TECHNICAL MANUAL

CIRCULARLY POLARIZED

CLASS A FM ANTENNA

HARRIS

GATES DIVISION

Harris-Intertype Corporation

CIRCULARLY POLARIZED CLASS A
FM ANTENNA

800 0831 001

SAFETY NOTICE

WARNING: THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS AND UNDER CERTAIN CONDITIONS, COULD BE FATAL.

This Manual is intended as general guidance for trained and qualified installation, operating, maintenance and service personnel who are familiar with and aware of the dangers inherent to handling potentially hazardous electrical and/or electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

THE INSTALLATION, OPERATION, MAINTENANCE AND SERVICING OF THIS EQUIPMENT INVOLVES RISKS TO BOTH PERSONNEL AND EQUIPMENT, AND MUST BE PERFORMED ONLY BY PROPERLY TRAINED AND EXPERIENCED PERSONNEL EXERCISING DUE CARE. PERSONNEL MUST FAMILIARIZE THEMSELVES WITH SAFETY REQUIREMENTS, SAFE HANDLING AND OPERATING PRACTICE, AND RELATED FIRST-AID PROCEDURES (E.G., FOR ELECTRICAL BURNS AND ELECTRICAL SHOCK).

Gates shall not be responsible for injury or damage resulting from improper installation, operation, maintenance or servicing, or from the use of improperly trained or inexperienced personnel in the performance of such tasks, or from the failure of persons engaged in such tasks to exercise due care.

As with all electronic equipment, care should be taken to avoid electrical shock in all circuits where substantial currents or voltages may be present, either thru design or short circuit. Caution should also be observed in lifting and hoisting equipment, especially regarding large structures, during installation.

LIABILITY LIMITATION

The procedures outlined in this Manual are based on the information available at the time of publication and should permit the specified use with minimum risk. However, the manufacturer cannot assume liability with respect to technical application of the contents and shall, under no circumstances, be responsible for damage or injury (whether to person or property) resulting from its use.

The manufacturer is specifically not liable for any damage or injury arising out of failure to follow the instructions in this Manual or failure to exercise due care and caution during installation, operation, maintenance and service of this equipment.

CAUTIONARY NOTICE

Always disconnect power before opening covers, doors, enclosures, gates, panels or shields. Always use grounding sticks and short out high voltage points before servicing. Never make internal adjustments, perform maintenance or service when alone or when tired.

Never remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances. Proper training of experienced personnel and observing the above guidelines will help assure safe and continued operation of this equipment.

FOREWORD

This Instruction Book provides the necessary information for application, installation, operation, adjustment, and maintenance of the Model FMC-(No. of bays) A, Class A, Circularly Polarized FM Antenna.

This antenna provides the broadcaster with all the electrical advantages of higher power installations, while maintaining a compact, low silhouette configuration for minimum windloading.

GENERAL

Before the antenna and associated transmission line are placed in service, tests should be made to insure that the overall system is operating properly. This is important in order to detect any errors which may have been made during installation. A VSWR of less than 1.5 to 1 at the operating frequency is to be expected. If a higher VSWR is observed, there may be a mechanical defect in the transmission line or antenna.

SECTION 1 - INSTALLATION

1.1 Check all components carefully on receipt to ascertain if any damage has been sustained during shipment. If any parts are damaged, notify the carrier promptly. In addition, the Gates Customer Service Department should be notified of any damage or shortages so that replacement parts may be shipped promptly to avoid delay in the installation.

NOTE: *Protect the transmission line and antenna feed blocks from dirt and moisture prior to installation. Exercise care in erection to avoid damaging the transmission line and antenna elements.*

1.2 The sections of rigid coaxial line supplied with the antenna are designed to space the antenna elements approximately one wavelength apart. During assembly, make certain that "O" rings (round neoprene gaskets) are installed between sections of transmission line and also between the transmission line and the antenna feed blocks.

1.3 One six foot transformer section is supplied to be attached to the bottom antenna line block, as marked. This coaxial line section has a standard 1 - 5/8" EIA female flange to accommodate standard EIA 50 ohm feed line. (The mating 1 - 5/8" heliax 50 ohm EIA flange is the Andrew Type 87R used with the Andrew Type 34660 inner connector).

