

## Functional Description

### 1.0 Overview of Product Operation

The use of the Drive-Thru device may be illustrated through an example application. A customer in a car might place an order through an intercom for food at a drive-thru restaurant. Typically, the customer would then pull his car forward and present a handheld transponder to the Drive-Thru Reader within a space of 2' high, 1' wide, and 1.5' deep. The 134 kHz signal from the Reader "illuminates" the transponder. The transponder then transmits the Customer's ID, or if added security is needed the tag simply responds to the Reader forcing the reader to make a further challenge (transmission to the transponder) before the transponder finally transmits the customer's ID to the Reader. The Reader subsequently passes the Customer ID to a Host/Controller via an RS232 port where the customer billing takes place.

The 134 kHz signal sent out by the reader originates in the Radio Frequency Module (Texas Instruments part number RI-RFM-007B). Subsequently, this signal travels over the antenna cable to the antenna (cable and antenna are both part of W03892 assembly) where it is radiated. The customer transponder replies at 134 kHz with the customer ID once it is energized by the reader and the proper protocol between the reader and the transponder is established. The same antenna that transmitted the reader signal receives the transponder reply. The transponder's reply signal is routed from the antenna to the Radio Frequency Module (RI-RFM-007B) and then to the RFM Controller board T20656 where circuitry in conjunction with the Microreader (RI-STU-MRD1) interpret the signal to determine the customer ID. The customer ID is then relayed to the Power Supply T20652 where it is routed to connector J2 (RS232 to from Host Controller).

## 2.0 Product Description

Marconi Commerce Systems Inc.'s product (for which this submittal is being filed) allows customers wishing to purchase retail products to interface directly with a point of sale via a handheld transponder. The product is called Marconi TIRIS™ Drive-Thru Reader. TIRIS: Texas Instruments Registration and Identification System. The Marconi TIRIS™ Drive-Thru Reader transmits at 134.2kHz, which provides energy to the handheld tag. The handheld tags contain a unique and secure ID code so each customer can be identified by their individually registered tag. The low frequency antennas of the system create magnetic charge-up fields, known as "read-zones". As soon as a tag enters the "read-zone" (the magnetic charge-up field created by the antenna) the reader receives the unique ID code.

The Marconi TIRIS™ Drive-Thru Reader (Part # C00017-XXX) is a Radio Frequency Identification Device (RFID) which is designed for use in conjunction with handheld battery-less transponders (Texas Instruments Part # RI-TRP-Series). The user carries the handheld transponder. The transmitter portion of the TRIND™TIRIS™EG™ 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 Marconi TIRIS™ Drive-Thru Reader is subject to FCC Part 15, Subpart B, "Unintentional Radiator", paragraph 15.109, under the Class A limits and as such, the Marconi TIRIS™ Drive-Thru Reader is installed into an application that is subject to Class A limits.

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## 3.0 Tested System Details

The Marconi TIRIS™ Drive-Thru Reader System is mounted inside a QSR (Quick-Serve Restaurant) or similar industrial application.

The system includes one Light/Beeper/Display/Gateway PCA (T20649), one 134.2kHz low 'Q' wound wire antenna (T20693-01), one RFM (Radio Frequency Module)(Texas Instruments part number RFM-007B), one RFM controller (T20656), one switched DC Power Supply (T20652), one Class II Energy Limiting transformer (R20719), and one EMI Line Filter (Q10895-01).

These components are listed in Table 1.1, and the functional relationship is provided in Figure 1: Marconi TIRIS™ Drive-Thru Reader RFID Functional Block Diagram. The 134.2 kHz transmit signal originates on the RFM located inside the distribution/interface sheet metal housing and travels via its' respective cable to its' respective antenna where it is intentionally radiated. These components are assembled per the drawings in Figure 1.

The Marconi TIRIS™ Drive-Thru Reader operates from 120VAC converted to 24VAC using a Class II step-down energy limited transformer. The 24VAC is then rectified and converted to +22.5VDC, +8VDC, and -8VDC by means of a switching power supply. The system functional block diagram is located in Figure 1.

