

COAXIAL DYNAMICS
6800 LAKE ABRAM DRIVE
MIDDLEBURG HEIGHTS, OHIO 44130
U.S.A.

MODEL 86705/86775
COAXIAL LOAD RESISTOR



LIMITED WARRANTY

We take pride in manufacturing products of the highest quality and we warrant them to the original purchaser to be free from defects in material and workmanship for the period of one year from date of invoice. Additionally, products of our manufacture repaired by us are warranted against defects in material and workmanship for a period of 90 days from date of invoice, with the provisions described herein.

Should a product, or a portion of a product of our manufacture prove faulty, in material or workmanship, during the life of this warranty, we hereby obligate ourselves, at our own discretion, to repair or replace such portions of the product as required to remedy such defect. If, in our judgment, such repair or replacement fails to be a satisfactory solution, our limit of obligation shall be no more than full refund of the purchase price.

This warranty is limited to products of our own manufacture. Equipment and components originating from other manufacturers are warranted only to the limits of that manufacturer's warranty to us. Furthermore, we shall not be liable for any injury, loss or damage, direct or consequential, arising out of the use, or misuse (by operation above rated capacities, repairs not made by us, or any misapplication) of the equipment. Before using, the user shall determine the suitability of the product for the intended use; and the user assumes all risk and liability whatsoever in connection therewith.

The foregoing is the only warranty of Coaxial Dynamics and is in lieu of all other warranties expressed or implied.

Warranty returns shall first be authorized by the Customer Service Department and shall be shipped prepaid. **Warranty does not cover freight charges.**

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WARNINGS

OPERATING TEMPERATURE

**CARE SHOULD BE TAKEN TO OPERATE UNIT BELOW STATED
MAXIMUM AMBIENT OPERATING TEMPERATURE.**

**OPERATION ABOVE RATED AMBIENT
TEMPERATURE CAN CAUSE MOTOR THERMAL
PROTECTION TO SHUT OFF FAN, WHICH WILL
CAUSE DAMAGE TO UNIT.**

**PROVISIONS ARE MADE TO TRIP THE INTERLOCK
IN THE EVENT OF OVERHEAT, BUT THE INTERLOCK
MUST BE PROPERLY CONNECTED TO THE RF SOURCE
FOR THIS FUNCTION TO OPERATE.**

**NEVER OPERATE WITH INTERLOCK
BYPASSED OR MALFUNCTIONING.
TO DO SO WILL VOID THE WARRANTY.**

PRECAUTIONS

⚡WARNING⚡

This equipment can start automatically. Do not attempt any service or parts replacement without first disconnecting all AC power and RF power. Failure to do so may result in serious or *fatal electrical shock or physical injury.*

CAUTION

Do not block air grills or restrict airflow when ducting inlet and discharge air. Restrictions in airflow limit the load's ability to dissipate RF power and could damage and/or cause the unit to fail.

CAUTION

Do not connect the Model 86705/86775 to an RF power source without first ensuring that the load is connected to the proper line voltage and that the interlock circuit is properly attached to the transmitter. The interlock circuit is designed to indicate a fault and prevent operation when line voltage is not present. Do not apply more than rated power to unit. Damage will occur before thermal protectors can activate interlock circuit if large overloads are applied.

☠CAUTION☠

When using any cleaning solvents or solutions, assure that there is adequate ventilation to protect personnel from breathing any irritable or toxic fumes.

INTRODUCTION

This handbook was prepared for technical personnel as an aid in understanding and performing installation, service and maintenance procedures for the Model 86705/86775 Air-Cooled Coaxial Load. Personnel are considered to be skilled if they have the necessary knowledge and practical experience of electrical and radio engineering to appreciate the various hazards that can arise from working on radio transmitters, and to take appropriate precautions to ensure the safety of personnel.

SECTION I

DESCRIPTION AND LEADING PARTICULARS

- 1-1. Purpose and Application of Equipment.** The Model 86705/86775 Coaxial Load is designed to safely dissipate a maximum of 5,000/75,000 watts of electrical energy over a frequency range of DC to 110 MHz and can be optimized for frequencies above 110 MHz.
- 1-2. Equipment Supplied.** The Model 86705/86775 Coaxial Load is supplied with standard RF connectors.

The standard power supply voltages are (specified at time of order):

- 110-120VAC, single phase, 60 Hz
- 208-230VAC, single & three phase, 50/60 Hz
- 380-440VAC, three phase, 50/60 Hz

- 1-3. Equipment Required But Not Supplied.** The Model 86705/86775 Coaxial Load is complete as supplied, but the user must furnish AC Mains input cable, RF input coaxial line, interlock control cable and ground cable appropriate to each installation.
- 1-4. General Description.** The Model 86705/86775 Coaxial Load is enclosed in a single aluminum case which is painted with a durable acrylic finish. Power connections are made by conventional cord connections or by passing the AC cord through the access hole labeled AC main voltage on the fan compartment and fastening to the terminals for the AC Mains and Ground. This panel also contains an access hole for cables that attach to the 4 position screw terminal strip connections of the interlock circuit. The RF connector is located in the center of the top panel of the main unit.
- 1-5. Electrical Description.** The Model 86705/86775 contains a 50-ohm non-reactive resistor assembly capable of dissipating 5,000/75,000 watts of applied electrical energy at sea level at frequencies between DC and 110 MHz and can be optimized for frequencies between 110 MHz and 240MHz with a maximum VSWR of 1.15 to 1 at room temperature. Some VSWR variation may occur at operating temperatures. No provisions are made for tuning the resistor assembly and all operating controls relate to the operation of the blower assembly. The blower control circuit consists of three switches wired in parallel to control the blower motor relay. Power is supplied to this relay and to the "Blower On" lamp whenever the equipment is attached to the correct power supply and the main power switch is "ON" or when one of the fan thermostats senses a temperature equal to or greater than 120° ($\pm 7^\circ$) F.

