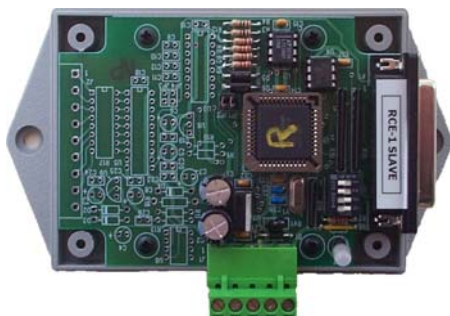


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Remote Contact Extender

RCE-1
RCE-1E(ENCLOSED)

Integrity Instruments RCE-1 User Manual

Introduction

The Integrity Instruments **RCE-1** allows the user to monitor contact status at one location, and send these signals to a remote location. The system is bi-directional allowing contact status at the remote location to be sent back to the other end. Up to 8 inputs at each end can be sent as outputs to the other end. The uniqueness is that this is done over a single set of twisted pair wires using rs-485 communications.

Applications

The **RCE-1** can be used for a multitude of uses.

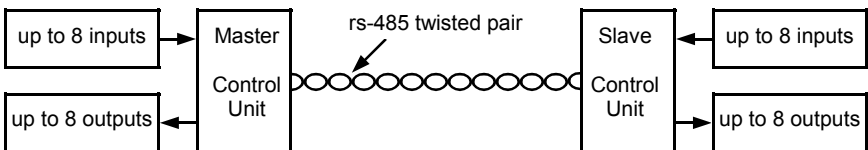
- Remote alarm indication and reset.
- Contact control from a remote source.
- Physical status (loading doors open, pumps running).
- Production operational status.
- Manned operations acknowledgement.
- Remote physical positioning operations.
- Remote access control.
- Physical operations (open windows, start watering pumps)
- Remote lighting control.

These are but a few, if there is a need for any remote operations, the remote contact extender is the answer.

Operation

The **RCE-1** system consists of a master slave set. Power to each unit is supplied from the area it is at. When the units are powered a communication protocol is maintained between the units. Similar to a "watch dog" operation the units send information to each other. ***When an input is sensed at one end, this information is sent to the opposite end and a corresponding output is activated at the other end.*** If communication is lost, all outputs at both ends are de-activated.

The communications between the units is done via rs-485. Normal baud rate is 115,200K. The rs-485 is capable of 4,000 foot distances. Using repeaters this can be increased almost indefinitely.



RS-485 Cabling

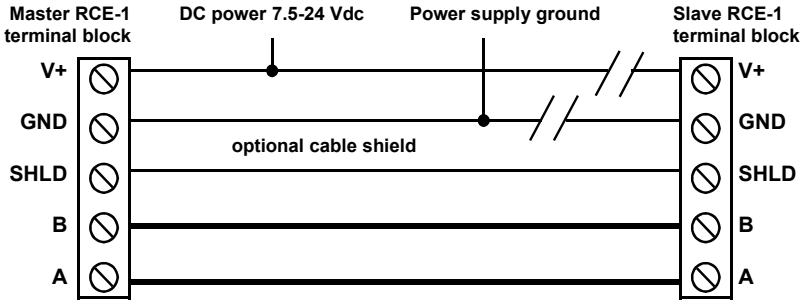
The **RCE-1** is designed to operate in a Multi-Drop RS-485 LAN configuration. In a half-duplex multi-drop environment all RS-485 nodes share the same data lines. A single pair of data lines act as both Transmit and Receive wires.

**Data lines (A/B) are the only wires required between RS-485 nodes
All RS-485 nodes need not share the same V+ and GND**

Integrity Instruments RCE-1 User Manual

Cabling Notes:

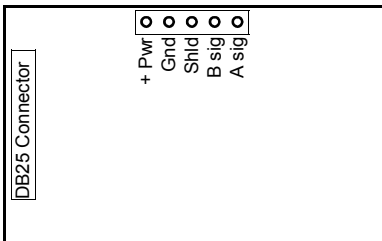
- 1) Gnd and Shld are connected internally within the **RCE-1**
- 2) Cable termination is important for long distance and high-speed applications
- 3) Suggested cable: 24 awg stranded twisted pair with shield for cable runs in excess of 200 feet. See also Belden cable #9841 and #9463.
- 4) The end units (A) and (B) should be terminated. The **RCE-1** has built in termination in the unit.



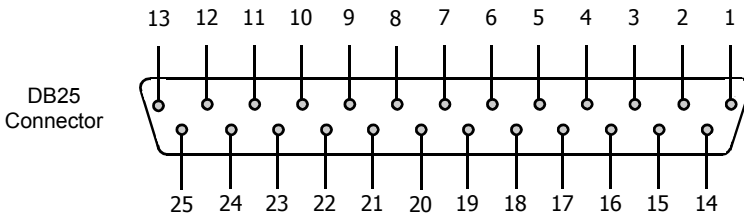
Physical

The inputs and outputs are available through a **female DB25 connector**. The I/O lines are 5vdc operation. When + 5vdc is sensed at an input line, the corresponding output line goes high to + 5vdc. Voltage is present at the DB25 connector for external use.

