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Operational Description of OEM 176-177 (LF-MTE)

History

Version 0.1 – Document created

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1 Introduction

Sirit Technologies Ltd. is a wholly owned UK subsidiary of Sirit Technologies inc. of Toronto Canada and forms the design and development arm of the corporation.

This document covers the Operational description of the OEM 176 / 177 combined RFID and bar-code scanner module when fitted to the Symbol 8146 UL approved, colour screen, hand held computer. The OEM 177 is the version of this module, which is RFID equipped only and is not fitted in this case. The module occupies the same space envelope as the Symbol Technologies SE1223 Bar-code scan engine and when replaced by the OEM176 / 177 gives the combined RFID and bar-code function by utilising the Symbol SE923 ultra miniature bar-code scanner with the RFID components mounted around it. The interface to the 8146 directly emulates that of the bar-code scan engine with the addition of RFID commands.

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2 Functional Description

Refer to the block diagram

The Symbol 8146 Colour handheld computer in which the module is mounted supplies regulated +5VDC power to the module. The 8146 has the ability to shut off power to the module so as to extend battery life when not in use. The module can operate in a further low power mode; in the “module” low power mode the module shuts off most of its internal circuitry after about 1 second of inactivity on either any of its 4 “Wake Up” lines or it does not receive a command on the serial interface from the Symbol 8146. In the standard power mode all circuitry remains active and power control is via the 8146 both normal and low power modes are software selectable.

The micro-controller mounted on the bottom PCB receives a master clock signal of 16MHz from the crystal oscillator circuit mounted on the right-hand PCB. This signal is divided by 4 on the left hand PCB to produce a 4MHz signal that is fed to the Top PCB which contains the RFID circuitry.

Each of the RFID ASICs (Application Specific Integrated Circuits) is dedicated to one of the two RFID frequencies used by this module, 125kHz and 134.2kHz. (In this particular version of the module the 125kHz ASIC is not used and is not fitted). The 4MHz signal is gated to both ASICs to further reduce power consumption and to reduce the possibility of both ASICs transmitting at the same time. Each of the ASICs derives its carrier frequency by internally dividing the 4 MHz clock fed to it.

134.2Khz

The 134.2kHz ASIC will only “come to life” when commanded by the micro controller which communicates with the ASIC via a bi-directional serial data link. Upon receiving a command to communicate with a RFID tag, a 134.2kHz carrier is generated in the ASIC, the carrier signal is amplified by the PA stage and is fed to the external resonating and matching circuit. The antenna is a 400µH coil is constructed to fit around the inside face of the 8146 bar-code window. This antenna coil is series resonated to 134.2kHz by a close tolerance capacitor. Other components around this circuit are fitted to reduce EMC and to provide additional protection to the ASIC.

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RFID tags operating on the 134.2kHz frequency work on the half duplex principle that is the transmitter sends out a “Power pulse” (which may or may not contain modulation depending on the required tag response) and the tag absorbs energy during the “power pulse” then responds by transmitting a signal back to the reader antenna in the period sfter the power pulse. The received signal is picked off the antenna coil and is fed into the receiver circuits of the ASIC. Data is received from the tag in the form off a Frequency Shift Keying (FSK) signal; this is decoded by the receiver and converted to a serial data stream, which is fed back to the micro-controller for final decoding and error checking. The fully decoded and checked data is passed back to the hand held computer by the serial data link.

125KHz

This is not fitted to this version of the module but operates in a similar way to the 134.2KHz with 2 notable differences:-

- The 125kHz tags operate in the full duplex (backscatter) mode i.e. they “load modulate” the carrier signal.
- The tags use Amplitude Shift Keying (ASK) Not FSK.
- There are a lot more different types of tags, all of which have a slightly different protocol.

Bar-code Scan Engine

The Symbol SE923 bar code scan engine mounted within the module is directly controlled by the modules micro-controller which filters and diverts all relevant signals to and from the bar-code scan engine.

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