The transmitter interlock circuit consists of two switches wired in series to control the interlock relay. Models ordered with an airflow interlock switch have a third switch in series in this circuit. This switch closes only when it senses higher pressure internally, therefore confirming correct blower operation. When power is applied to the AC Mains of the load and the blower is not operating, a lamp labeled "LOWFLOW" is illuminated on the front panel. Power is supplied to control the interlock relay whenever the equipment is attached to the correct power supply and neither of the overtemperature thermal switches senses a temperature equal to or greater than 250° ($\pm 7^\circ$) F or the differential pressure switch senses no differential between ambient and internal pressures on units so equipped. A lamp is provided to indicate when one or more of the overtemperature switches opens. It is labeled "OVERHEAT", indicating a change in state of the interlock.

- 1-6. Mechanical Description.** The Model 86705/86775 RF Coaxial Load is a 50-ohm non-reactive resistor assembly which is cooled by forced ambient air. The blower assembly is a centrifugal blower. The blower moves air from floor level into a closed plenum surrounding the resistor assembly. Air then enters the resistor assembly and flows downward through it to the transition duct and then out of the enclosure via the discharge grill. This places the RF input connector at the coolest point in the air stream and affords exceptionally quiet operation.
- 1-7. General Principle of Operation.** After ascertaining that the Model 86705/86775 is connected to the correct power supply, connect the transmitter interlock circuit and RF source. Turn the main power switch ON to start the fan and enable transmitter. Operate transmitter as desired. To stop operation, it is necessary to first turn off the transmitter, then the main power switch on the Model 86705/86775. The fan may continue to run for some time. This depends upon the power level at which the load was operating and upon the ambient air temperature. This feature is necessary to prevent damage to the load. The Model 86705/86775 can be operated in a "Standby" or "Reject" mode with the blower off. Current draw in this mode is 630 milliamperes. To operate in this mode, connect the unit as before and leave the main power switch on the front panel "Off".
- 1-8. Operating and Adjustment Controls.** The only operating control is the main power switch. No field adjustments are necessary or possible.
- 1-9. Operator Training.** The operator of this equipment must have the following skills/knowledge:
- An understanding of the purpose of the equipment;
 - An understanding of the principles of operation of the equipment;
 - An understanding of the normal operating procedures for the equipment;
 - An understanding of the normal and abnormal indications which may be presented at the control point;
 - The proper procedures for starting, using and stopping the equipment under normal conditions;
 - The proper procedure for stopping the equipment under abnormal or emergency conditions;
 - The proper procedure to lock out and mark controls prior to allowing or commencing maintenance on the equipment;
 - The proper procedure to obtain clearance to remove lockouts and out-of-service marks and return the equipment to normal service.

SECTION II

TEST EQUIPMENT AND SPECIAL TOOLS

2-1. Test Equipment Required. No test equipment is required for routine maintenance. In some circumstances it may be desirable to determine the temperature differential (outlet air minus inlet air) and ambient air temperature which the equipment is experiencing. We recommend the John B. Fluke Mfg. Co. Model 52 or equivalent instrument for this function.

2-2. Special Tools Required. Although no non-standard tools are required for routine maintenance, we recommend the technician have the following specialized tools available:

- 1 Torx T-15 driver
- 1 Tee handle hex key, 6/16" bit
- 1 Power screwdriver with 3/16" hex key & torx T-15 bit

SECTION III

PREPARATION FOR USE AND RESHIPMENT

3-1. Unpacking Equipment. The units should be handled and unpacked with care. Inspect outer cartons for evidence of damage during shipment. *Claims for damage in shipment must be filed promptly with the transportation company involved.* No internal packaging or bracing is used for shipments and the units should not rattle when being unpacked.

3-2. Pre-installation Inspection. Conduct a thorough inspection of the units, paying particular attention to the following items:

- Screws in place and tight.
- All panels and grills free of dents and scratches.
- AC input receptacle visually OK.
- Interlock terminal strip visually OK.
- RF connector visually OK.

While inspecting RF connector, measure DC resistance of the unit by reading from the center conductor to the outer conductor. Compare this reading to that on the specification sheet at the end of this manual. Reading should be ± 1 ohm. If not, consult factory.

3-3. Pre-installation Tests. Prior to installation, connect the load to AC Mains power for the following tests:

- a. Read data plate on lower rear panel of resistor enclosure and connect to a suitable source of AC power.
- b. Turn main switch on and check for quiet blower operation.
- c. Connect an ohmmeter or a battery operated test lamp across the normally closed terminal pair on the interlock terminal board.
- d. Turn the main power switch off, observing the indicator (ohmmeter or test lamp). It should remain as it was.
- e. Now disconnect the AC power from the unit. The indicator should change state (terminals open).

3-4. Installation. The Model 86705/86775 must be installed in a location convenient for servicing. Consideration should be given to adequate accessibility for maintenance and unit replacement. No attempt is made in this handbook to present complete installation instructions, since physical differences in plant will determine the installation procedure. General guidelines are outlined in subsequent paragraphs.

3-5. Location. The location selected for the Model 86705/86775 should be dry, free of excessive dust and have an ambient temperature below 104°F (40°C). The room should be well ventilated to prevent excessive temperature rise and consequent derating of the unit. The maximum dissipation of the unit is 5,000/75,000 watts. This is equal to 17076 / 256,138 Btu/hr., which may be ducted out of the building envelope.

The unit should be oriented to provide a short, direct duct run in order to avoid high static pressure and loss of cooling efficiency. The assistance of a competent heating and air conditioning installer will help avoid over-or-under-specifying the duct system.

3-6. Mounting. The Model 86705/86775 is designed to be a free-standing device. It rests on four adjustable-length leveling feet.

CAUTION!

THE UNIT SHOULD BE ATTACHED TO THE PROPER AC POWER SUPPLY WITH INTERLOCK CONNECTED WHENEVER THE RF CONNECTOR IS ATTACHED TO THE SOURCE. INADVERTENT APPLICATION OF RF POWER TO THE UNIT WITHOUT AC POWER MAY DAMAGE OR DESTROY THE RESISTOR ASSEMBLY.

3-7. Connections. There are four possible connections on the Model 86705/86775: the RF connector, the AC power supply, the remote operation terminals and the transmitter interlock.

3-8. Ducting. In many installations it will be necessary to duct the discharge air from the Model 86705/86775 to the exterior of the building. In some installations it will also be necessary to supply inlet air from outside of the climate-controlled portion of the building.

