Functional Description
HLX Scale/Printer with RFID option

Scale/Printer (with RFID) description

The HLX Scale/Printer is used in food retail markets, typically at service counters such as fresh meat, seafood and deli counters, to weigh products, calculate price and print a label with UPC bar code to apply to the product. Many operators use each scale/printer in the department and it is important to keep track of transactions by operator and product information changes, such as price per pound. Previously, the operator had to key in their ID to sign on to the scale. This Radio Frequency Identification (RFID) option to the HLX Scale/Printer allows the operator to be automatically signed on, to speed up the transaction time.

The RFID upgrade kit (p.n. 445130) is 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.

Overview of scale/printer operation (RFID option)

An operator selects a food product from the scale/printer's database by keying in the Product Look Up number and places the food product on the scale platter. Total price is calculated and displayed. In the background, the RFID reader repeats a transmit/receive cycle at ~ 5 times per second. If an RFID transponder enters the read zone of the scale/printer (within ~9 to 12 inches of the operator console) and the RFID receiver properly detects an RFID transponder that is associated with an operator, then that operator is immediately signed on to the scale/printer. If the transponder leaves the read zone, a programmable delay (~ 5 sec) occurs before the operator is signed off. If the operator makes changes that affect the transaction (e.g., price per pound, tare weight, etc.) and presses "PRINT" to complete the transaction, then the changes are recorded with the operator ID. Another use is to record all transactions with operator ID.

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).

