

INSTRUCTION MANUAL

Load Manager 2MOT

Dual Load Manager/Power Supply

**An Electrical System to Provide
Voltage and Time Load
Management, High Voltage
Transient Suppression, and a +5.0
Volt Regulated Power Supply**

MODEL #091-125-012

3 YEAR WARRANTY



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INTRODUCTION

The KUSSMAUL ELECTRONICS Co., Model 091-125-012 Load Manager 2MOT (LM2MOT) is depicted in the schematic Block Diagram of Figure 1. It enables and disables Vehicle Battery Voltage (V_{BV}) power to mobile; Central Processing Unit (CPU), Monitor (MON), Radio, Printer and Disc Drive in conjunction with associated Ignition Sense enable signals by monitoring battery voltage, a vehicle starter signal and vehicle engine ON/OFF sensor within the LM2MOT.

Load Manager OUTPUTS

The Load Manager 2MOT contains two (2) Load Management power supply output circuits herein referred to as the "Main Power Output" and "Auxiliary Power Output". Reference Figure 1 and 2.

Main Power Output: Intended to interface vehicle battery power to the following.

CPU and CPU Monitor Power:

V_{BV} at 15 Amperes Maximum via external connection(s) at Terminal Board 1 (TB1) terminals; 3 and 4, TB1-3 [12VDC CPU PWR Ground] and TB1-4 [+12VDC CPU PWR Out].

The Load Manager 2MOT CPU output power terminals at TB1-3 and TB1-4 are rated at 30 Amperes Maximum.

Radio Power:

V_{BV} at 3.0 Amperes Maximum via Jack/Plug 1, (J1/P1), terminal 7, J1-7/P1-7 and System Grounds at Jack/Plug 1, (J1/P1), terminal 1, 2, 3, J1-1, -2, -3/P1-1, -2, -3.

Printer Power:

V_{BV} at 3.0 Amperes Maximum via Jack/Plug 1, (J1/P1), terminal 6, J1-6/P1-6 and System Grounds at Jack/Plug 1, (J1/P1), terminal 1, 2, 3, J1-1, -2, -3/P1-1, -2, -3.

The Main Power Output circuit within the LM2MOT is internally fused at 15 Amperes.

Auxiliary Power Output: Intended to interface vehicle battery power to the following.

Disc Drive Power Supply:

+5VDC at 2.5 Amperes Maximum via Jack/Plug 1, (J1/P1), terminal 5, J1-5/P1-5 and System Grounds at Jack/Plug 1, (J1/P1), terminal 1, 2, 3, J1-1, -2, -3/P1-1, -2, -3.

**Enabled by CPU/CPU Monitor (TB1-4) current draw of 1.0 amperes or more.*

Ignition Sense Power:

V_{BV} at 2.0 Amperes Maximum via Jack/Plug 1, (J1/P1), terminal 8, J1/P1-8 and System Grounds at Jack/Plug 1, (J1/P1), terminal 1, 2, 3, J1-1, -2, -3/P1-1, -2, -3.

The Auxiliary Power Output circuit within the LM2MOT is internally fused at 10 Amperes.

INTRODUCTION, continued

Load Manager INPUTS

The Load Manager 2MOT contains two (2) Load Management input circuits herein referred to as the "Primary Power Input" and "Starter Signal Input". Reference Figure 1 and 2.

Primary Power Input:

The Load Manager 2MOT receives vehicle battery power via external connection(s) at Terminal Board 1 (TB1) terminals; 1 and 2, vehicle high side power and ground return respectively. It is the responsibility of the installing agent to appropriately size the wire gage and external over-current protection device in accordance with intended load configuration, customer requirements and or regulatory specifications in effect.

The Load Manager 2MOT Primary Power Input terminals at TB1-1 and TB1-2 are rated at 30 Amperes Maximum.

Starter Signal Input:

The Load Manager 2MOT requires a +12VDC low level (less than 100ma) signal at Jack/Plug 1, (J1/P1), terminal 4 that is referenced to vehicle ground. This signal typically originates from the "Start" position of the vehicle ignition switch or from the vehicle starter motor solenoid coil excitation circuit.

