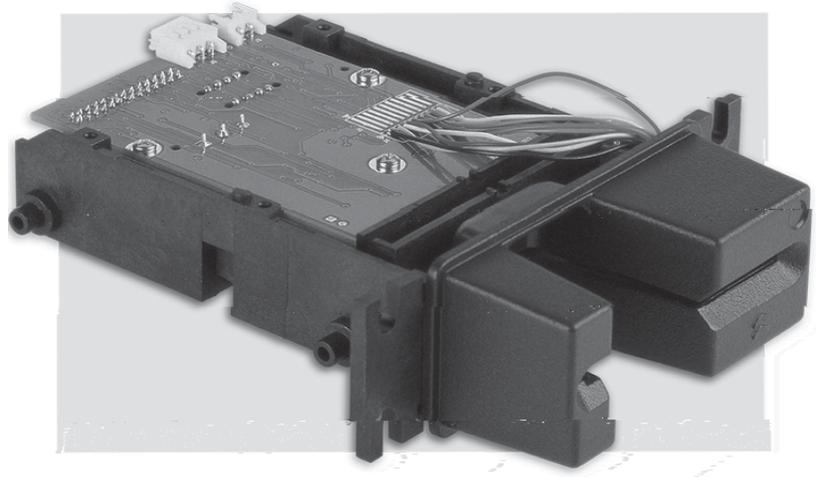


SPECTRUM IIaTM

Full Insert Magnetic Stripe Reader and/or Smart Card Reader-Writer TTL

User's Manual



Warning

This equipment has not been tested to comply with Part 15 of the FCC Rules for a digital device. This device is designed to be incorporated into a product that will be tested to comply with all regulatory requirements.

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DESCRIPTION

The ID TECH TTL Hybrid Insert Reader can be configured to read 1, 2, or 3 tracks of magnetic stripe data from cards conforming to ISO 7810 and 7811 standards. TTL “data” and “clock” signals (CMOS levels) are output for each track. Spectrum also makes direct connection to IC cards conforming to ISO 7810, 7816, and EMV standards. The landing-style contacts ensure maximum card and connector contact life.

An optional “latch” mechanism is available to hold the card in the slot until processing has been completed.

A “card present” switch is also available as an option. This switch provides a signal when the card is inserted into the front portion of the reader.

The reader’s chassis is molded from a glass and lubricant-filled engineering plastic that supports the magnetic head. The head is spring-loaded for good contact with warped or bowed cards. The smart card connector has gold-plated contacts that “land” on the ICC’s contacts and create a .02 inch “wiping” action to ensure a dependable connection and long life.

The reader is vandal resistant and has an open internal design that allows foreign matter entering through the bezel (up to half a card) to fall away and not clog or otherwise obstruct the card path. Any one of several molded bezels attaches to the chassis to guide the card.

SPECIFICATIONS

MAGNETICS PERFORMANCE CHARACTERISTICS

Media speed: The circuit decodes data reliably at 3 to 50 inches per second (ips).

Card Jitter: The circuit decodes data with bit cell spacing errors up to 15% (30% for subintervals) at media speeds of 3 to 50 ips.

Low Amplitude Reading: Media with data recording amplitudes below ANSI and ISO specifications can be read. Media amplitudes of 30% (210 bpi) and higher, or 40% (75 bpi) and higher, can be read at speeds of 10 ips or greater.

Media Specification: Media with magnetic coercivity of 300 through 4000 Oersted can be reliably read.

DC CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max
Output Low Voltage	V_{OL}	IOL=20 ma			0.5 V
Output High Voltage	V_{OH}	IOL= -3 ma	Vcc-0.5V		
Supply Current	Icc			<15 ma	
Supply Voltage	Vcc		4.5V	5 V	5.5 V

CLOCK CHARACTERISTICS*

Item	Symbol	Min	Typ	Max
Clock Pulse Width	T_w	21.3 μ sec.	32 μ sec.	53.3 μ sec.

* See Appendix C: "Output Signal Description and Timing Diagram"

SMART CARD CHARACTERISTICS

ICC Contacts: Meet or exceed ISO 7816 and EMV standards/specifications.

ICC Card Reliability: Contacts are gold plated and exceed EMV requirements for minimum resistance over life.