1.4 The mounting brackets normally supplied allow for the use of two brackets for each section of 1 - 5/8" coaxial interconnecting line between antenna bays. The lower bracket for each bay should be mounted approximately 12 inches below each line block. The upper bracket for each bay should be mounted 12 inches above each line block.

1.5 Insure that all antenna elements are attached in the same manner. The red band on the vertical section of each antenna bay must face downward to assure proper phase relationship between the stacked bays.

1.6 In multiple bay installations, each antenna section has a number stamped on the flange which attaches the antenna element to the line block. The element with the smaller number should always be on top. When the antenna has been completely assembled, the numbers on the flanges will read consecutively from the top to the bottom of the antenna.

1.7 Numbers have been stamped into the flanges on each section of the interconnecting coaxial line. As the antenna is assembled, the numbers on the line flanges should match with the numbers stamped on each element flange; i.e., the No. 1 line flange should be bolted to the line block adjacent to the No. 1 on the antenna element flange, etc. All feed straps of all elements will be on the same side of the antenna if this procedure is followed.

1.8 Care should be exercised in assembling the inner conductor of the coaxial line to the inner conductor connector, or bullet. The inner conductor should be perfectly centered on the bullet as it is being installed in order to prevent bullet damage. The bullet should fit firmly in the inner conductor to assure a minimum R.F. resistance connection. Many antenna troubles have been traced to improper installation of bullets between the inner conductors of the transmission line.

1.9 GENERAL

A sufficient quantity of hardware and neoprene gaskets is supplied with the antenna to effect an airtight assembly of the coaxial line to the antenna element line blocks. It is advisable to apply a small quantity of non-melting silicone dielectric lubricant (such as Dow-Corning No. 4 Compound) sparingly to the neoprene gaskets during assembly.

NOTE: *To insure a proper antenna installation, care must be exercised to see that no undue stress is placed on the antenna elements which might bend or distort them. When the installation is completed, the sections of interconnecting coaxial cable between antenna bays and the antenna elements should all be in alignment respectively.*

1.10 The Low Power Antenna has been carefully assembled and pretuned to the station's operating frequency before leaving the Gates factory. The input impedance is 50 ohms. Adjustments have been made to obtain the optimum VSWR at the station's frequency with the entire antenna assembled. Tests have also been conducted, using air pressure, to insure that the antenna system is free from gas leaks.

SECTION 2 - EXAMINATION PRIOR TO OPERATION

2.1 The transmission line and antenna system should be purged prior to placing the system in service, or at any other time that moist air may enter the line. This is accomplished by pressurizing the line at the transmitter end to approximately 5 to 10 lbs. / sq. in. The system may now be bled by temporarily loosening the four bolts in the brass plate on the top of the upper most antenna line block. Retighten the four bolts to seal the system and repressurize. Repeat this procedure three times to assure complete purging.

NOTE. *Leaks in a transmission line are often audible, if the leak is large and the line is under sufficient pressure (approximately 15 lbs. P.S.I.). Small leaks may be located by the use of bubble liquid which may be brushed on the suspected leak areas.*

2.2 After purging the transmission line feeding the antenna system should be kept filled with dry air or nitrogen at a pressure of 3 to 5 pounds per square inch. There is no advantage in pressurizing the system in excess of 5 lbs. / sq. in. However, the system should be pressurized so that changes in temperature will not cause moisture condensation from outside air, thereby impairing the electrical efficiency of the antenna system.

2.3 The antenna elements and transmission line do not require painting. Only the antenna brackets require painting.

NOTE: *Should any of the antenna elements ever be painted, care should be taken to keep the paint off the insulated surfaces.*

SECTION 3 - TECHNICAL DATA

ELECTRICAL

Frequency Range:	Factory tuned to one specific frequency in the 88-108 MHz band.
Polarization:	Circular, clockwise.
Free Space Pattern:	Horizontal component circular ± 2 dB. Vertical component circular ± 2 dB.
Vertical to Horizontal Ratio:	Fixed at 1 to 1.
VSWR:	1.2 to 1 or better ± 200 kHz as tuned at the factory. VSWR when tower mounted 1.5 to 1 or better ± 200 kHz Capable of adjustment to 1.1 to 1 ± 100 kHz with field tuning.
Power Gain:	Horizontal polarization: See table. Vertical polarization: See table.
Power Input Rating:	Maximum of 5 kW for two to six bays. 3 kW for single bay.
Input Connection:	A six foot transformer section is provided on the bottom of each antenna system which has a 1 - 5/8" 50 ohm EIA female connector.