THEORY of OPERATION

The LM2MOT manages interfaced electrical loads using both voltage and time management topologies. Load management by voltage is developed by sensing the vehicle battery (vehicle 12VDC electrical system) voltage which is representative of the amount of electrical load on the system. Load management by time is developed conditionally as a function of; engine ON sensor, vehicle start, CPU/CPU Monitor load on the Main Power Output circuit and system input voltage with respect to time.

Load Management by Voltage

Under Voltage: The LM2MOT will remove Main and Auxiliary Output Power when the sensed system voltage at TB-1 (+VDC) and TB1-2 (Ground) is 10.4VDC or less. Power will be restored to the loads when the sensed system voltage returns to V_{BV} Threshold setting level +.50 VDC. A "Hold-Up" circuit internal to the LM2MOT will provide a 3 second (approx. & load dependent) Under Voltage transient protection. These Under Voltage transients are demonstrated by a temporary reduction of Battery Terminal Voltage caused by the application of a heavy load in excess of battery or alternator rating.

Over Voltage: The LM2MOT will remove Main and Auxiliary Output Power when the sensed system voltage at TB-1 (+VDC) and TB1-2 (Ground) is 15.2VDC or greater. Power will be restored to the loads when the sensed system voltage returns to normal system voltage; 10.50VDC min. to 15.00VDC max.

THEORY of OPERATION, continued

Load Management by Voltage, continued

V_{BV} Threshold: The LM2MOT will remove Main and Auxiliary Output Power when the sensed system voltage at TB-1 (+VDC) and TB1-2 (Ground), V_{BV}, falls below a preset threshold herein referred to as "drop-out" voltage. Main Power Output V_{BV} drop-out voltage thresholds are programmable from 10.5 to 12.5VDC with the Auxiliary Power Output V_{BV} drop-out voltage fixed at the Main Power Output V_{BV} drop-out voltage +.50VDC and hence are 11.0 to 13.0VDC. These V_{BV} drop-out thresholds are programmable by an eight (8) position dip switch selector located on the LM2MOT printed circuit board assembly. Refer to FIGURE 2 for Main and Auxiliary Power Output drop-out voltages as established by the eight (8) position dip switch selector "S1". Main and Auxiliary Power outputs are restored when V_{BV} exceeds the respective drop-out thresholds by .50 VDC.

CPU/CPU Monitor Load (Disc Drive Power):

The +5.0VDC Disc Drive Power Output, reference J1-5/P1-5, is enabled **ONLY** when the LM2MOT senses 1.0 amperes or greater CPU/CPU Monitor Load current at the CPU Power Output circuit of TB1-4.

Engine ON Sensor:

When the engine alternator is not running the battery voltage will drop below 12.87 VDC removing Auxiliary Power Output after a preset time has elapsed per Load Management by Time specifications. The Main Power Output is not directly subject to the engine ON/OFF sensor but will, however, be removed 6 minutes after the Auxiliary Power Output is removed. This 6 minute Main Power Output drop-out after Auxiliary Power Output drop-out is fixed.

Load Management by Time:

The Load Manager 2MOT also keeps track of time. When the engine alternator is not running the battery voltage will drop below 12.87 VDC and the Auxiliary Power Output will be removed after the time set by the four (4) position dip switch selector located on the LM2MOT printed circuit board assembly has expired. Refer to Figure 2 for Auxiliary Power Output drop-out time as established by the four (4) position dip switch selector "S2". The Main Power Output will be removed 6 minutes after the Auxiliary Power Output is removed if the engine sensor triggers a timed load management removal of load power. This timer is reset and has no effect if the sensed system voltage at TB-1 (+VDC) and TB1-2 (Ground), V_{BV}, falls below the Load Management by Voltage setting prior to the time set by time selector S2.

THEORY of OPERATION, continued

Load Management by Vehicle Start:

Upon receipt of a +12VDC low level (less than 100 ma) vehicle starter engaged signal at Jack/Plug 1, (J1/P1), terminal 4 (J1-4/P1-4) the LM2MOT will disable ALL Load Management settings and maintain output power to loads connected to the Main and Auxiliary outputs, irrespective of battery terminal voltage Load Management by Voltage settings, as well as maintaining DISC Drive output power if enabled by CPU/CPU Monitor (TB1-4) current draw of 1.0 amperes or more. This Load Management by Voltage "by-pass" during vehicle engine starting will be maintained by the LM2MOT during and for 3 to 5 seconds after the starter signal is removed from J1-4/P1-4 wherein Load Management by Voltage and Time will resume. This by-pass is to accommodate for a lowered system voltage typical of an engine start.

