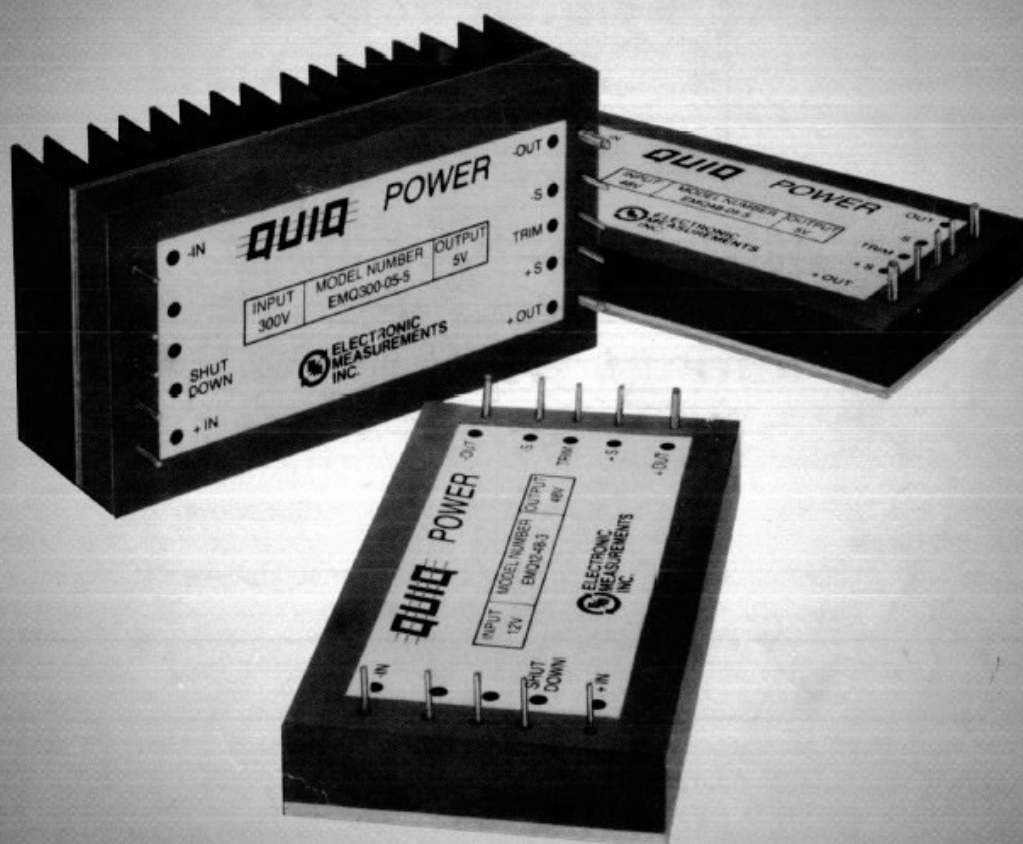


TheMAGIC MODULE™

High Density DC-DC Converters



QUIQ
MODULAR POWER

A PRODUCT OF
**ELECTRONIC
MEASUREMENTS
INC.**

Model Selection



NOMINAL INPUT VOLTAGE (VDC)	INPUT VOLTAGE RANGE (VDC)		OUTPUT VOLTAGE (VDC)				OUTPUT POWER (WATTS)
	MIN.	MAX.	5V	12V	15V	24V	
300	200 (170) ¹	400 (425) ²	EMQ300-05-40	EMQ300-12-16	EMQ300-15-13	EMQ300-24-8	200
			EMQ300-05-30	EMQ300-12-12	EMQ300-15-10	EMQ300-24-6	150
			EMQ300-05-20	EMQ300-12-8	EMQ300-15-6	EMQ300-24-4	100
			EMQ300-05-15	EMQ300-12-6	EMQ300-15-5	EMQ300-24-3	75
150	100 (85) ¹	200 (210) ²	EMQ150-05-40	EMQ150-12-16	EMQ150-15-13	EMQ150-24-8	200
			EMQ150-05-30	EMQ150-12-12	EMQ150-15-10	EMQ150-24-6	150
			EMQ150-05-20	EMQ150-12-8	EMQ150-15-6	EMQ150-24-4	100
			EMQ150-05-15	EMQ150-12-6	EMQ150-15-5	EMQ150-24-3	75
48	40 (36) ¹	60 (72) ²	EMQ48-05-40	EMQ48-12-16	EMQ48-15-13	EMQ48-24-8	200
			EMQ48-05-30	EMQ48-12-12	EMQ48-15-10	EMQ48-24-6	150
			EMQ48-05-20	EMQ48-12-8	EMQ48-15-6	EMQ48-24-4	100
			EMQ48-05-15	EMQ48-12-6	EMQ48-15-5	EMQ48-24-3	75
24	20 (18) ¹	30 (36) ²	EMQ24-05-30	EMQ24-12-12	EMQ24-15-10	EMQ24-24-6	150
			EMQ24-05-15	EMQ24-12-6	EMQ24-15-5	EMQ24-24-3	75
12	11 (10) ¹	20 (24) ²	EMQ12-05-20	EMQ12-12-8	EMQ12-15-6	EMQ12-24-4	100
			EMQ12-05-10	EMQ12-12-4	EMQ12-15-3	EMQ12-24-2	50