MECHANICAL

Windload:	Designed for 50 psf for flat surfaces, 33 psf for cylindrical surfaces.
Weight:	Single bay 27 lbs., less brackets. 1 - 5/8" interbay coaxial line weighs approximately 10 lbs. per section.
Dimensions:	Height approximately 12". Length approximately 16".

TABLE 3.1

TECHNICAL DATA FOR MULTIPLE BAY INSTALLATIONS

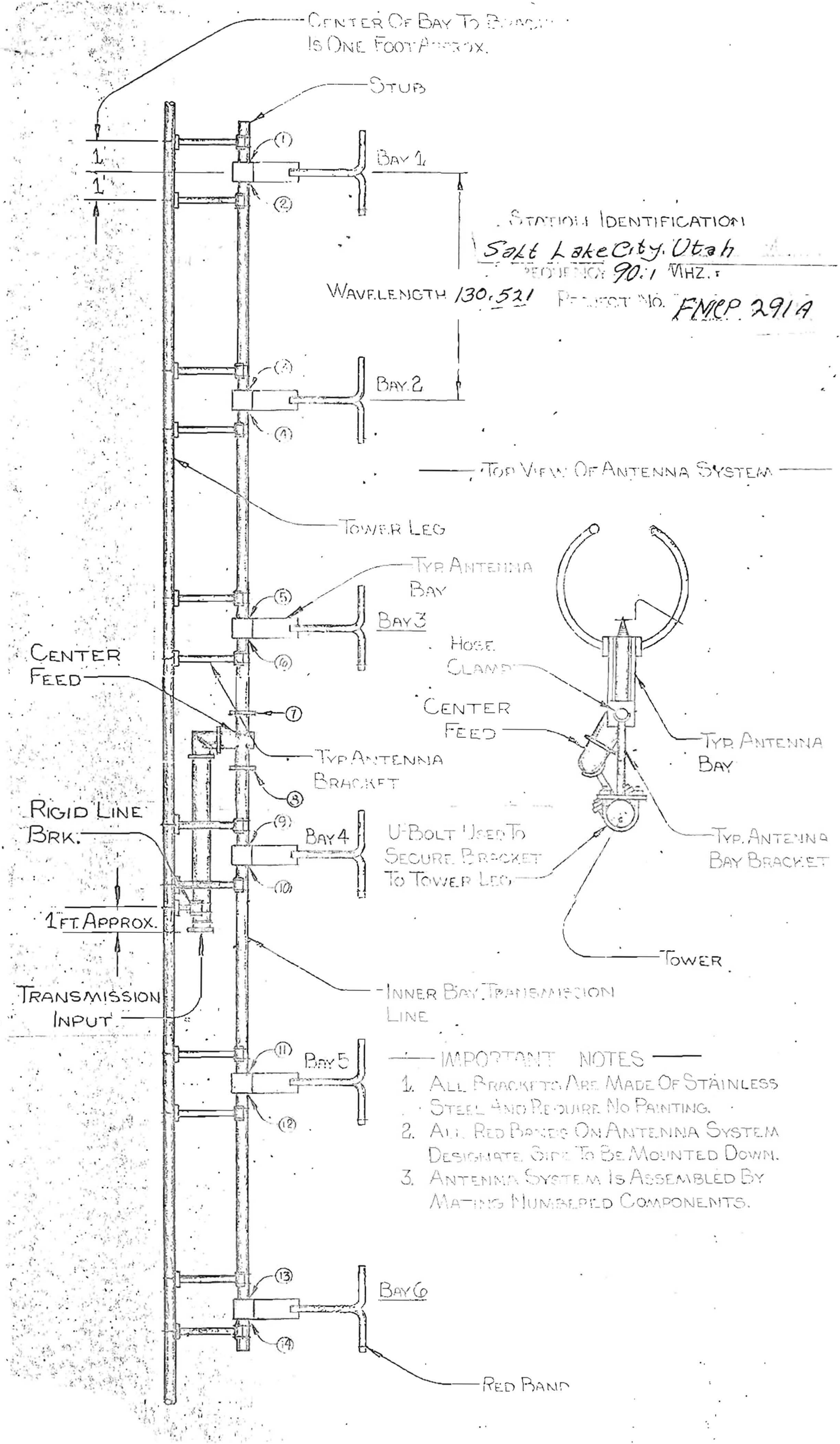
GATES TYPE	POWER GAIN		dB GAIN		FIELD GAIN[1]		POWER RATING	APPROX.[2] LENGTH	WEIGHT[3] (lbs.)	WIND-[4] LOAD
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical				
FMC-1A	0.438	0.438	−3.585	−3.585	0.662	0.662	3 kW		24	54
FMC-2A	0.947	0.947	−0.237	−0.237	0.973	0.973	5 kW	10	53	126
FMC-3A	1.480	1.480	1.702	1.702	1.216	1.216	5 kW	20	81	198
FMC-4A	2.025	2.025	3.064	3.064	1.423	1.423	5 kW	30	110	271
FMC-5A	2.577	2.577	4.111	4.111	1.605	1.605	5 kW	40	138	343
FMC-6A	3.134	3.134	4.961	4.961	1.770	1.770	5 kW	50	167	414
FMC-7A	3.695	3.695	5.676	5.676	1.922	1.922	5 kW	60	196	486
FMC-8A	4.258	4.258	6.292	6.292	2.063	2.063	5 kW	70	225	558

