Functional Description

1.0 Overview of Product Operation

Briefly, there are two basic modes of operation depending on whether the fuel customer has his transponder in his hand or mounted to his car: 1) "handheld" and 2) "vehicle-mount". TI series 5000 electronics handle the internal generation and communication of signal/data while Marconi Commerce Systems antennas transmit and receive the radiated signal/data in both cases. A transponder that is within range will communicate the customer's ID data back to the system. Another common feature of the two modes is that once the customer's ID information is received and interpreted by the TI series 5000 electronics, the Marconi designed "Gateway" board communicates with the rest of the fuel dispenser to authorize and bill the fuel sale.

- Referring to the block diagram below, for the handheld transponder application, the TI series 5000 electronics (Micro-Reader Q13551 and Data Control Board Q13563-02 or –04) periodically produce commands or signals that are transmitted by Marconi's "Advantage" dispenser antenna (T20524). This antenna is typically mounted inside the fuel dispenser at about the customer's arm level. A transponder when presented by the customer will communicate the customer's ID data back to the Micro-Reader/Data Control Board via the "Advantage" antenna (note same antenna is used to transmit and receive). The data is then communicated to the "Gateway" board.
- For the case of the "vehicle-mount" transponder, the TI series 5000 electronics (LF Transmitter Module Q13579 and Data Control Board Q13563) periodically produce commands or signals. Because there is a need for a larger range, these signals are generated by a TI series 5000 LF Transmitter Module Q13579. The T20231-G1 antenna then transmits these signals. This antenna is mounted at a high location (typically on top of the fuel dispenser). A vehicle mounted transponder that is within range will communicate the customer's ID data back via the same T20231-G1 antenna. This received signal is then routed to a TI series 5000 UHF Receiver Module (RI-RFM-HREA). The UHF receiver module then communicates the data to the Data Control Board. The data is then communicated to the "Gateway" board.

While these descriptions reference fuel dispenser applications, it should be clear that use of such equipment is not limited to only fuel dispensers.

2.0 Product Description

Marconi Commerce Systems Inc.'s product (for which this submittal is being filed) allows customers wishing to purchase products to interface directly with a Point-Of-Sale (POS) via handheld tag or a vehicle mounted transponder. The product is called TRIND ™TIRIS™ (TRIND: Transmitter/Receiver In Dispenser; TIRIS: Texas Instruments Registration and Identification System). The system is designed for retail sales and the fuel dispensing environment.

The TRIND™TIRIS™ system has two antennas when operated in the 'hand-held' only mode (one for each side) and four antennas when operated in the 'hand-held'/'vehicle-mount' mode (two for each side). The 'hand-held' tags and 'vehicle-mounted' transponders each contain a unique and secure ID code so each customer can be identified by their individually registered tag or transponder. The low frequency antennas of the system create magnetic charge-up fields, known as "read-zones". As soon as a tag/transponder enters the "read-zone" (the magnetic charge-up field created by the antenna) the reader receives the unique ID code.

Essentially, Marconi Commerce Systems Inc. is providing the packaging, power, indicators, and antennas for the three boards supplied by Texas Instruments Inc. (Data Control Board, Low Frequency Transmitter Module and the Micro-Reader) – see Figure 1: TRIND ™TIRIS™ RFID Functional Block Diagram.

The TRIND™ TIRIS™ (Part # C00011-XXX) is a Radio Frequency Identification Device (RFID) which is designed for use in conjunction with both battery powered vehicle transponders (Texas Instruments Part # 9795101, FCC ID: A92VEHICLE) and handheld battery-less transponders (Texas Instruments Part # RI-TRP-Series key ring tag). The vehicle transponder is on a vehicle , and the handheld transponder is carried by the user. The transmitter portions of the TRIND™ TIRIS™ operates at 134.2kHz and is subject to FCC Part 15, Subpart C, "Intentional Radiator", paragraphs 15.207 and 15.209. The digital electronics portion of the TRIND™ TIRIS™ is subject to FCC Part 15, Subpart B, "Unintentional Radiator", paragraph 15.109, under the Class A limits and as such, the TRIND™ TIRIS™ is incorporated into an application that is subject to Class A limits.