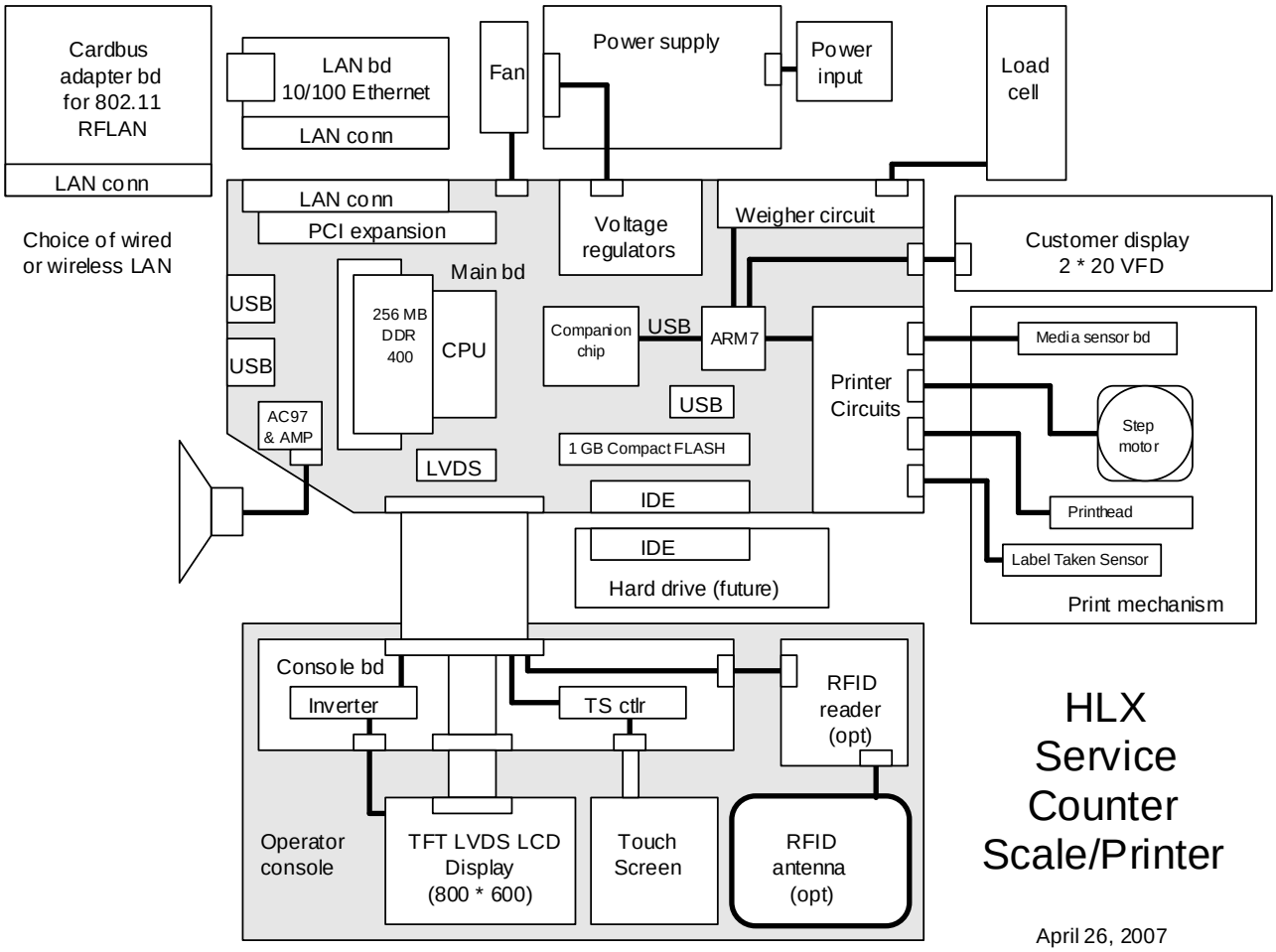
RFID reader board description

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.

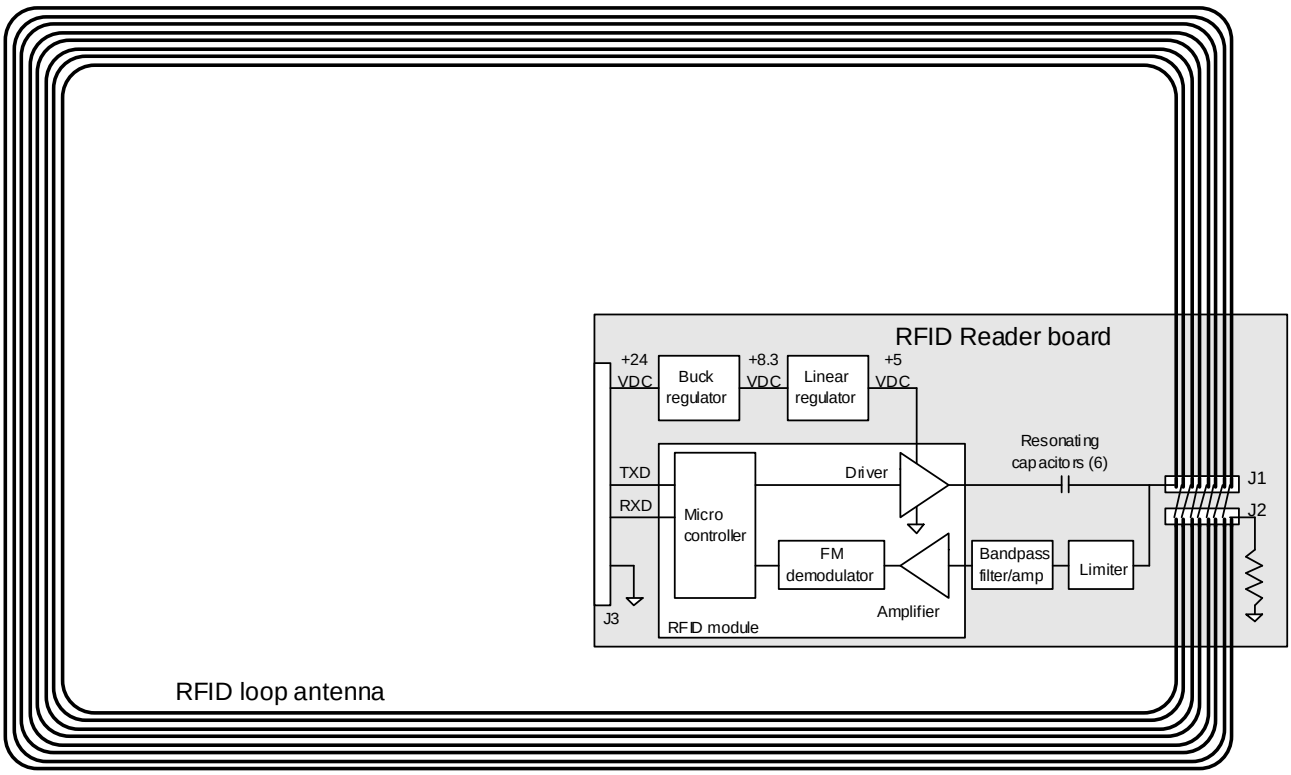
RFID antenna description

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 μH inductance having a Q of ~32.5 at 134.2 KHz resonant frequency. To limit transponder read range to ~9 to 12 inches and to eliminate resonant tuning of the coil, a 2Ω resistor on the RFID reader board is included in the antenna circuit to lower the coil’s Q to ~12.3. The antenna is used for both transmission and reception.

Scale/Printer block diagram



RFID option block diagram



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Appendix – RFID kit installation instructions