1. Voltage at which unit will support 75% of full load and still maintain load regulation.

2. Unit will withstand this input voltage for up to 10 seconds (maximum duty cycle of 1%).

NOTE: CONSULT FACTORY FOR NON-STANDARD OUTPUT VOLTAGES

Operational Ratings and Characteristics

INPUT	
Input Voltage	(See above)
Input Reflected Ripple	5% of Nominal Input Current
Turn-on Time	100 mS Typical
OUTPUT	
Voltage Accuracy	1%
Isolation (Input/Output), 24-48V input	1500 VDC Min.
Isolation (Input/Output), 300V input	2500 VDC
Efficiency (Nominal Line/Full Load)	80% Typical—All output voltages
Switching Frequency	250 KHz Typical
Line Regulation	0.2%
Load Regulation	0.5%
Peak-to-Peak Output Ripple and Noise	3% (20 MHz Bandwidth)
Transient Response, 50-100% Full Load	500 μ S Max.
Current Limit	110%-125% of Full Load Rating
Overvoltage Protection (OVP)	115%-135% of Nom. Output Voltage (Latches off until power is recycled)
Thermal Shutdown (Baseplate Temp.)	90-105°C (Auto Recovery)
Short Circuit Current Limit (Current at which shutdown occurs)	130% of Load Rating (Auto Recovery)
Maximum RMS Short Circuit Current	10% of Rated Output Current

PRODUCT CHANGES - product information published in this brochure was current at time of printing, however, E/M reserves the right to change specifications, designs and models without prior notice.