The discharge airflow is at a maximum temperature of 250°F. Due to the high temperatures involved, non-metallic duct materials should not be used. Attaching a discharge duct to the unit is easily accomplished:

1. Remove the 10 torx head screws at the discharge on the exhaust panel.
2. Then, attach a discharge air duct adapter to the exhaust panel.

Suitable ducting can then be attached to the adapter. This duct should be as short as possible to minimize backpressure. Design of the ducting and wall or ceiling penetrations should be referred to a competent heating and air conditioning firm.

"Make-up air" is a ventilation term used to indicate the supply of outdoor replacement air to a building in a controlled manner. It may be provided for the Model 86705/86775 by ducting into the room or by extending a supply duct to both intake grills of the blower enclosure.

Make-up air will enter the building to equal the volume actually exhausted, whether or not provision is made for this replacement. However, the actual exhausted volume may not equal the design volume unless an adequate supply is provided.

3-9. Adjustments. No field adjustments are necessary or possible.

3-10. Preparation for Reshipment. When shipping 86710 through 86735 place the right side of the load down as you face the control panel. This will keep the motor from moving in the fan housing. On 86750/86775 ship the blower unit upright resting on the feet. No other special measures are required to prepare the Model 86705/86775 for reshipment. Care must be taken to protect the RF connector and to immobilize the swivel flange. Packaging should provide protection against abrasion and impact. Special containers are available from the factory. Please inquire.

SECTION IV THEORY OF OPERATION

4-1. General. The Model 86705/86775 contains a 50-ohm non-reactive resistor assembly which is cooled by forced air supplied by a centrifugal blower assembly. Control of the blower and of the transmitter interlock circuit is accomplished with a single rocker switch and five thermal switches.

Model	Resistor Assembly
86705	4 @ 200
86710	8@400
86715	10@500
86725	20@250
86735	24@300
86750	36@200
86775	54@300

4-2. Control Circuits. There are 2 control circuits in the Model 86705/86775. One circuit controls the blower, and the other controls the transmitter interlock circuit. On models 86705 through model 86735 a control transformer (T1) is used to control the fan and interlock circuits. On model 86750/86775 a power supply (PS) is used to control the fan and interlock circuits.

On models with a control transformer three thermal switches and one rocker switch are connected to AC Control Line 1. The thermal switches are SPNO and connect to blower contactor "RY1" terminal 0, as does the SPST rocker switch. Blower contactor "RY1" terminal 1, connects to AC Control Line 2. The blower indicator lamp is connected in parallel with the contactor coil.

On models with a control transformer the transmitter interlock circuit has two SPNC thermal switches connected in series from Control Line 1 to interlock relay "RY2" terminal 13. The overheat lamp is connected from Line 1 to interlock relay "RY2" Terminal 13. Interlock relay "RY2" terminal 14 is connected to Control Line 2.

On models with a power supply the blower circuit has three thermal switches and one rocker switch connected to PS+. The thermal switches are SPNO and connect to contactor terminal A2, as does the SPST rocker switch. Contactor terminal A1 connects to PS-. The blower indicator lamp (DS1) is connected in parallel with the contactor coil.

On models with a power supply two SPNC thermal switches are connected in series from PS+ to interlock relay terminal 14. The overheat lamp is connected from interlock PS- to interlock relay terminal 13. Interlock relay terminal 14 is connected to PS+.

Interlock relay (RY2) terminals 5 & 6 are paralleled and are connected to interlock terminal strip (TB1)-1. Interlock relay (RY2) terminals 9 & 10 are paralleled and are connected to interlock terminal strip (TB1) terminal 2. This terminal pair is NC when there is AC main power to the load.

When sold with two sets of NC terminals at TB1 interlock relay (RY2) terminals 7 & 8 are paralleled and are connected to interlock terminal strip (TB1) terminal 4. Interlock relay terminals 11 & 12 are paralleled and are connected to interlock terminal strip (TB1) terminal 3. This terminal pair is normally closed when AC power is supplied to the load.

When sold with one set of NC terminals and one set of NO terminals at TB1 interlock relay (RY2) terminals 3 & 4 are paralleled and are connected to interlock terminal strip (TB1) terminal 4. Interlock relay terminals 11 & 12 are paralleled and are connected to interlock terminal strip (TB1) terminal 3. This terminal pair is NO when AC power is supplied to the load.

SECTION V MAINTENANCE

WARNING!!

***PERSONNEL WORKING ON THIS LOAD MUST BE
CONSIDERED SKILLED AS DEFINED BY
EN60215 SECTION 3.1 AND APPENDIX D***

BEFORE PERFORMING ANY MAINTENANCE:

- 1. DISCONNECT POWER AND ALLOW MOTOR TO COME TO A FULL STOP.**
- 2. DISCONNECT RF CONNECTOR ASSEMBLY AND LOCK OUT TRANSMITTER OPERATING CONTROLS.**
- 3. DISCONNECT TRANSMITTER INTERLOCK LINE.**

***FAILURE TO FOLLOW THESE DIRECTIONS
MAY CAUSE FATAL ELECTRICAL SHOCK!***

5-1. Cleaning. The enclosure of the Model 86705/86775 is finished with an acrylic finish or other durable coating system. It should be cleaned with a neutral plastic and glass cleaner such as Windex or Glass Plus. The RF connector should be cleaned with a non-residue contact cleaner such as Miller-Stephenson MS-171/CO₂. Remove dirt accumulations from the fan and motor by vacuuming. Do not use solvents or an air jet, as these can damage the motor. Remove dirt and dust accumulations from the grills and resistor assembly with an air jet and a soft brush.

5-2. Lubrication. Lubricate motor with 10-30 drops of SAE 30 motor oil applied to each bearing oil tube annually.

5-3. RF Circuit. The RF circuit does not require any periodic maintenance and the only repairs possible are the replacement of parts in the connector, quick-step or support portions of the resistor assembly or the replacement of resistors.

To replace resistors it is necessary to remove the panels as follows:

- Remove the 8-32 X 1/2" torx head screws holding the rear panel and set this panel aside.
- Remove screws from the vertical sides of the exposed inner panel.
- Remove the two 1/4-20 X 2 hex head cap screws at the bottom. •Remove three 8-32 1/2 torx head screws from top of unit. You can now remove panel by bowing it out. With this panel removed, you will have access to the resistor bank.
- It is usually not necessary to remove any other panels, but you may find it easier to fit some resistors if you remove the opposite inner panel.
- Reverse procedure to reinstall.