Transient Protection:

The LM2MOT uses high speed semiconductor transient protection on the Primary Power Input, Main Power Output and Auxiliary Power Output. This transient protection is capable of providing electronic circuitry protection from the damaging effects of up to and including 20 Joules of energy transients that are 15.6 VDC or greater in magnitude, 10 milliseconds in duration that repeat every 4 seconds.

Factory Default Settings:

The LM2MOT is shipped with the following Load Management by Voltage and Load Management by Time Settings. Reference Figure 2.

Load Management by Voltage, Drop-Out Thresholds, V_{BV} :

Main Power Output: 10.50 VDC

Auxiliary Power Output: 11.00 VDC

* **ALL** eight (8) position dip switch selectors on "S1" located on the LM2MOT printed circuit board assembly for Main Power Output and Auxiliary Power Output drop-out voltage set to "OFF".

Load Management by Time, Auxiliary Power Time-Out:

7.50 Hours

* **ALL** four (4) position dip switch selectors on "S2" located on the LM2MOT printed circuit board assembly for Main Power Output and Auxiliary Power Output drop-out voltage set to "OFF".

Switch "S3" located on the LM2MOT printed circuit board assembly is also set at the factory to the "RUN" position. THIS SWITCH SETTING MUST NOT BE CHANGED.

INSTALLATION

1. Wire LM2MOT in accordance with Figure 1. and the following criteria;
 - >AWG 16, minimum, for J1 connections via supplied P1 connector.
 - >AWG 6, minimum, for TB1 connections.
 - >Assumes a Maximum length of 15 Foot for each circuit.
2. Select LM2MOT mounting such that;
 - Unit and interface wiring is accessible for maintenance.
 - *Unit is securely and mechanically mounted on a metallic surface.
 - *Unit is in a free or moving air space.

 - * The anodized aluminum chassis of the LM2MOT forms an integral part of the Thermal Management of the unit and is an extension of internal electronic semiconductor and passive component "heat-sinking". The chassis should be mounted to a vehicle surface that is metallic with a large as possible continuous surface area. The LM2MOT DOES NOT RELY on metallic metal chassis mounting for Vehicle Electrical System Ground Potential connection.

SPECIFICATIONS

Temperature Environment: 0 to 55 degree C

Primary Power Input: 12 Volts DC (vehicle battery) Typ., 30 Amperes Maximum

Main Power Output: 12 Volts DC, Internally Fused; 15 Amperes

Auxiliary Power Output: 12 Volts DC, Internally Fused; 10 Amperes

Disk Drive Output: +5.0 Volts DC, 2.5 Amperes max. +/- 1% regulation. Disk Drive Output Power enabled by CPU/CPU Monitor current draw of 1.0 Ampere or more at TB1-4. Disk Drive Output power removed when Auxiliary Power Output shuts off or when CPU/CPU Monitor current draw is less than 1.0 Ampere.

Auxiliary Power Output: 11.00-13.00 Volts DC, programmable in .25 Volts DC increments.

Main Power Low Voltage Drop Out: .50 Volts DC less than Auxiliary Power Output programming. Main Power Output also drops out 6 minutes after Auxiliary Power Output dropout.

Auxiliary & Main Power Restoration: .50 Volts DC higher than the programmable drop out voltages

Auxiliary Power Output Time Out: .50 to 7.50 hours, programmable in .50 hour increments. Activated when vehicle battery/system voltage is less than 12.87 Volts DC (engine alternator off).

Transient Protection: 20 joules energy spike up to 10 milliseconds, repeating once every 4 seconds. Automatic disconnect when transient exceeds 15.6 for longer than 10 milliseconds.

Main Power and ignition sense will not drop out while the engine is being started.

Weight: 24 ounces.

Dimensions: Less Input/Output Cabling; 7.25"W X 5.50"D X 2.35"H, see FIGURE 3.

Mounting: 4 X .188 Dia. holes, see FIGURE 3. for locations.