ENVIRONMENTAL

Operating Temperature: -5°F to 158°F (-20°C to 70°C). Latch units: 32°F to 131°F (0°C to 55°C)

Storage Temperature: -40°F to 158°F (-40°C to 70°C).

Humidity: Maximum 95% non-condensing.

RELIABILITY

Magnetic Head Life: 1,000,000 card cycles minimum.*

IC Card Connector: 1,000,000 card cycles minimum.*

Chassis and Bezel: 1,000,000 card cycles minimum.*

Magnetic Read Rate: Less than one error in 100,000 bits on cards conforming to ISO 7811 1-5 (not induced by operator error).**

MECHANICAL

Magnetic Stripe Formats: ISO 7811, F2F.

Reading Speed: 3 to 50 inches per second.

Media Thickness: .025 to .035 inches. (Maximum card thickness .035 inches.)

Dimensions: Length: 4.64 inches (117 mm). Width: 3.97 inches (101 mm). Height: 1.35 inches (34.20 mm).

** All wear reliability numbers are based on operation in a laboratory environment.*

*** Based on reading on withdrawal.*

INSTALLATION

The ID TECH Hybrid Insert Reader with the standard or metal bezel can be mounted via the front mounting flanges. Side mounting studs are also provided.

The reader can be mounted in any orientation, but the preferred position is with the printed circuit board (PCB) on top (so that debris will not accumulate on its surface). It accepts a 26-pin Molex connector 51110-2650 or equivalent for power, ground, and I/O signals. The connector pin-out is provided in Appendix C.

OPERATION

The ID TECH Hybrid Insert Reader is easy to operate. Make sure the reader is properly connected and securely mounted in position.

Reading a Magnetic Stripe Card: (reader is mounted with the PCB up)

1. Insert the card, magnetic stripe down and toward the thick (right) side of the bezel, into the reader as far as it will go, using one continuous motion. Media Detect, Data, and Clock signals for all bits read will be sent as they are decoded.

2. Withdraw the card in one continuous motion. (The reader is capable of reading a magnetic stripe on both insertion and withdrawal, but a more reliable read is achieved on withdrawal.) When reading on withdrawal, Media Detect, Data, and Clock signals for all bits read will again be sent as they are decoded. (The data will be output as a mirror image of the encoded card data because the card is moved in a reverse direction.)

Reading a Smart Card:

1. Insert the card, chip up (facing the PCB), into the reader as far as it will go. There will be a hard stop.

2. If the “latch” option is present, the latch can be engage to prevent the withdrawal of the card prior to the completion of processing.

3. When processing is completed and the latch (if present) has disengaged, withdraw the card.

OPTIONAL FEATURES

“Gate” Operation

A spring-loaded gate protects the bezel opening from dust, dirt, and the insertion of foreign objects, but easily opens to permit card insertion.

“Card Latch” Operation

The optional “latch” mechanism is available with Standard and Flush-Mount bezels. A TTL-level control signal controls the mechanism’s operation. It holds an inserted card in place in the reader’s slot until processing has been completed. Please refer to Appendix B for details of “Latch Control” and “Card Latch” signals.

An optional feature available with the latch mechanism is “power failure latch release,” which automatically unlatches the card when power fails. The host terminal’s +5V power supply must not decay at a rate greater than 50V/s for this feature to perform reliably, because the power for driving the latch motor in the event of a power failure is derived from the host terminal’s power supply filter capacitor. (The latch circuit gets its power from the power supply’s decaying voltage for a period of 20ms minimum to ensure a reliable latch release.) In the event the host terminal’s power supply filter capacitor is too small for reliable unlatching, an external capacitor with a voltage rating of at least 10V and a capacitance of 2200 microfarads must be used. (The capacitor’s positive lead must be connected to Pin 1.) If required, a capacitor assembly (a capacitor, with 6” wires and connector) can be provided by the factory.