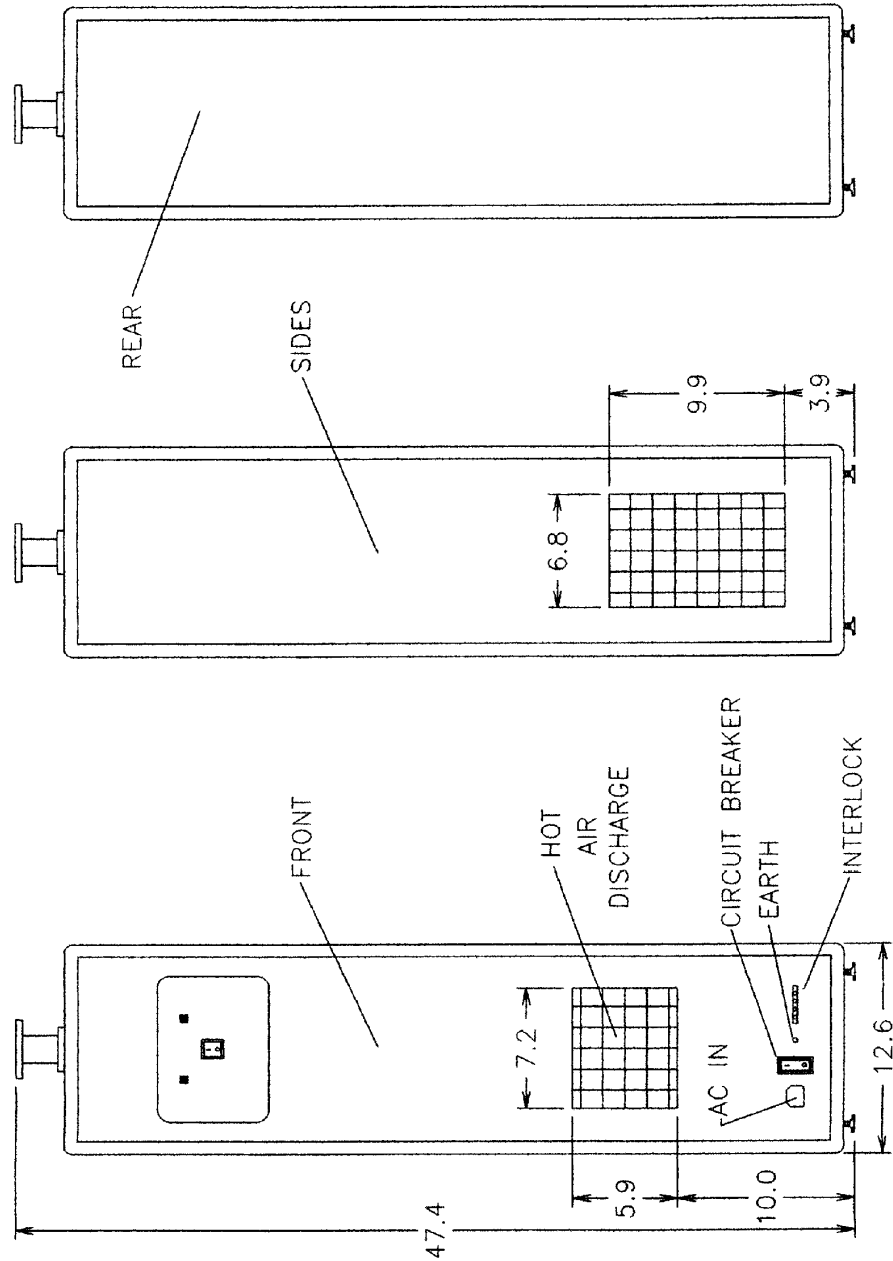
CAUTION!

When installing the 1/4-20 X 2 screws, take care not to overtighten them and fracture the resistors. The resistors are hard, brittle ceramic material. It is very important to avoid impact and excessive force when installing or removing them.