This connector mates to our **EXP-TRK** or **EXP-STA** module allowing industry standard I/O modules to be used. Our **DB25TSM** unit is also available for easy terminal strip connections to the DB25 connector



| Performance Characteristics | |
|-----------------------------|---------------|
| DC input voltage | 7.5 to 24 VDC |
| DC input current | 45 to 250 ma |
| Baud Rate | 115,200Kbps |
| Termination resistance | 120 ohms |



Female front view - Male rear view

Integrity Instruments RCE-1 User Manual

DB 25 connector inputs and outputs

| DB25 | Description | Master | Slave |
|------|----------------------------|------------|------------|
| 1 | Port 2 bit 0 (PIC PORTD 0) | Input → | Output |
| 2 | Port 2 bit 1 (PIC PORTD 1) | Output ← | Input |
| 3 | Port 2 bit 2 (PIC PORTD 2) | Input → | Output |
| 4 | Port 2 bit 3 (PIC PORTD 3) | Output ← | Input |
| 5 | Port 2 bit 4 (PIC PORTD 4) | Input → | Output |
| 6 | Port 2 bit 5 (PIC PORTD 5) | Output ← | Input |
| 7 | Port 2 bit 6 (PIC PORTD 6) | Input → | Output |
| 8 | Port 2 bit 7 (PIC PORTD 7) | Output ← | Input |
| 9 | DO NOT USE | DO NOT USE | DO NOT USE |
| 10 | No Connection | N/A | N/A |
| 11 | +V Unregulated Out | N/A | N/A |
| 12 | +5Vdc | N/A | N/A |
| 13 | GND | N/A | N/A |
| 14 | Port 1 bit 0 (PIC PORTB 0) | Input → | Output |
| 15 | Port 1 bit 1 (PIC PORTB 1) | Output ← | Input |
| 16 | Port 1 bit 2 (PIC PORTB 2) | Input → | Output |
| 17 | Port 1 bit 3 (PIC PORTB 3) | Output ← | Input |
| 18 | Port 1 bit 4 (PIC PORTB 4) | Input → | Output |
| 19 | Port 1 bit 5 (PIC PORTB 5) | Output ← | Input |
| 20 | Port 1 bit 6 (PIC PORTB 6) | Input → | Output |
| 21 | Port 1 bit 7 (PIC PORTB 7) | Output ← | Input |
| 22 | DO NOT USE | DO NOT USE | DO NOT USE |
| 23 | No Connection | N/A | N/A |
| 24 | +5Vdc | N/A | N/A |
| 25 | GND | N/A | N/A |

| DIP Switch Settings | | | |
|------------------------------|------------|------------|---------------------|
| Position 1 Master control | Position 3 | Position 4 | Baud |
| N/A | ON | ON | 115,200 |
| N/A | OFF | ON | 57,600 |
| N/A | ON | OFF | 19,200 |
| ON | N/A | N/A | Master run |
| OFF | N/A | N/A | Master idle/program |

Integrity Instruments RCE-1 User Manual

Operation characteristics

Firmware version --- -----V2.5
Power on default --- -----OFF
Watchdog ----- -----If no communications within 1 second all outputs will be turned off.
Communication protocol-----Master sends, slave responds
Addressing----- -----Master unit has odd numbered address
Slave unit has even numbered address
Initiation-- ----- -----**Dip switch position 1 on master must be on to enable**
CPU clock----- -----14.7456 Mhz
Update speed ----- -----10 milliseconds at 115,200 baud rate
11.5 milliseconds at 57,600 baud rate
18.4 milliseconds at 19,200 baud rate

Master unit

Address -- ----- -----01 Factory default
Even numbered bits are inputs
Odd numbered bits are outputs
Async destination address -----02

Slave unit

Address -- ----- -----02 Factory default
Even numbered bits are outputs
Odd numbered bits are inputs
Async destination address -----N/A

LED Operation

Assume the system is wired, and power is applied to both the Master and Slave units.

