINE (7 SPARES)	8829343	2
13	158	SCREW, SHOULDER (14 SPARES)	8824420	1
14	35	STRAP, FEED LINE (3 SPARES)	8824427	1
15	42	STRAP, FEED LINE (4 SPARES)	8824427	2
16	2	BENDER, FEED LINE	8841527	1
17	104	CLAMP, 1 3/4 DIA. ADJUSTABLE (8 SPARES)	897258	11
18	30	CLAMP, 3 1/2 DIA. ADJUSTABLE (2 SPARES)	897258	9
19	234	WASHER 5/16 STN. STEEL (20 SPARES)	189820	14

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-8

MI-19177-8 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 8) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR SPECIAL
20	53	CAP SCREW HEX HD. 1/4-20 X 1 LG. STN.STL (5 SPARES)	59285	18
21	86	CAP SCREW HEX HD. 5/16-18 X 3/4 STN. STL(2 SPARES)	59286	16
22	62	BOLT 5/16-18 X 3/4 HEX HD. DURONZE (6 SPARES)	890051	23
23	80	CAP SCREW HEX HD. 5/16-18 X 1 STN.STL. (8 SPARES)	59286	18
24	52	BOLT 5/16-18 X 1/2 HEX HD. DURONZE (4 SPARES)	890051	27
25	595	LOCKWASHER, 5/16 STN. STEEL (27 SPARES)	59048	36
26	114	LOCKWASHER, 5/16 DURONZE (10 SPARES)	8898153	5
27	53	LOCKWASHER, 1/4 STN. STEEL (5 SPARES)	59048	35
28	158	NUT HEX 1/4-20 STN. STEEL (18 SPARES)	73103	9
29	1	MARKER PLATE (N-S HI)	8634270	3
30	1	MARKER PLATE (N-S LO)		4
31	1	MARKER PLATE (E-W HI)		5
32	1	MARKER PLATE (E-W LO)	8634270	6
33	10	MACH. SCREW 6-32 X 3/8 LG. RD. HD. BRASS (2 SPARES)	57456	59
34	10	LOCKWASHER #6 BRONZE (2 SPARES)	59048	59
35	1	FEED LINE (NS-HI-2 TO B5-N)	747425	1
36	1	(EW-HI-2 TO B5-W)		2
37	1	(NS-HI-5 TO B5-S)		3
38	1	FEED LINE (EW-HI-5 TO B5-E)	747425	4

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-8

MI-19177-8 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 8) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
39	1	FEED LINES (NS-HI-3 TO B6-N)	747425	5
40	1	(EW-HI-3 TO B6-W)		6
41	1	(NS-HI-4 TO B6-S)		7
42	1	(EW-HI-4 TO B6-E)		8
43	1	(NS-HI-8 TO B2-N)		9
44	1	(EW-HI-8 TO B2-W)		10
45	1	(NS-HI-9 TO B1-N)		11
46	1	(EW-HI-9 TO B1-W)		12
47	1	(NS-HI-10 TO B1-S)		13
48	1	(EW-HI-10 TO B1-E)		14
49	1	(NS-HI-11 TO B2-S)		15
50	1	(EW-HI-11 TO B2-E)		16
51	1	(NS-LO-2 TO B11-N)		17
52	1	(EW-LO-2 TO B11-W)		18
53	1	(NS-LO-5 TO B11-S)		19
54	1	(EW-LO-5 TO B11-E)		20
55	1	(NS-LO-3 TO B12-N)		21
56	1	(EW-LO-3 TO B12-W)		22
57	1	FEED LINES (NS-LO-4 TO B12-S)	747425	23

PACK IN BOXES AS ADJUSTED

LIST OF CONTENTS OF MASTER ITEM MI-19177-8

MI-19177-8 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 8) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
58	1	FEED LINES (EW-LO-8 TO B12-E)	747425	24
59	1	(NS-LO-8 TO B8-N)		25
60	1	(EW-LO-8 TO B8-W)		26
61	1	(NS-LO-9 TO B7-N)		27
62	1	(EW-LO-9 TO B7-W)		28
63	1	NS-LO-10 TO B7-S)		29
64	1	(EW-LO-10 TO B7-E)		30
65	1	(NS-LO-11 TO B8-S)		31
66	1	(EW-LO-11 TO B8-E)		32
67	1	(NS-HI-12 TO B3-S)		33
68	1	(EW-HI-7 TO B3-W)		41
69	1	(NS-HI-7 TO B3-N)		42
70	1	(EW-HI-12 TO B3-E)		34
71	1	(NS-HI-6 TO B4-S)		43
72	1	(EW-HI-1 TO B4-W)		35
73	1	(NS-HI-1 TO B4-N)		36
74	1	(EW-HI-6 TO B4-E)		44
75	1	(NS-LO-6 TO B10-S)		45
76	1	FEED LINES (EW-LO-1 TO B10-W)	747425	37

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-8

MI-19177-8 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 8) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
77	1	FEED LINES (NS-LO-1 TO B10-N)	747425	38
78	1	(EW-LO-6 TO B10-E)		46
79	1	(NS-LO-7 TO B9-N)		47
80	1	(EW-LO-12 TO B9-E)		39
81	1	(EW-LO-7 TO B9-W)		48
82	1	(NS-LO-12 TO B9-S)	747425	40
83	2	FEED LINES (SPARES)	745189	508
84	52	SADDLE (4 SPARES) RADIATOR	8822768	1
85	52	CLAMP 2 1/4" DIA. ADJUSTABLE (4 SPARES)	897458	31
[illegible]				
88	156	CAP SCREW HEX HD. 5/16-18 X 1/2 LG. STN.STL (14 SPARES)	59286	14
89	4	JUNCTION BOX & TRANSFORMER	745123	501
90	89	PLATE, RADIATOR (BAYS 4-5-6) (2 SPARES)	8816260	1
91	92	PLATE, RADIATOR (BAYS - LOWER 6) (2 SPARES)	8815339	1
92	5	CLAMP, FEED LINE (1 SPARE)	8825323	2
93	34	CLAMP, FEED LINE DUAL (4 SPARES)	8814052	1
94	38	CAP SCREW HEX HD. 5/16-18 X 1 1/2 LG. STN.STL (4 SPARES)	59286	20
95	1	CLAMP (WRAPLOCK)	8829466	1

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-8

MI-19177-8 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 8) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
96	1	BLUEPRINT-RADIATOR MOUNTING (PACK IN BOX #1)	467392	
97	1	BENDING FIXTURE (PACK IN BOX #1)	467394	501
98	49	PLATE - RADIATOR BAYS 1-2-3 (4 SPARE) (PACK IN BOX #1)	8816260	1
99	1	BLUEPRINT, ASSEMBLY LATEST ISSUE (PACK IN BOX #1)	311389	
100	1	BLUEPRINT, MTL. PARTS LST. LATEST ISSUE (PACK IN BOX #1)	349e182	
101	1	PACKING LIST (PACK IN BOX #1)	THIS MI SHTS. 1,2 3,4,5 & 6	

NOTE #1: PACK IN BOXES AS DESIGNATED. STENCIL

LIST OF CONTENTS OF MASTER ITEM MI-19177-9

MI-19177-9 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 9) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
1	2	HANGER, TRANSMISSION LINE SUPPORT	8824433	1
2	4	HANGER, TRANSMISSION LINE SUPPORT	465135	501
3	18	HANGER, TRANSMISSION LINE SUPPORT	465135	502
4	4	HANGER, TRANSMISSION LINE SUPPORT	465135	503
5	26	SUPPORT, END SEAL, POLE (2 SPARES)	8822767	1
6	26	SUPPORT, END SEAL, RADIATOR (2 SPARES)	8829359	1
7	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	501
8	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	503
9	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	501
10	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	503
11	154	CLAMP, FEED LINE (14 SPARES)	8826573	1
12	75	CLAMP, FEED LINE (7 SPARES)	8825323	1
13	154	SCREW, SHOULDER (14 SPARES)	8824420	1
14	35	STRAP, FEED LINE (3 SPARES)	8824427	1
15	42	STRAP, FEED LINE (4 SPARES)	882447	2
16	2	BENDER FEED LINE	8841557	1
17	104	CLAMP, 1 3/4 DIA. ADJUSTABLE (8 SPARES)	897258	11
18	30	CLAMP, 3 1/2 DIA. ADJUSTABLE (2 SPARES)	897258	1

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-9

MI-19177-9 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 9) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR IDENT.
19	234	WASHER 5/16 STN. STEEL (20 SPARES)	169820	14
20	53	CAP SCREW HEX HD. 1/4-20 X 1 LG. STN.STL(5 SPARES)	59285	18
21	28	CAP SCREW HEX HD.5/16-18 X 3/4 STN.STL.(2 SPARES)	59286	16
22	62	BOLT 5/16-18 X 3/4 HEX HD. DURONZE (6 SPARES)	890051	23
23	80	CAP SCREW HEX HD. 5/16-18 X 1 LG. (5 SPARES) STN.STL	59286	18
24	52	BOLT 5/16-18 X 1/2 HEX HD. DURONZE (4 SPARES)	890051	27
25	293	LOCKWASHER, 5/16 STN. STEEL (27 SPARES)	59048	36
26	114	LOCKWASHER, 5/16 DURONZE (10 SPARES)	8898153	5
27	53	LOCKWASHER, 1/4 STN. STEEL (5 SPARES)	59048	35
28	156	NUT HEX 1/4-20 STN. STEEL (14 SPARES)	73103	9
29	1	MARKER PLATE (N-S HI)	8834270	3
30	1	MARKER PLATE (N-S LO)	8834270	4
31	1	MARKER PLATE (E-W HI)	8834270	5
32	1	MARKER PLATE (E-W LO)	8834270	6
33	10	MACH. SCREW 6-32 X 3/8 LG. RD. HD. BRASS (2 SPARES)	57456	59
34	10	LOCKWASHER #6 BRONZE (2 SPARES)	59048	59

LIST OF CONTENTS OF MASTER ITEM MI-19177-9

MI-19177-9 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 9) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
35	1	FEED LINE (NS-HI-2 TO B5-N)	747425	51
36	1	(EW-HI-2 TO B5-W)		52
37	1	(SS-HI-5 TO B5-S)		53
38	1	(EW-HI-5 TO B5-E)		54
39	1	(NS-HI-3 TO B6-N)		55
40	1	(EW-HI-3 TO B6-W)		56
41	1	(NS-HI-4 TO B6-S)		57
42	1	(EW-HI-4 TO B6-E)		58
43	1	(NS-HI-8 TO B2-N)		59
44	1	(EW-HI-8 TO B2-W)		60
45	1	(NS-HI-9 TO B1-N)		61
46	1	(EW-HI-9 TO B1-W)		62
47	1	(NS-HI-10 TO B1-S)		63
48	1	(EW-HI-10 TO B1-E)		64
49	1	(NS-HI-11 TO B2-S)		65
50	1	(EW-HI-11 TO B2-E)		66
51	1	(NS-LO-2 OT B11-N)		67
52	1	(EW-LO-2 TO B11-W)		68
53	1	FEED LINE (NS-LO-5 TO B11-S)	747425	69

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-9

MI-19177-9 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 9) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
54	1	FEED LINE (EW-LO-5 TO B11-E)	747425	70
55	1	(NS-LO-3 TO B12-N)		71
56	1	(EW-LO-3 TO B12-W)		72
57	1	(NS-LO-4 TO B12-S)		73
58	1	(EW-LO-4 TO B12-E)		74
59	1	(NS-LO-6 TO B8-N)		75
60	1	(EW-LO-6 TO B8-W)		76
61	1	(NS-LO-9 TO B7-N)		77
62	1	(EW-LO-9 TO B7-W)		78
63	1	(NS-LO-10 TO B7-S)		79
64	1	(EW-LO-10 TO B7-E)		80
65	1	(NS-LO-11 TO B8-S)		81
66	1	(EW-LO-11 TO B8-E)		82
67	1	(NS-HI-12 TO B3-S)		83
68	1	(EW-HI-7 TO B3-W)		91
69	1	(NS-HI-7 TO B3-N)		92
70	1	(EW-HI-12 TO B3-E)		84
71	1	(NS-HI-6 TO B4-S)		93
---	1	FEED LINE (EW-HI-1 TO B4-W)	747425	85

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-9

MI-19177-9 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 9) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
73	1	FEED LINE (NS-HI-1 TO B4-N)	747425	86
74	1	(EW-HI-6 TO B4-E)		94
75	1	(NS-LO-6 TO B10-S)		95
76	1	(EW-LO-1 TO B10-W)		87
77	1	(NS-LO-1 TO B10-N)		88
78	1	(EW-LO-6 TO B10-E)		96
79	1	(NS-LO-7 TO B9-N)		97
80	1	(EW-LO-12 TO B9-E)		89
81	1	(EW-LO-7 TO B9-W)		98
82	1	(NS-LO-12 TO B9-S)	747425	90
83	2	FEED LINE (SPARES)	745169	509
84	52	SADDLE (4 SPARES) RADIATOR	8822768	1
85	52	CLAMP 2 1/8" DIA. ADJ. (4 SPARES)	897258	3
86	154	CAP SCREW HEX HD. 5/16-18 X 1/2 LG. STN. STEEL (14 SPARES)	59286	14
87	4	JUNCTION BOX A TRANSFORMER	745123	501
88	49	PLATE, RADIATOR (BAYS 7-8-9) (1 SPARE)	8817357	1
89	98	PLATE, RADIATOR (BAYS UPPER 6) (2 SPARES)	8817356	1
90	5	CLAMP, FEED LINE (1 SPARE)	8825323	2

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-9

MI-19177-9 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 9) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
91	34	CLAMP, FEED LINE (4 SPARES) DUAL	8814052	1
92	34	CAP SCREW HEX HD. 5/16-18 X 1 1/2 LG. STN. STEEL (4 SPARES)	59286	20
93	1	CLAMP, (WRAPLOCK)	8829466	1
94	1	BENDING FIXTURE	467394	501
95	49	PLATE, RADIATOR (BAYS 10-11-12) (1 SPARE)	8817358	1
96	1	BLUEPRINT, ASSEMBLY LATEST ISSUE	311389	
97	1	BLUEPRINT, MFG. PARTS LIST LATEST ISSUE	8892182	
98	1	BLUEPRINT, MOUNTING RADIATOR	467392	
99	1	PACKING LIST	THIS MI SHTS. 1,2, 3,4,5 & 6	

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-10

MI-19177-10 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 10) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
1	2	HANGER, TRANSMISSION LINE SUPPORT	8824433	1
2	4	HANGER, TRANSMISSION LINE SUPPORT	465135	501
3	18	HANGER, TRANSMISSION LINE SUPPORT	465135	502
4	4	HANGER, TRANSMISSION LINE SUPPORT	465135	503
5	26	SUPPORT, END SEAL, POLE (2 SPARES)	8826767	1
6	26	SUPPORT, END SEAL, RADIATOR (2 SPARES)	8829359	1
7	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	501
8	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	503
9	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	501
10	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	503
11	154	CLAMP, FEED LINE (14 SPARES)	8826573	1
12	75	CLAMP, FEED LINE (7 SPARES)	8825323	1
13	154	SCREW, SHOULDER (14 SPARES)	8824420	1
14	35	STRAP, FEED LINE (3 SPARES)	8824427	1
15	42	STRAP, FEED LINE (4 SPARES)	8824427	2
16	2	BENDER, FEED LINE	8841557	1
17	104	CLAMP, 1 3/4 DIA. ADJUSTABLE (8 SPARES)	897258	11
18	30	CLAMP, 3 1/2 DIA. ADJUSTABLE (2 SPARES)	897258	1

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-10

MI-19177-10 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 10) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
19	232	WASHER 5/16 STN. STEEL (20 SPARES)	189820	14
20	53	CAP SCREW HEX HD. 1/4-20 X 1 LG. STN. STL (5 SPARES)	59285	18
21	26	CAP SCREW HEX HD. 5/16-18 X 3/4 LG. STN. STL. (2 SPARES)	59286	16
22	62	BOLT 5/16-18 X 3/4 HEX HD. DURONZE (6 SPARES)	890051	23
23	60	CAP SCREW HEX HD. 5/16-18 X 1 LG. (6 SPARES) STN. STEEL	59286	18
24	52	BOLT 5/16-18 X 1/2 HEX HD. DURONZE (4 SPARES)	890051	27
25	293	LOCKWASHER, 5/16 STN. STEEL (27 SPARES)	59048	36
26	114	LOCKWASHER, 5/16 DURONZE (10 SPARES)	8898153	5
27	53	LOCKWASHER, 1/4 STN. STEEL (5 SPARES)	59048	35
28	158	NUT HEX 1/4-20 STN. STEEL (14 SPARES)	73103	9
29	1	MARKER PLATE (N-S MI)	8834270	3
30	1	MARKER PLATE (N-S LO)		4
31	1	MARKER PLATE (E-W MI)		5
32	1	MARKER PLATE (E-W LO)	8834270	6
33	10	MACH. SCREW 6-32 X 3/8 LG. RD. HD. BRASS (2 SPARES)	57456	59
34	10	LOCKWASHER #6 BRONZE (2 SPARES)	59048	59

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-10

MI-19177-10 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 10) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
35	1	FEED LINE (NS-HI-2 TO B5-N)	747425	1
36	1	(EW-HI-2 TO B5-W)		2
37	1	(NS-HI-5 TO B5-S)		3
38	1	(EW-HI-5 TO B5-E)		4
39	1	(NS-HI-3 TO B6-N)		5
40	1	(EW-HI-3 TO B6-W)		6
41	1	(NS-HI-4 TO B6-S)		7
42	1	(EW-HI-4 TO B6-E)		8
43	1	(NS-HI-8 TO B2-N)		9
44	1	(EW-HI-8 TO B2-W)		10
45	1	(NS-HI-9 TO B1-N)		11
46	1	(EW-HI-9 TO B1-W)		12
47	1	(NS-HI-10 TO B1-S)		13
48	1	(EW-HI-10 TO B1-E)		14
49	1	(NS-HI-11 TO B2-S)		15
50	1	(EW-HI-11 TO B2-E)		16
51	1	(NS-LO-2 TO B11-N)		17
52	1	(EW-LO-2 TO B11-W)		18
53	1	FEED LINE (NS-LO-5 TO B11-S)	747425	19

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-10

MI-19177-10 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 10) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
54	1	FEED LINE (EW-LO-5 TO B11-E)	747425	20
55	1	(NS-LO-3 TO B12-N)		21
56	1	(EW-LO-3 TO B12-W)		22
57	1	(NS-LO-4 TO B12-S)		23
58	1	(EW-LO-4 TO B12-E)		24
59	1	(NS-LO-8 TO B8-N)		25
60	1	(EW-LO-8 TO B8-W)		26
61	1	(NS-LO-9 TO B7-N)		27
62	1	(EW-LO-9 TO B7-W)		28
63	1	(NS-LO-10 TO B7-S)		29
64	1	(EW-LO-10 TO B7-E)		30
65	1	(NS-LO-11 TO B8-S)		31
66	1	(EW-LO-11 TO B8-E)		32
67	1	(NS-HI-12 TO B3-S)		33
68	1	(EW-HI-7 TO B3-W)		41
69	1	(NS-HI-7 TO B3-N)		42
70	1	(EW-HI-12 TO B3-E)		34
71	1	(NS-HI-6 TO B4-S)		43
72	1	FEED LINE (EW-HI-1 TO B4-W)	747425	35

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-10

MI-19177-10 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 10) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
73	1	FEED LINE (NS-HI-1 TO B4-N)	747425	36
74	1	(EW-HI-6 TO B4-E)		44
75	1	(NS-LO-6 TO B10-S)		45
76	1	(EW-LO-1 TO B10-W)		37
77	1	(NS-LO-1 TO B10-N)		38
78	1	(EW-LO-6 TO B10-E)		46
79	1	(NS-LO-7 TO B9-N)		47
80	1	(EW-LO-12 TO B9-E)		39
81	1	(EW-LO-7 TO B9-W)		48
82	1	(NS-LO-12 TO B9-S)	747425	40
83	2	FEED LINE (SPARES)	745189	508
84	52	SADDLE (4 SPARES) RADIATOR	8822768	1
85	52	CLAMP 2 1/4" DIA. ADJ. (4 SPARES)	897258	3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
88	154	CAP SCREW HEX HD. 5/16-18 X 1/2 LG. STN. STEEL (14 SPARES)	59286	14
89	-	JUNCTION BOX & TRANSFORMER	745123	501
90	49	PLATE, RADIATOR (BAYS -1-2-3) (1 SPARE)	8814094	1

PACK IN BOXES AS REQUIRED (items 73–83)

PACK IN BOX #1 (items 84–90)

LIST OF CONTENTS OF MASTER ITEM MI-19177-10

MI-19177-10 SET OF FEED LINES & ACCESSORIES (12 SECT. CH.10) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
91	98	PLATE, RADIATOR (BAYS- LOWER 6) (2 SPARES)	8814097	1
92	5	CLAMP, FEED LINE (1 SPARE)	8825323	2
93	34	CLAMP, FEEDLINE (4 SPARES) DUAL	8814052	1
94	34	CAP SCREW HEX HD. 5/16-18 X 1 1/2 LG. STN. STEEL (4 SPARES)	59286	20
95	1	BLUEPRINT, ASSEMBLY LATEST ISSUE	311349	
96	1	BLUEPRINT, ATL.PARTS LIST LATEST ISSUE	8892182	
97	1	CLAMP, (WRAPLOCK)	8829466	1
98	1	BLUEPRINT - MOUNTING RADIATOR	467392	
99	1	BENDING FIXTURE	467394	501
100	49	PLATE, RADIATOR (BAYS 4-5-6) (1 SPARE)	8814096	1
101		PACKING LIST	THIS MI SHTS 1,2, 3,4,5,&6	

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-11

MI-19177-11 SET OF FEED LINES & ACCESSORIES (12 SECTION CH.11) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
1	2	HANGER, TRANSMISSION LINE SUPPORT	8824433	1
2	4	HANGER, TRANSMISSION LINE SUPPORT	465135	501
3	18	HANGER, TRANSMISSION LINE SUPPORT	465135	502
4	4	HANGER, TRANSMISSION LINE SUPPORT	465135	503
5	26	SUPPORT, END SEAL, POLE (2 SPARES)	8822767	1
6	26	SUPPORT, END SEAL, RADIATOR (2 SPARES)	8829359	1
7	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	501
8	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	503
9	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	501
10	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	503
11	154	CLAMP, FEED LINE (14 SPARES)	8828573	1
12	75	CLAMP, FEED LINE (7 SPARES)	8825323	1
13	154	SCREW, SHOULDER (14 SPARES)	8824420	1
14	35	STRAP, FEED LINE (3 SPARES)	8824427	1
15	42	STRAP, FEED LINE (4 SPARES)	8824427	2
16	2	BENDER, FEED LINE	8841557	1
17	104	CLAMP, 1 3/4 DIA. ADJUSTABLE (8 SPARES)	897258	11
18	30	CLAMP, 3 1/2 DIA. ADJUSTABLE (2 SPARES)	897258	1
19	232	WASHER 5/16 STN. STEEL (20 SPARES)	189820	14