1. To obtain the effective free space field intensity at one mile in MV/M for one kilowatt antenna power, multiply field gain by 137.6.

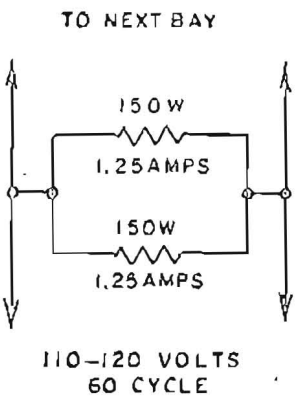
2. When determining coax length, add six feet to antenna length.

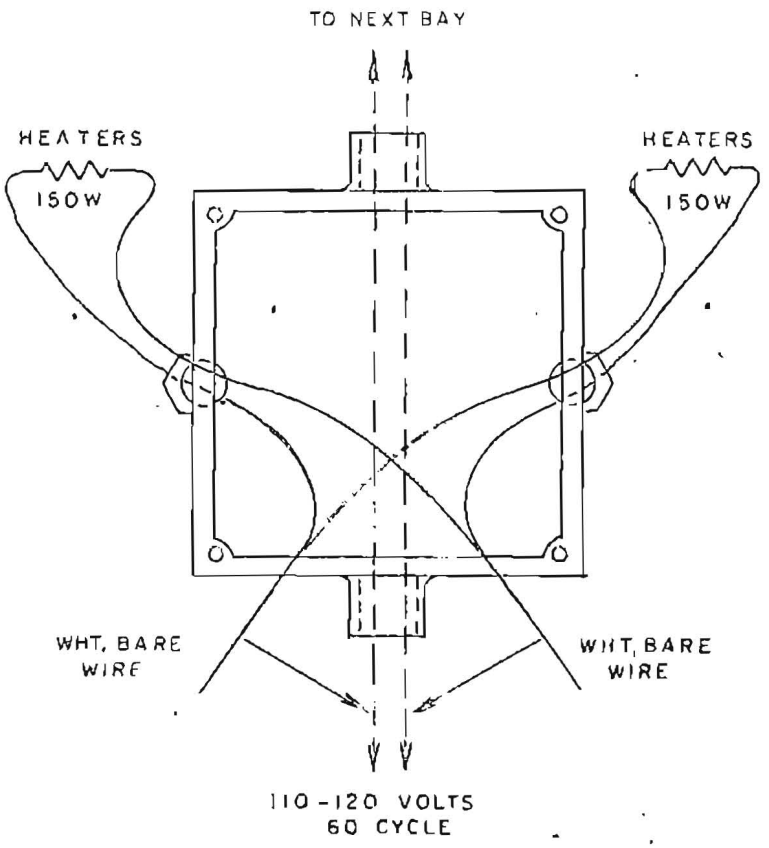
3. The weights given are less brackets, but the interbay transmission line and transformer section are all included in the weight.

4. Windload based on 50 psf on flat surfaces and 33 psf for cylindrical surfaces (actual wind velocity 110 mph). Computed for a 100 MHz antenna less mounting brackets and less heater junction boxes and heater cables.