### Circuit Board Descriptions

- The Marconi TIRIS™ Drive-Thru Reader Power Supply Circuit Board (T20652) provides switched +22VDC, +8VDC, -8VDC and GND to the Light/Beeper/Display/Gateway PCA (T20649), +22VDC to the RFM (Radio Frequency Module)(Texas Instruments part number RFM-007B), and +22VDC to the RFM controller (T20656).
- The RFM Controller Circuit Board Assembly (T20656) has digital interface and RS-232 conversion circuitry, an RFM timing controller circuit, LCD shutter drive controller circuitry, and a +22VDC to +5VDC buck switcher.
- The MicroReader, (Texas Instruments part number RI-STU-MRD1), is soldered on the RFM Controller 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 kHz control functions to read and program TIRIS™ transponders and works together with the RFM, which generates the intentionally radiated signal.
- The Drive-Thru Reader antenna is a 27 $\mu$ H antenna (part of W03892 assembly) that works with the RFM. It is energized by the RFM at 134.2kHz to initialize a TIRIS™ tag.
- The Drive-Thru RFID Light/Beeper/Display/Gateway PCA (T20649) has digital interface and RS-232 conversion circuitry. It manages RFID processing and provides simple, generic event messages to the POS electronics via RS-232. It also has current-limited light-emitting diode (LED) light circuits which are the customer indicators when using the system with a key ring tag.
- The RFM (Q13899-01) contains all the analog functions of a TIRIS reading unit needed to send an energizing signal via the antenna to initialize a TIRIS transponder, to demodulate the received identification signal and to send the received data together with clock signals to a Control Module. The RFM also sends the necessary programming and addressing signals to Read/Write and Multipage transponders. The data input and output lines, which are connected to a data processing unit, are low-power Schottky TTL and HCMOS logic compatible. In order to achieve a high charge-up field strength, the antenna resonator frequency must be tuned to the transmitter frequency of 134.2 kHz. This is done by changing the capacitance of the antenna resonator. To compensate for the tolerances of the antenna coil and the capacitors, six binary weighted tuning capacitors (C\_ATC1 to C\_ATC6) have been included. Their values are weighted in steps of 1, 2, 4, 8, 16 and 32, where C\_ATC1 has the smallest value corresponding to the factor 1, C\_ATC2 has double the capacity of C\_ATC1, so that C\_ATC2 corresponds to the factor 2 and so on.

**Table 1. 1  
TESTED  
LF SYSTEM COMPONENTS**

| Component Description                                     | Marconi Part Number     | Texas Instruments Part Number |
|---|-------------------------|-------------------------------|
| Drive-Thru Reader Power Supply Circuit Board (1)          | T20652                  | NA                            |
| RFM Controller Circuit Board Assembly (1)                 | T20656                  | NA                            |
| MicroReader (1)<br>(one per T20656)                       | Q13551-01               | RI-STU-MRD1                   |
| Drive-Thru Reader Antenna (1)                             | Part of W03892 assembly | NA                            |
| The Drive-Thru RFID Light/Beeper/ Display/Gateway PCA (1) | T20649                  | NA                            |
| Radio Frequency Module (1)                                | Q13899-01               | RI-RFM-007B                   |

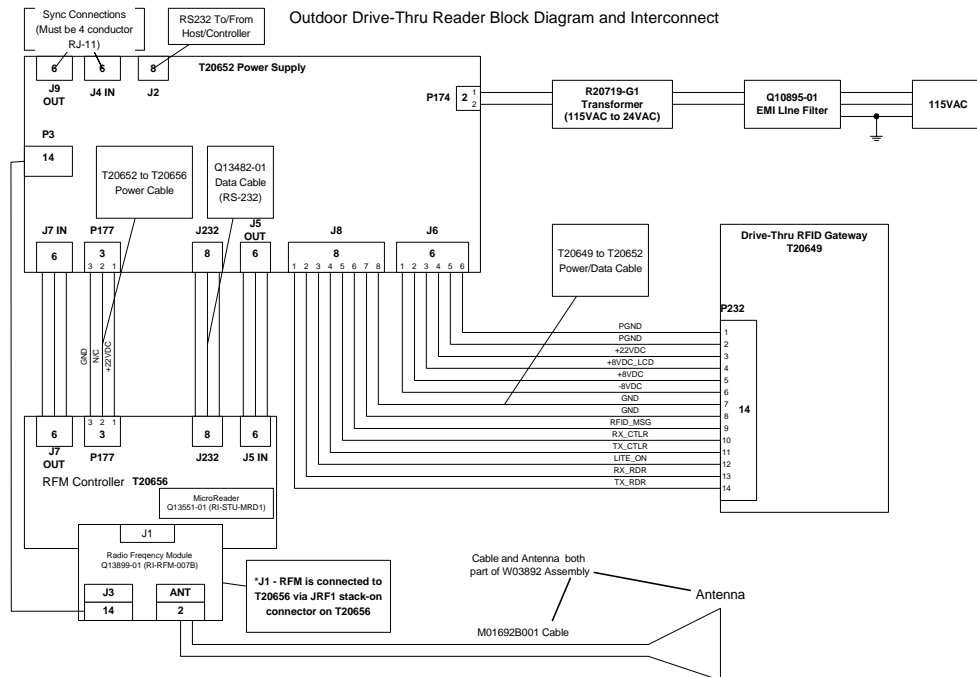


Figure 1: Marconi TIRIS™ Drive-Thru Reader  
Radio Frequency Identification (RFID)  
Functional Block Diagram

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