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-11

MI-19177-11 SET OF FEED LINES & ACCESSORIES (12 SECTION CH 11) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
20	53	CAP SCREW HEX HD. 1/4-20 X 1 LG. STN. STL (5 SPARES	59285	18
21	26	CAP SCREW HEX HD. 5/16-18 X 3/4 STN. STL (2 SPARES	59286	16
22	62	BOLT 5/16-18 X 3/4 HEX HD. DURONZE (6 SPARES	890051	23
23	80	CAP SCREW HEX HD. 5/16-18 X 1 STN. STL.(8 SPARES)	59286	18
24	52	BOLT 5/16-18 X 1/2 HEX HD. DURONZE (4 SPARES	890051	27
25	293	LOCKWASHER, 5/16 STN. STEEL (27 SPARES)	59048	36
26	114	LOCKWASHER, 5/16 DURONZE (10 SPARES)	8898153	5
27	53	LOCKWASHER, 1/4 STN. STEEL (5 SPARES)	59048	35
28	154	NUT HEX 1/4-20 STN. STEEL (14 SPARES)	73103	9
29	1	MARKER PLATE (N-S HI)	8834270	3
30	1	MARKER PLATE (N-S LO)		4
31	1	MARKER PLATE (E-W HI)		5
32	1	MARKER PLATE (E-W LO)	8834270	6
33	10	MACH. SCREW 6-32 X 3/8 LG. RD. HD. BRASS (2 SPARES	57456	59
34	10	LOCKWASHER #6 BRONZE (2 SPARES)	59048	59
35	1	FEED LINE (NS-HI-2 TO B5-N)	747425	1
36	1	(EW-HI-2 TO B5-W)		2
37	1	(NS-HI-5 TO B5-S)		3
38	1	FEED LINE (EW-HI-5 TO B5-E)	747425	4

PACK IN BOX #1 (items 20–34)

PACK IN BOXES AS REQUIRED (items 35–38)

LIST OF CONTENTS OF MASTER ITEM MI-19177-11

MI-19177-11 SET OF FEED LINES & ACCESSORIES (12 SECTION CH.11) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
39	1	FEED LINES (NS-HI-3 TO B6-N)	747425	5
40	1	(EW-HI-3 TO B6-W)		6
41	1	(NS-HI-4 TO B6-S)		7
42	1	(EW-HI-4 TO B6-E)		8
43	1	(NS-HI-8 TO B2-N)		9
44	1	(EW-HI-8 TO B2-W)		10
45	1	(NS-HI-9 TO B1-N)		11
46	1	(EW-HI-9 TO B1-W)		12
47	1	(NS-HI-10 TO B1-S)		13
48	1	(EW-HI-10 TO B1-E)		14
49	1	(NS-HI-11 TO B2-S)		15
50	1	(EW-HI-11 TO B2-E)		16
51	1	(NS-LO-2 TO B11-N)		17
52	1	(EW-LO-2 TO B11-W)		18
53	1	(NS-LO-5 TO B11-S)		19
54	1	(EW-LO-5 TO B11-E)		20
55	1	(NS-LO-3 TO B12-S)		21
56	1	(EW-LO-3 TO B12-W)		22
57	1	FEED LINES (NS-LO-4 TO B12-S)	747425	23

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-11

MI-19177-11 SET OF FEED LINES & ACCESSORIES (12 SECTION CH.11) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
58	1	FEED LINES (EW-LO-4 TO B12-E)	747425	24
59	1	(NS-LO-8 TO B8-N)		25
60	1	(EW-LO-8 TO B8-W)		26
61	1	(NS-LO-9 TO B7-N)		27
62	1	(EW-LO-9 TO B7-W)		28
63	1	(NS-LO-10 TO B7-S)		29
64	1	(EW-LO-10 TO B7-E)		30
65	1	(NS-LO-11 TO B8-S)		31
66	1	(EW-LO-11 TO B8-E)		32
67	1	(NS-HI-12 TO B3-S)		33
68	1	(EW-HI-7 TO B3-W)		34
69	1	(NS-HI-7 TO B3-N)		42
70	1	(EW-HI-12 TO B3-E)		34
71	1	(NS-HI-6 TO B4-S)		43
72	1	(EW-HI-1 TO B4-W)		35
73	1	(NS-HI-1 TO B4-N)		36
74	1	(EW-HI-6 TO B4-E)		44
75	1	(NS-LO-6 TO B 10-S)		45
76	1	FEED LINES (EW-LO-1 TO B10-W)	747425	37

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-11

MI-19177-11 SET OF FEED LINES & ACCESSORIES (12 SECTION CH.11) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
77	1	FEED LINES (NS-LO-1 TO B10-S)	747425	38
78	1	(EW-LO-6 TO B10-E)		46
79	1	(NS-LO-7 TO B9-S)		47
80	1	(EW-LO-12 TO B9-E)		39
81	1	(EW-LO-7 TO B9-W)		48
82	1	(NS-LO-12 TO B9-S)	747425	40
83	2	FEED LINES (SPARES)	745189	508
84	52	SADDLE (4 SPARES) RADIATOR	8822768	1
85	52	CLAMP 2 1/4" DIA. ADJUSTABLE (4 SPARES)	897258	3
86	154	CAP SCREW HEX HD. 5/16-18X 1/2 LG.STN. STL (14SPARE	59286	14
87	4	JUNCTION BOX & TRANSFORMER	745123	501
88	98	PLATE, RADIATOR (BAYS- UPPER 6) (2 SPARES)	8816238	2
89	98	PLATE, RADIATOR (BAYS- LOWER 6) (2 SPARES)	8816238	1
90	5	CLAMP, FEED LINE (1 SPARE)	8825323	2
91	34	CLAMP, FEED LINE DUAL (4 SPARES)	8818052	1
92	34	CAP SCREW HEX HD.5/16-18 X 1 1/2 LG. STN. STL (4 SPARES)	59286	20
93	1	CLAMP (WRAPLOCK)	8829466	1
94	1	BLUE PRINT-RADIATOR MOUNTING	467392	
95	1	BENDING FIXTURE	467394	501

PACK IN BOX #3

LIST OF CONTENTS OF MASTER ITEM MI-19177-11

MI-19177-11 SET OF FEED LINES & ACCESSORIES (12 SECTION CH.11) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
96	1	BLUEPRINT, ASSEMBLY LATEST ISSUE	311389	
97	1	BLUEPRINT, MTL. PARTS LIST. LATEST ISSUE	8692182	
98	1	PACKING LIST	THIS MI SHTS 1,2, 3,4,5& 6	

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-12

MI-19177-12 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 12) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
1	2	HANGER, TRANSMISSION LINE SUPPORT	8824433	1
2	4	HANGER, TRANSMISSION LINE SUPPORT	465135	501
3	18	HANGER, TRANSMISSION LINE SUPPORT	465135	502
4	4	HANGER, TRANSMISSION LINE SUPPORT	465135	503
5	26	SUPPORT, END SEAL, POLE (2 SPARES)	8822767	1
6	26	SUPPORT, END SEAL, RADIATOR (2 SPARES)	8829359	1
7	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	501
8	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	503
9	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	501
10	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	503
11	154	CLAMP, FEED LINE (14 SPARES)	8828573	1
12	75	CLAMP, FEED LINE (7 SPARES)	8825323	1
13	154	SCREW, SHOULDER (14 SPARES)	8824420	1
14	35	STRAP, FEED LINE (3 SPARES)	8824427	1
15	42	STRAP, FEED LINE (4 SPARES)	8824427	2
16	2	BENDER, FEED LINE	8841557	1
17	104	CLAMP, 1 3/4 DIA. ADJUSTABLE (8 SPARES)	897258	11
18	30	CLAMP, 3 1/2 DIA. ADJUSTABLE (2 SPARES)	897258	1
19	238	WASHER 5/16 STN. STEEL (20 SPARES)	189820	14

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-12

MI-19177-12 SET OF FEED LINES & ACCESSORIES (12 SECTION CH 12) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
20	53	CAP SCREW HEX HD. 1/4-20 X 1 LG.STN.STL (5 SPARES)	59285	18
21	26	CAP SCREW HEX HD. 5/16-18 X 3/4 STN.STL (2 SPARES	59286	16
22	62	BOLT 5/16-18 X 3/4 HEX HD. DURONZE (6 SPARES)	890051	23
23	80	CAP SCREW HEX HD 5/16-18 X 1 STN.STL. (8 SPARES)	59286	18
24	52	BOLT 5/16-18 X 1/2 HEX HD. DURONZE (4 SPARES)	890051	27
25	293	LOCKWASHER,5/16 STN.STEEL (27 SPARES)	59048	36
26	114	LOCKWASHER,5/16 DURONZE (10 SPARES)	8898153	5
27	53	LOCKWASHER, 1/4 STN. STEEL (5 SPARES)	59048	35
28	154	NUT HEX 1/4-20 STN. STEEL (14 SPARES)	73103	9
29	1	MARKER PLATE (N-S HI)	8834270	3
30	1	MARKER PLATE (N-S LO)		4
31	1	MARKER PLATE (E-W HI)		5
32	1	MARKER PLATE (E-W LO)	8834270	6
33	10	MACH. SCREW 6-32 X 3/8 LG. RD. HD. BRASS (2 SPARES	57456	59
34	10	LOCKWASHER #6 BRONZE (2 SPARES)	59048	59
35	1	FEED LINE (NS-HI-2 TO B5-N)	747425	1
36	1	(EW-HI-2 TO B5-W)		2
37	1	(NS-HI-5 TO B5-S)		3
38	1	FEED LINE (EW-HI-5 TO B5-E)	747425	4

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-12

MI-19177-12 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 12) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
39	1	FEED LINES (NS-HI-3 TO B6-N)	747425	5
40	1	(EW-HI-3 TO B6-W)		6
41	1	(NS-HI-4 TO B6-S)		7
42	1	(EW-HI-4 TO B6-E)		8
43	1	(NS-HI-8 TO B2-N)		9
44	1	(EW-HI-8 TO B2-W)		10
45	1	(NS-HI-9 TO B1-N)		11
46	1	(EW-HI-9 TO B1-W)		12
47	1	(NS-HI-10 TO B1-S)		13
48	1	(EW-HI-10 TO B1-E)		14
49	1	(NS-HI-11 TO B2-S)		15
50	1	(EW-HI-11 TO B2-E)		16
51	1	(NS-LO-2 TO B11-N)		17
52	1	(EW-LO-2 TO B11-W)		18
53	1	(NS-LO-5 TO B11-S)		19
54	1	(EW-LO-5 TO B11-E)		20
55	1	(NS-LO-3 TO B12-N)		21
56	1	(EW-LO-3 TO B12-W)		22
57	1	FEED LINES (NS-LO-4 TO B12-S)	747425	23

LIST OF CONTENTS OF MASTER ITEM MI-19177-12

MI-19177-12 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 12) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
58	1	FEED LINES (EW-LO-4 TO B12-E)	747425	24
59	1	(NS-LO-8 TO B6-N)		25
60	1	(EW-LO-8 TO B6-W		26
61	1	(NS-LO-9 TO B7-N)		27
62	1	(EW-LO-9 TO B7-W)		28
63	1	(NS-LO-10 TO B7-S)		29
64	1	(EW-LO-10 TO B7-E)		30
65	1	(NS-LO-11 TO B6-S)		31
66	1	(EW-LO-11 TO B6-E)		32
67	1	(NS-HI-12 TO B3-S)		33
68	1	(EW-HI-7 TO B3-W)		41
69	1	(NS-HI-7 TO B3-N)		42
70	1	(EW-HI-12 TO B3-E)		34
71	1	(NS-HI-6 TO B4-S)		43
72	1	(EW-HI-1 TO B4-W)		35
73	1	(NS-HI-1 TO B4-N)		36
74	1	(EW-HI-6 TO B4-E)		44
75	1	(NS-LO-6 TO B10-S)		45
76	1	FEED LINES (EW-LO-1 TO B10-W)	747425	37

LIST OF CONTENTS OF MASTER ITEM MI-19177-12

MI-19177-12 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 12) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
77	1	FEED LINES (NS-LO-1 TO B10-N)	747425	38
78	1	(EW-LO-6 TO B10-E)		46
79	1	(NS-LO-7 TO B9-N)		47
80	1	(EW-LO-12 TO B9-E)		39
81	1	(EW-LO-7 TO B9-W)		48
82	1	(NS-LO-12 TO B9-S)	747425	40
83	2	FEED LINES (SPARES)	745189	508
84	52	SADDLE (4 SPARES) RADIATOR	8822768	1
85	52	CLAMP 2 1/4" DIA. ADJUSTABLE (4 SPARES)	897258	3
86	154	CAP SCREW HEX HD.5/16-18 X 1/2 LG. STN. STL.(14SPARE	59286	14
87	4	JUNCTION BOX & TRANSFORMER	745123	501
88	98	PLATE, RADIATOR (BAYS-UPPER 6) (2 SPARES)	8816238	3
89	98	PLATE, RADIATOR (BAYS-LOWER 6) (2 SPARES)	8816236	1
90	5	CLAMP, FEED LINE (1 SPARE)	8825323	2
91	34	CLAMP, FEED LINE DUAL (4 SPARES)	8814052	1
92	34	CAP SCREW HEX HD.5/16-18 X 1 1/2 LG. STN STL (4 SPARES)	59286	20
93	1	CLAMP (WRAPLOCK)	8829466	1
94	1	BLUE-PRINT- RADIATOR MOUNTING	467392	
95	1	BENDING FIXTURE	467394	501

PACK IN BOX #1 REQUIRED AS

LIST OF CONTENTS OF MASTER ITEM MI-19177-12

MI-19177-12 SET OF FEED LINES & ACCESSORIES (12 SECTION CH 12) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
96	1	BLUEPRINT, ASSEMBLY LATEST ISSUE	311389	
97	1	BLUEPRINT, MTL. PARTS LST. LATEST ISSUE	8892182	
98	1	PACKING LIST	THIS MI WI3 1,2, 3,4,5 & 6	

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-13

MI-19177-13 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 13) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
1	2	HANGER, TRANSMISSION LINE SUPPORT	8824433	1
2	4	HANGER, TRANSMISSION LINE SUPPORT	465135	501
3	18	HANGER, TRANSMISSION LINE SUPPORT	465135	502
4	4	HANGER, TRANSMISSION LINE SUPPORT	465135	503
5	26	SUPPORT, END SEAL, POLE (2 SPARES)	8822767	1
6	26	SUPPORT, END SEAL, RADIATOR (2 SPARES)	8829359	1
7	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	501
8	13	JUMPER, POLE TO RADIATOR (1 SPARE)	465102	503
9	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	501
10	13	JUMPER, RADIATOR TO POLE (1 SPARE)	465103	503
11	154	CLAMP, FEED LINE (14 SPARES)	8828573	1
12	75	CLAMP, FEED LINE (7 SPARES)	8825323	1
13	154	SCREW, SHOULDER (14 SPARES)	8824420	1
14	35	STRAP, FEED LINE (3 SPARES)	8824427	1
15	42	STRAP, FEED LINE (4 SPARES)	8824427	2
16	2	BENDER FEED LINE	8841557	1
17	104	CLAMP, 1 3/4 DIA. ADJUSTABLE (8 SPARES)	897258	11
18	30	CLAMP, 3 1/2 DIA. ADJUSTABLE (2 SPARES)	897258	1
19	238	WASHER 5/16 STN. STEEL (20 SPARES)	189820	14

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-13

MI-19177-13 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 13) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
20	53	CAP SCREW HEX HD.1/4-20 X 1 LG.STN.STL.(5 SPARES)	59285	18
21	26	CAP SCREW HEX HD.5/16-18 X 3/4 STN.STL.(2 SPARES)	59286	16
22	62	BOLT 5/16-18 X 3/4 HEX HD. DURONZE (6 SPARES)	890051	23
23	80	CAP SCREW HEX HD.5/16-18 X 1 STN.STL.(8 SPARES)	59286	18
24	52	BOLT 5/16-18 X 1 1/2 HEX HD. DURONZE (4 SPARES)	890051	27
25	293	LOCKWASHER 5/16 STN. STEEL (27 SPARES)	59048	36
26	114	LOCKWASHER 5/16 DURONZE (10 SPARES)	8906153	5
27	53	LOCKWASHER 1/4 STN. STEEL (5 SPARES)	59048	35
28	154	NUT HEX 1/4-20 STN. STEEL (14 SPARES)	73103	9
29	1	MARKER PLATE (N-S MI)	8834270	3
30	1	MARKER PLATE (N-S LO)	8834270	4
31	1	MARKER PLATE (E-W MI)	8834270	5
32	1	MARKER PLATE (E-W LO)	8834270	6
33	10	MACH. SCREW 8-32 X 3/8 LG.RD.HD. BRASS (2 SPARES	57456	59
34	10	LOCKWASHER #6 BRONZE (2 SPARES)	59048	59
35	1	FEED LINE (NS-MI-2 TO B5-N)	747425	51
36	1	(EW-MI-2 TO B5-W)		52
37	1	(NS-MI-5 TO B5-S)		53
38	1	FEED LINE (EW-MI-5 TO B5-E)	747425	54

PACK IN BOX #1 AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-13

MI-19177-13 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 13) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
39	1	FEED LINES (NS-HI-3 TO B6-N)	747425	55
40	1	(EW-HI-3 TO B6-W)		56
41	1	(NS-HI-4 TO B6-S)		57
42	1	(EW-HI-4 TO B6-E)		58
43	1	(NS-HI-8 TO B2-N)		59
44	1	(EW-HI-8 TO B2-W)		60
45	1	(NS-HI-9 TO B1-N)		61
46	1	(EW-HI-9 TO B1-W)		62
47	1	(NS-HI-10 TO B1-S)		63
48	1	(EW-HI-10 TO B1-E)		64
49	1	(NS-HI-11 TO B2-S)		65
50	1	(EW-HI-11 TO B2-E)		66
51	1	(NS-LO-2 TO B11-N)		67
52	1	(EW-LO-2 TO B11-W)		68
53	1	(NS-LO-5 TO B11-S)		69
54	1	(EW-LO-5 TO B11-E)		70
55	1	(NS-LO-3 TO B12-N)		71
56	1	(EW-LO-3 TO B12-W)		72
57	1	FEED LINES (NS-LO-4 TO B12-S)	747425	73

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-13

MI-19177-13 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 13) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
58	1	FEED LINES (EW-LO-4 TO B12-E)	747425	74
59	1	(NS-LO-6 TO B8-N)		75
60	1	(EW-LO-6 TO B8-W)		76
61	1	(NS-LO-9 TO B7-N)		77
62	1	(EW-LO-9 TO B7-W)		78
63	1	(NS-LO-10 TO B7-S)		79
64	1	(EW-LO-10 TO B7-E)		80
65	1	(NS-LO-11 TO B8-S)		81
66	1	(EW-LO-11 TO B8-E)		82
67	1	(NS-HI-12 TO B3-S)		83
68	1	(EW-HI-7 TO B3-W)		91
69	1	(NS-HI-7 TO B3-N)		92
70	1	(EW-HI-12 TO B3-E)		84
71	1	(NS-HI-6 TO B4-S)		93
72	1	(EW-HI-1 TO B4-W)		85
73	1	(NS-HI-1 TO B4-N)		86
74	1	(EW-HI-6 TO B4-E)		94
75	1	(NS-LO-6 TO B10-S)		95
76	1	FEED LINES (EW-LO-1 TO B10-W)	747425	87

PACK IN BOXES AS REQUIRED

LIST OF CONTENTS OF MASTER ITEM MI-19177-13

MI-19177-13 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 13) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
77	1	FEED LINES (NS-LO-1 TO B10-N)	747425	88
78	1	(EW-LO-6 TO B10-E)		96
79	1	(NS-LO-7 TO B9-N)		97
80	1	(EW-LO-12 TO B9-E)		89
81	1	(EW-LO-7 TO B9-W)		98
82	1	FEED LINES (NS-LO-12 TO B9-S)	747425	90
83	2	FEED LINES (SPARES)	745189	509
84	52	SADDLE (4 SPARES) RADIATOR	8822768	1
85	52	CLAMP 2 1/4" DIA. ADJUSTABLE (4 SPARES)	897258	3
86	154	CAP SCREW HEX HD.5/16-18 X 1/2 LG.STN.STL(14 SPARES)	59286	14
87	4	JUNCTION BOX & TRANSFORMER	745123	501
88	98	PLATE, RADIATOR (BAYS-UPPER 6) (2 SPARES)	8816238	4
89	49	PLATE, RADIATOR (BAYS-7,8,9) (1 SPARE)	8816238	5
90	49	PLATE, RADIATOR (BAYS-10,11,12) (1 SPARE)	8816238	6
91	5	CLAMP, FEED LINE (1 SPARE)	8825323	2
92	34	CLAMP, FEED LINE (4 SPARES) DUAL	8814052	1
93	34	CAP SCREW HEX HD.5/16-18 X 1 1/2 LG.STN.STL (4 SPARES)	59286	20
94	1	CLAMP (WRAPLOCK)	8829466	1

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19177-13

MI-19177-13 SET OF FEED LINES & ACCESSORIES (12 SECTION CH. 13) TOWER

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
95	1	BLUEPRINT, RADIATOR MOUNTING	467392	
96	1	BENDING FIXTURE	467394	501
97	1	BLUEPRINT, ASSEMBLY LATEST ISSUE	311369	
98	1	BLUEPRINT, MTL. PARTS LIST LATEST ISSUE	8892182	

PACK IN BOX #1

LIST OF CONTENTS OF MASTER ITEM MI-19345

MI-19345 COMBINING NETWORK (2 LINE BRIDGE 3 1/8 TOWER CH. 7 - 13)

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
1	2	COMBINING TEE (70/30 SPLIT) 3 1/8 DIA.	464523	3
2	4	LINE, TRANSMISSION 3 1/8-51.5 OHMS 20 FT.	MI-19313	1
3	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 10 FT.	MI-19313	1
4	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 10 FT. 6 INCHES	MI-19313	1
5	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 4 FT. 9 7/8"	MI-19313	1
6	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 2 FT.10 7/8"	MI-19313	1
7	-	~~LINE, TRANSMISSION 3 1/8-51.5 OHMS 1 FT. 4"~~ (FOR PHASING)	~~467366~~	~~10~~
8	6	ELBOW, MITER 3 3/4-X 6	MI-19113	16
9	4	HANGER, SUSPENSION	MI-19113	32
10	1	BLUEPRINT, ASSEMBLY (LATEST ISSUE)	627884	
11	1	BLUEPRINT, MTL. PARTS LIST (LATEST ISSUE)	8626547	
12	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 7 FT. 8 INCHES	MI-19313	1
13	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 13 FT. 0"	MI-19313	1
14	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 14 FT. 0"	MI-19313	1
15	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 12 FT. 9"	MI-19313	1
16	2	ELBOW MITER 3 3/4 X 8 3/4	457583	4

NOTE #1 THE SUBJECT ITEM MI INCLUDES ALL OF THE TRANSMISSION LINE, FITTINGS, HANGERS AND COMBINING TEE FOR A TRIZAH ANTENNA.