3.0 System Details

The TRIND™ TIRIS™ System is mounted into an enclosure such as, but not limited to, a fueling dispenser. The system includes two overhead 134.2kHz antennas, a low frequency (LF) transmitter module, a data control board (DCB) with a 902.858Mhz UHF receiver module, two 902.858Mhz UHF receive antennas, two 134.2kHz low 'Q' printed circuit board antennas, two Light/Micro-Reader Boards (T20601-GX where X indicates the LED colors), and a switched DC Power Supply. These components are listed in Table 1.1, and the functional relationship is provided in Figure 1: TRIND™TIRIS™ RFID Functional Block Diagram. The 134.2 kHz transmit signal originates on the LF Transmitter board and from the Micro-Reader located on the Light/Micro-Reader Board and travels via their respective cables to their respective antennas where it is intentionally radiated.

Circuit Board Descriptions

- The RFID Power Regulating Circuit Board (T20314-G1) provides
  - switched +22VDC, +5VDC, and ground to the DCB, LF transmitter module, and the Light/Micro-Reader Boards
  - +5VDC and ground to the TRIND™ Gateway circuit board.

- The RFID Light/Micro-Reader Circuit Board Assembly (T20601-GX where X indicates the LED colors) has digital interface and RS-232 conversion circuitry, an eight-bit microcontroller (Philips 87C750) with an embedded program to interact with the Micro-Reader. It also has current-limited light-emitting diode (LED) light circuits which are the customer indicators when using the system with a transponder or key tag.

- The Micro-Reader, (Texas Instruments part number RI-STU-MRD1), is soldered on the Light/Micro-Reader Circuit Board Assembly. It has a serial communications interface (SCI), which supports RS-232 protocol communication and TTL data communication. It provides radio frequency (RF) 134.2 kHz control functions to read and program TIRIS™ transponders and works together with a 47µH, low 'Q' antenna; therefore, the system does not need tuning.

- The T20524-G1 antenna is (for "Advantage" dispenser application) a 47µH, low 'Q' (10-20) antenna that work with the Micro-Reader. It is energized by the Micro-Reader at 132kHz to generate the exciter frequency of 134.2kHz.

- The Q13563-02 (Texas Instruments Part Number 9795108-0003 or 9795108-0004) and Q13563-04 (Texas Instruments Part Number RI-STU-DUSA-00) Data Control are the heart of the TRIND™TIRIS™ reader system. The DCB interfaces with the Micro-Readers mounted on the Light/Microreader Boards (RS-232), the LF transmitter module (TTL - transistor-transistor-logic), and the TRIND™ Gateway Board (RS-485). It contains a microprocessor system that is used to poll vehicle transponders and perform system control.

- The UHF Receiver (Texas Instruments Part Number RI-RFM-HRUA/HREA) is an integral part of the DCB and is connected to the DCB directly. It is the uplink receiver for the vehicle transponder, acquiring the signals from the transponder on the 902 MHz carrier. After acquisition, the receiver down converts and demodulates the binary FM signal from the vehicle transponder. It then passes this information on to the DCB for verification.

- The Q13579-01 LF Transmitter module (Texas Instruments part number RI-MOD-048A) is the source of the intentional radiation from the overhead loop antennas. It is used with the LF tuning circuit that this made up of the tuning board and single loop antenna to write data to a TIRIS transponder. It is comprised of a carrier board (RI-MOD-038A) onto which two transmit only RFMs (RI-RFM-028A) are mounted. The RFM together with the tuning circuit, generates the magnetic charge-up field needed for vehicle mounted transponders.

- The overhead antenna assembly T20231-G1 is a purchased part. It transmits at 134.2 kHz which creates the magnetic charge-up field with which the vehicle mount transponder interacts. It creates the active zone for the vehicle transponder and initiates communications. The T20231 assembly receives at 902.858MHz and passes this signal to the UHF Reciever Module RI-RFM-HREA.

- The TRIND™ Gateway Board (T20128-G3) manages RFID processing and provides simple, generic event messages to the pump electronics via TTL (transistor-transistor-logic). It communicates with the DCB via RS-485 standard protocol at 9600 baud.

- The TI/RFID Dummy Load (R20526-G1) is a two kΩ/ten-watt resistive load put in place of the overhead antenna circuit when the system is being operated in the 'hand-held' only mode of operation. This resistive load prevents the final stage output of the LF transmitter from being damaged while operating in this mode. This load connects to the JA and JB connectors on the LF Transmitter Board. The M00878 cables and overhead antennas are missing so the J2A and J2B connectors on the DCB are left open.