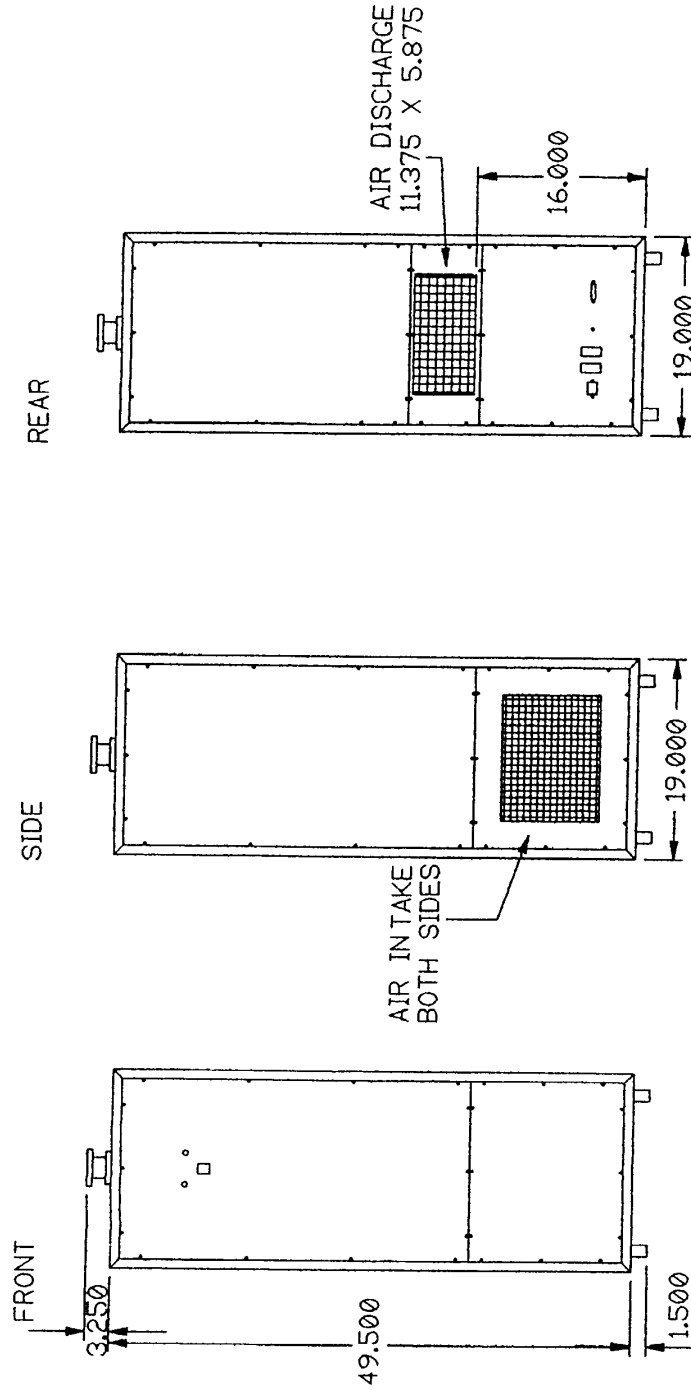
SECTION VI

6-1 OUTLINE AND DIMENSIONS

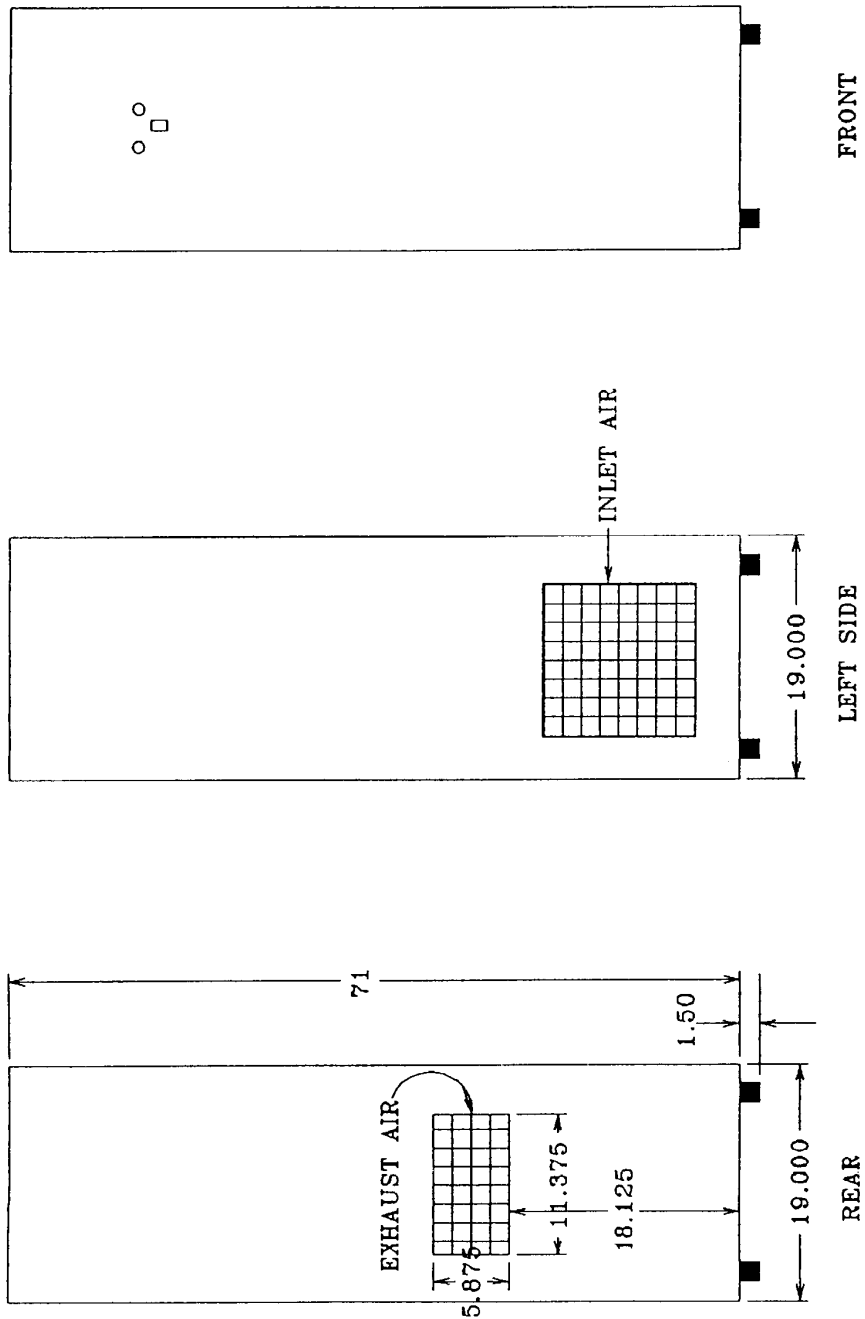
Model 86705



Model 86710/86715



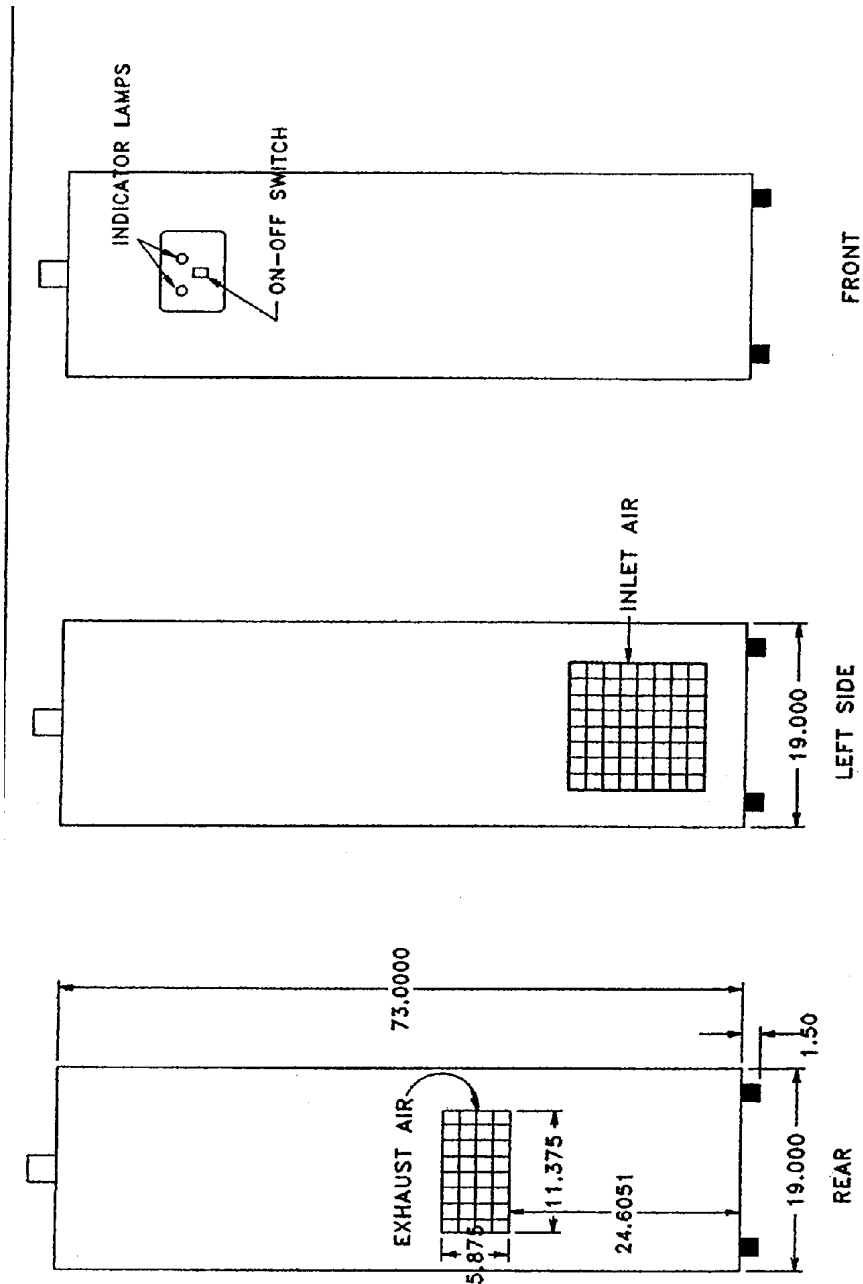