LIST OF CONTENTS OF SCHEDULE ES-19296-H

3 1/8 PEDESTAL

ES-19296-H TYPE TF 12AH-P ANTENNA EQUIP. (CH. 7-13) 2 LINE BRIDGE

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR SPARE
1	1	ANTENNA POLE & ACCESSORIES	MI-19096	
2	1	POLE & SUPPORTS	MI-19192-F	
3	1	FEED LINE & ACCESSOIRES	MI-19177-*	
[illegible]				
		*(NOTE) PRIOR TO ORDERING, CUSTOMER'S ASSIGNED CHANNEL SHOULD BE ASCERTAINED. IF CHANNEL HAS NOT BEEN ASSIGNED, A KIT OF PARTS MI-19177-TP MAY BE ORDERED FROM WHICH A FINAL EQUIPMENT MAY BE FABRICATED TO MEET CUSTOMER'S REQUIREMENTS. IT IS RECOMMENDED THAT THE MI-19177-TP KIT BE ORDERED FOR THIS CONDITION TO EXPEDITE DELIVERY UPON ASSIGNMENT OF THE CHANNEL (FREQUENCY). IF CHANNEL HAS BEEN ASSIGNED, ORDER FEEDLINE & ACCESSORIES EQUIP. AS MI-19177- FOLLOWED BY A DASH NUMBER CORRESPONDING TO THE ASSIGNED CHANNEL, E.G. MI-19177-8 FOR A CHANNEL 8 FEEDLINE & ACCESSORIES. EQUIPMENT.		
5	1	COMBINING NETWORK	MI-19345-H	
6	1	INSTRUCTION BOOK	IB-36129	
		THE FOLLOWING ARE AUXILIARY ITEMS AND SHOULD BE CONSIDERED WHEN ORDERING AN ANTENNA EQUIPMENT.		
	*	SLEET MELTING EQUIPMENT *(NOTE) SUPPLY TWELVE IF A AS SPECIFIED BY SALES ORDER.	MI-19009-J	

LIST OF CONTENTS OF SCHEDULE ES-19296-H

3 1/8 PEDESTAL

ES-19296-H TYPE TF-12AH-P ANT. EQUIP. (CH 7-13) 2 LINE BRIDGE

ITEM	QUAN	DESCRIPTION	REFERENCE	PART OR SPARE
	*	1/2° BEAM TILTING SECTION *(NOTE) SUPPLY ONE IF A AS SPECIFIED BY SALES ORDER	MI-19395	
	*	1° BEAM TILTING SECTION *(NOTE) SUPPLY ONE IF A AS SPECIFIED BY SALES ORDER	MI-19395-A	

LIST OF CONTENTS OF MASTER ITEM MI-19192-F

MI-19192-F POLE & SUPPORTS (ANT. BOTTOM SECT.)(12 SECTION CH. 7-13)

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR SPARE
1	1	POLE (BOTTOM SECTION) } STENCIL MI & ITEM NO.	463061	4
2	1	PEDESTAL	463057	5

LIST OF CONTENTS OF MASTER ITEM MI-19345-H

MI-19345-H COMBINING NETWORK (2 LINE BRIDGE 3 1/8 PEDESTAL CH. 7-13)

ITEM	QUAN	DESCRIPTION	REFERENCE	PART OR SPARE
1	2	COMBINING TEE (70/30 SPLIT) 3 1/8 DIA.	464523	3
~~2~~	~~2~~	~~LINE, TRANSMISSION 3 1/8-51.5 OHMS 19' 3" LG.~~	~~MI-19313~~	~~1~~
3	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 10' 0" LG.	MI-19313	1
4	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 3' 9 7/8" LG.	MI-19313	1
5	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 2'10 7/8" LG.	MI-19313	1
6	6	ELBOW, MITER 3 3/4X 8	MI-19113	16
7	4	HANGER, SUSPENSION	MI-19113	32
8	1	BLUEPRINT, ASSEMBLY (LATEST ISSUE)	627884	
9	1	BLUEPRINT, MT'L PARTS LIST (LATEST ISSUE)	8828547	
10	2	ELBOW, MITER 3 3/4 X 8 3/4	457583	4
11	4	LINE, TRANSMISSION 3 1/8-51.5 OHMS 20' LG.	MI-19313	1
12	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 14' 0" LG.	MI-19313	1
13	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 12' 9" LG.	MI-19313	1
14	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 1' 6" LG.	MI-19313	1
15	2	LINE, TRANSMISSION 3 1/8-51.5 OHMS 1' 6" LG.	[illegible]	2
		NOTE #1: THE SUBJECT ITEM MI INCLUDES ALL OF THE TRANSMISSION LINE, FITTINGS, HANGERS AND COMBINING TEE FOR A TF-12AH-P ANTENNA.		

The remainder of the MI sheets for the TF-12AH-P (MI-19096 and MI-19177) are identical to those listed for the TF-12AH.