Thermal Operating Characteristics

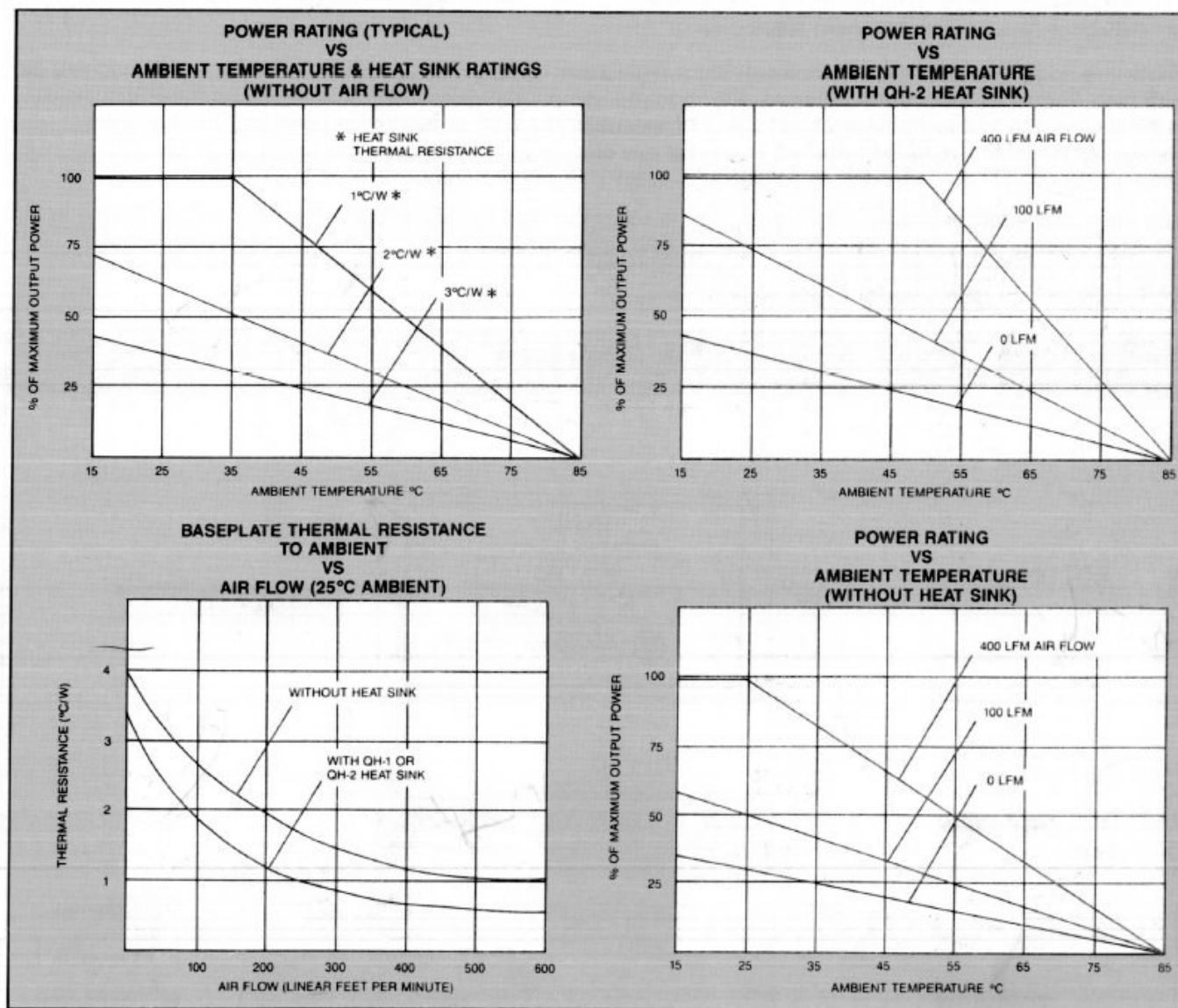


Thermal Resistance, Baseplate-to-Ambient
Storage Temperature
Operating Temperature

4°C/W
-40° to 100°C
0 to 85°C*

*CONSULT FACTORY FOR EXTENDED TEMPERATURE RANGE

The EMQ Series requires that the baseplate temperature be kept below 85°C. Maintaining the baseplate at an appropriate temperature can be achieved by either providing an adequate amount of moving air and/or additional heatsinking. Illustrated below are typical performance curves for the EMQ Series.

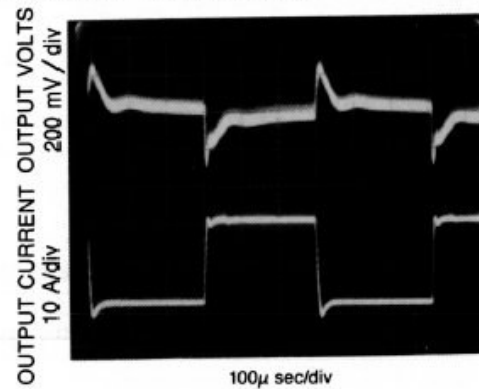


Special Features of the EMQ Series



- More Watts Per Cubic Inch (29W/Cu. Inch for 5V/40 A unit)
- Proven Forward Converter Topology To Reduce Voltage and Current Stresses in Power MOSFET
- Fixed Frequency (250 KHz) For Reduced EMI, Better Stability and Greater Ease of Synchronization
- Short Circuit Current Limited to Negligible Level to Protect Load Circuit to Much Greater Degree Than Conventional Foldback Circuits
- Fast Response Overvoltage Protection Circuit Limits Voltage Excursions During Fault or Transient Condition
- Proprietary Planar Magnetics Design For Exceptional Repeatability and Control of Leakage Inductance
- Excellent *Guaranteed* Transient Response