CENTER OF BAY TO BRACKET IS ONE FOOT APPROX.
STUB
1'
1'
BAY 1
STATION IDENTIFICATION
Salt Lake City, Utah
FREQUENCY 90.1 MHZ.
WAVELENGTH 130.521 PROJECT NO. FNCP 291A
BAY 2
TOP VIEW OF ANTENNA SYSTEM
TOWER LEG
TYP ANTENNA BAY
BAY 3
HOSE CLAMP
CENTER FEED
CENTER FEED
TYP ANTENNA BRACKET
TYP ANTENNA BAY
RIGID LINE BRK.
BAY 4
U-BOLT USED TO SECURE BRACKET TO TOWER LEG
TYP. ANTENNA BAY BRACKET
1 FT. APPROX.
TOWER
TRANSMISSION INPUT
INNER BAY TRANSMISSION LINE
BAY 5
IMPORTANT NOTES
1. ALL BRACKETS ARE MADE OF STAINLESS STEEL AND REQUIRE NO PAINTING.
2. ALL RED BANDS ON ANTENNA SYSTEM DESIGNATE SIDE TO BE MOUNTED DOWN.
3. ANTENNA SYSTEM IS ASSEMBLED BY MATING NUMBERED COMPONENTS.
BAY 6
RED BAND

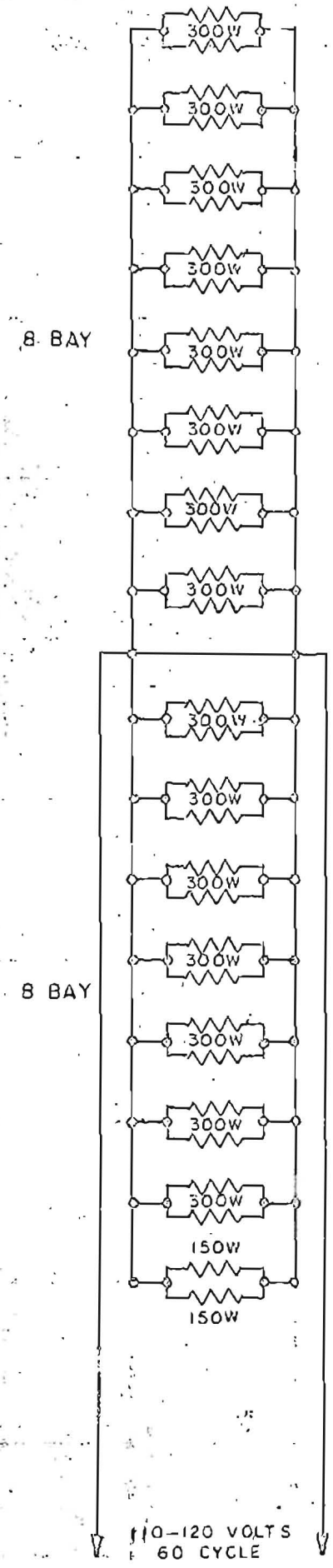
300 WATT HEATERS





The two bare wires indicated extending from the junction box are to be connected parallel across the 110-120 volt line. In checking for continuity of heaters, any reliable multimeter that will measure between 0-100 ohms will be sufficient. Single heaters should measure 75 ohms, two in parallel will be half of this, approximately 37 ohms.