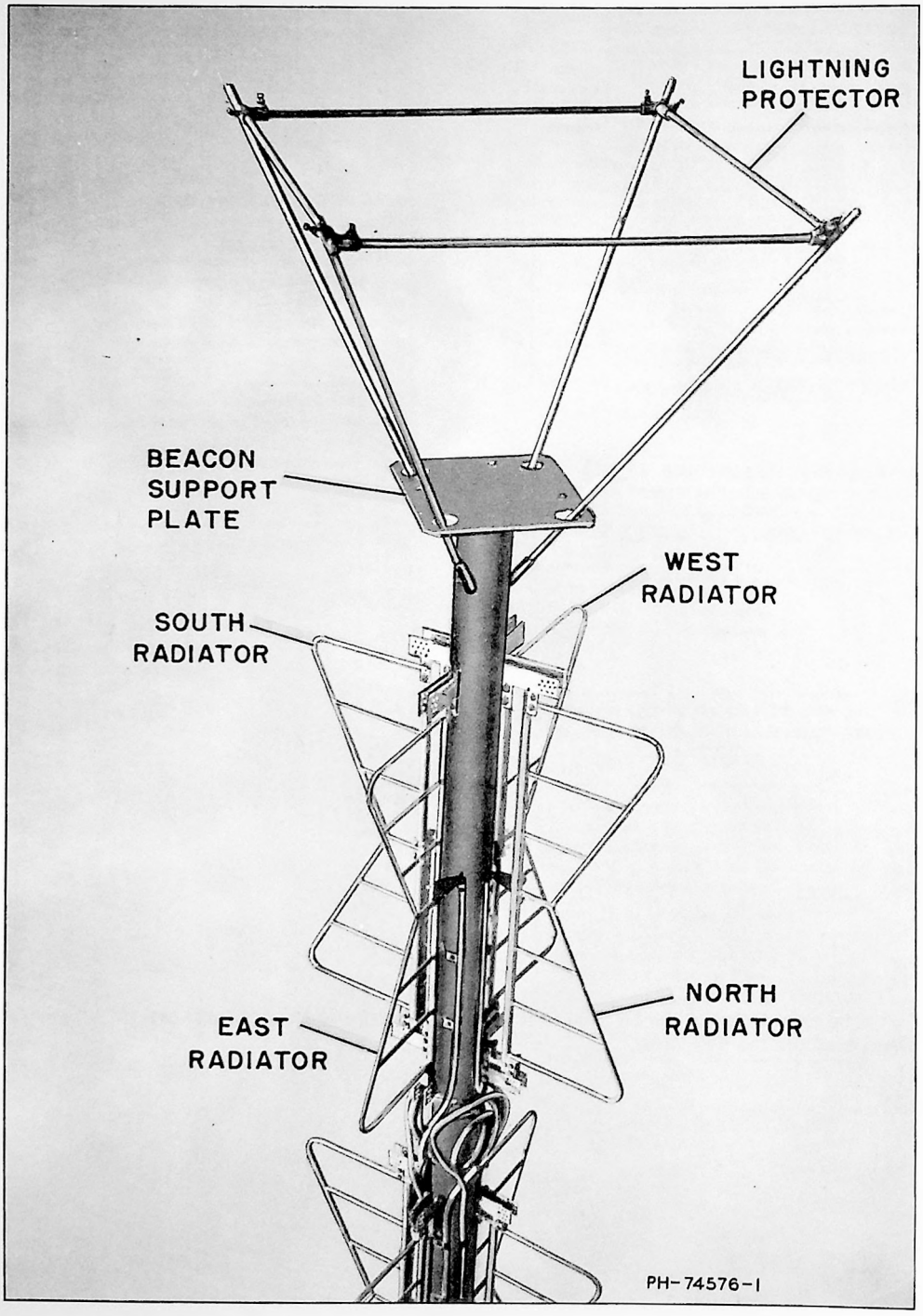


Figure 2 - Detail, Radiator Section 1

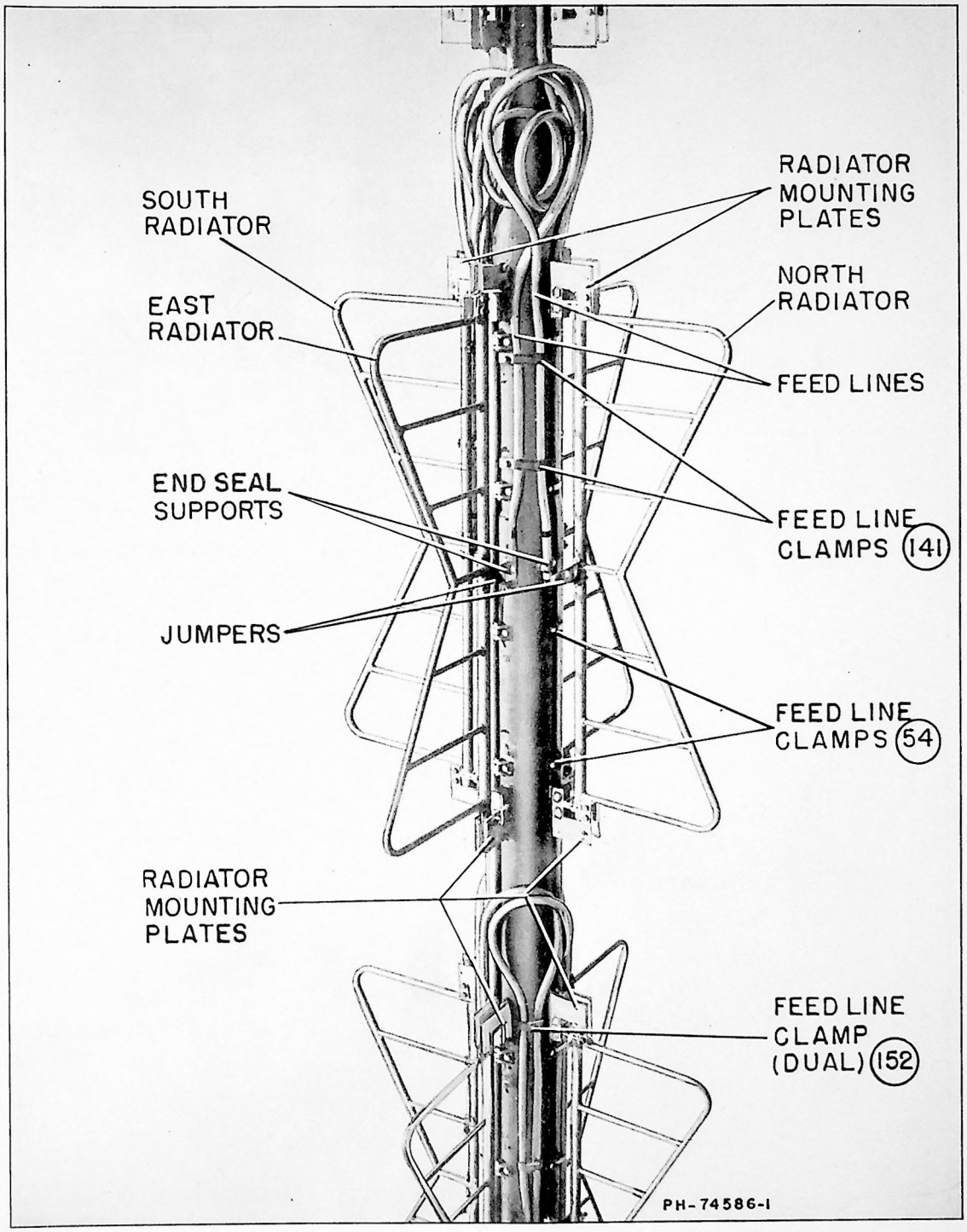


Figure 3 - Detail, Radiator Section 2

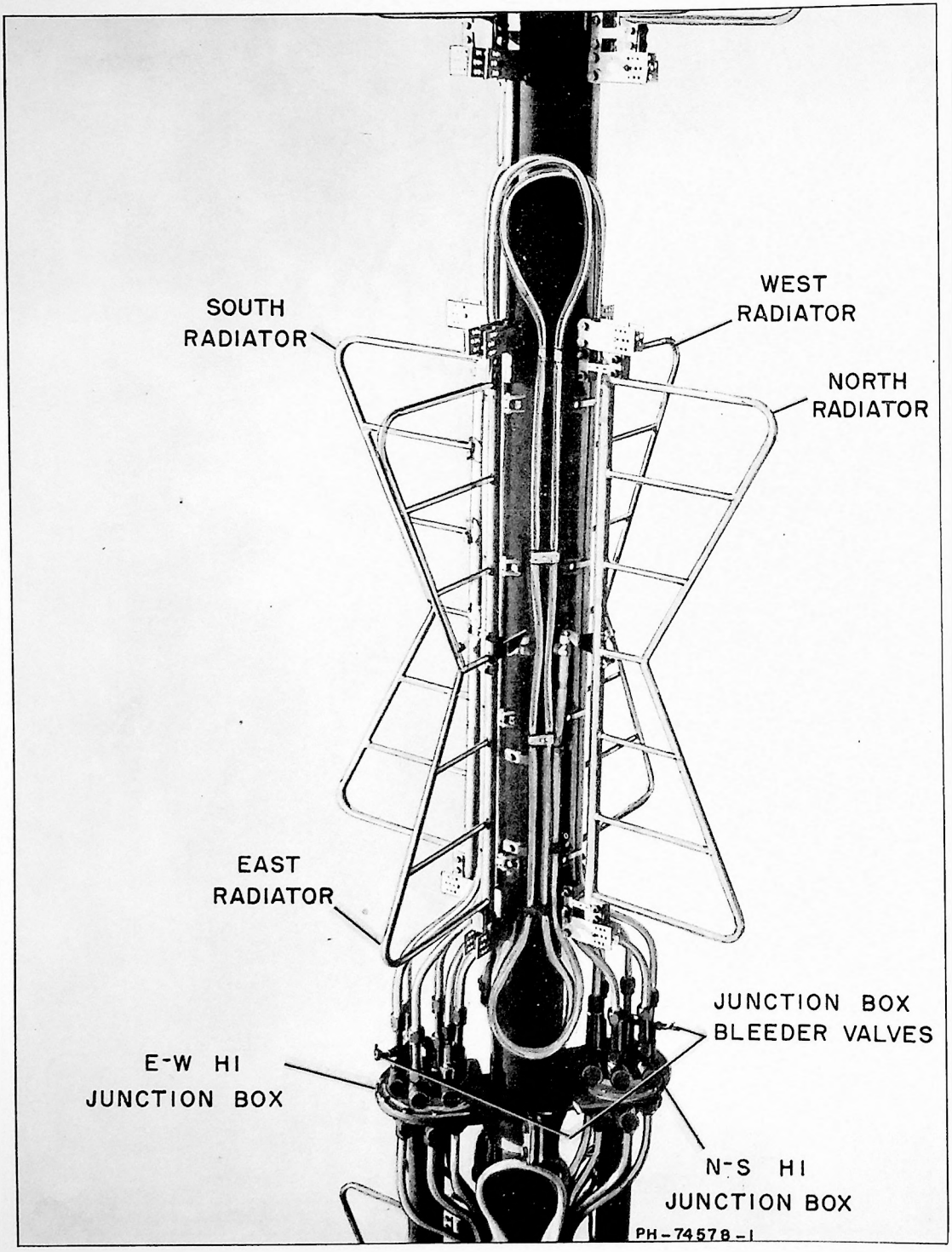


Figure 4 - Detail, Radiator Section 3

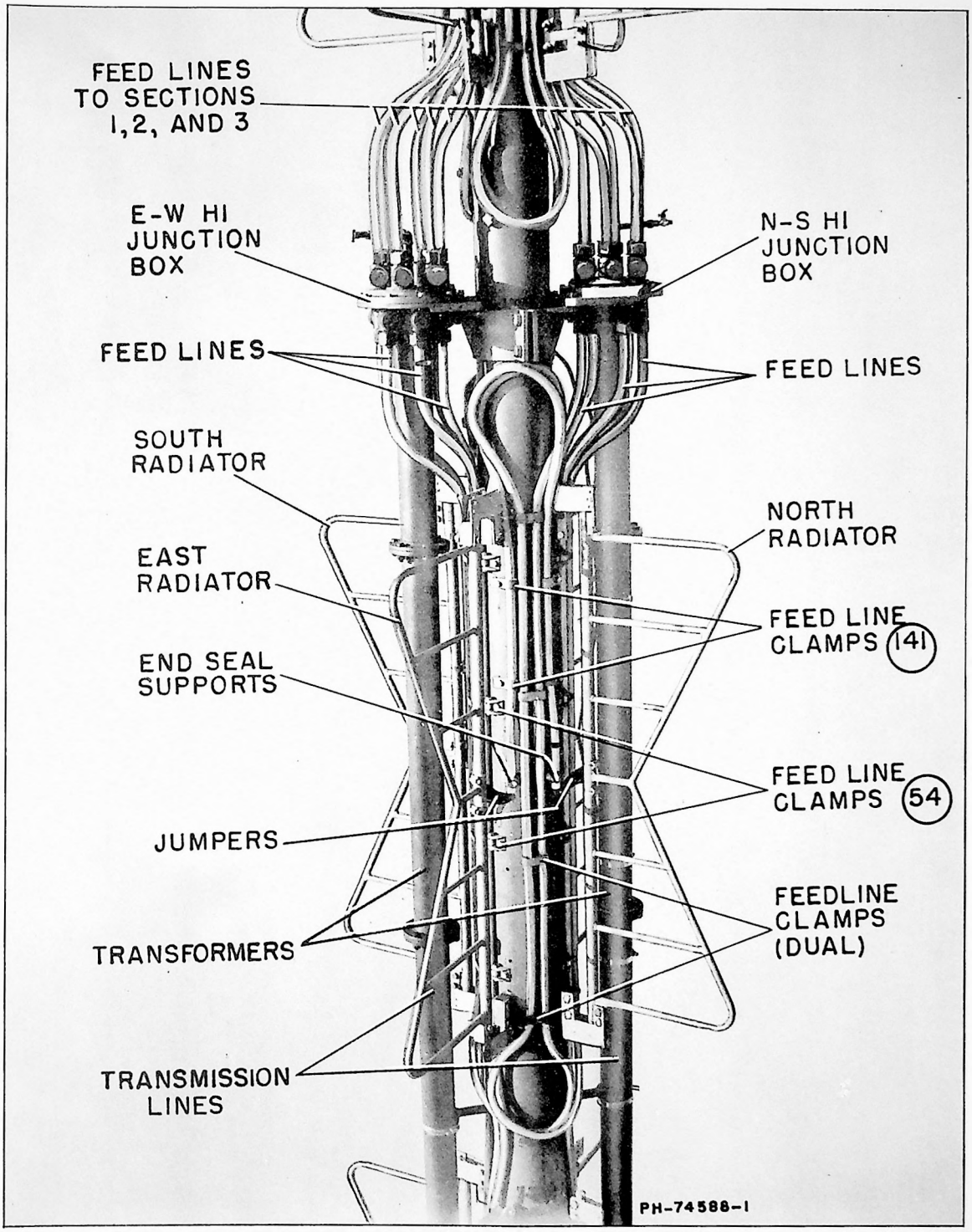


Figure 5 - Detail, Radiator Section 4

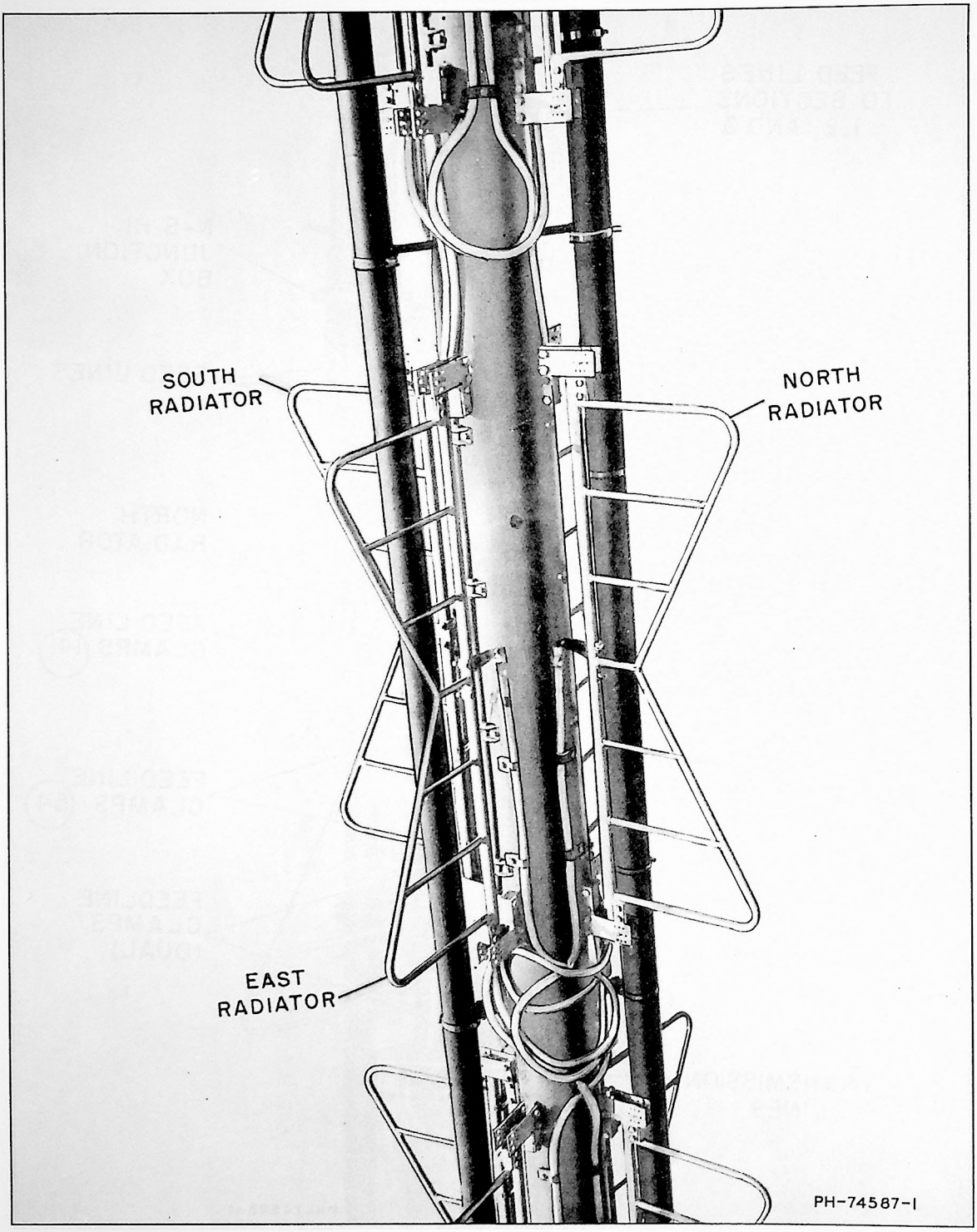


Figure 6 - Detail, Radiator Section 5

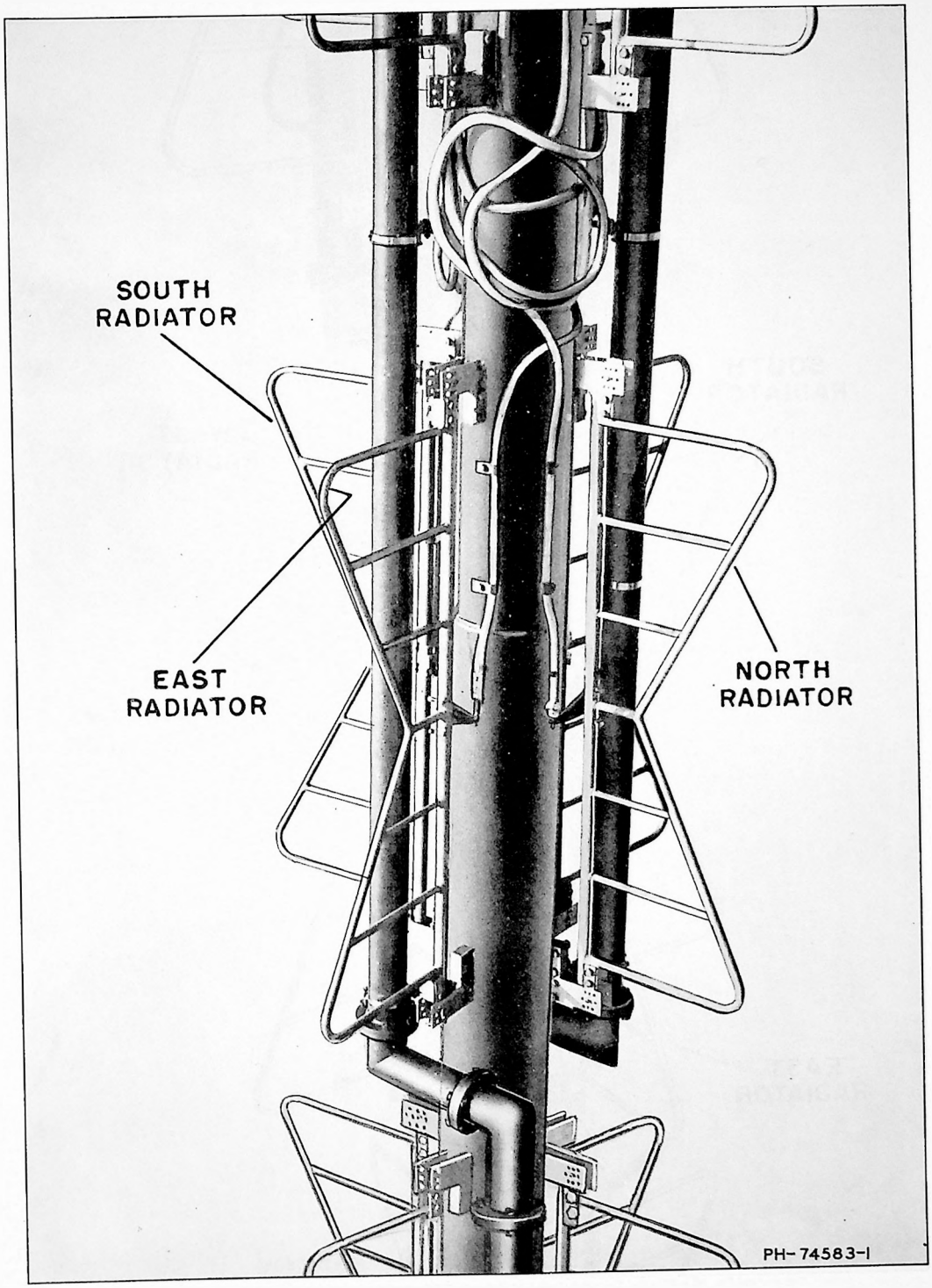


Figure 7 - Detail, Radiator Section 6

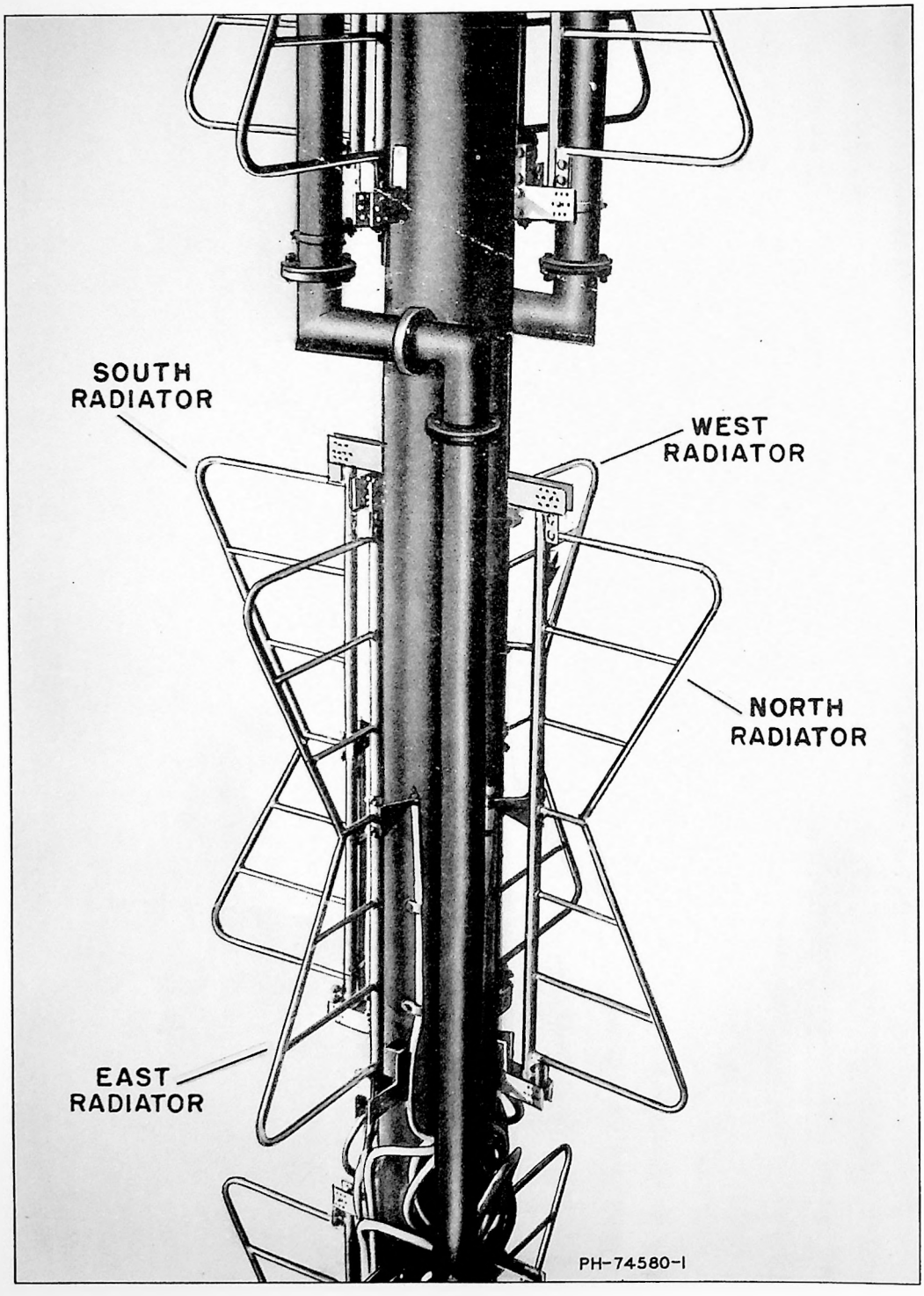


Figure 8 - Detail, Radiator Section 7

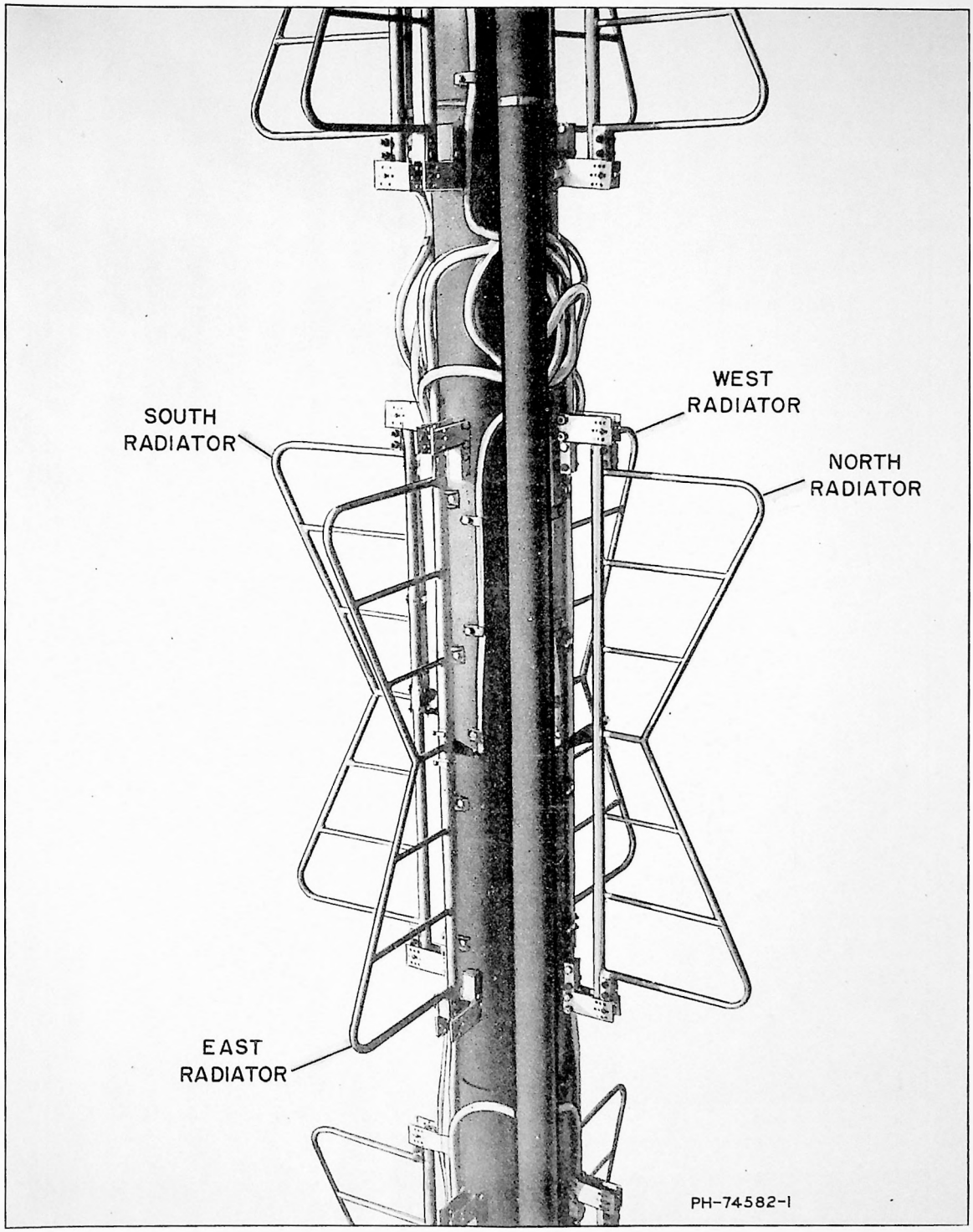


Figure 9 - Detail, Radiator Section 8

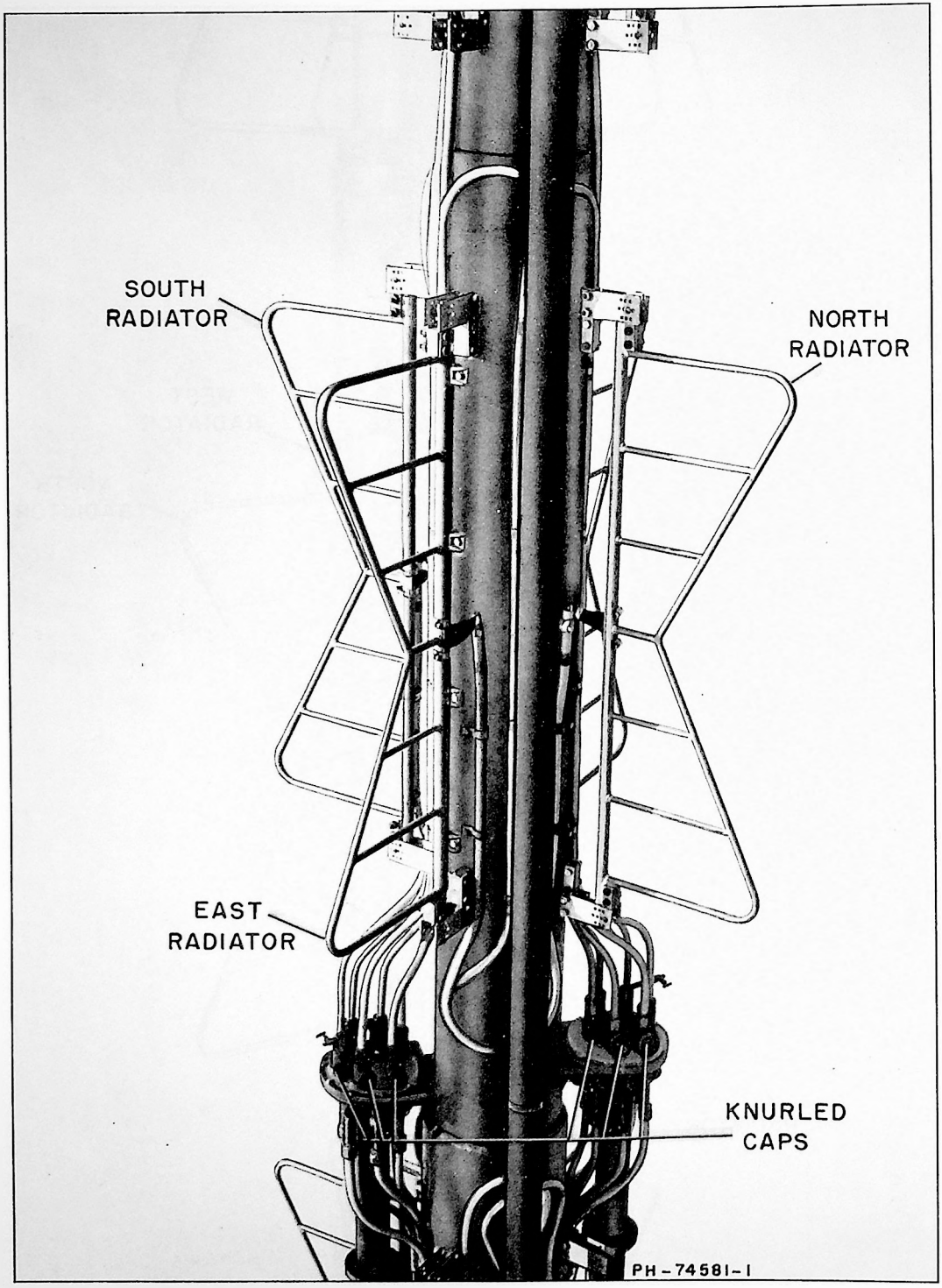


Figure 10 - Detail, Radiator Section 9

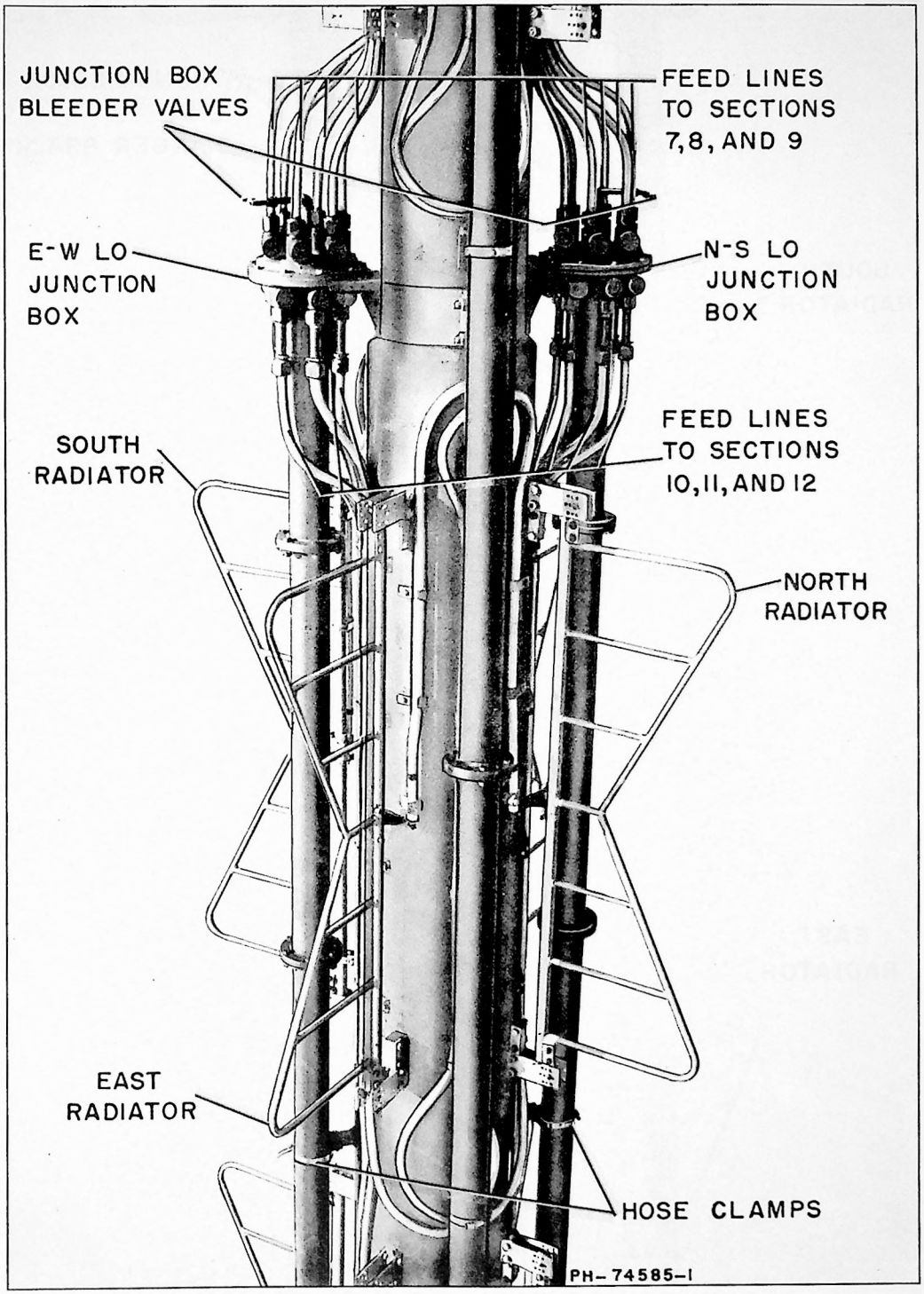


Figure 11 - Detail, Radiator Section 10

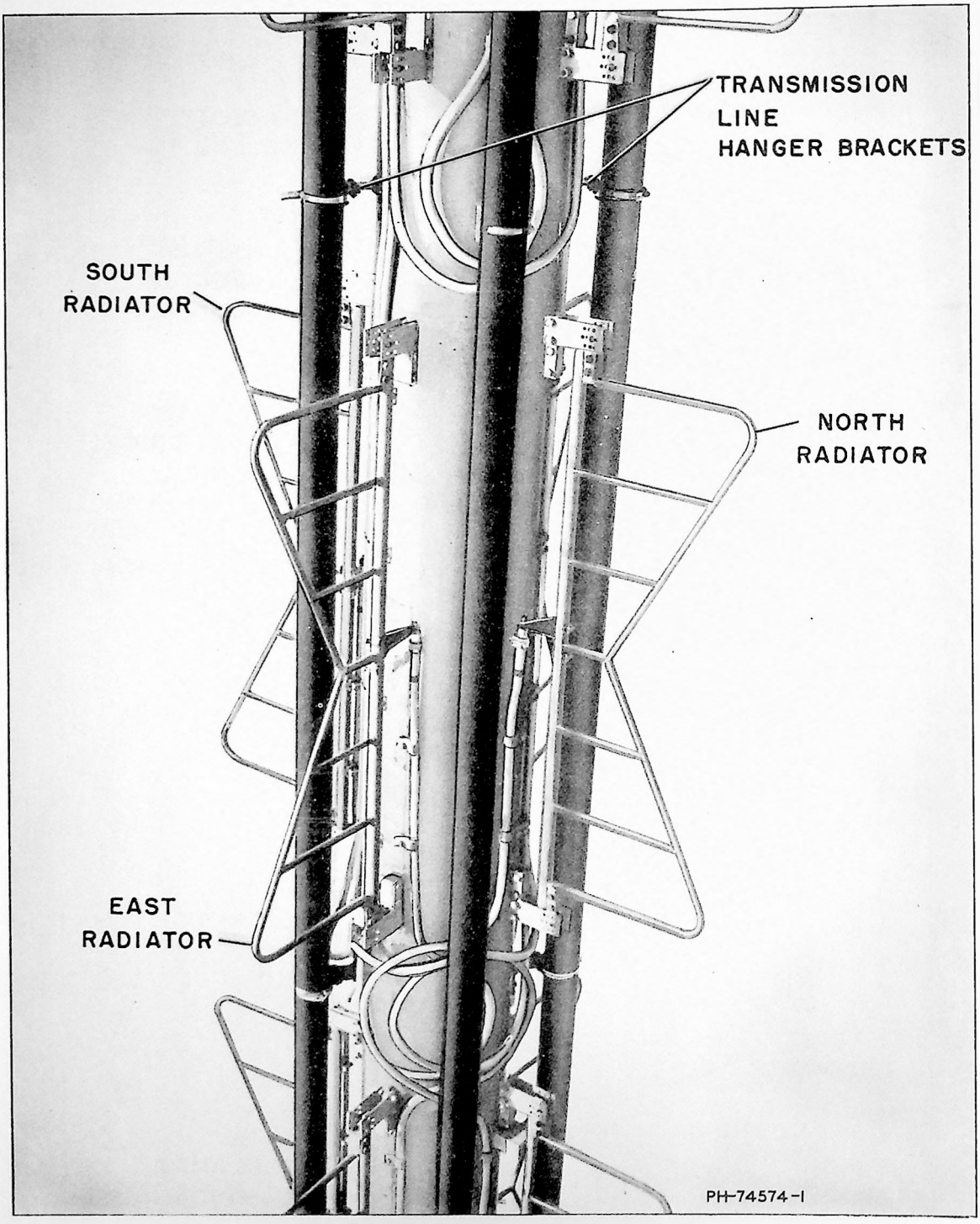


Figure 12 - Detail, Radiator Section 11

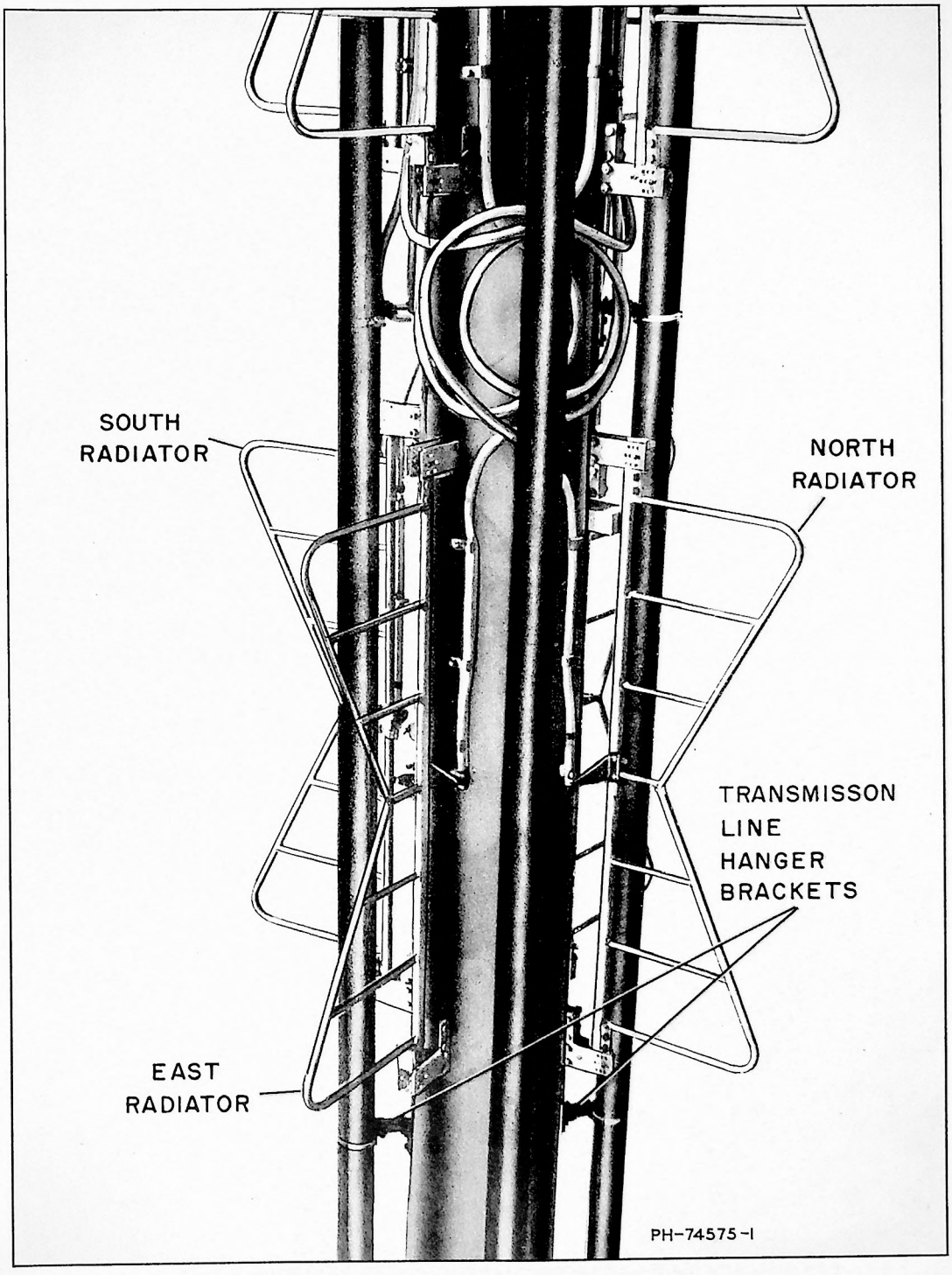


Figure 13 - Detail, Radiator Section 12

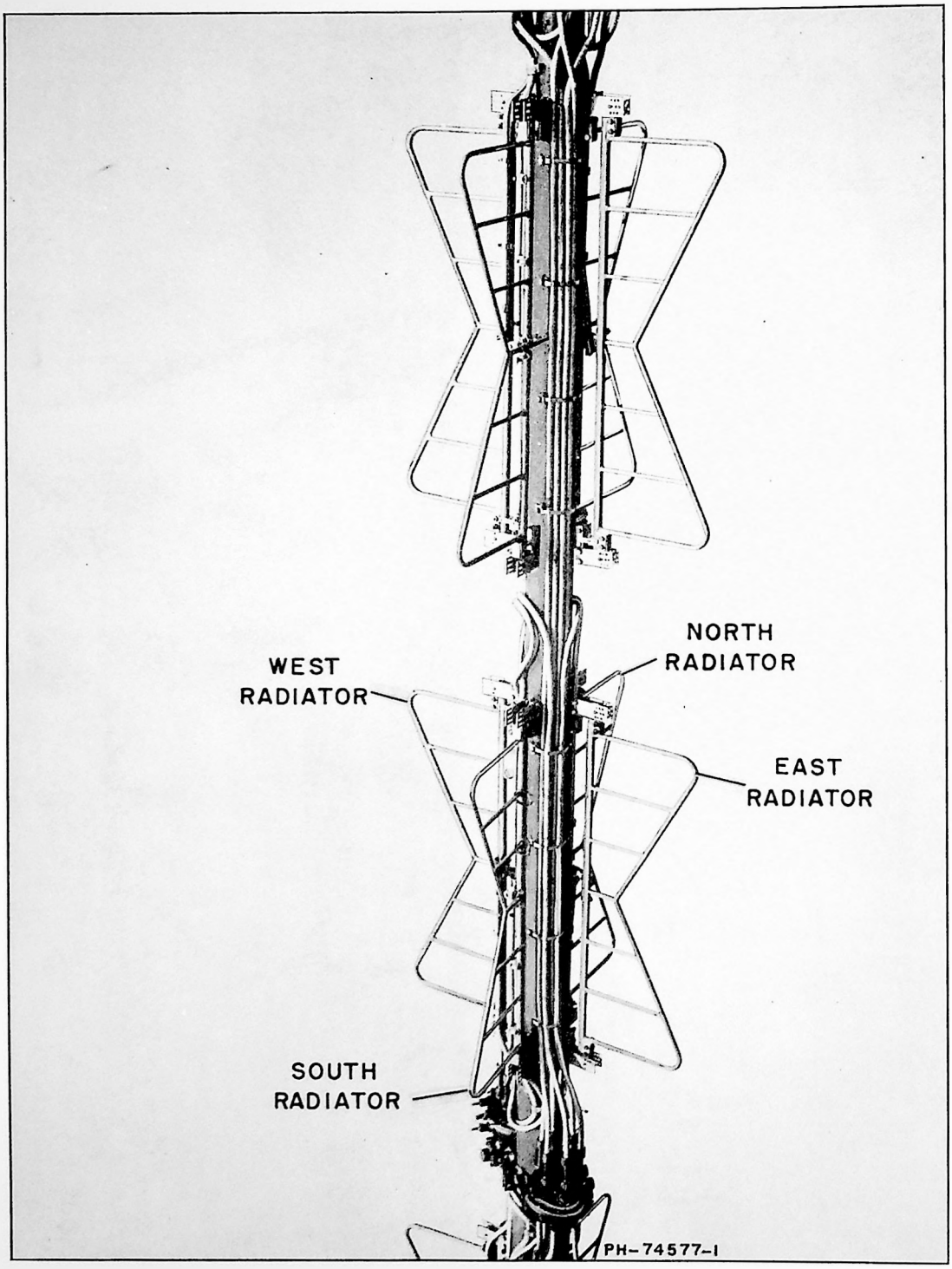


Figure 14 - Typical Feed Line Arrangement, Sections 2 and 3

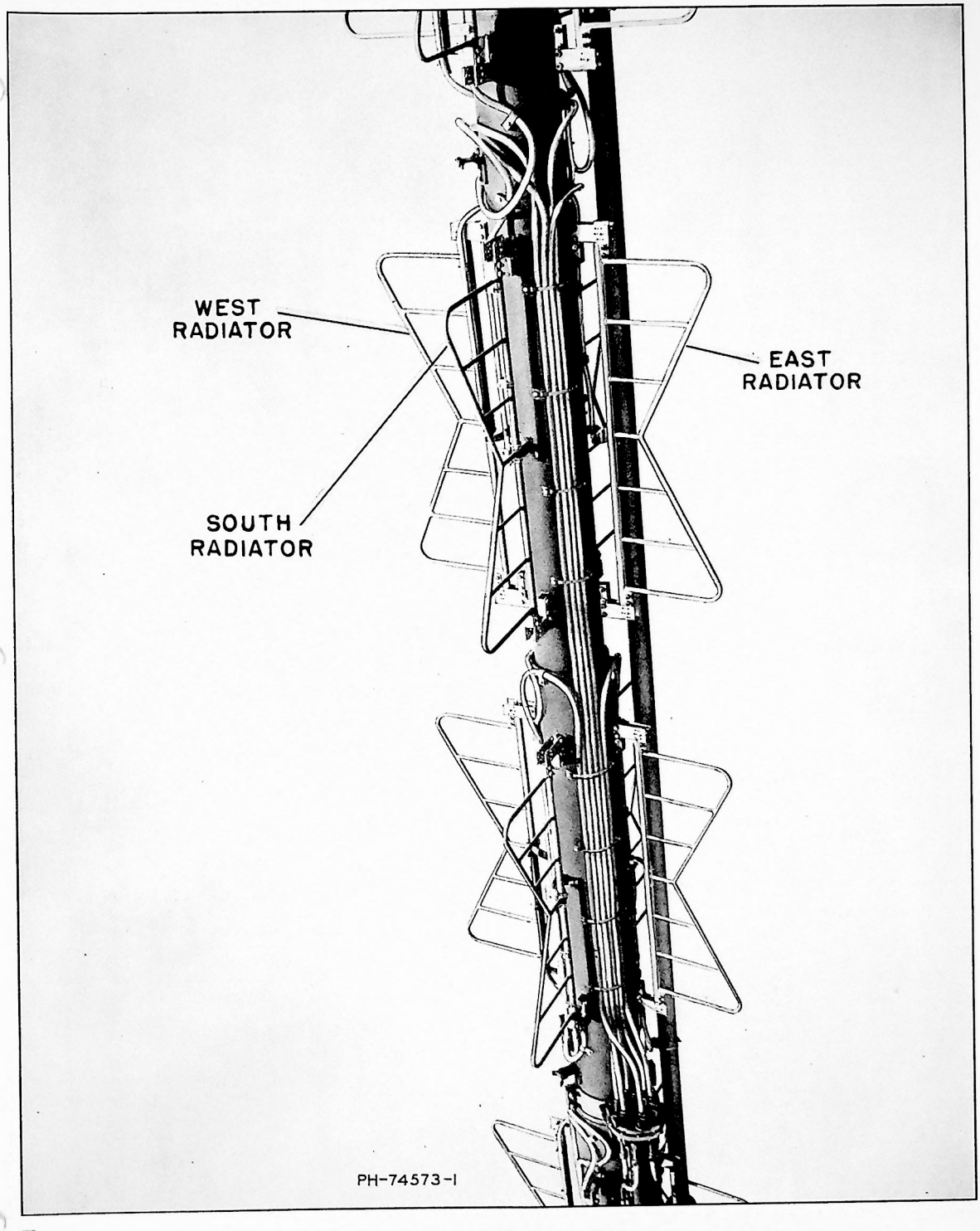


Figure 15 - Typical Feed Line Arrangement, Sections 8 and 9

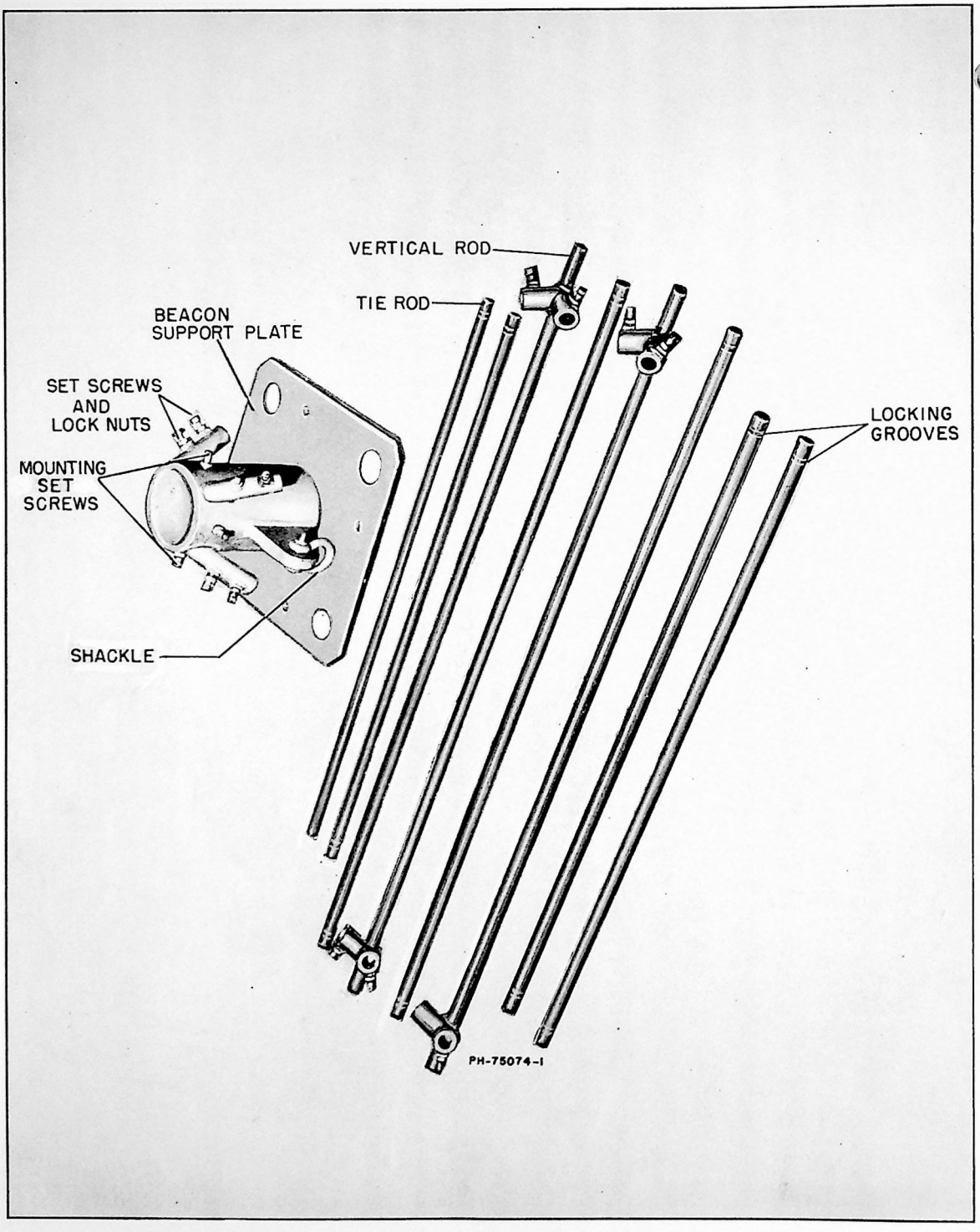


Figure 16 - Disassembled Lightning Protector

REPLACEMENT PARTS AND ENGINEERING SERVICE

When ordering replacement parts, please give symbol, description, and stock number of each item ordered.

The part which will be supplied against an order for a replacement item may not be an exact duplicate of the original part. However, it will be a satisfactory replacement differing only in minor mechanical or electrical characteristics. Such differences will in no way impair the operation of the equipment.

The following tabulations list service parts, electron tube, and field engineering service ordering instructions according to the geographical location of the station.

SERVICE PARTS

STATION LOCATION	OBTAIN SERVICE PARTS FROM
Continental United States or Alaska	Local Broadcast Equipment Sales Representative, his office, or directly from the Service Parts Order Service, Bldg.60, 19th and Federal Streets, Camden 5, N. J. Emergency orders may be telephoned, telegraphed, or teletyped to RCA Emergency Service, Bldg.60, Camden, N.J. (Telephone: Woodlawn 3-8000).
Dominion of Canada	Local Broadcast Equipment Sales Representative, his office, or directly from RCA Victor Company Limited, 1001 Lenoir Street, Montreal, Quebec.
Outside of Continental United States, Alaska, and the Dominion of Canada	Local Broadcast Equipment Sales Representative, or Service Parts Order Service, RCA International Division, Gloucester, New Jersey. U.S.A.

ELECTRON TUBES

STATION LOCATION	OBTAIN ELECTRON TUBES FROM
Continental United States or Alaska	Local Distributor or nearest of the following warehouses: 34 Exchange Place Jersey City 2, New Jersey 589 E. Illinois Street Chicago 11, Illinois 420 S. San Pedro Street Los Angeles 13, California
Dominion of Canada	Local Broadcast Equipment Sales Representative, his office, or directly from RCA Victor Company Limited, 1001 Lenoir Street, Montreal, Quebec.
Outside of Continental United States, Alaska, and the Dominion of Canada	Local Distributor or from: Tube Department RCA International Division 30 Rockefeller Plaza New York 20, New York. U.S.A.

If for any reason, it is desired to return tubes, please return them to the place of purchase. If this is not convenient, please notify your RCA serving warehouse so that Return Authorization may be forwarded to you.

PLEASE DO NOT RETURN TUBES DIRECTLY TO RCA WITHOUT AUTHORIZATION AND SHIPPING INSTRUCTIONS.

It is important that complete information regarding each tube (including type, serial number, hours of service and reason for its return) be given.

When tubes are returned, they should be shipped to the address specified on the Return Authorization form. A copy of the Return Authorization and also a Service Report for each tube should be packed with the tubes.

FIELD ENGINEERING SERVICE*

STATION LOCATION	REQUEST FIELD ENGINEERING SERVICE FROM
Continental United States or Alaska	Local Broadcast Equipment Sales Representative or the RCA Service Company, Inc., Broadcast Communications Service Division, Camden, N.J. Telephone: Woodlawn 3-8000.
Dominion of Canada	Local Broadcast Equipment Sales Representative, his office, or directly from RCA Victor Company Limited, 1001 Lenoir Street, Montreal, Quebec.
Outside of Continental United States, Alaska, and the Dominion of Canada	Chief Engineer RCA International Division 30 Rockefeller Plaza New York 20, New York, U.S.A.

**Charges for field engineering service will be made at current rates.*

Description	Drawing No.	Stock No.
ANTENNA POLE AND ACCESSORIES, MI-19096		
Bolt, machine, hex head with nut, 5/8-11 x 2" lg, steel, galvanized; for mtg. junction box	8892149-51	97955