Table 1.1
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LF/UHF SYSTEM COMPONENTS

Component Description	Marconi Part Number	Texas Instruments Part Number
Power Regulating Circuit Board	T20314-G1	NA
Light/Micro-Reader Board	T20601-GX(Advantage)	NA
134.2kHz Bezel Antenna	T20524-G1 (Advantage)	NA
Microreader	Q13551-01	RI-STU-MRD1
Data Control Board (DCB)	Q13563-02 Q13563-04	9795108 -003 or -004 RI STU DUSA 00
LF Transmitter Module	Q13579-01	RI-MOD-048A
134.2kHz transmit antenna 902 MHz receive antenna	T20231-G1	NA
TRIND™ Gateway Board	T20128-G3	NA
TI/RFID Dummy Load	R20526-G1	NA

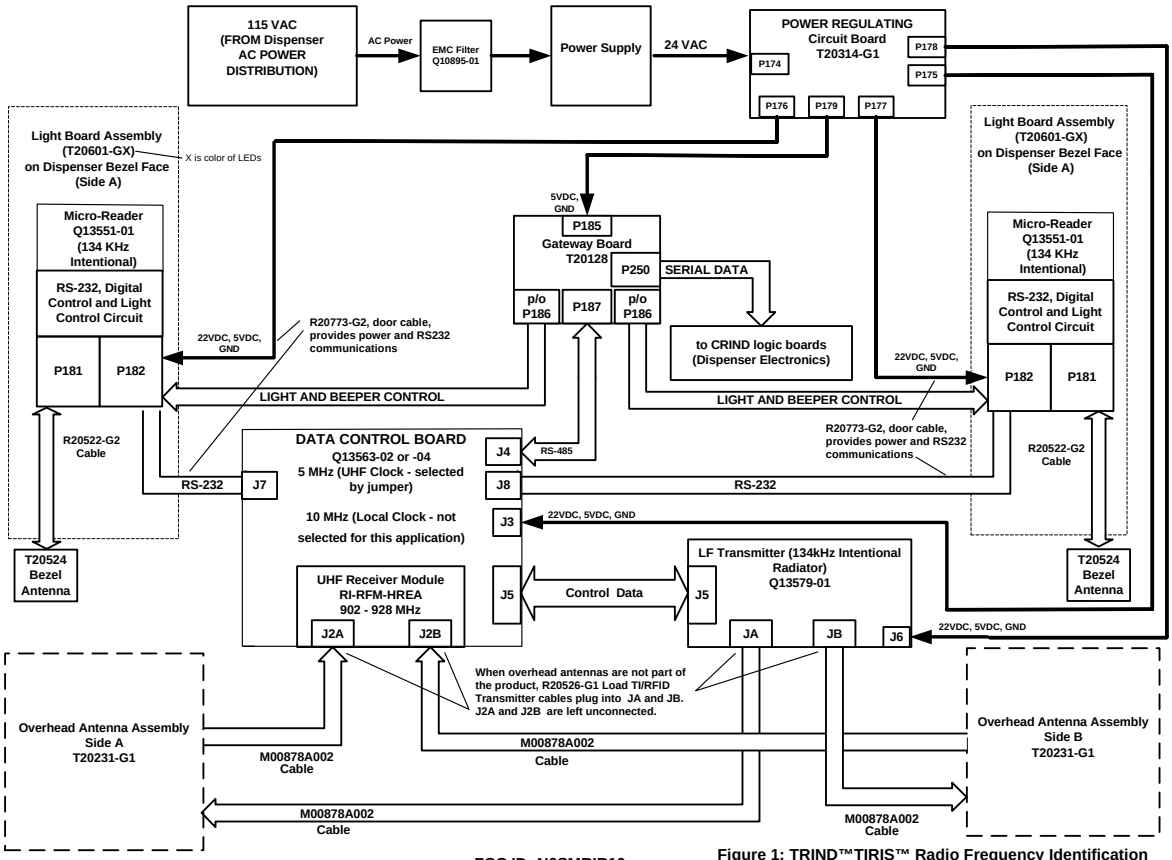

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Figure 1: TRIND™TIRIS™ Radio Frequency Identification (RFID) Functional Block Diagram