FIGURE 1

INSTALLATION SCHEMATIC, Typical
KUSSMAUL LOAD MANAGER 2M, LM2MOT, (MOTOROLA)

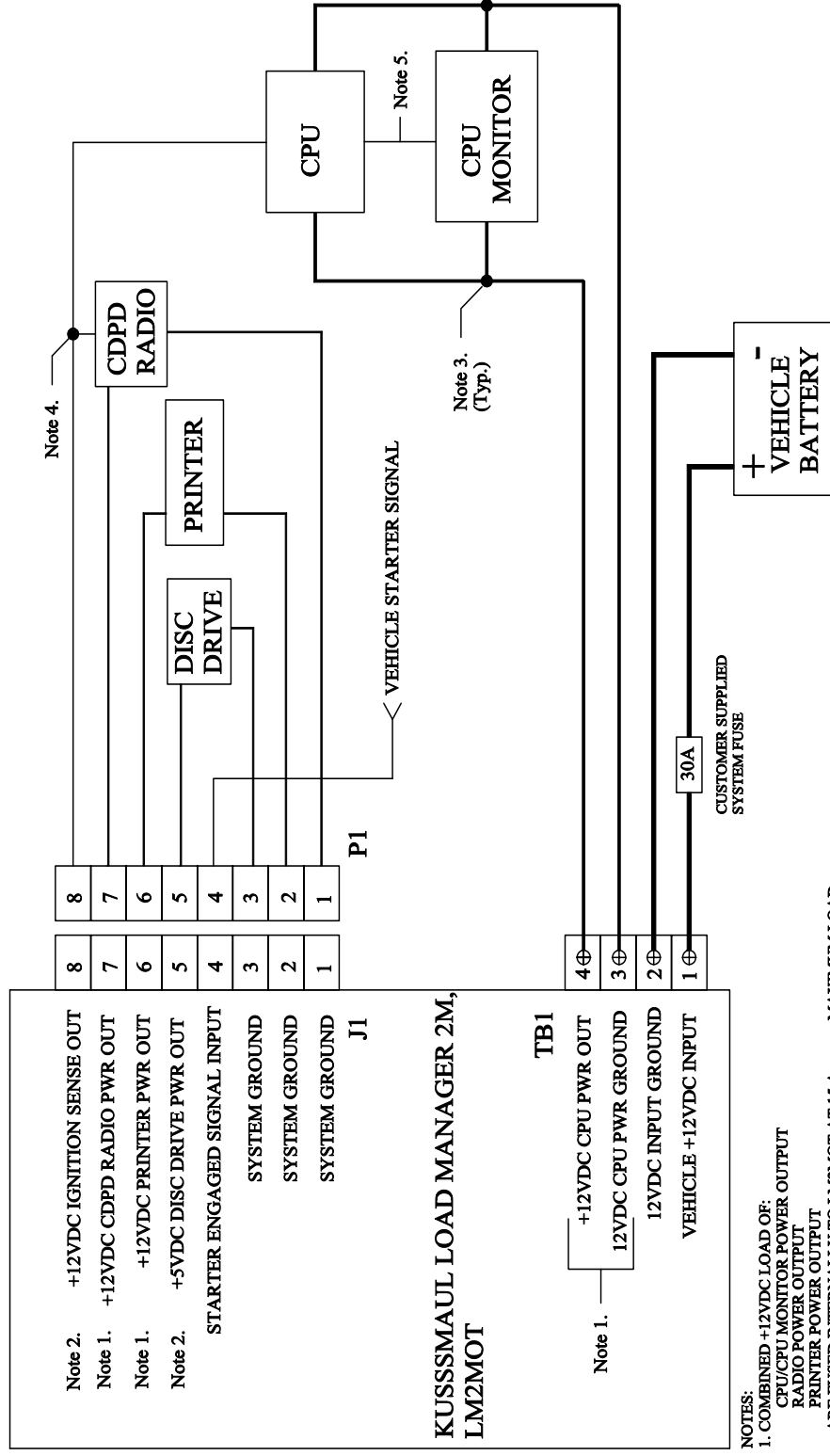


FIGURE 2

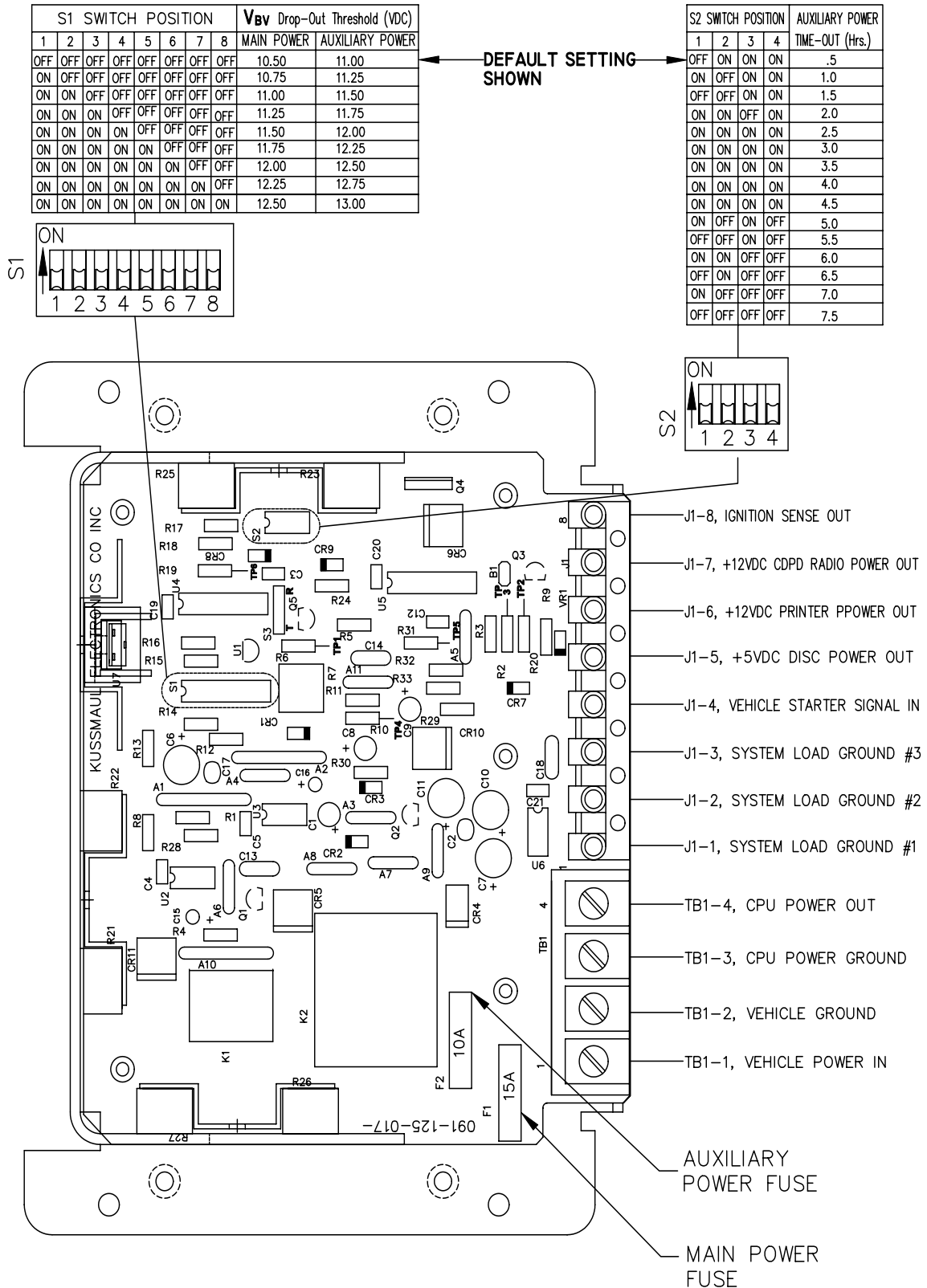
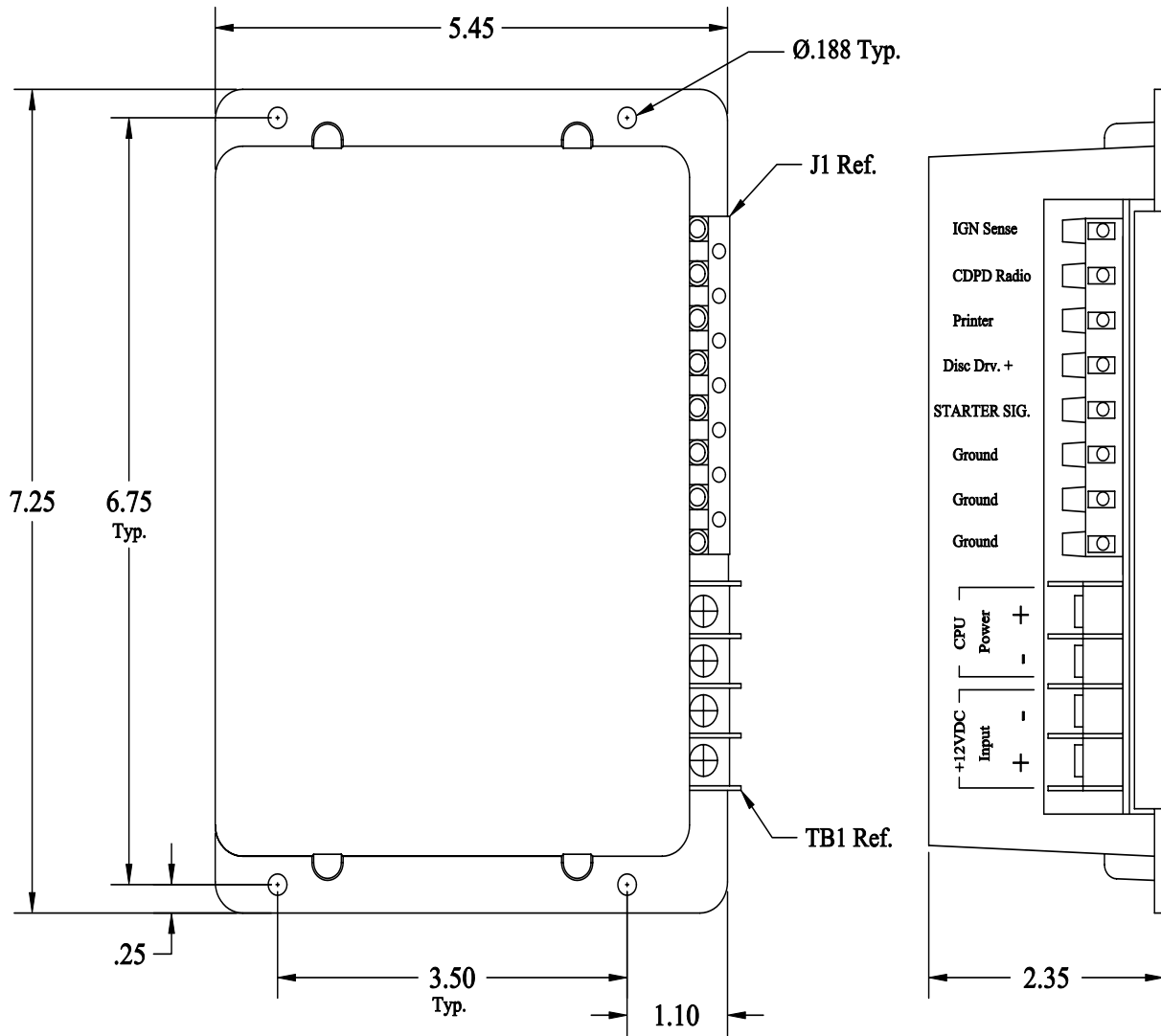


FIGURE 3
KUSSMAUL LOAD MANAGER LM2+ (MOTOROLA)
PACKAGE DETAIL



INSTALLATION RECORD & WARRANTY

Date Installed _____

Installed By _____

Vehicle Identification _____

Vehicle Owner _____

WARRANTY

All product of Kusssmaul Electronics Company Inc. are warranted to be free of defects of material or workmanship. Liability is limited to repairing or replacing at our factory, without charge, any material or defects which become apparent in normal use within 3 years from the date the equipment was shipped.

Kusssmaul Electronics Company, Inc. shall have no liability for damages of any kind to associated equipment arising from the installation and /or use of the Kusssmaul Electronics Company, Inc. products. The purchaser, by the acceptance of the equipment, assumes all liability for any damages which may result from its installation, use or misuse, by the purchaser, his or its employees or others.