Bolt, machine, hex head with nut, 3/8-16 x 2" lg, steel, galvanized; for mtg. radiator	8892149-21	96387
Nut, hex, 5/8-11, steel, galvanized; for pole step	8898736-10	97827
Plug, pipe; for antenna radiator 1/8 I. P. S.	183860-14	97826
Radiator	619081-501	96389
Step, pole, hook type head, 5/8-11 x 6-5/8" lg	8881666-1	97825
Washer, lock, 5/8" steel; for junction box mtg	8887005-35	97933
Washer, lock, 3/8" steel; for radiator mtg.	8887005-31	96386
SET OF FEED LINES AND ACCESSORIES, MI-19177-7 to 13 Incl.		
Bolt, hex head, 3/8-16 x 1-1/4" lg, duronze; for junction box tube and transformer connection	890051-9	97966
Bolt, hex head, 5/16-18 x 3/4" lg, duronze; for fastening jumper to pole	890051-27	98541
Clamp, feed line, 23/32" thk x 1-7/32" wide, aluminum sand casting	8828573-1	97895
Clamp, feed line, 1" wide, aluminum sand casting	8825323-1	97897
Clamp, adjustable, 2-9/16" min. dia. x 3-1/2" max. dia.	897258-1	54371
Clamp, coil retaining	8825337-1	97900
Clamp, adjustable, 13/16" min. dia. x 1-3/4" max. dia.	897258-11	97902
Clamp, adjustable, 1-5/16" min. dia. x 2-1/4" max. dia	897258-3	55913
Clamp. feed line, dual, 1/2" thk. x 3/4" wide, aluminum sand casting	8814052-1	98592
Clamp, feed line, 1" wide, aluminum sand casting	8825323-2	99428
Connector, male, 2-7/16" lg, slotted, phosphor bronze, silver plated; for transformer to junction box connection	8822724-1	98019
Feed Line, 77-1/2-ohm coaxial, 198-1/4" ± 1/4" lg, color code: black and red; for channels 7, 8, 10, 11, and 12	745189-508	98156
Feed Line, 77-1/2-ohm coaxial, 186-3/4" ± 1/4" lg, color code: black and yellow; for channels 9 and 13	745189-509	98157
Gasket, "O Ring", 7/8" I. D. x 1-1/8" O. D.; for r-f cable, junction box connection	449668-17	59695
Gasket, "O Ring", 3-3/8" I. D. x 3-3/4" O. D.; used between junction box tube and transformer	449668-43	97910
Gasket, "O Ring", 7" I. D. x 7-1/2" O. D.; for junction box, between base and cover	449668-68	97965
Hanger Assembly, with five 2" lg leaf springs; transmission line support	465135-501	97890
Hanger Assembly, with six 2-1/2" lg leaf springs; transmission line support	465135-502	97891
Hanger Assembly, with six 3" lg leaf springs; transmission line support	465135-503	97892
Hanger, transmission line support, brass sand casting	8824433-1	98007
Jumper, pole to radiator end seal that points to bottom of pole	465102-501	98003
Jumper, pole to radiator end seal that points to top of pole	465102-503	98004
Jumper, radiator to end seal on pole that points to bottom of pole	465103-501	98005
Jumper, radiator to end seal on pole that points to top of pole	465103-503	98006
Junction Box	747016-501	97964
Nut, hex, 1/4-20 stainless steel; for coil retaining clamp	73103-9	52281
Nut, hex, 3/8-16, duronze; for junction box tube, transformer connection	890053-3	97968
Plate, radiator spacer, bays 1, 2, and 3, channel 10, 1/4" thk. x 2-1/2" x 3-5/8", four 7/16" dia. holes and 7/8" x 7/8" notch, steel, hot dip galvanized	8814094-1	99423
Plate, radiator spacer, lower 6 bays, channel 7, 1/4" thk. x 3-3/4" x 4-1/2", four 7/16" dia. holes and 1-5/8" x 2-7/8" notch, steel, hot dip galvanized	8814095-1	99424
Plate, radiator spacer, bays 4, 5, and 6, channel 10, 1/4" thk. x 2-1/2" x 4", four, 7/16" dia. holes and 7/8" x 1-1/4" notch, steel, galvanized	8814096-1	99425
Plate, radiator spacer, lower 6 bays, channel 8, 1/4" thk. x 2-7/8" x 4-1/4", four, 7/16" dia. holes and 1-1/2" x 2" notch, steel, galvanized	8815339-1	99426
Plate, radiator spacer, lower 6 bays, channel 10, 1/4" thk. x 2-1/2" x 4-1/2", four, 7/16" dia. holes and 1/2" x 1-3/4" notch, steel, galvanized	8814097-1	99427
Plate, radiator spacer, lower 6 bays, channels 11 and 12, 1/4" thk. x 2-1/2" x 4-1/8", four 7/16" dia. holes, steel, galvanized	8816238-1	99429
Plate, radiator spacer, bays 7, 8, and 9, channel 13, 1/4" thk. x 2-1/2" x 4-1/8", four 7/16" dia. holes, steel, galvanized	8816238-5	203051
Plate, radiator spacer, upper 6 bays, channel 11, 1/4" thk. x 2-1/2" x 3-5/8", four 7/16" dia. holes, steel, galvanized	8816238-2	99430
Plate, radiator spacer, upper 6 bays, channel 12, 1/4" thk. x 2-1/2" x 3-3/4", with four 7/16" dia. holes, steel, galvanized	8816238-3	99431
Plate, radiator spacer, upper 6 bays, channel 13, 1/4" thk. x 2-1/2" x 4", with four 7/16" dia. holes, steel, galvanized	8816238-4	99432
Plate, radiator spacer, bays 10, 11, and 12, channel 13, 1/4" thk. x 2-1/2" x 4-3/8", with four 7/16" dia. holes, steel, galvanized	8816238-6	99434
Plate, radiator spacer, upper 6 bays, channel 7, 1/4" thk. x 3" x 3-3/4", with four 7/16" dia. holes with 1" x 2" notch, steel, galvanized	8816249-1	99435
Plate, radiator spacer, bays 4, 5, and 6, channel 8, 1/4" thk. x 2-1/2" x 3-3/4", with four 7/16" dia. holes and 7/8" x 1" notch, steel, galvanized	8816261-1	99436