Idle (master DIP switch position 1 = OFF : no communication)

Master ---- ----- -----Green blinking
Slave ---- ----- -----Green blinking

Running (master DIP switch position 1 = ON : communication good)

Master ---- ----- -----Green/Red
Slave ---- ----- -----Red

Running (master DIP switch position 1 = ON : communication failure)

Master ---- ----- -----Red
Slave ---- ----- -----Green blinking

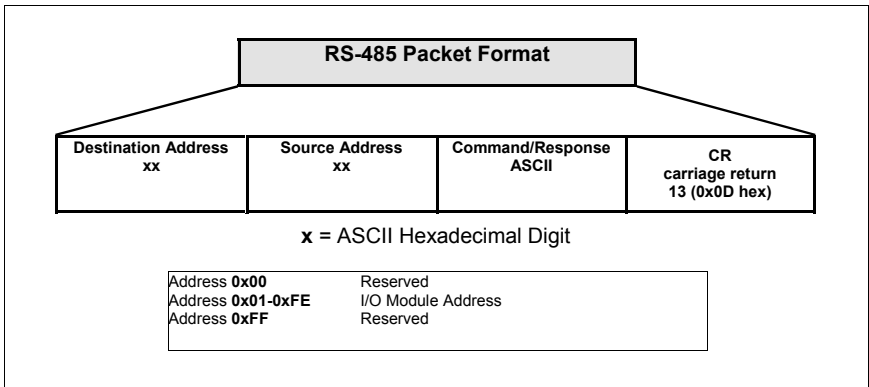
Integrity Instruments RCE-1 User Manual

Communications

The Integrity Instruments **RCE-1** modules use rs-485 as the communications interface. The interface uses simple **ASCII** commands. A carriage return (**decimal code 13 or Hex code 0x0D**) marks the end of a data packet.

RS-485 Interface:

- RS-485 operates Half Duplex
- Each module (node) on the bus has a unique Address 1 to 254 (0x01-0xFE hex)
- We use the latest Linear Technologies® RS-485 bus drivers (LTC1487)
- Address 0 (0x00 hex) is reserved for host PC.
- **Address 255 (0xFF hex) is reserved for broadcast address.**



Commands and Responses

The following table illustrates the Integrity Instruments I/O module commands and responses.

NOTE

- All numeric data is represent as ASCII Hexadecimal integers (value **x/y** in the table)
- If a module receives an illegal or improperly formatted command, Error Response is sent.
- All ASCII characters are **CASE SENSITIVE** (use all capital letters!)
- **For field programming and troubleshooting contact Integrity Instruments.**
- **DIP switch 1 on master must be set off to program or monitor unit.**
- **You will have to have a rs-232 to rs-485 converter like our 485-25E to communicate with the unit.**

Integrity Instruments RCE-1 User Manual

Example Commands

The following table illustrates actual command and response data for an RS-485 interface.

NOTE

- All numeric data is represent as ASCII Hexadecimal integers
- Example **Host Address** = 0x00 and **Module Address** = 0x01 (Master)
- The symbol ↵ equates to a carriage return (decimal 13, hex 0x0D)

| Command Sent by Host | Response Sent by I/O Module | Description |
|----------------------|-----------------------------|---|
| 0001V↵ | Vxy | Firmware version x.y |
| 0001K↵ | Kxx | Get receive error count (xx current count) |
| 0001J↵ | J | Clear receive error count |
| 0001Wyyxx↵ | W | Write EEPROM (yy address, xx value) |
| 0001Ryy↵ | Rxx | Read EEPROM (yy address in command, xx value in reponse) |
| S (master to slave) | S | Master sends Sxxyy (Master current inputs xx=Port 1 yy=Port 2) |
| Slave reaction | | Slave updates with new Port 1 and Port 2 values from master |
| S (slave to master) | S | Slave responds Sxxyy (Slave current inputs xx=Port s yy=Port 2) |
| Master reaction | | Master updates with new Port 1 and Port 2 values from slave |
| 0001Z↵ | Z | Reset CPU |
| | | |
| | X | Command error response |

EEPROM Map

| Address | Description |
|--------------------|--|
| 0x00 MASTER | Module Address (RS-485 address) [factory default = 0x01] |
| 0x01 MASTER | Async Destination Address, or slave address [factory default = 0x02] |
| 0x00 SLAVE | Module Address (RS-485 address) [factory default = 0x02] |
| 0x01 SLAVE | Async Destination Address, or slave address [N/A] |

Integrity Instruments RCE-1 User Manual

Digital Input/Output parameters

| Characteristic | Value |
|----------------------------|--|
| Digital I/O Current | I/O line source & sink 25 ma Total current PORT1 200 ma Total current PORT2 200 ma |
| Digital I/O Voltage Levels | Input Off (0) = 0V - 0.8V Input On (1) = 2.0V - 5.0V Output Off (0) = 0.6V max. Output On (1) = 4.3V min. |

| Digital I/O Levels | |
|--------------------------|---|
| Master or Slave Input Lo | Corresponding Master or Slave Output Lo |
| Master or Slave Input Hi | Corresponding Master or Slave Output Hi |

NOTES

WARRANTY

Integrity Instruments warranties all products against defective workmanship and components for the life of the unit. Integrity Instruments agrees to repair or replace, at its sole discretion, a defective product if returned to Integrity Instruments with proof of purchase. Products that have been mis-used, improperly applied, or subject to adverse operating conditions fall beyond the realm of defective workmanship and are not covered by this warranty.

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