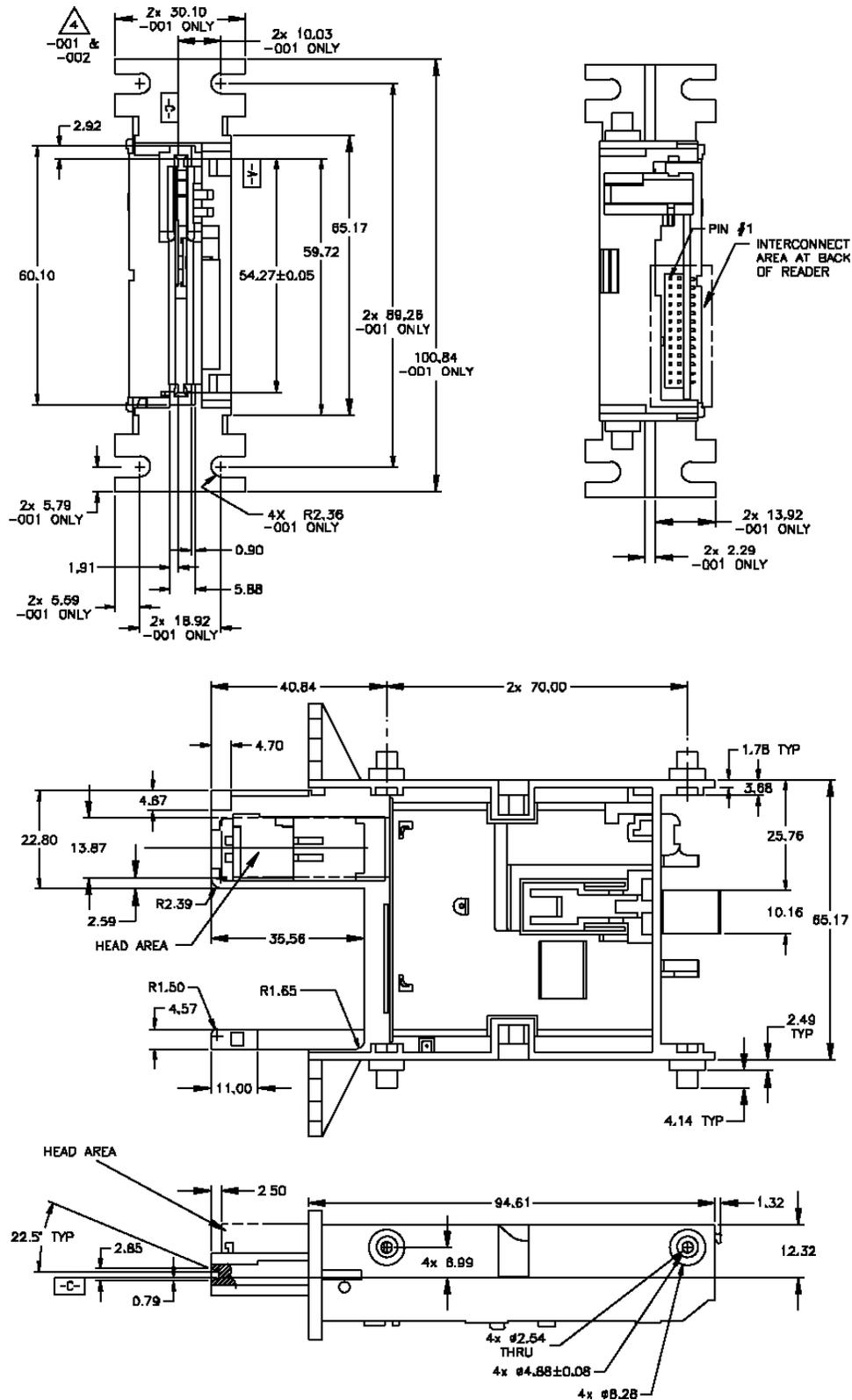
The “power failure latch release” feature operates by sensing the unit’s +5V supply input at (Pin 11). A circuit is used to monitor a 4.62V maximum threshold on the +5V supply and generates an active, continuous low level if the +5V supply is below this threshold. A “reset pulse” occurs when the +5V supply for the PCA rises above the threshold (4.62V). This reset pulse width ranges from 140ms to 560ms over the unit’s operating temperature range (-25C to +70C). During the delay of 140ms to 560ms, the LATCH CONTROL signal is not conducted to the motor driver circuitry.

“Card Present” Switch Operation

A “card present” switch is available as an option on readers that utilize the standard or metal bezel designs. The switch provides a signal when the card is inserted into the front portion of the reader, and it remains triggered until the card is withdrawn past the switch.