For Ordering Information See Page 69

Description	Drawing No.	Stock No.
Plate, radiator spacer, bays 1, 2, and 3, channel 8, 1/4" thk. x 2-1/2" x 3-1/2" and 3/4" x 7/8" notch, with four 7/16" dia. holes, steel, galvanized	8816260-1	99437
Plate, radiator spacer, bays 7, 8, and 9, channel 9, 1/4" thk. x 2-1/2" x 4-1/8" with four 7/16" dia. holes and 1-3/8" x 1-1/2" notch, steel, galvanized	8817357-1	99438
Plate, radiator spacer, upper 6 bays, channel 9, 1/4" thk. x 2-1/2" x 3-3/4" with four 7/16" dia. holes and 1" x 1-5/8" notch, steel, galvanized	8817356-1	99439
Plate, radiator spacer, bays 10, 11, and 12, channel 9, 1/4" thk. x 2-1/2" x 4-1/8", with four 7/16" dia. holes, steel, galvanized	8817358-1	99440
Saddle, radiator, 1" x 1-1/4", aluminum sand casting	8822768-1	98009
Screw, cap, hex head, 5/16-18 x 3/4" lg, stainless steel; used to fasten end seal support to pole	59286-16	97904
Screw, shoulder, hex head, 1/4-20, 1-1/2" lg, slotted, aluminum; for feed line strap	8824420-1	97896
Screw, cap, hex head, 5/16-18 x 1" lg, stainless steel; for feed line clamp	59286-18	98526
Screw, cap, hex head, 1/4-20 x 1" lg, stainless steel; used to secure jumper assembly in end seal support	59285-18	98542
Screw, cap, hex head, 5/16-18 x 1/2" lg, stainless steel; for feed line strap	59286-14	98543
Screw, cap, hex head, 5/16-18 x 1-1/2" lg, stainless steel; for feed line clamp, dual	59286-20	98544
Spring, transformer connector, 0.125" wide x 0.250" I.D. x 0.310" O.D., beryllium copper	8822770-1	98020
Screw, hex head, duronze, 5/16-18 x 3/4"; for transmission line hanger	890051-23	96385
Strap, feed line, stainless steel, 0.016" thk. x 1/2" wide x 9" lg	8824427-1	97898
Strap, feed line, stainless steel, 0.016" thk. x 1/2" wide x 7-3/8" lg	8824427-2	97899
Support, end seal to pole, 1" wide, aluminum sand casting	8822767-1	97893
Support, end seal to radiator, aluminum sand casting	8829359-1	98002
Transformer, 3-1/8" O.D. line; channels 7 and 13	633402-501	98001
Valve, needle, junction box pressure release valve	890000-1	97841
Washer, lock, 1/4" stainless steel; for end seal support	59048-35	97833
Washer, lock, 5/16" duronze; used in fastening jumper to pole	8898153-5	97839
Washer, stainless steel; for feed line clamp	189820-14	97903
Washer, lock, 3/8" duronze; for junction box tube and transformer connection	8898153-7	97967
Washer, lock, 5/16" stainless steel; for end seal support	59048-36	98527
SLEET MELTING EQUIPMENT, MI-19009-J		
Clamp, cable, 5/8" with 0.257" dia. mtg. hole; for junction box and riser cable	892526-21	97830
Connector, 1/2" tapered pipe thread; for heater cords	880918-2	97828
Connector, 1" tapered pipe thread; for riser bus cable	880918-3	97829
Heater, sleet melter, 250 watts, 110 volts, 45" lg with 4 ft. lg., 2-conductor cable	445638-4	58940
Screw, machine, 1/4-20 x 1/2" round head, slotted, stainless steel	59280-13	97832
Screw, set, hex socket (Allen) type, 10-32 x 1/4" cup point; stainless steel	8898666-83	98162
Screw, machine, 1/4-20 x 3/4", round head, stainless steel	59280-17	98163
Washer, lock, split type, 1/4", stainless steel	59048-35	97833
Wrench, Allen set screw #10	828505-1	26581

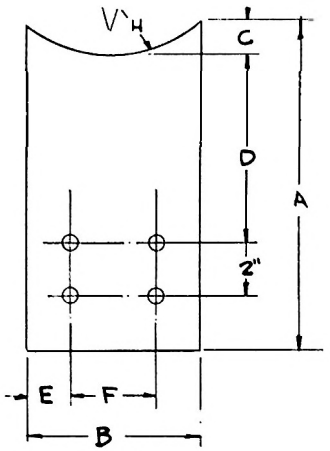


FIG. #1

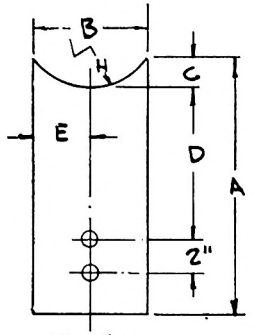


FIG. #2

DETAIL OF PLATE MAT'L. ST'L 1/4 THK.

DIMENSIONS FOR PLATE								
PT	FIG.	A	B	C	D	E	F	H (RAD.)
2	1	10 1/8	9	1 3/4	4 5/8	2 1/4	4 1/2	6 7/16
3	1	11 5/8	6	1 3/16	6 5/8	1 1/2	3	4 3/8
4	2	13 1/4	4	15/16	8 1/2	2	OMIT	2 9/16

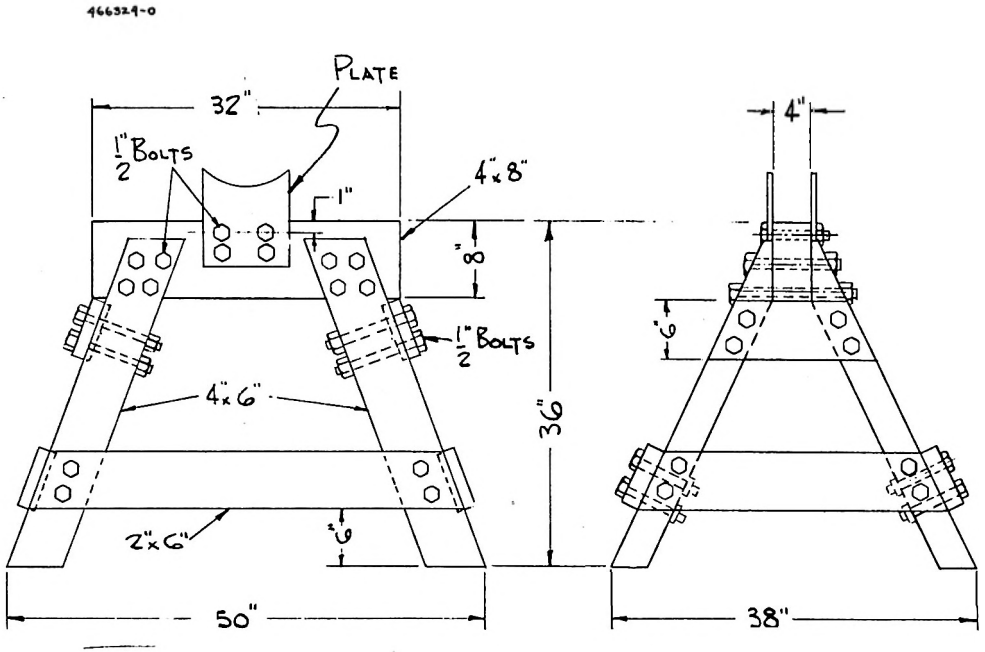
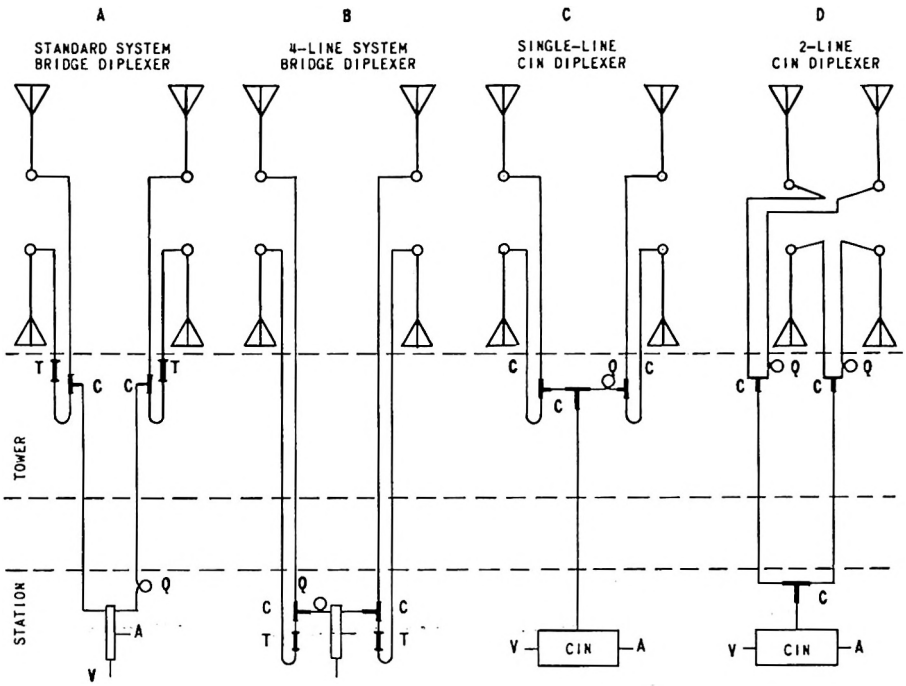


Figure 17 - Antenna Mounting Trestle

TRANSMISSION LINE SYSTEMS FOR FEEDING ANTENNAS OF MORE THAN SIX LAYERS



EMERGENCY OPERATION			
FIGURE-8 PATTERN	MODIFIED FIGURE-8 PATTERN	NONE	CIRCULAR, HALF POWER

THE (A) STANDARD SYSTEM IS USED IN MOST CASES SINCE IT PROVIDES FOR EMERGENCY OPERATION AND USES THE BRIDGE DIPLEXING SYSTEM FOR COMBINED VISUAL AND AURAL OPERATION INTO THE ANTENNA. IF ONE LINE FAILS IT IS REPLACED AT THE DIPLEXER BY A R-F LOAD AND WATTMETER.

THE (B) SYSTEM PROVIDES GREATER FLEXIBILITY BY THE ADDITION OF TWO MORE TRANSMISSION LINES.

THE (C) SYSTEM CAN BE USED WHERE THE TRANSMISSION LINE LENGTH IS VERY GREAT AND WHERE OTHER EMERGENCY ANTENNA FACILITIES ARE AVAILABLE.

THE (D) SYSTEM RESULTS IN A HALF-POWER CIRCULAR PATTERN FOR EMERGENCY OPERATION.

LEGEND

- C – COMBINING TEE
- T – BEAM TILTING ADJUSTMENT
- Q – QUADRATURE PHASING LENGTH
- A – AURAL INPUT
- V – VISUAL INPUT
- CIN – CONSTANT IMPEDANCE NOTCH DIPLEXER. A FILTERPLEXER, (COMBINED VESTIGIAL SIDEBAND FILTER AND DIPLEXER) MAY ALSO BE USED.

B-464592-O

Figure 18 - Antenna Feed Systems

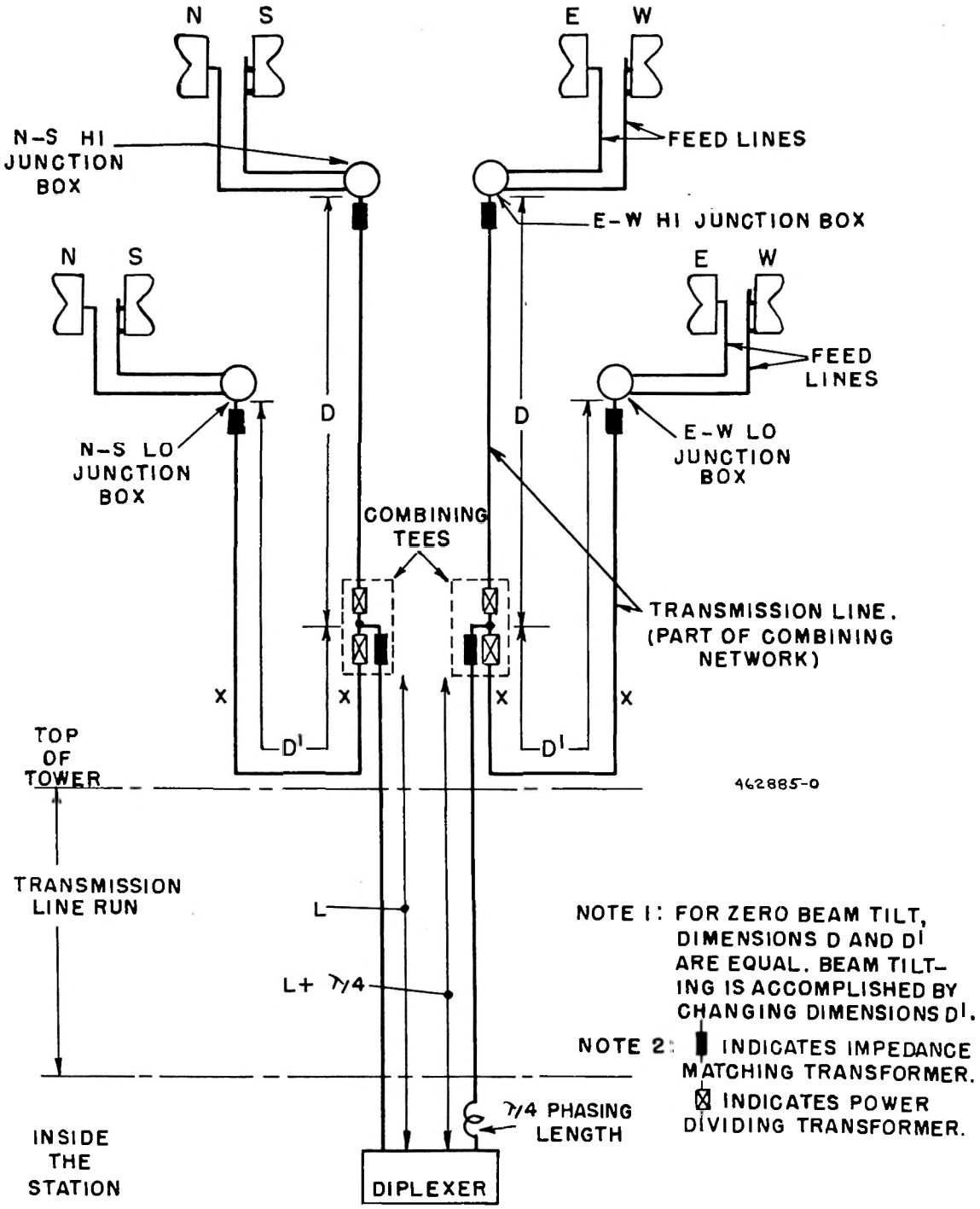


Figure 19 - Simplified Schematic Diagram, TF-12AH Feed System

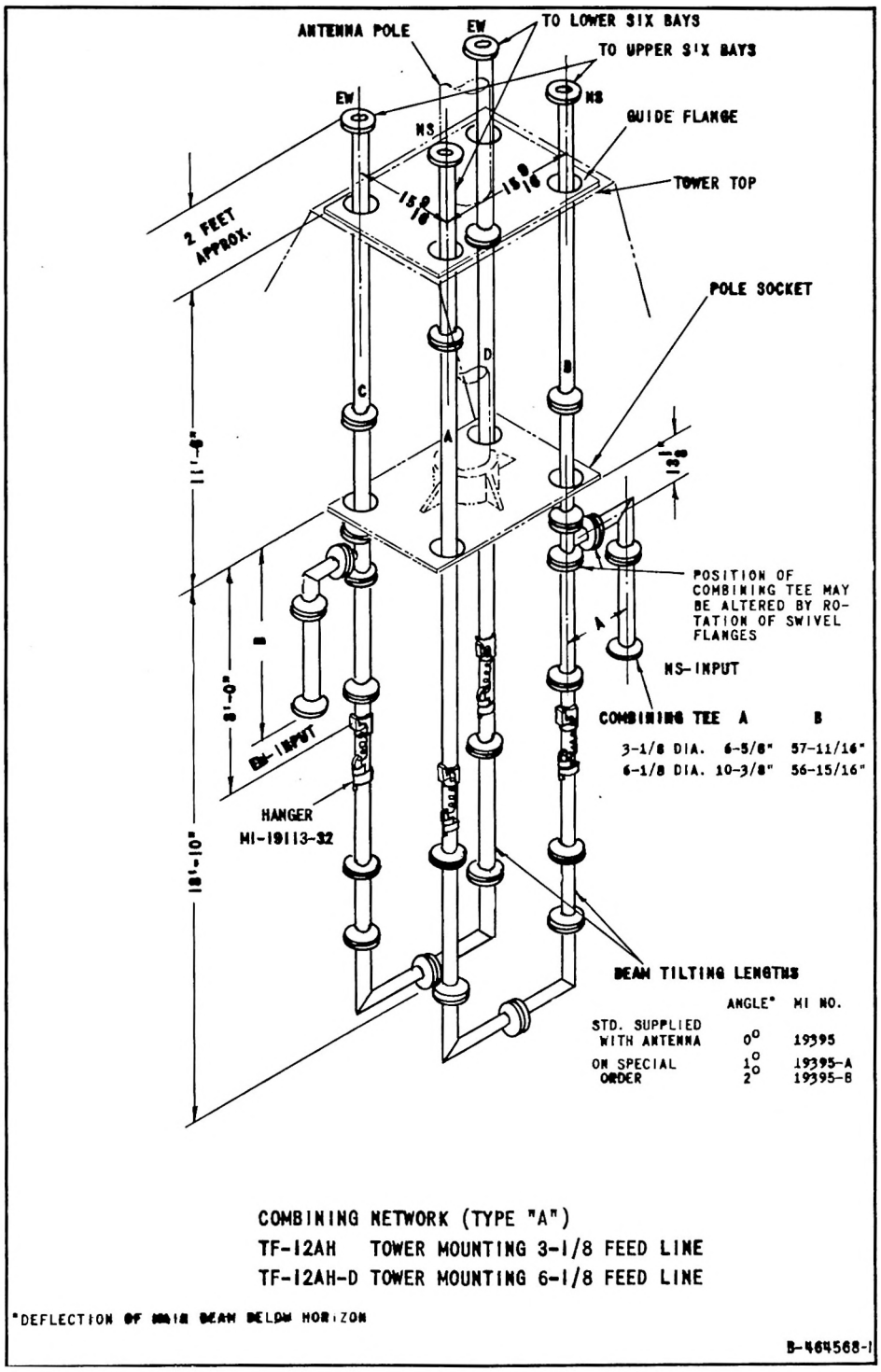


Figure 20 - Combining Network

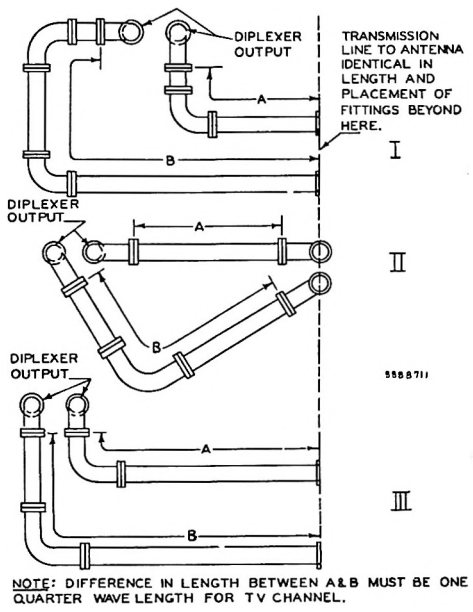


Figure 21 - Typical Quarter-Wavelength Phasing Layouts

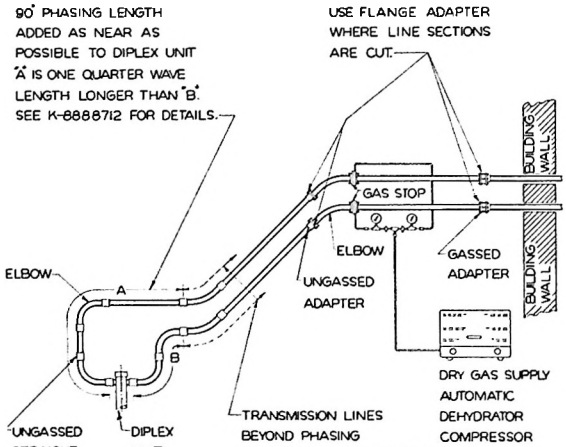


Figure 22 - Typical Transmission Line Installation Inside the Station

TYPICAL INSTALLATION OF TV TRANSMISSION LINE ON TOWER DUAL LINES ARE USED FOR TV REFER TO TABLE BELOW FOR SYMBOL DESIGNATIONS

SYMBOL DESIGNATIONS

SYMBOL	DESCRIPTION	1 5/8 DIA. MI NO.	3 1/8 DIA. MI NO.	6 1/8 DIA. MI NO.
A	TRANSMISSION LINE	19112-1	19113-1	19314-1
B	90° ELBOW	19112-2	19113-2	19314-2
C	REDUCER 3 1/8 TO 1 5/8	19112-6	19113-6	
C	REDUCER 6 1/8 TO 3 1/8			19314-4
D	GAS STOP	19112-5	19113-5	
E	ADAPTER	19112-4	19113-4	
F	GASSING ACCESSORIES	19112-12	19113-12	
G	FIXED HANGER	19112-15	19113-15	
H	SPRING HANGER	19112-14	19113-14	
J	LATERAL BRACE	19312-36	19313-36	
K	HORIZONTAL ANCHOR	19312-18	19313-18	
M	ROLLER ASSEMBLY	19312-35	19313-35	
N	SWIVEL HANGER	19312-38	19313-38	
P	45° ELBOW	19112-3	19113-3	19314-3
R	DEHYDRATOR	ON APPLICATION		