Model 86725



NOTES:

- 1.) AIRFLOW = 875 SCFM
- 2.) AIR INLETS IDENTICAL BOTH SIDES
- 3.) ONLY ONE INLET REQUIRED FOR NORMAL OPERATION

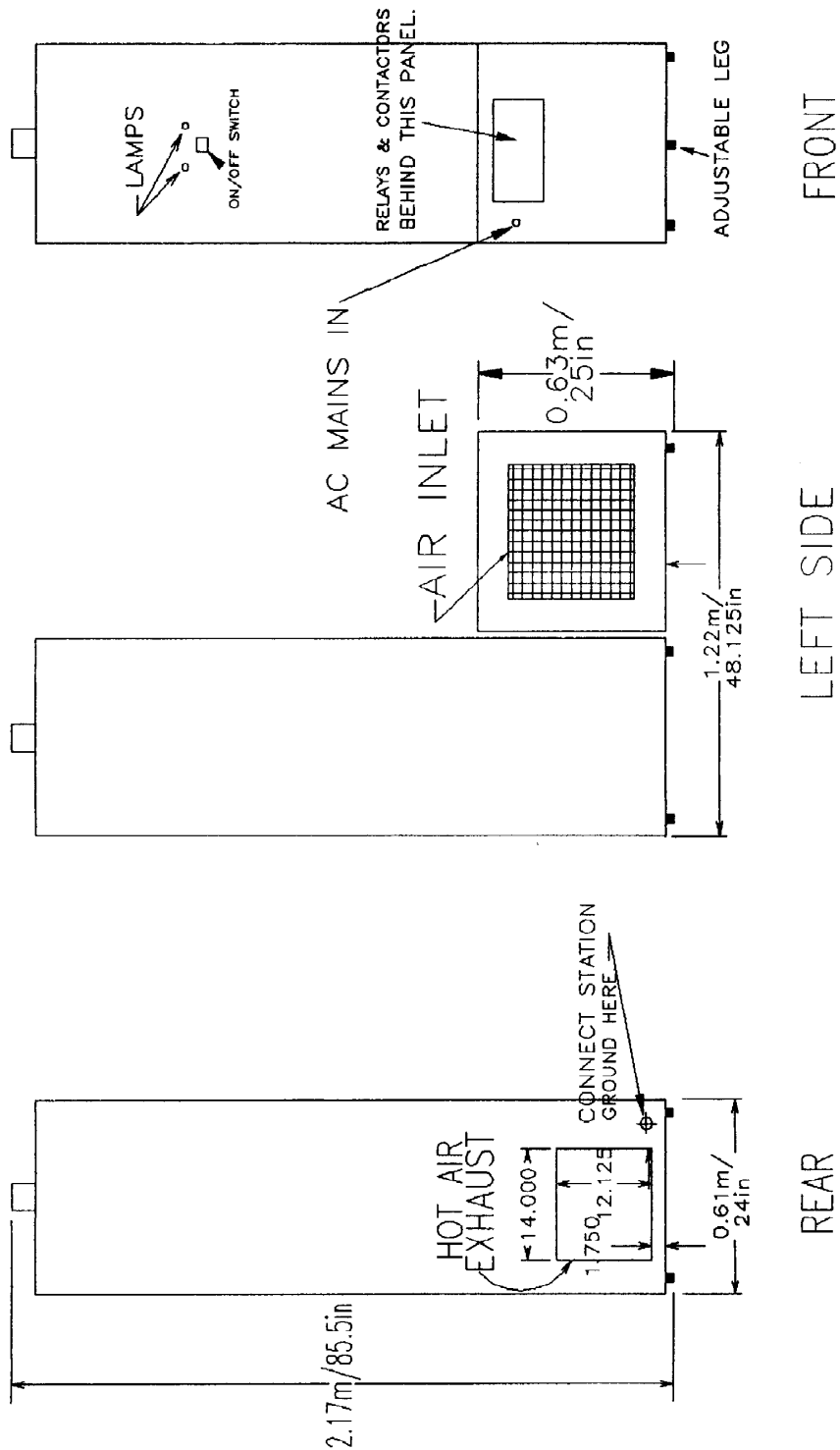
Model 86735



NOTES:

