RTE8000 OVERVIEW AND OPERATION

The RTE8000 is a compact, full page document scanner designed for OCR and RF reading of e-Passports and other Machine Readable Travel Documents (MRTDs) which comply to ICAO Document 9303. The scanner offers a full range of options including linear and 2D barcode reading and co-axial illumination. The integral RF reader enables simultaneous reading of the bio-data page and embedded contactless chip as a single operation without repositioning the document.

The scanner includes red, green and blue visible light sources to capture full colour images with optimum colour rendition. Infra Red (IR) light is used for codeline reading according to ICAO specifications and Ultra Violet (UVA) light is used to reveal covert UV security features in full colour. Optional coaxial visible and coaxial IR illumination allow validation and tamper checking of retroreflective security laminates such as Confirm™.

The RF section comprises dual custom antennae and a decode PCB mounted directly beneath the scanner glass. The use of separate antennae for each half of the passport ensures that shielding mechanisms built into one half of the book do not interfere with reading a chip located in the other half.

The scanner automatically detects when a document is placed on the scanning window, takes an IR image and decodes the MRZ. A fast check is performed to detect a contactless chip in either half of the book. If none is found, the MRZ data is returned together with any other document images requested by the host software. If a chip is found then it is opened using any security access protocol and data may be retrieved from it. Data groups may be accessed non-sequentially, in any order to allow overlapping of host operations with reading of larger data groups.

The RTE8000 is a small desktop unit measuring 7.5" x 7.9" x 6.2" (191mm x 200mm x 158mm) and weighing only 4.6 lbs. It is ruggedly constructed using a plastic injection moulded chassis and metal outer cover. The scanning surface is a single piece of glass which allows an opened e-Passport to be placed flat and slid into place. The glass also protects the RF antennae mounted underneath it, without interfering with their operation. Printing on the underside of the glass defines the extent of the scanning window and may also contain graphics to aid the user e.g. arrows or written instructions.

The scanner has an inbuilt USB hub and all OCR, image and chip data is transferred to the host at USB2.0 speeds.

The RTE8000 has an external, fully enclosed, universal input mains power supply which provides 12Vdc at up to 5.5A.

THE BLOCK DIAGRAM DESCRIPTION

The USB Hub PCB consists of the following functional parts:
- Power regulation
- USB 2.0 Hub (4 port) and interface circuitry
- USB 1.1 Hub and impedance matching circuitry
- USB Mass Storage Device (UMSD) conforming to industry standards (USB 2.0)
- External connectors for power, USB 2.0 upstream and USB 2.0 downstream ports
- Internal connectors for power distribution and USB ports

The power regulation circuitry generates 5Vdc and 3.3Vdc from a 12Vdc input which is then distributed to the USB ports and Illumination Control PCB via a ribbon connector. The input side has EMC protection components for emission and immunity, including ESD and voltage transients. The input has a resettable fuse.

The USB hubs and mass storage device provide industry standard functionality as defined in the USB specifications (see www.usb.org). Each is a single chip solution with associated circuits. The USMD and USB 1.1 Hub are connected to ports on the USB2.0 Hub. The UMSD is seen as a standard 32Mb removable drive on the host PC and is used to hold configuration data. It uses the Microsoft FAT32 file system.

The external USB ports use the USB standard connectors (Type A and Type B) and are protected against over voltages.

The internal USB ports (one 2.0 and four 1.1) use single or dual row 5 pin headers with an industry standard pin out.

The Camera is a single board device with a lens attached over a CMOS colour image sensor. On board circuitry converts the sensor's data into an RGB video stream which is transmitted via the USB 2.0 port to the Hub PCB. The camera is powered from the USB port. In addition there is a 4 bit General Purpose In/Out interface which is connected to the illumination Control PCB. In this way commands can be sent from the host via the camera to the illumination Control microprocessor.

The Illumination Control PCB takes its power (+12Vdc and +5Vdc) via a ribbon cable from the Hub board's regulators. It takes commands from the host PC via the USB and camera boards. The PCB is controlled with a low speed microprocessor which responds to a number of commands to turn on and off light sources, enter / leave diagnostic mode and provide version information. The Illumination Control PCB connects to another 4 PCBs which contain the main document illumination (light sources are red, green, blue, infra-red and ultra-violet) and a user interface LED PCB which contains 2 bi-colour LEDs which are mounted under the glass top.

There is also an optional co-axial LED PCB. The main illumination PCBs are mounted one on each side of the document window at an angle to shine light on the document.

One of the Hub PCB's USB 1.1 ports is connected to the RFID and Antenna PCB. All other ports are spare.

The RFID and Antenna PCB consists of an USB to RS-232 interface chip, RFID module, antenna switching and matching circuitry. The PCB is powered from the USB port. Commands to the RFID module come directly from the host PC via USB and serial RS-232. The PCB is located directly under the glass document surface. The main processing is integrated on to a separately approved OEM RFID module RDHO-0401N0-01 (which is a small PCB) mounted by pin headers directly on to the RFID and Antenna PCB. The RFID module is a contactless, near field, proximity read/write device that, with its interoperability capability, supports various ISO14443A and ISO14443B RFID-devices, including the whole MIFARE® family and operates at 13.56MHz. The RFID and Antenna PCB has two PCB trace antennas, the first covering the document window for the data page of the passport and the second covering the other open page. An integrated Security Access Module socket allows SIM card sized contacted smartcards to be added. This RFID read/write unit is optimized for maximum data throughput rates on both, the air interface as well as the serial interface.

All USB devices conform to Microsoft's Plug and Play standard.