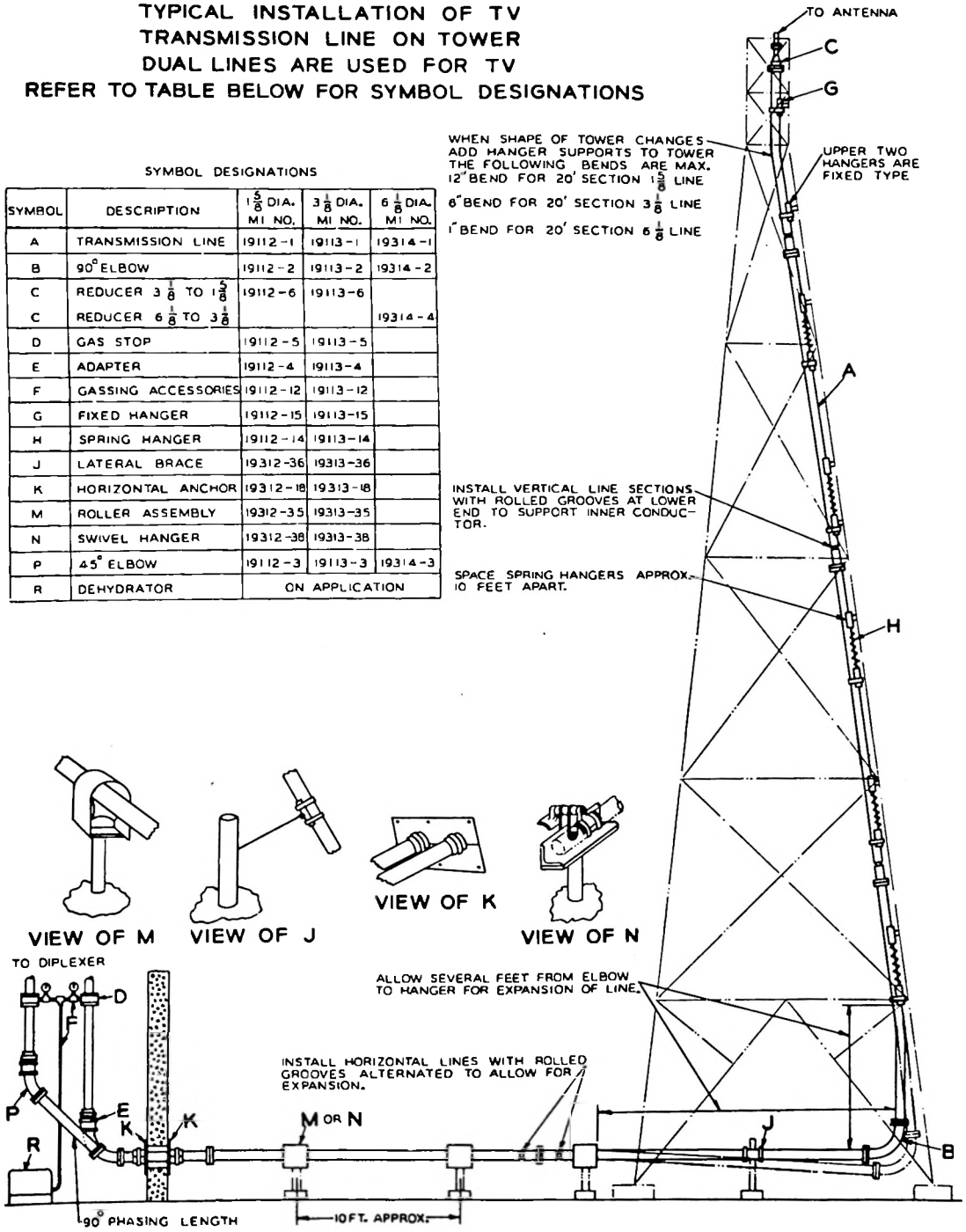


Figure 23 - Typical Transmission Line Installation on Tower

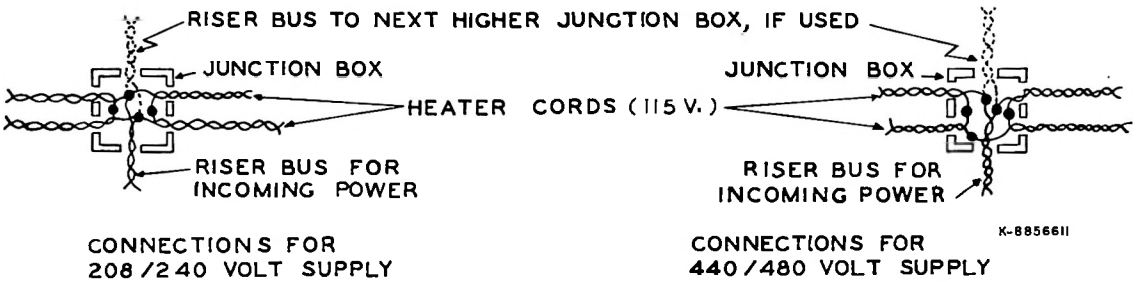


Figure 24 - Power Connections for Sleet Melting Equipment

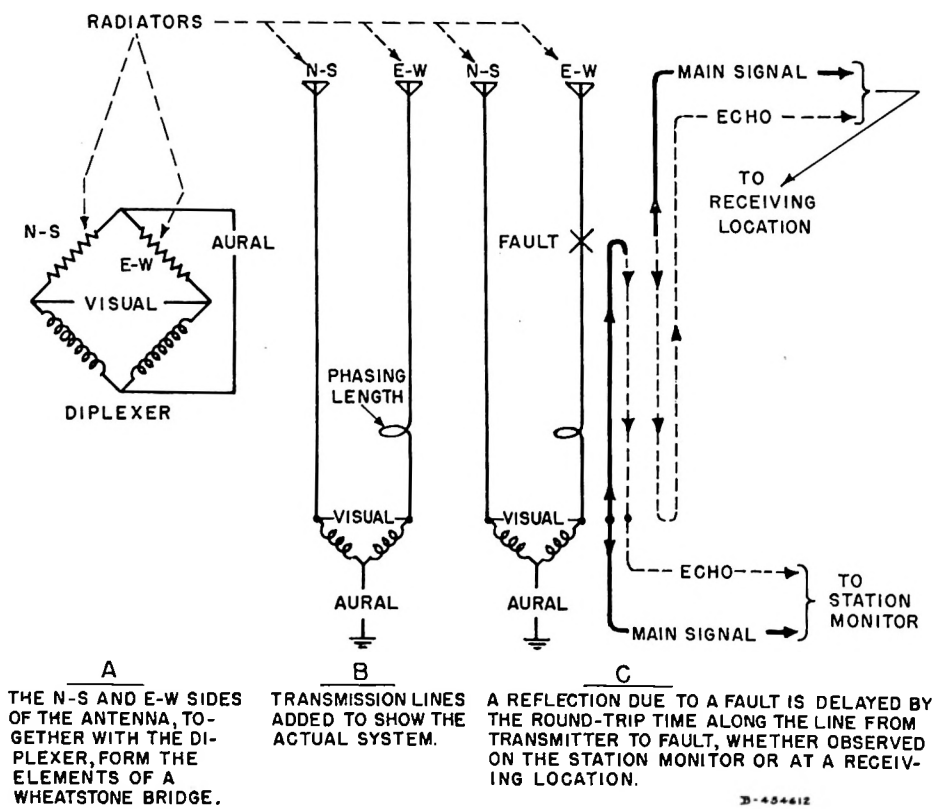
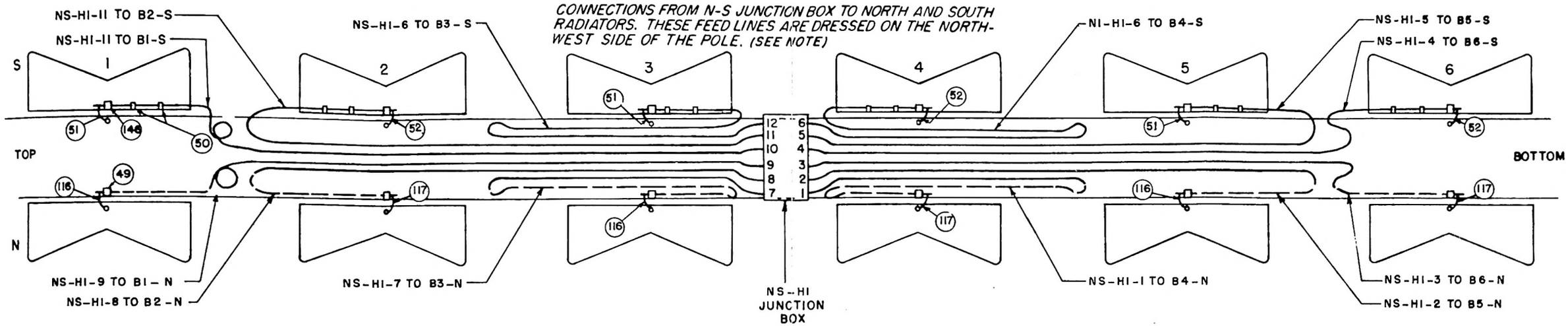


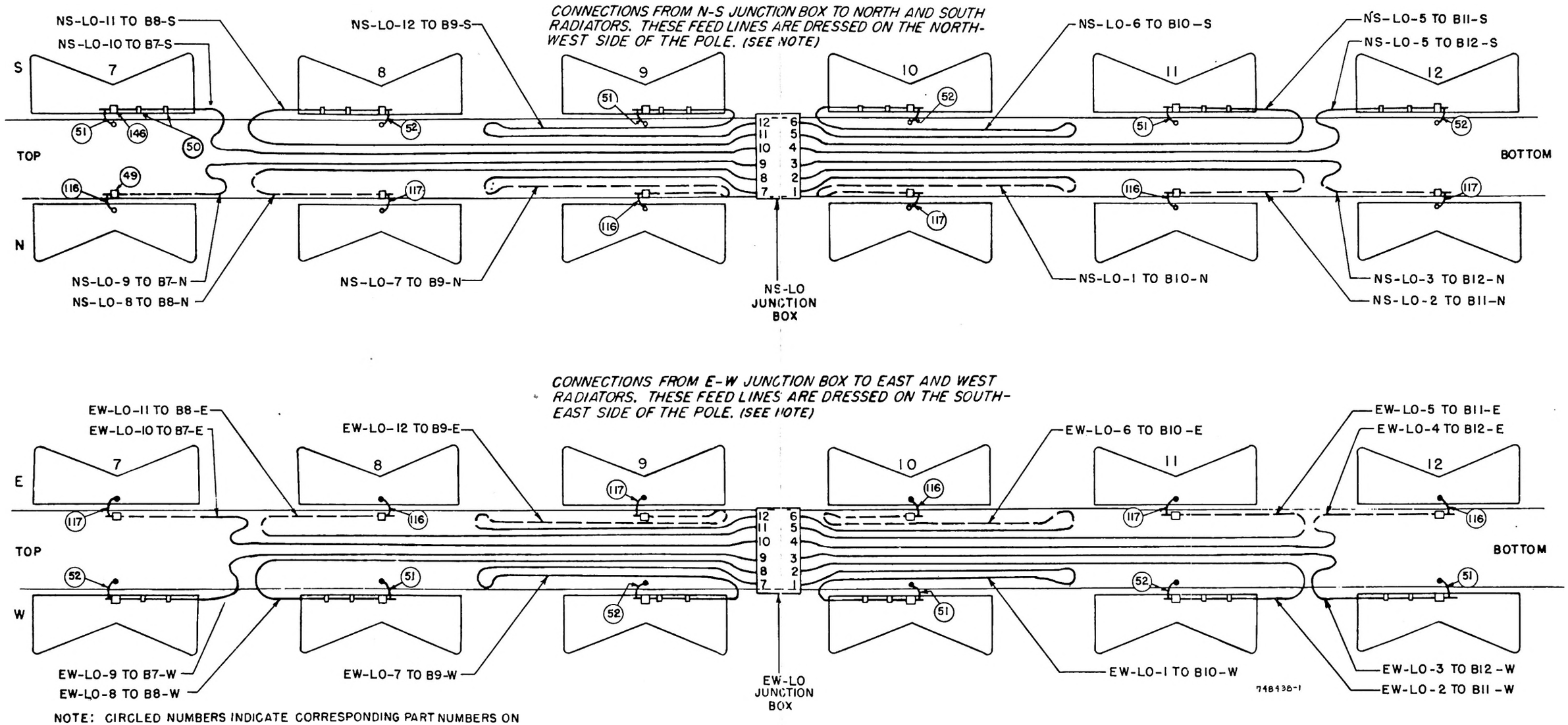
Figure 25 - Electrical Equivalent of Superturnstile Antenna



NOTE: CIRCLED NUMBERS INDICATE CORRESPONDING PART NUMBERS ON ASSEMBLY DRAWING AND MATERIAL PARTS LIST.

NOTE: FROM THE JUNCTION BOXES, THE FEED LINES ARE DRESSED ON THE NORTHWEST AND SOUTHEAST SIDES OF THE POLE TO THE POINTS AT WHICH THE BENDS OCCUR. BEYOND THESE POINTS, THE FEED LINES TO THE SOUTH AND WEST RADIATORS ARE DRESSED ON THE SOUTHWEST SIDE OF THE POLE; AND THE FEED LINES TO THE NORTH AND EAST RADIATORS (DOTTED PORTIONS) ARE DRESSED ON THE NORTHEAST SIDE OF THE POLE.

Figure 26 - Feed Line Arrangement, Upper Six Sections



NOTE: CIRCLED NUMBERS INDICATE CORRESPONDING PART NUMBERS ON ASSEMBLY DRAWING AND MATERIAL PARTS LIST.

NOTE: FROM THE JUNCTION BOXES, THE FEED LINES ARE DRESSED ON THE NORTHWEST AND SOUTHEAST SIDES OF THE POLE TO THE POINTS AT WHICH THE BENDS OCCUR. BEYOND THESE POINTS, THE FEED LINES TO THE SOUTH AND WEST RADIATORS ARE DRESSED ON THE SOUTHWEST SIDE OF THE POLE; AND THE FEED LINES TO THE NORTH AND EAST RADIATORS (DOTTED PORTIONS) ARE DRESSED ON THE NORTHEAST SIDE OF THE POLE.

Figure 27 - Feed Line Arrangement, Lower Six Sections

NOTES

NOTES

ADDENDA TO IB-36129

INSTRUCTION BOOK FOR TF-12AH and TF-12AH-P

SUPERTURNSTILE ANTENNAS

Disposition: To be inserted in and become part of IB-36129.

Make the following changes in the subject instruction book at the places indicated.

1. Replace the Engineering Data sheets on pages 5 and 6 with Figures 1 and 2 of this addenda. Substitute Figure 1 for the drawing on page 5 and Figure 2 for the drawing on page 6.

2. On page 7, in the table at the bottom of the page, change the RCA Reference to MI-19009-J-1. All subsequent references to sleet melting equipment should also be MI-19009-J-1.

3. Immediately following the heading COMBINING NETWORK, on page 10, delete the first sentence, and in its place substitute:

The combining network, Figure 20 for tower mounting, or Figure 20A for pedestal mounting, performs the following functions:

4. Delete the third paragraph from the bottom of page 13 beginning, "It is desirable...", and in its place substitute:

It is desirable that the antenna be mounted immediately following erection of the tower as the services of the same rigging crew may be employed. An RCA Service Company engineer should be present to supervise the assembly and installation of the antenna. A nominal amount of engineering time, for assembly supervision and electrical tests on the ground, is included in the antenna contract. System tests following erection may be contracted for with the RCA Service Company.

5. Add the following notes to the POLE ASSEMBLY procedure on page 15:

To insure that the pole is straight and strong enough to carry the array of elements, and to withstand the wind velocities and loading stated in the TECHNICAL SUMMARY, the following requirements must be met for each field-joint weld:

All welding procedures should comply with the American Welding Society Qualification Procedure publication B 3.0 - 41T or equivalent. Only operators that have qualified under this procedure should be employed. Use electrodes equivalent to classification number E-6010 in accordance with A.S.T.M. Designation A233-48T. Local building codes must be observed.

Shore up the pole sufficiently to be sure there are no bends in the entire length. Probably the best method of doing this is to support the pole sections with blocks of various heights resting on the ground.

One method of checking the pole straightness with the unit lying horizontally, is to use a spirit level on the upper or lower side while using the eye in the other quadrants. If the pole is assembled on the tower the spirit level may be utilized in all quadrants.

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RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DIVISION
Camden 2, New Jersey, U.S.A.

Printed in U.S.A.

Another and more accurate method, which may be employed with the pole mounted horizontally on the trestles or vertically on the tower, would be to use a surveyors transit.

Make certain the pole sections are seated to the full depth of the various sockets, and that the field-joint setscrews are tight. Recheck the straightness. Without changing the position of the pole, tack-weld at one spot. At a location 180 degrees from this spot tack-weld again, then tack-weld at right angles to these spots.

Make one root pass between any two tack-welds. At 180 degrees from this area make another root pass through a distance of 90 degrees. Then complete the remaining quadrants.

Recheck the pole straightness. If after making the root passes any slight pole distortion is noted, it can probably be corrected by applying heat from a large torch on the side of the pole opposite the point of greatest arc. Should this technique prove unsuccessful, "wash out" the welds, straighten the pole and repeat the root-pass operations.

If the pole is still straight after the root passes have been completed, fill in the remainder of the groove to make a full-depth or fillet weld, as required.

Recheck the pole straightness. Minor deformations in the pole at this stage of erection may possibly be removed by the application of the flame of a torch as described in a previous paragraph. A variation of this method which has met with repeated success, even in cases of severe warpage, is to use a combination of heat and hydraulic pressure.

Upon completing welding of the joints, remove the setscrews and plug-weld the setscrew holes. These welds should be accomplished in the same sequence as the other welds; i.e., weld one plug, then another located 180 degrees away, and then complete the remainder.

WARNING

RCA CANNOT ASSUME ANY RESPONSIBILITY FOR POLE WARPAGE, MISALIGNMENT, OR LOOSE JOINTS DUE TO IMPROPER WELDING PROCEDURES.

It is a good plan to investigate the availability of qualified welders prior to installation time. If this is done, a delay due to lack of qualified welding personnel may be avoided.

After all welding operations have been completed, grind the welds only enough to remove irregularities which might lead to strain cracks and paint each weld with one coat of red lead to prevent rusting.

6. After the second paragraph under the heading RADIATOR MOUNTING on page 17 add:

Previous to assembling the radiators to the pole, check each radiator vertical member for straightness. Looking at a radiator "broadside", the vertical tube should be straight within ±1/16 inch. For slight variations from this tolerance, the radiator should be straightened. However, if the tube straightness varies by more than 1/4 inch, the radiator should be rejected or, in the interest of expediting the installation, it may possibly be repaired in a local metal-working establishment.

7. Immediately following the heading SLEET MELTING EQUIPMENT, on page 26, insert:

Sleet melting equipment may be used on the antenna to keep the "slots" between the pole and radiators free of ice. For this protection, a resistance-type heater is inserted in each vertical radiator tube to prevent the initial formation of ice.

8. Near the bottom of page 26, delete the CAUTION and in its place substitute:

Ice forms between the temperatures of 10 and 35 degrees F depending upon the station location. Therefore care must be taken to have the heaters inoperative when temperatures are outside these limits. Heater control may be accomplished either manually or automatically. If automatic operation is desired, an Automatic Sleet Melter Control Unit, MI-27369, is available on order from RCA Broadcast Sales.

CAUTION

BE CERTAIN THE CONTROL EQUIPMENT IS FUNCTIONING PROPERLY, AND AVOID OPERATION OF THE HEATERS WHEN AIR TEMPERATURE IS ABOVE 40 DEGREES F OR AFTER HEAVY ICE ACCUMULATIONS. OPERATION UNDER THESE CONDITIONS WILL OVERHEAT AND DAMAGE THE ELEMENTS AND THE FEED LINES.

In locations where extreme icing conditions and heavy winds exist, it is recommended that the heater cords be reinforced by inserting them in a metal tubing that is anchored at both ends of the cord.

To install the tubing, the following procedure is recommended:

a. Purchase standard flare fittings, 1/2-inch pipe thread to 1/2-inch O.D. tubing. Two flare fittings are required for each heater.

b. Purchase soft copper tubing, 1/2-inch O.D. x 0.032-inch wall. Four feet for each heater should be sufficient.

c. Remove rubber compression fitting by unscrewing connector on end of heater, then remove brass bushing that screws into coupling. DO NOT REMOVE STRAIGHT COUPLING.

d. Screw flare fitting into coupling.

e. Insert flare fittings into junction box in place of 1/2-inch connectors.

f. Measure the required length of copper tubing for each heater-to-junction box cord, then cut the tubing to suit, allowing enough for a flare on both ends.

g. Slide the flare fitting nuts on the lengths of tubing, making certain the nuts face in the proper direction, and then flare the ends of the tubing.

h. Slide the tubing assemblies over the heater cords and couple the flare fitting nuts to the flare fittings allowing enough heater cord to protrude in junction box for splicing.

9. Replace the text following the heading JUMPER INSTALLATION (page 26) with the material which follows:

Four types of jumper assemblies are furnished with the antenna. Since some of the jumpers are very similar in appearance, the instructions for installing the jumpers should be carefully followed.

All of the jumpers are stamped with a drawing and group number. The tabulation following this paragraph correlates these numbers with the part numbers shown on the assembly drawing. Consequently, the jumpers may be sorted into four piles or put into four marked containers to facilitate their proper installation.

DRAWING NUMBER	PART NUMBER
465102-501	51
465102-503	52
465103-501	116
465103-503	117

After the jumpers have been identified, refer to section "A-A" on the assembly drawing and proceed as follows:

Mount a jumper (116) on the vertical tube of the NORTH radiator in section one using two 1-3/4-inch strap clamps (133). This jumper should be positioned at the center of the radiator, with a strap clamp located on either side of the center horizontal rod of the radiator. The free end of the jumper should point toward the center conductor of the end seal. Do not clamp it to the end seal at present. The d-c tests that will be made on the antenna require that the jumpers be disconnected from the end seal. Note that the slope of the jumper points in the same direction as the free end of its associated feed line. This relationship between the jumper and the feed line holds true for all the jumpers.

In the same manner, mount jumpers (116) on the NORTH radiators in sections three, five, seven, nine, and eleven; and on the EAST radiators in sections two, four, six, eight, ten, and twelve.

Mount jumpers (117) on the NORTH radiators in sections two, four, six, eight, ten, and twelve; and on the EAST radiators in sections one, three, five, seven, nine, and eleven.

Mount a jumper (51) on the pole adjacent to the center of the SOUTH radiator in section one, using two 5/16-18 x 1/2-inch bolts (123) and lockwashers (128). The free end should point toward the center conductor of the end seal mounted on the radiator. Do not clamp the jumper to the end seal at this time.

Mount jumpers (51) on the pole adjacent to the SOUTH radiators in sections three, five, seven, nine, and eleven; and on the pole adjacent to the WEST radiators in sections two, four, six, eight, ten, and twelve in the same manner.

Mount jumpers (52) on the pole adjacent to the SOUTH radiators in sections two, four, six, eight, ten, and twelve; and on the pole adjacent to the WEST radiators in sections one, three, five, seven, nine, and eleven.

ELECTRICAL TESTS

It is important that a site be found for checking the VSWR of the antenna while the antenna is mounted on the trestles. If possible, the testing area should be located at least 25 feet distant from any object that might cause reflections of the radio wave and result in erroneous impedance measurements. If an interfering object is close by, point the antenna at an angle to, rather than parallel with, this object. The antenna can not be tested on steel trestles or on the roof of a steel-constructed building.