TRANSIENT RESPONSE



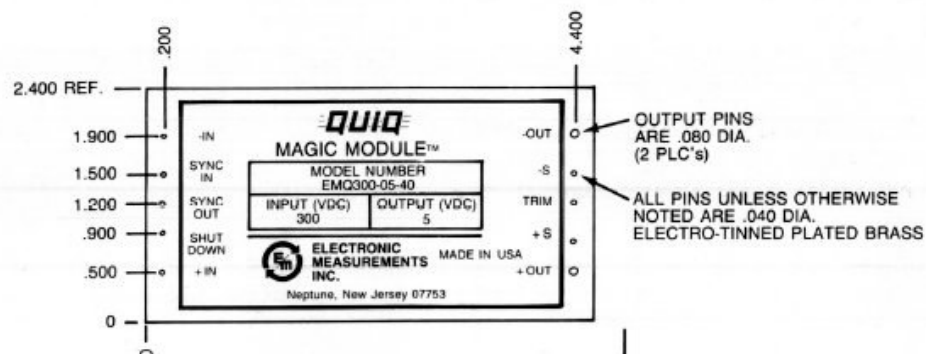
Output Transient Response—Model EMQ48-05-40
25% Full Load to 75% Full Load

There are numerous approaches to designing a high-power-density DC converter. With some approaches, as with high frequency resonant topologies, the required component restrictions and circuit nuances can result in subtle but serious performance tradeoffs. For example, the high primary-side peak current, high-line voltage stresses and reduced transient response are often a problem. Operation under short circuit or overvoltage conditions can result in additional undesirable performance characteristics.

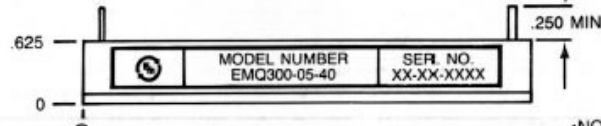
The advanced EMQ series has been designed to meet the high density power objectives without giving in to the above tradeoffs. It represents a blend of proven engineering with a careful application of advanced concepts in semiconductor technology, magnetics design, thermal management, fault protection and packaging. It represents performance without risk.

Mechanical Specifications

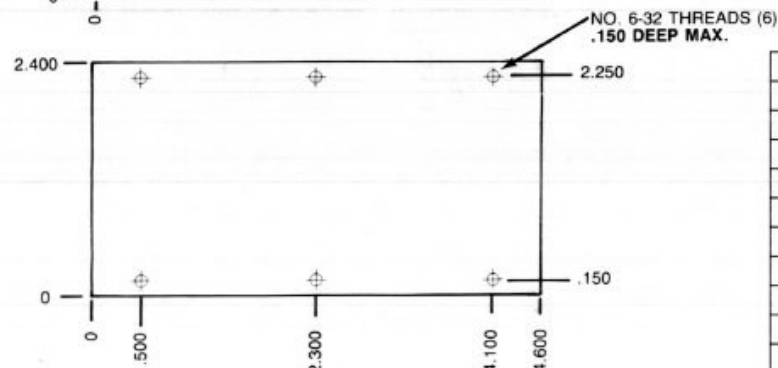
BOTTOM VIEW



SIDE VIEW



TOP VIEW



Pin	Function
1	+ In
2	Shutdown
3	Sync Out
4	Sync In
5	- In
6	+ Out
7	+ Sense
8	Trim
9	- Sense
10	- Out

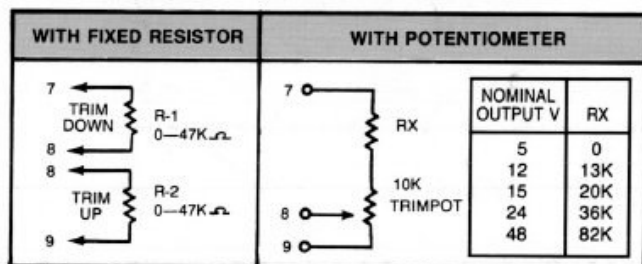
NOTE: PINS 3 AND 4 NOT PRESENT UNLESS SYNC OPTION IS SPECIFIED.

Applications Notes



TRIM/MARGINING

The output voltage may be trimmed a minimum of $\pm 10\%$ with a fixed resistor or by using a potentiometer as shown.



REMOTE SENSE

Terminals 7 and 9 allow a four-wire connection between the converter and load. These connections can compensate for voltage drops up to .25 volts in each of the main connecting wires.