Appendix A

OUTLINE DRAWING OF READER



Appendix B

MAGNETIC OUTPUT SIGNAL DESCRIPTIONS AND TIMING DIAGRAM

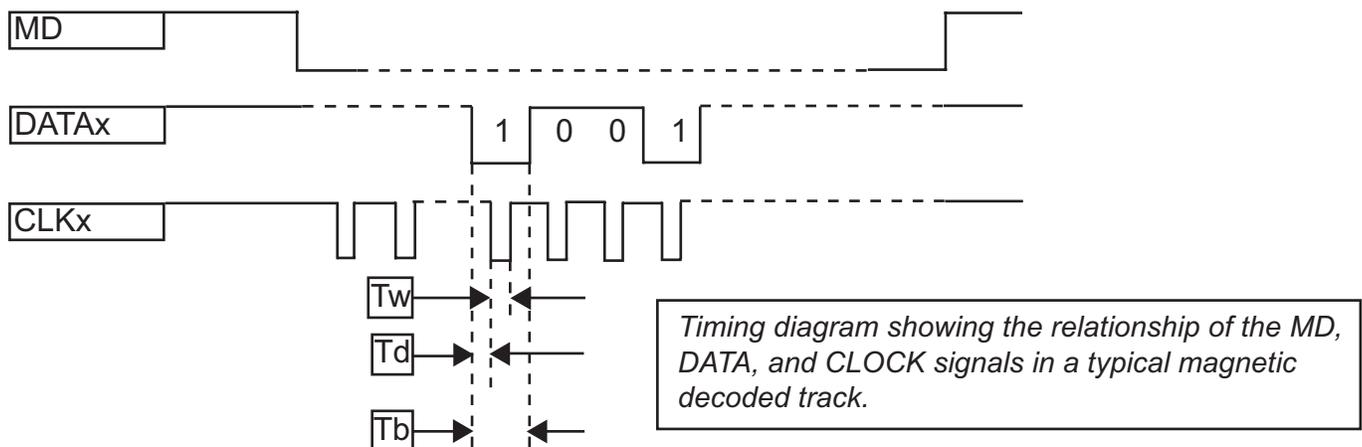
Magnetic Stripe Reader/Smart Card Reader

DATA_x (DATA TRACK LEVEL SIGNAL): The level of this signal indicates the value of the current bit being read. A LOW level data bit has a value of ONE. A HIGH level data bit has a value of ZERO. The data level is true and stable while the CLK (clock) pulse is low and at both the falling and raising edges. The data rate is proportional to the data density on the magnetic stripe and the velocity of the media being swiped. Example: For data densities from 75 to 210 BPI, and velocities from 5 to 60 IPS, the data rates can range from 375 to 13,650 bits per second.

NOTE: The subscript x is the track number. It may be 1, 2, or 3.

CLK_x (CLOCK TRACK SIGNAL): This signal is a negative pulse that is nominally 40 micro seconds in duration. The falling edge indicates that the DATA output is valid and continues until after the rising edge. The clock signal can be used as a clocking signal for a shift register, etc. The clock pulse width can be set at the factory, and therefore it can be modified if required.

MD (MEDIA DETECT PIN 22): This output is a media detect signal. Its normal level is HIGH and goes LOW to indicate that magnetic media is detected. This signal is created from reading the leading zero on an encoded card, and only goes LOW (it is normally high) after detecting a set number of zeros. After recognizing a sufficient number of zeros, the MD signal goes LOW and stays LOW throughout the decoding process. After the last flux reversal is read from the media, it goes back to HIGH. Media detect is used to signal the start and end of a media swipe. **NOTE: No data is output until MD goes low.**



Tb: Bit Width, Track1: $T_b = 1/(\text{Swipe Speed} * 210)$.

Track2: $T_b = 1/(\text{Swipe Speed} * 75)$.

Td: Clock Delay Time, 2 ms.

Tw: Clock Width, Typical: 32 ms.