The following electrical tests will at this time normally be made by the RCA Service Company engineer:

The bottom ends of the transformers (transmission line sections) attached to the junction boxes are sealed by cover plates. In order to perform the following electrical tests on the

feed-line system, it will first be necessary to remove these cover plates. A Wheatstone bridge and a negger will be required for the tests.

a. Connect the megger to the input of a junction box. With all the jumpers disconnected from the end seals, the shunt resistance should exceed 100 megohms. If the resistance is somewhat less than this, it probably indicates moisture in the feed system. In this case clear the system of moisture as described under Pre-Erection Gassing, then recheck the shunt resistance.

If the shunt resistance is extremely low (less than one megohm) it probably indicates a faulty feed line. Isolate the faulty line by removing the lines one at a time from the junction box. Be certain one of the jumpers is not touching the center conductor at an end seal.

b. Connect the Wheatstone bridge to the input of a junction box. Measure the closed-circuit resistance of each feed line connected to this junction box by touching each jumper in turn to the center conductor of its associated feed line. The resistance should be between 0.010 and 0.015 ohm. If any line deviates from these limits, it is probably a faulty feed line or the jumper is making poor contact. If the resistance values of all the lines are approximately equal and all exceed the limits previously mentioned, it is probable that a poor connection exists between the transformer and junction box.

Repeat this test on the remaining junction boxes.

After the foregoing electrical tests have been accomplished connect all of the jumpers to their corresponding end seals. The jumpers should be installed with only enough slack to allow for the slight "bow-out" shown on the assembly drawing, section "A-A". Make certain the "bow-out" arcs in the direction of the radiator centerline as shown. Because of the various distances between the pole and vertical radiator tubes, an adjustment may be necessary on some jumper assemblies. To adjust the NORTH and EAST jumper assemblies, rotate the jumper assembly on the vertical tubes of the radiators. To adjust the SOUTH and WEST jumper assemblies, rotate the end-seal supports on the radiator vertical tubes.

c. Using either a sweep generator and delay line, or preferably a 51.5-ohm slotted measuring line, check the antenna VSWR at the input of each junction box. For this test, the radiators undergoing test must lie in the vertical plane. Under no circumstances should this reading exceed 1.1 at any frequency within the channel.

Replace the cover plates on the bottoms of the transmission line sections attached to the junction boxes. Be certain the "O"-ring gaskets are properly seated.

10. Add the following paragraph to the antenna mounting notes on page 29:

Before lowering antenna through guide flange and pole socket or pedestal, make certain that the orientation of the transmission lines is correct, relative to planned location of combining network. Orientation of the antenna, other than that proposed during the transmission line layout, will require re-orientation of the combining network or antenna. Re-orientation of the combining network will make necessary a revision in the planned routing of the tower transmission lines.

11. Add the following material to the first paragraph after item 4 on page 30:

Note that an inner connector adapter is furnished with each junction box. This adapter is to be used with MI-19313 transmission line. Exercise care that the smaller diameter of the adapter is inserted into the junction box.

12. Replace the tabulation at the bottom of page 31 and the top of page 32 with the following table:

QUARTER-WAVELENGTH PHASING LINE

DIMENSIONS

Channel	Frequency (megacycles)	Electrical Quarter Wavelength (inches)	*Physical Length of Teflon Line MI-19313 3-1/8" dia. (inches)
7	174 to 180	16-5/8	16-5/8
8	180 to 186	16-1/8	16-1/8
9	186 to 192	15-5/8	15-5/8
10	192 to 198	15-1/8	15-1/8
11	198 to 204	14-3/8	14-3/8
12	204 to 210	14-1/4	14-1/4
13	210 to 216	13-7/8	13-7/8

*Based on quarter-wave section without insulators.

13. In the tabulation on page 33, change MI-19113-B-48 to MI-19113-B-53.

14. In the note following Step 2 on page 34, change MI-19113-B-50 to MI-19089-15.

15. Add the following paragraph to the text immediately preceding the heading OPERATION.

Note that a number of spare antenna components (itemized on MI sheets) are still on hand even though the installation is complete. It is a good plan to place these spares in a convenient dry storage for future use. The station spares should be maintained at this level at all times. This procedure may prove profitable both in time and money.

16. In the PARTS LIST (page 71) make the following changes:

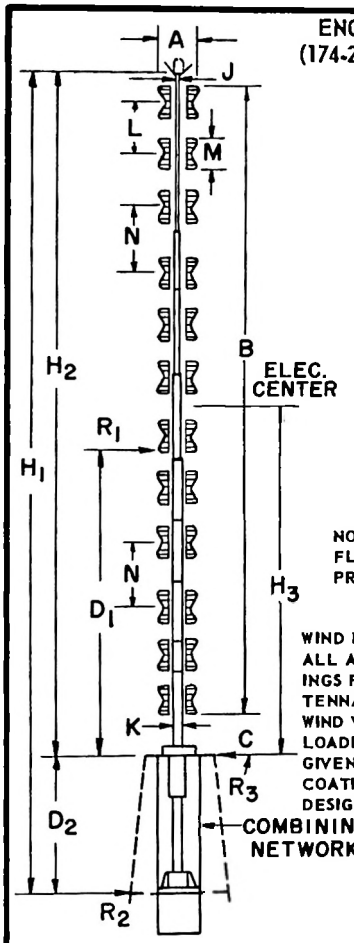
(a) Change the Drawing No. of the Transformer to 634405-506.

(b) Change the Stock No. of the Transformer to 204320.

(c) Change the Drawing No. of the Heater to 471402-4.

(d) Change the Stock No. of the Heater to 204170.

17. Replace Figure 20 on page 75 with Figure 3 of this addenda; and add Figure 4 of this addenda to the book as Figure 20A.



ENGINEERING DATA FOR TF-12AH TOWER MOUNTED (174-216 MC) SUPERTURNSTILE TELEVISION ANTENNA

MECHANICAL SPECIFICATIONS

WEIGHT	8000 #	H_2	72'-11"
A	3'-2"	H_3 *	44'-3 7/16"
B	68'-5 3/8"	J	5" O.D.
C	3'-0 1/4"	K	12 3/4" O.D.
D_1	32'-2"	L	5'-8"
D_2	11'-6"	M	3'-7 3/8"
H_1	84'-5"	N	6'-11" (AT CENTER)

SHIPPING LENGTHS: (26'-8") (23'-9") (17'-8") (21'-10")
SHIPPING WEIGHTS: (491#) (1226#) (1749#) (2213 #)
TRANS. LINE CONN.: 16'-3 7/8" BELOW TOWER TOP FLANGES. MI-19113 TYPE

LOADS, REACTIONS & MOMENTS FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 3950$ #
$R_2 = 11{,}070$ #
$R_3 = 15{,}020$ #
$M = R_1 \times D_1 = 127{,}000$ ft.#

NOTE: THESE VALUES ARE FOR A 50#/SQ. FT. WIND PRESSURE ON FLATS. VALUES FOR OTHER PRESSURES MAY BE OBTAINED BY PROPORTION.

STRUCTURAL DESIGN ASSUMPTIONS

WIND PRESSURE: 50 psf ON FLATS (30 psf ON CYLINDRICAL SURFACES). ALL ANTENNA MEMBERS ARE CONSIDERED CYLINDRICAL BUT RATINGS FOR FLAT SURFACES SHOULD BE USED WHEN COMPARING ANTENNA AND TOWER SPECIFICATIONS.
WIND VELOCITY (NO ICE) 110 mph (TRUE EXTREME).
LOADINGS WITH ICE MUST BE CALCULATED WITH CONSIDERATION GIVEN TO WEATHER RECORDS, HIGHEST WIND VELOCITY & MAX. ICE COATING EXPERIENCED OR ANTICIPATED.
DESIGN STRESSES: A.I.S.C. 20,000 psi (IN BENDING).
SUGGESTED ANTENNA BASE STABILITY: 1°

ELECTRICAL SPECIFICATIONS

POWER RATING: 50 KW (35 KW EACH HALF)
CIRCULARITY: ±2 DB
INPUT IMPEDANCE: 51 1/2 OHMS (ACTUAL). (V.S.W.R. 1.1 OR BETTER). FOR MI-19113 LINE USE MI-19113B-53 TRANSFORMERS.

GAIN (AT VISUAL CARRIER):

CHANNEL	7	8	9	10	11	12	13
POWER GAIN**	11.5	11.7	12.1	12.4	12.1	11.8	11.7
DB GAIN	10.61	10.68	10.83	10.93	10.83	10.72	10.68

GUIDE FLANGE DWG: 745166-501
POLE SOCKET DWG: 745167-504

† INFORMATION MAY BE OBTAINED ON OTHER CONNECTIONS. REFER TO DWG. 461467

ACCESSORIES

SLEET MELTERS: 12 OF MI-19009-J-1. POWER REQUIRED: 12 KW 230 VOLTS 3Ø, OR 460 VOLTS 1Ø OR 3Ø.
BEAM TILTING SECTIONS: FOR 1°, 1 OF MI-19395-A
FOR 1/2°, 1 OF MI-19395

TRANSMISSION LINE CONNECTIONS †

TYPE NO.	LINES	DIPLEXER	DWG. AND TYPE	COMBINING NETWORK DWG.
TF-12AH	TWO- 3 1/8	BRIDGE	B-464592-A	627884
TF-12AH-A	FOUR- 3 1/8	BRIDGE	B-464592-B	627884
TF-12AH-D	TWO- 6 1/8	BRIDGE	B-464592-A	627884
TF-12AH-E	FOUR- 6 1/8	BRIDGE	B-464592-B	627884

* H_3 IS FOR 70-30 POWER DIVISION (STANDARD ANTENNA). H_3 FOR 50-50 POWER DIVISION IS 37'-2 15/16'
** GAIN FIGURES ARE FOR 70-30 POWER DIVISION. POWER GAINS FOR 50-50 POWER DIVISION ARE 4% HIGHER.

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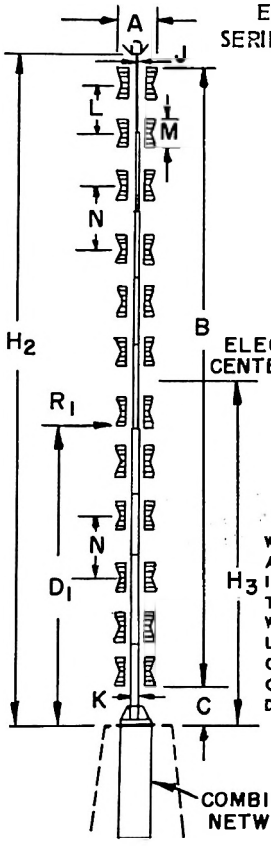
Figure 1

ENGINEERING DATA FOR TF-12AH-P PEDESTAL MOUNTED SERIES (174-216 MC) SUPERTURNSTILE TELEVISION ANTENNAS



PEDESTAL DWG: 463057-501

MECHANICAL SPECIFICATIONS

WEIGHT	7675#	H_3 *	46'-9 1/16"
A	3'-2"	J	5" O.D.
B	68'-5 3/8"	K	12 3/4" O.D.
C	5'-5 7/8"	L	5'-8"
D_1	34'-0"	M	3'-7 3/8"
H_2	75'-4 5/8"	N	6'-11" (AT CENTER)

SHIPPING LENGTHS: (26'-8") (23'-9") (17'-8") (10'-9 5/8")
SHIPPING WEIGHTS: (491#) (1226#) (1749#) (1112#)
TRANS. LINE CONN.: 4'-9 3/8" BELOW TOWER TOP
. FLANGES: MI-19313 TYPE.

LOADS, REACTIONS & MOMENTS FOR MAXIMUM DESIGN CONDITIONS

$R_1 = 3900\#$

$M = R_1 X D_1 = 132{,}700$ ft.#

NOTE: THESE VALUES ARE FOR A 50#/ SQ. FT. WIND PRESSURE ON FLATS. VALUES FOR OTHER PRESSURES MAY BE OBTAINED BY PROPORTION.

STRUCTURAL DESIGN ASSUMPTIONS

WIND PRESSURE: 50 psf ON FLATS (30 psf ON CYLINDRICAL SURFACES) ALL ANTENNA MEMBERS ARE CONSIDERED CYLINDRICAL BUT RATINGS FOR FLAT SURFACES SHOULD BE USED WHEN COMPARING ANTENNA AND TOWER SPECIFICATIONS.
WIND VELOCITY (NO ICE) 110 mph (TRUE EXTREME).
LOADINGS WITH ICE MUST BE CALCULATED WITH CONSIDERATION GIVEN TO WEATHER RECORDS, HIGHEST WIND VELOCITY & MAX. ICE COATING EXPERIENCED OR ANTICIPATED.
DESIGN STRESSES: A.I.S.C. 20,000 psi (IN BENDING).
SUGGESTED ANTENNA BASE STABILITY: 1°.

ELECTRICAL SPECIFICATIONS

POWER RATING: 50 KW (35 KW EACH HALF)
CIRCULARITY: ±2 DB
INPUT IMPEDANCE: 51 1/2 OHMS ACTUAL. (V.S.W.R. 1.1 OR BETTER). FOR MI-19113 LINE USE MI-19113B-53 TRANSFORMER.

GAIN (AT VISUAL CARRIER):

CHANNEL	7	8	9	10	11	12	13
POWER GAIN**	11.5	11.7	12.1	12.4	12.1	11.8	11.7
DB GAIN	10.61	10.68	10.83	10.93	10.83	10.72	10.68

ACCESSORIES

SLEET MELTERS: 12 OF MI-19009-J-1. POWER REQUIRED: 12 KW. 230 VOLTS 3Ø, OR 460 VOLTS 1Ø OR 3Ø.
BEAM TILTING SECTIONS: FOR 1°, 1 OF MI-19395-A.
FOR 1/2°, 1 OF MI-19395.

TRANSMISSION LINE CONNECTIONS†

TYPE NO.	LINES	DIPLEXER	DWG. AND TYPE	COMBINING NETWORK DWG.
TF-12AH-P	TWO- 3 1/8	BRIDGE	B-464592-A	627884
TF-12AH-PA	FOUR- 3 1/8	BRIDGE	B-464592-B	627884
TF-12AH-PD	TWO- 6 1/8	BRIDGE	B-464592-A	627884
TF-12AH-PE	FOUR- 6 1/8	BRIDGE	B-464592-B	627884

* H_3 FOR 70-30 POWER DIVISION. H_3 FOR 50-50 POWER DIVISION IS 39'-8 9/16".
** GAINS ARE FOR 70-30 POWER DIVISION (STANDARD ANTENNA). POWER GAINS ARE 4% HIGHER FOR 50-50 POWER DIVISION.
FOR VERTICAL PATTERN DATA SEE B-466344
† INFORMATION MAY BE OBTAINED IN OTHER CONNECTIONS, REFER TO DWG. 461467.

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Figure 2

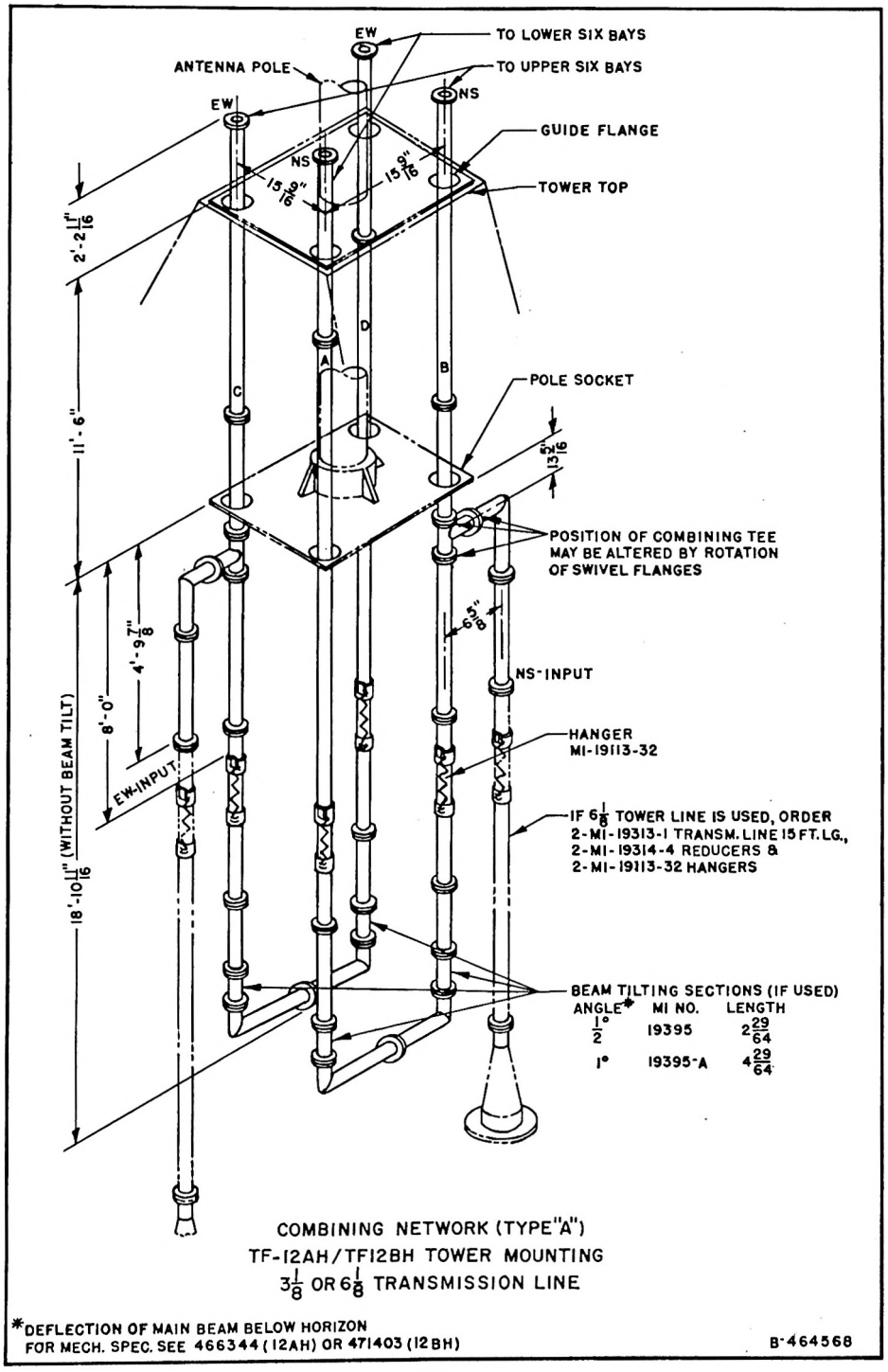
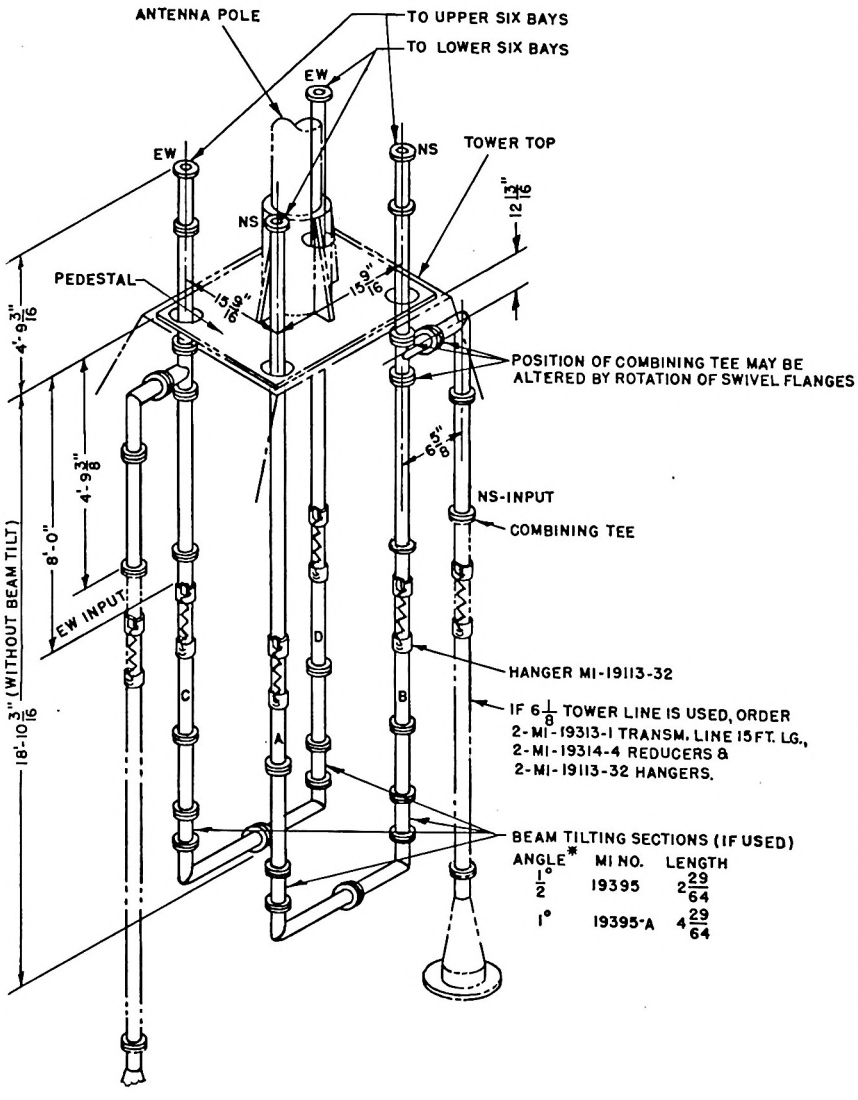

EW
TO LOWER SIX BAYS
ANTENNA POLE
TO UPPER SIX BAYS
NS
EW
GUIDE FLANGE
NS
15 9/16"
15 9/16"
TOWER TOP
2'-2 1/16"
A
D
B
C
POLE SOCKET
11'-6"
13 5/16"
POSITION OF COMBINING TEE MAY BE ALTERED BY ROTATION OF SWIVEL FLANGES
6 5/8"
4'-9 7/8"
8'-0"
NS-INPUT
EW-INPUT
HANGER MI-19113-32
18'-10 1/16" (WITHOUT BEAM TILT)
IF 6 1/8 TOWER LINE IS USED, ORDER
2-MI-19313-1 TRANSM. LINE 15 FT. LG.,
2-MI-19314-4 REDUCERS &
2-MI-19113-32 HANGERS
BEAM TILTING SECTIONS (IF USED)
ANGLE* MI NO. LENGTH
1/2° 19395 2 29/64
1° 19395-A 4 29/64
COMBINING NETWORK (TYPE "A")
TF-12AH/TF12BH TOWER MOUNTING
3 1/8 OR 6 1/8 TRANSMISSION LINE
*DEFLECTION OF MAIN BEAM BELOW HORIZON
FOR MECH. SPEC. SEE 466344 (12AH) OR 471403 (12BH)
B-464568

Figure 3



COMBINING NETWORK (TYPE "A")
TF-12AH-P/TF-12BH-P PEDESTAL MOUNTING
3 1/8 OR 6 1/8 TRANSMISSION LINE

*DEFLECTION BELOW HORIZON
FOR MECH. SPEC. SEE 466362 (12AH-P) OR 471404 (12BH-P)

B-464567

Figure 4

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