TURN ON DELAY

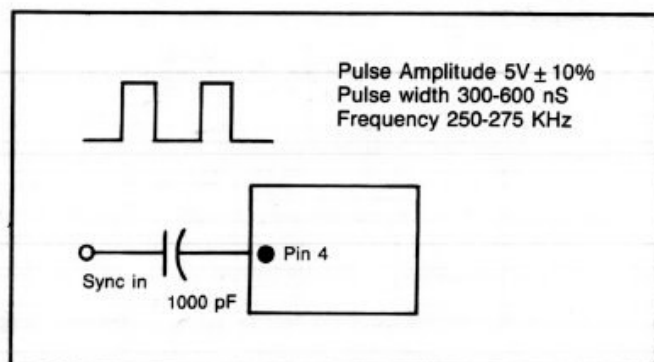
An EMQ unit incorporates a small delay (typically, a hundred milliseconds) at turn on. This is done to eliminate the false indication of short circuit which might occur in the presence of a high-capacitance or tungsten lamp load. These types of loads, at turn on, draw a momentary surge current which could be sensed as an overcurrent condition.

SYNCHRONIZING (OPTIONAL)

SYNC OUT — Provides a pulse approximately .4uS wide, 1 volt in amplitude. Synchronized to the switching frequency, this signal can be used to synchronize other circuits or to indicate an On condition in the converter.

SYNC IN — A pulse as described in the figure below will cause the converter switching frequency to be identical to that of the input pulses.

NOTE - SPECIFY SUFFIX "S" FOR SYNC OPTION



LOGIC INHIBIT/SHUTDOWN

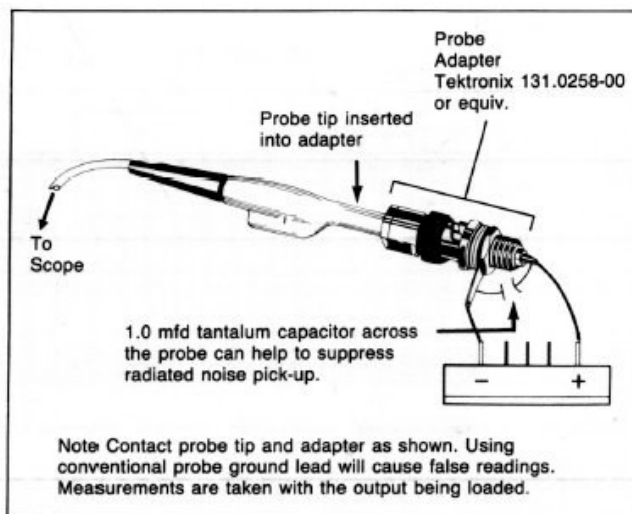
With the EMQ Series, remote shutdown is achieved by bringing primary side pin LOW (less than .5V with respect to the minus input terminal). When the shutdown pin is opened, the unit will turn back on.

PARALLEL/REDUNDANT OPERATION

DC-DC converters are generally paralleled for two reasons: a) to achieve higher current capabilities or b) the more common use, to achieve $N + 1$ redundancy. All EMQ units are designed to be used in either application. Where close current sharing is necessary, paralleling modules are required. These modules automatically sense load current and adjust converter output voltages so as to make respective output currents essentially equal.

RIPPLE AND NOISE MEASUREMENTS

Shown below is the appropriate method to measure output ripple and noise. The idea is to minimize the length of the oscilloscope probe ground lead. A standard ground lead, typically 3-4" long, can pick up 50 millivolts or more of peak-to-peak noise per inch (i.e., the lead acts as an antenna). Hence the "tip and barrel" method serves to eliminate or minimize the erroneous portion of the measured value.





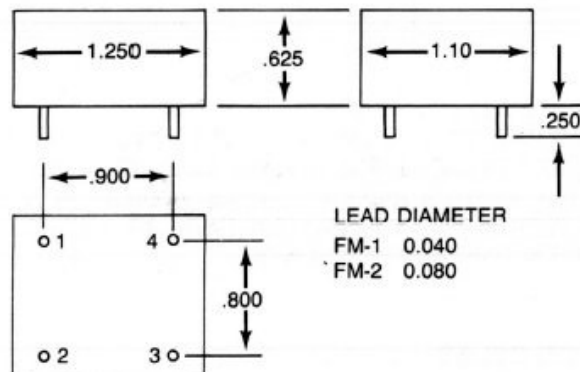
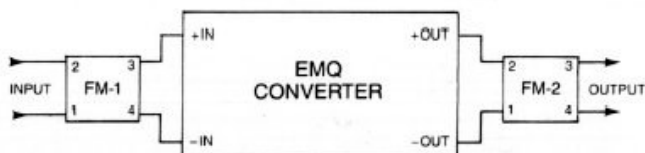
RIPPLE AND NOISE ATTENUATION MODULE

