THEORY OF OPERATION

RADIO FREQUENCY EXTERNAL PROGRAMMING MODULE (EPM)

March 13, 2000

- INTRODUCTION:

  This design note includes information regarding the electronic design of the External Programming Module (EPM) developed by Brady Worldwide Inc.

- DESCRIPTION:

  The EPM is a micro-controller based transceiver designed to read from and write to passive RF transponder labels as they exit from a printer.

  The absolute maximum operational parameters of the RF reader are as follows:

Input Voltage (V_{in})	$12V_{dc(MAX)}$
Input Current (I_{in})	$300mA_{(MAX)}$
Operating Temperature (T_A)	$-40^oC \leq T_A \leq +85^oC$

- FUNCTIONAL DESCRIPTION:

  The design of the EPM is divided into the following circuit functions.

- DC Power Supply
  (refer to schematic)

  The DC power supply generates the regulated +5V supply voltage required by the EPM circuitry. Input power is provided from either an external source, such as an external AC to DC converter.

  U1 is a low-dropout +5V voltage regulator. This device provides the regulated +5V supply voltage. The LM2940 has a dropout voltage of approximately 0.2V @300mA. This allows the reader to operate with a minimum input voltage of 5V. The input capacitor C1 is required to maintain regulator stability. C2 and C3 is required to maintain regulator stability and to bypass stray A/C signals on the +5V buss. The LM2940 also provides internal short circuit and thermal overload protection.

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- RF Module
  (refer to Attached Data Sheet)
  The RF module (OEM-MSR1) is a OEM RFID reader module manufactured by id Systems Ltd, UK. It performs all of the RF functions of the EPM including transmitting, receiving and demodulation.

- Communication
  (refer to schematic)

  The MAX202CSE (U2) allows for communication between the EPM and a host PC. The MAX202CSE is a 5V, RS-232 transceiver. I t is used in the design to convert +/- 12V RS-232 signal levels to and from a host PC +5V and 0V TLL signals used by the RF Module.

- Antenna
  (refer to schematic)
  The antenna is an etched PCB antenna which is part of the EPM P.C.B. It is a matched to 30 ohms, is tuned to a center frequency of 13.56MHz and has a unloaded Q=20. The Tuning and impedance matching is accomplished by the circuitry comprised of R1,C6,C9,C10 and C11. The antenna is connected to the output of the RF module by coaxial cable.