

## Functional Description

### RFID-1 installed in HLX Scale/Printer

#### RFID-1 description

The RFID upgrade kit (p.n. 445130) is factory or field installed into model HLX scale/printers by Hobart factory trained service technicians, per installation instructions in the Appendix. The transmitter portion of the RFID reader operates at 134.2 KHz and is subject to FCC part 15, subpart C, “Intentional Radiator”, paragraphs 15.207 and 15.209. The digital electronics portion of the RFID reader and the HLX scale/printer to which it installed is subject to FCC part 15, subpart B, “Unintentional Radiator”, paragraph 15.109 under the Class A limits.

#### RFID transponder read operation

The transponder is a battery-less device that is powered from the magnetic field generated by the RFID reader and antenna. The transponder can be in the form of a wristband, key fob or access card, among others. The reader drives the resonant antenna for 50 msec at 134.2 KHz to charge a nearby transponder. After the charge cycle, the antenna is no longer driven and is switched to a receive mode. The transponder sends its unique 64 bit code within 20 msec to the reader by frequency modulation (logic 1 is ~122 KHz & logic 0 is ~134 KHz). The antenna, also resonant in receive mode, amplifies the weak transponder signal. Several stages of amplification & band pass filtering precede the frequency demodulation.

#### RFID system details

The two main components of the RFID reader are the RFID reader board assembly (p.n. 445029) and RFID antenna (p.n. 445099) which are installed in the operator console by the service technician per installation instructions, F-25238 (see the Appendix). The RFID reader board assembly contains a TI low frequency RFID reader module (TI p.n. RI-STU-MRD1).

#### RFID reader board description

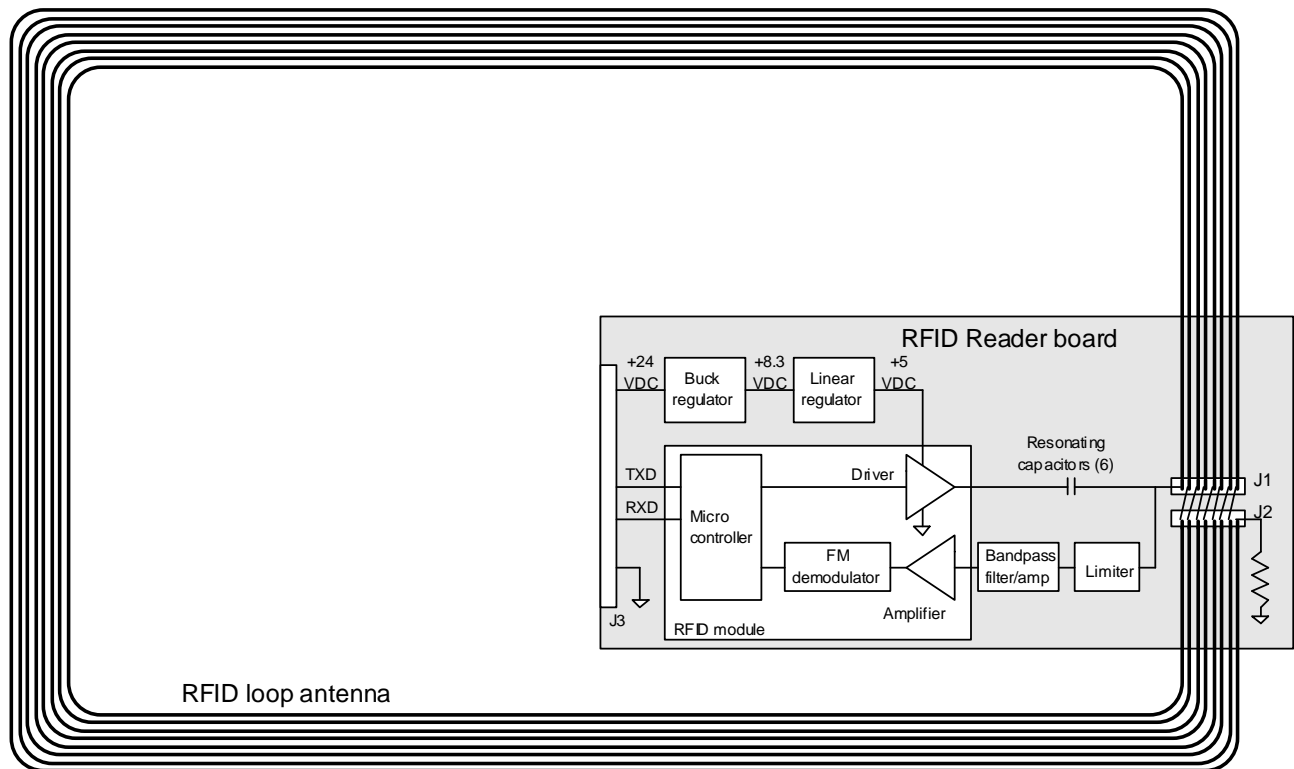
The RFID reader board assembly is powered by +24VDC supplied from the HLX power supply routed through the main board assembly and console board assembly. The +24VDC is converted to +8.3 VDC by a buck switching regulator, then post regulated by a +5VDC linear regulator which supplies both the RFID logic and antenna drive circuits. Communication between the RFID reader micro controller and the host processor on the main board is by UART at 5VDC logic levels. Higher quality resonating circuit capacitors and receiver band pass filter circuit replace similar functions on the TI RFID module for better receive performance. Although there are 3 jumpers on the RFID reader board to allow resonant tuning of the antenna, the installation instructions describe a fixed jumper setting slightly off resonance. Regardless, emissions tests were performed with the antenna tuned to resonate at its driven frequency of 134.2 KHz, to test at maximum radiated power.

#### RFID antenna description

The RFID loop antenna is an unshielded cable that is 42” long with 8 conductors of #22 wire. The loop is located at the inside perimeter of the operator console housing. Connectors at both ends of the cable attach to the RFID reader board and are wired through the reader board to make an 8 turn

coil of 47  $\mu\text{H}$  inductance having a Q of  $\sim 32.5$  at 134.2 KHz resonant frequency. To limit transponder read range to  $\sim 9$  to 12 inches and to eliminate resonant tuning of the coil, a  $2\Omega$  resistor on the RFID reader board is included in the antenna circuit to lower the coil's Q to  $\sim 12.3$ . The antenna is used for both transmission and reception.

## RFID-1 block diagram



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## Appendix – RFID kit installation instructions