- 1.) AIRFLOW = APPROX 1000 SCFM
- 2.) AIR INLETS IDENTICAL BOTH SIDES
- 3.) ONLY ONE INLET REQUIRED FOR NORMAL OPERATION

Model 86750/86775

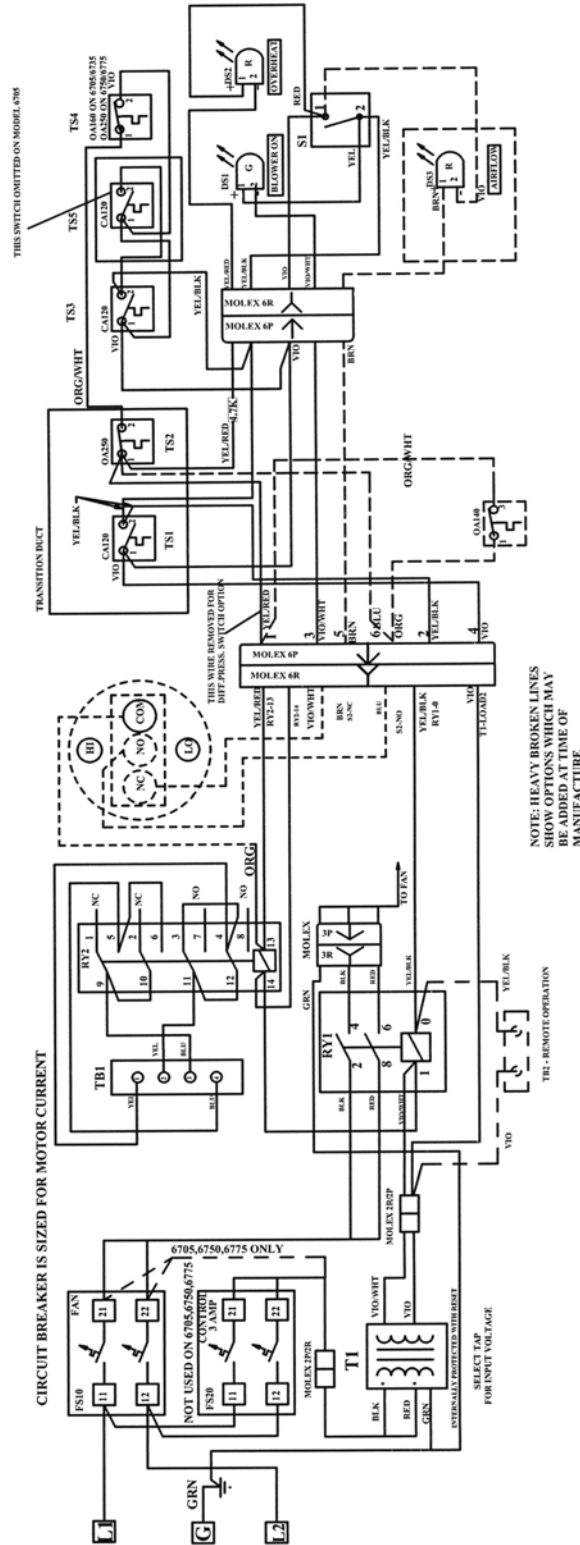


NOTES:

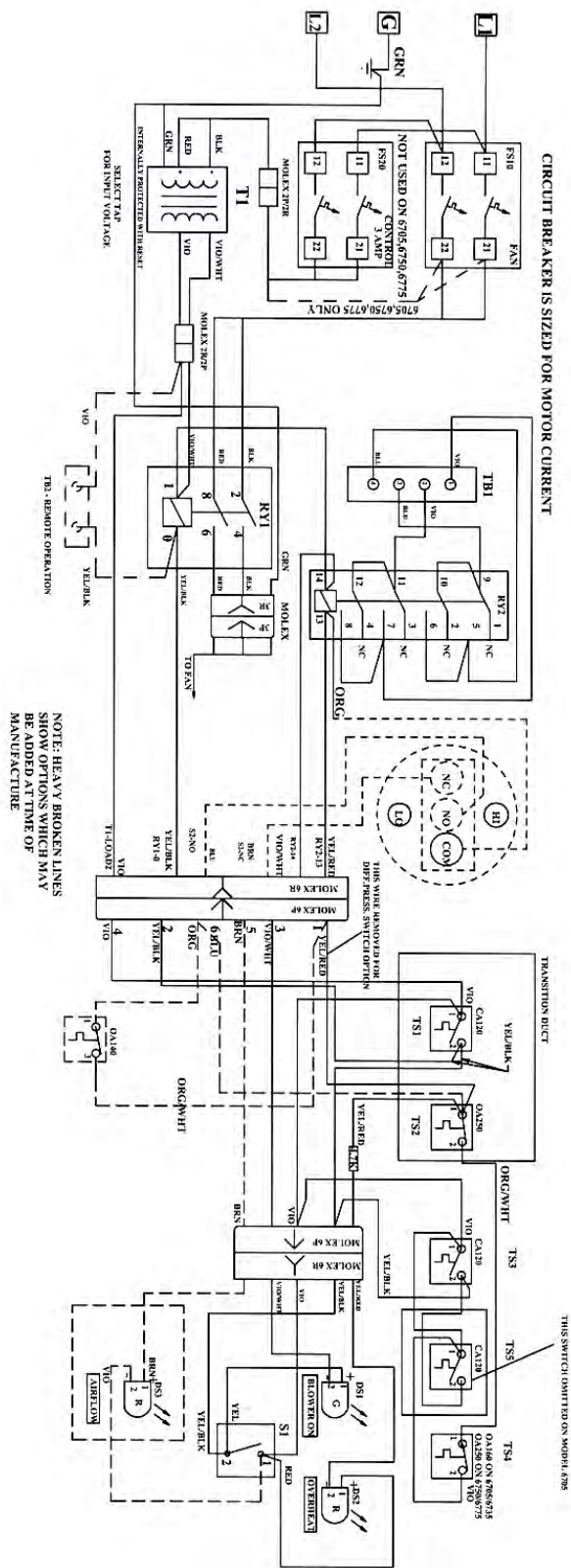
- 1.) EXHAUST OPENING GRILL FURNISHED, NOT SHOWN
- 2.) EXHAUST AIRFLOW IS 2100 CFM @ 277°F MAX
- 3.) COOLING AIR INLETS IDENTICAL BOTH SIDE
- 4.) 3-1/8 INCH EIA CONNECTOR SHOWN