The FM-1 and FM-2 filter modules are effective in providing substantial attenuation of both differential and common mode noise. In addition, they can reduce fundamental ripple to that approaching levels typically found in linear supplies (below 15 millivolts). For best results both the FM-1 and FM-2 should be used together. These miniature, cost effective modules are characterized for operation at power levels up to 200 watts and DC output currents up to 40 amps.

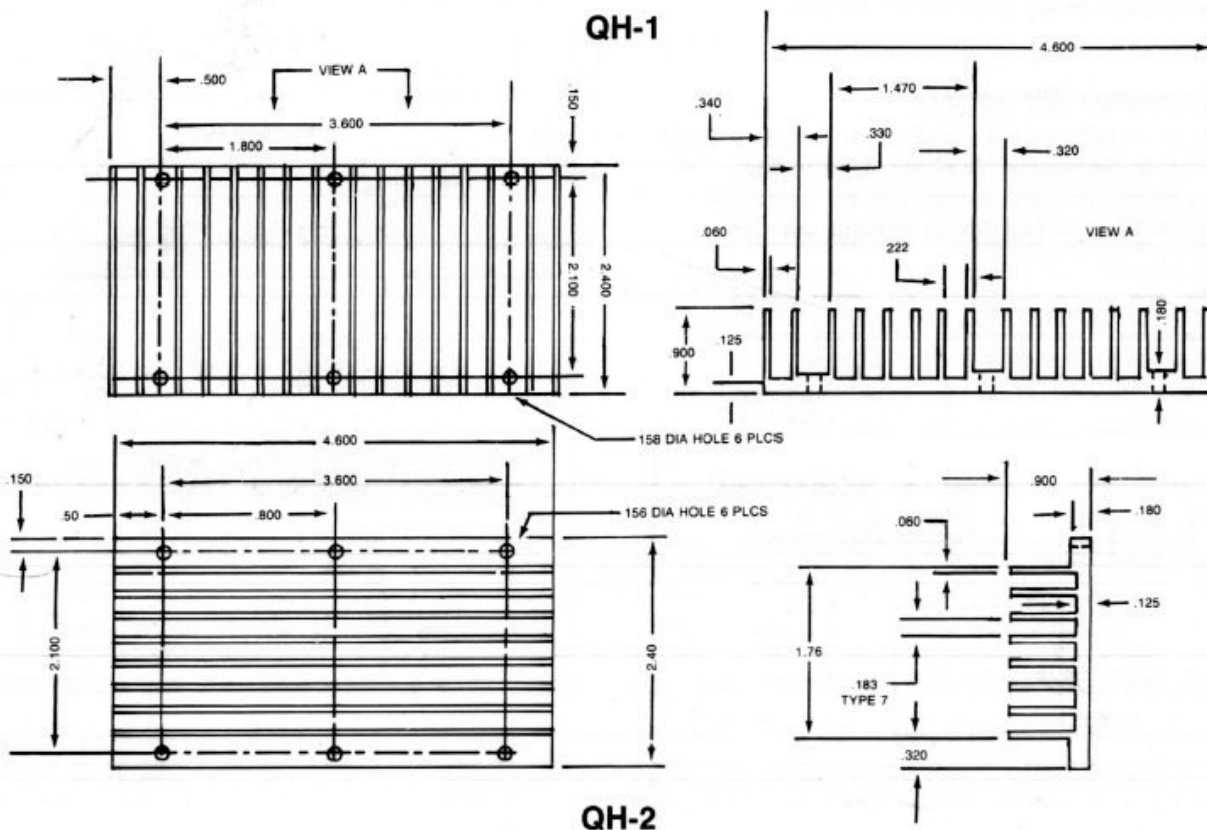
SPECIFICATIONS

MODEL	TYPE	TYPICAL DC RESISTANCE (EACH LEG, IN MILLIOHMS)	*CURRENT RATING (AMPS)
FM-1	INPUT	12.0	8
FM-2	OUTPUT	1.20	30

*CURRENT RATING 33% HIGHER WITH 200 LFM AIR FLOW



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