SUBJECT Circular Polarized Antenna
300 Watt Heaters



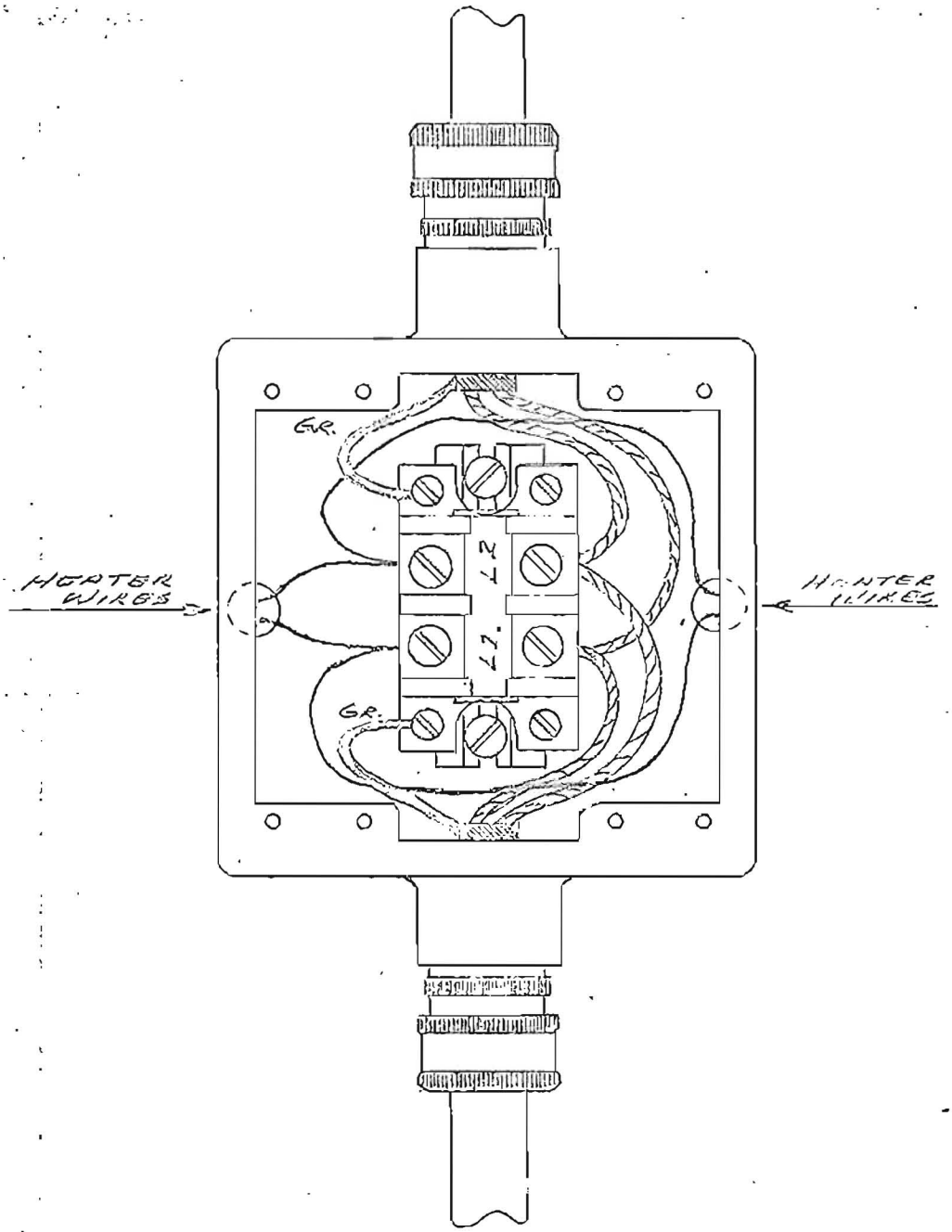
300 Watt Heaters
Each Element rated 150 Watts at 120 V

No. of Bays	Watts	Volts	Cold Amps.	Hot Amps.
1	300	120	2.5	2.7
2	300	120	5.0	5.5
3	300	120	7.5	8.1
4	300	120	10.0	10.9
5	300	120	12.5	13.6
6	300	120	15.0	16.3
7	300	120	17.5	19.1
8	300	120	20.0	21.8
9	300	120	22.5	24.5
10	300	120	25.0	27.2
11	300	120	27.5	30.0
12	300	120	30.0	32.7
13	300	120	32.5	35.4
14	300	120	35.0	38.1
15	300	120	37.5	40.9
16	300	120	40.0	43.6

Note: Interbay cable rated at 25 amps, therefore antenna with more than eight bays must have A.C. voltage fed at center of antenna to avoid overheating in electrical cable.

BY L. Ice DATE 12-6-67 SUBJECT Circular Polarized Heater Drawing - For use with insulated cable SHEET NO ____ OF ____

CHKD. BY ____ DATE ____ JOB NO. ____



Remove male portion of connectors from cable and screw into junction box.

Insert cable into junction box and tighten connector nut.

Connect upper and lower line wires across L1 and L2.. Connect heaters to opposite side of terminal block across L1 and L2.

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LOS ANGELES, CALIFORNIA 90007
1945 South Figueroa
Phone: 747-7129, Area 213

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HOUSTON, TEXAS 77027
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