SW (CARD SEATED SIGNAL Pin 10) : Its normal level is HIGH. When the card is fully inserted (seated), the SW signal goes LOW to indicate that all eight contacts on the reader are in full connection with the IC contacts on the smart card. This signal is used to tell the host that the ICC is fully inserted and power can be applied to the smart card contacts. When the card is withdrawn (that is, when the card is moved from the fully-seated position) the SW goes back to HIGH, which indicates the card has moved from the seated position and is about to be disconnected from the smart card contacts.

The following timing is guaranteed: the SW goes LOW after all eight contacts on the reader are in full connection with the IC contacts on the smart card. SW goes HIGH before the card is moved from the fully-seated position. The SW can be used by the processor to guarantee that power is applied to the smart card only when all eight contacts on the card are firmly connected with the contacts on the reader.

CP (CARD PRESENT SWITCH SIGNAL PIN 9): Its normal level is HIGH. A card-sensing switch furnishes output to the host via connector pin 9. The CARD PRESENT switch is activated when a card is inserted into the front portion of the insert reader.

LC (LATCH CONTROL SIGNAL Pin 12) and CL (CARD LATCHED SIGNAL Pin 18): When the signal LATCH CONTROL (Pin 12) is taken HIGH, the latch is engaged. When it is taken LOW, the latch is disengaged. The signal CARD LATCHED (Pin 18) goes LOW when the latch mechanism is engaged. To ensure full latching and unlatching, the host terminal should wait a minimum of 500ms between “latch” and “unlatch” levels on the LATCH CONTROL signal input. (This allows the motor control circuits to properly reset after each motor operation.)

M READ ENABLE (PIN 20): Normally HIGH signal. The host pulls this signal LOW to apply power to the magnetic circuit. A jumper can be added to have power applied at all times, this option must be specified at the time the unit is ordered.

RST, CLK, I/O, C1, C4, VCC, VPP, GND (ICC SIGNALS PINS 1-8): Please refer to ISO 7816 for the signal definition. The connector is ISO 7816 and EMV-compliant.

CHASSIS GROUND (PIN 17) is internally connected to signal ground by a jumper.

Appendix C

CONNECTOR PIN-OUTS

26-PIN MOLEX CONNECTOR

I/O	PIN	SIGNAL
IN	1	IC-C1 POWER
IN	2	IC-C2 RESET
IN	3	IC-C3 CLOCK
—	4	IC-C4 NO DEFINITION
IN	5	IC-C5 GROUND
IN	6	IC-C6 PROG. POWER
I/O	7	IC-C7 DATA
—	8	IC-C8 NO DEFINITION
OUT	9	CARD PRESENT* (CP)
OUT	10	CARD SEATED* (SW)
IN	11	+5 V SUPPLY (VCC)
IN	12	LATCH CONTROL (LC)
IN	13	CIRCUIT GROUND (GND)
OUT	14	N/C
OUT	15	M-DATA TK. 2*
OUT	16	M-CLOCK TK. 2*
IN	17	CHASSIS GROUND
OUT	18	CARD LATCHED*
IN	19	N/C
IN	20	M-READ ENABLE*
IN	21	N/C
OUT	22	M-MEDIA DETECT* (MD)
OUT	23	M-DATA TK. 1*
OUT	24	M-CLOCK TK. 1*
OUT	25	M-DATA TK. 3*
OUT	26	M-CLOCK TK. 3*

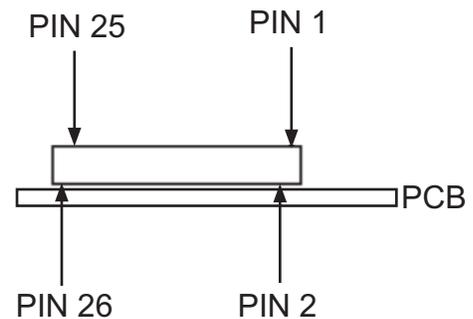
* Indicates active low signal

M = Magnetic only signals

IC = Smart card only signals

Notes:

- Prefix “IC-” for the signal from Smart Card Contactor, “M-” for the signal from Magnetic Stripe Card Reader.
- The connector on the reader is a 26-Pin connector equivalent to Molex part number 87760-2616 (RoHS compliant). It accepts a Molex connector 51110-2650 (standard), or 51110-2651 (with polarization keys), or equivalent.
- Power Input (+5V): VCC, GND.



Rear View of I/O Connector