6-2 SCHEMATIC DIAGRAMS

Model 86705-86775 with Optional Diff. Pressure Switch and Remote Actuation

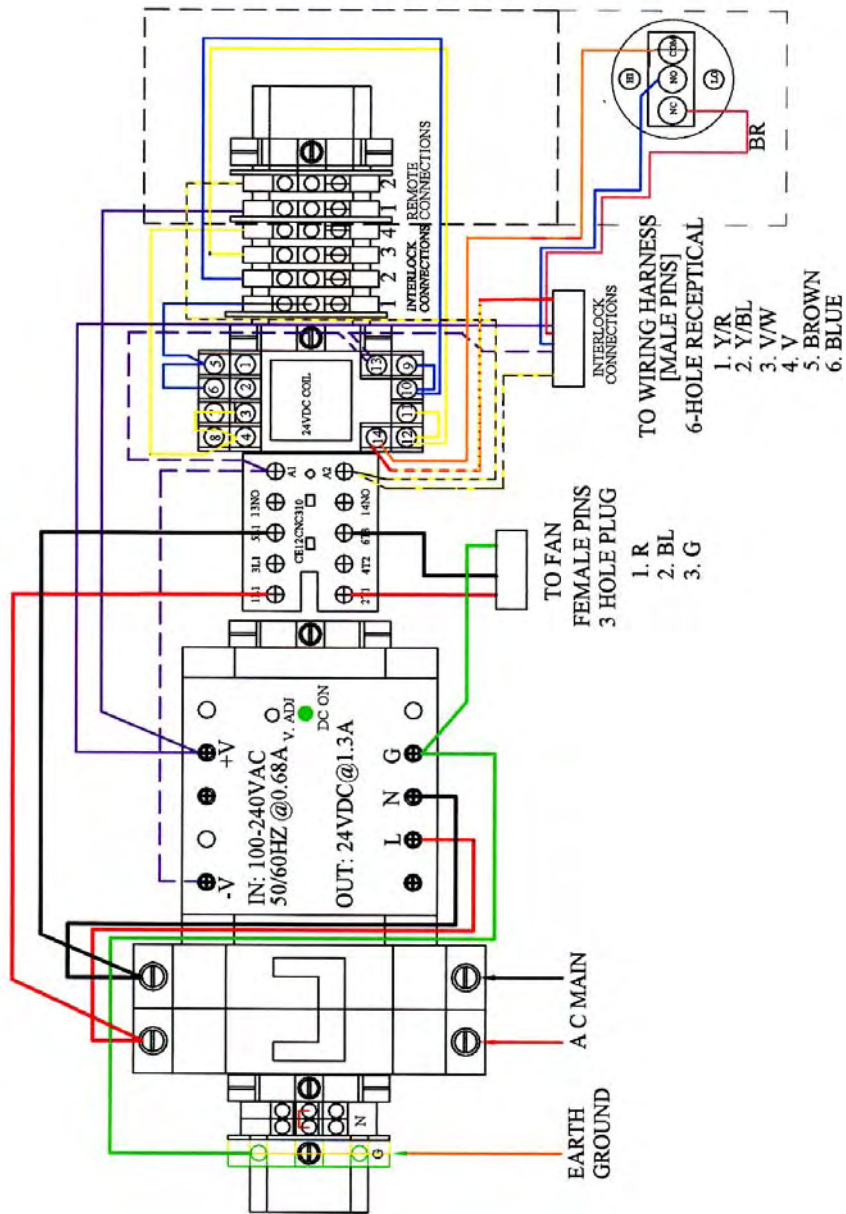


Model 86705-86775 with Optional Diff. Pressure Switch and Remote Actuation



DIN RAIL ASSEMBLY

115-240 VAC, 50/60 HZ, SINGLE PHASE



NOTES:

- 1.) SLEEVE ENDS GOING TO MOLEXES
- 2.) LABEL INTERLOCK, GROUND AND AC MAIN CONNECTIONS

6-3 HOW TO RECEIVE REPLACEMENT PARTS
MODEL 86705/86775

(CONSULT FACTORY)
CALL 440-243-1100

When consulting the factory for replacement parts please have the model and the serial number of loads requiring service.

SPECIFICATIONS

Model 86705/86775

Impedance ----- > 50 ohms nominal

86705 VSWR @ DC to 110MHz1.10:1 110 to 240MHz 1.15:1
86710 VSWR @ DC to 110MHz1.10:1 110 to 240MHz 1.15:1
86715 VSWR @ DC to 110MHz1.10:1 110 to 240MHz 1.15:1
86725 VSWR @ DC to 110MHz1.10:1 110 to 240MHz 1.15:1
86735 VSWR @ DC to 110MHz1.10:1 110 to 240MHz 1.15:1
86750 VSWR @ DC to 110MHz1.10:1 110 to 240MHz 1.15:1
86750 VSWR @ DC to 110MHz1.15:1 Consult Factory

Power Rating @ Sea Level ----- > 5/75 KW

Frequency Range----- > DC to 110 MHz

Cooling Method ----- > Forced Air Ductable

Ambient Temperature ----- > -30°C to 43°C

Fan Assembly ----- > 1/6 hp /1½ hp (50 Hz /60 Hz) centrifugal

AC Power Requirements: 86705 3 amp at 115 Volts
86710 3 amp at 115 Volts 5 amps at 230 Volts
86715 5 amp at 115 Volts 5 amps at 230 Volts
86725 9 amp at 115 Volts 5 amps at 230 Volts
86735 18 amp at 115 Volts 5 amps at 230 Volts
86750 15 amp at 115 Volts 15 amps at 230 Volts
86775 25 amp at 115 Volts 15 amps at 230 Volts

Finish ----- > Beige Splatter

Serial No. _____ Frequency _____ Resistance _____ dBA@3ft < 80dBA

Model _____ Inspected by _____ Date _____

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

CRAFTED WITH PRIDE IN THE U.S.A.