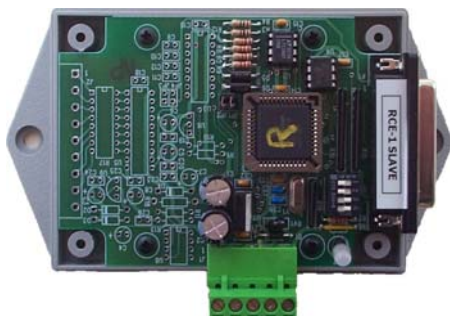


# Integrity Instruments

P.O. Box 451  
Pine River Minnesota  
56474 USA

Order Phone 800-450-2001  
Fax Phone 218-587-3414  
Tech Phone 218-587-3120

<http://www.integrityusa.com>



## Remote Contact Extender

**RCE-1**  
**RCE-1E(ENCLOSED)**

## 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.

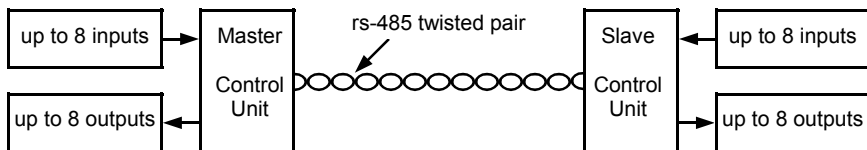
- Remote alarm indication and reset.
- Contact control from a remote source.
- Physical status (loading doors open, pumps running).
- Production operational status.
- Manned operations acknowledgement.
- Remote physical positioning operations.
- Remote access control.
- Physical operations (open windows,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



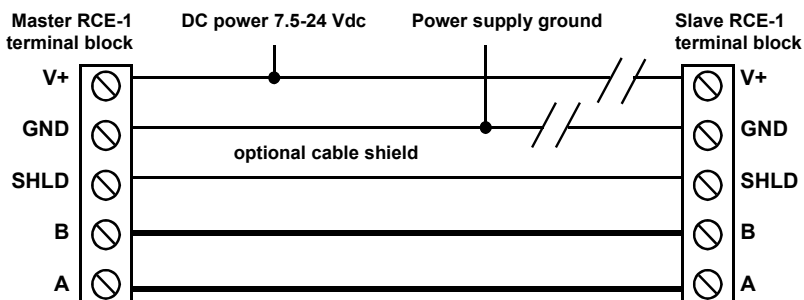
## RS-485 Cabling

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**

## Cabling Notes:

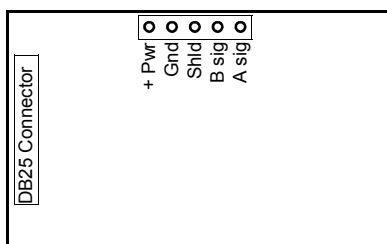
- 1) Gnd and Shld are connected internally within the **RCE-1**
- 2) Cable termination is important for long distance and high-speed applications
- 3) Suggested cable: 24 awg stranded twisted pair with shield for cable runs in excess of 200 feet. See also Belden cable #9841 and #9463.
- 4) The end units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



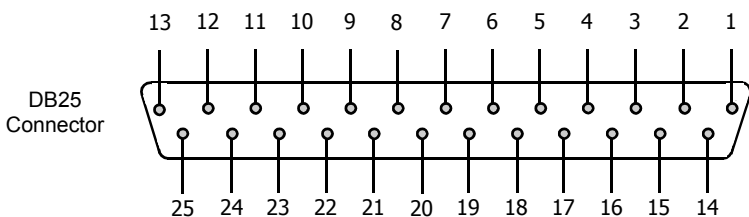
## Physical

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

**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

## **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)

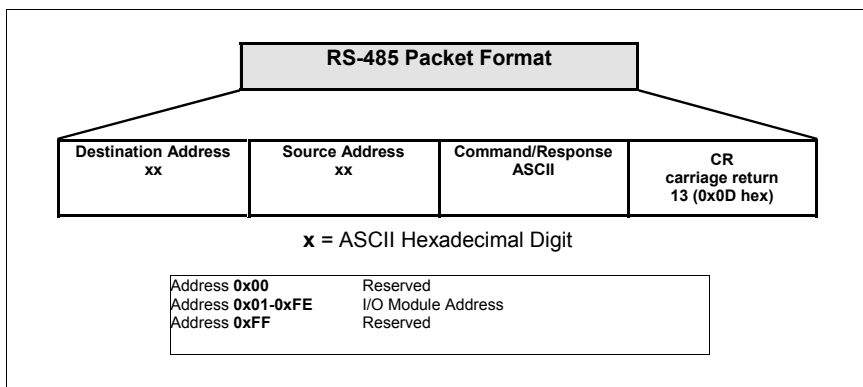
Master----Red  
Slave ----Green blinking

## 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.**

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

### **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.

### **NOTES**

#### **Warranty:**

**Integrity Instruments** warrants **all** products against defective workmanship and components for the life of the unit. Integrity Instruments agrees to repair or replace, at it's sole discretion, a defective product if returned to Integrity Instruments with proof of purchase.

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