SMARTEYE S-net

with DeviceNet Interface
SP4000/01

User Manual

Version 1.0.5

Revision 3

SMARTEYE CORPORATION

www.smarteyecorporation.com

related documents:

SMARTEYE Sender/Receiver Reader User Manual

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1.0 Introduction

A Smarteye Reader senses an identification number coded into a Smarteye Label. When a label moves past the reader, signals are sent from the reader to the S-net that enables the S-net to determine the label identification number.

Smarteye Labels are typically constructed of 12-gauge steel and come in a variety of lengths to suit specific application requirements. A label contains a pattern of punched slots that can be detected by a reader as the label passes by.

The S-net processes label inputs from one Smarteye Reader and communicates this information (in binary or ASCII form) to a control device such as a programmable controller over a DeviceNet network.

2.0 S-net Features

The S-net includes the following major features:

- Smarteye CPU circuit card with power on and low power indicators, one (1) DeviceNet communication Control Port, one (1) serial communication Auxiliary Port, and reader interface circuitry. A cage clamp connector is provided for connection to field wiring from the reader. A cage clamp connector is also used for the auxiliary communication port.
- NEMA-12 enclosure.
- Five pin male mini connector for DeviceNet communication and power.

3.0 S-net Installation

The Smarteye S-net is designed to function in the environment found in most industrial facilities. The S-net will operate properly in the same environment as a programmable controller. It is rated for operation at temperatures from **0 to 60° C.**

Electromagnetic interference on signal lines will not be a problem if the recommended cables are used for equipment interconnections. These will provide adequate shielding.

The S-net should be mounted in such a way to allow access to open the hinged cover for maintenance.

Mounting dimensions for the S-net NEMA-12 enclosure can be found on drawing SP4000/01-420 in Appendix A.

4.0 Power Wiring and Power Consumption

The S-net is powered by the DeviceNet Bus and requires 8 watts at 11-24VDC. A five pin male mini connector is provided on the S-net. A diagram of the DeviceNet connection can be found on drawing SP4000/01-412 in Appendix A.

5.0 Communications Wiring

5.1 Control Port Wiring

The S-net is supplied with a five pin mini male connector on the outside of the box for the DeviceNet connection. This connector provides control port communication and power connections for the S-net. A diagram of the DeviceNet connection can be found on drawing SP4000/01-412 in Appendix A.

5.2 Auxiliary Port Wiring

The auxiliary port connection is a cage clamp connector located next to the control port on the CPU circuit card. The auxiliary port is factory configured for RS232 communications.

Belden 8723 or equivalent (2 shielded pairs, 22 gauge) is recommended for RS232 connections. A detailed wiring diagram can be found on drawing SP4000/01-413 in Appendix A.

6.0 Reader Wiring and Mounting

6.1 S-net Reader Wiring

A Smarteye Reader features a six-foot cable prewired to each of its three receiver photoeyes and a twenty-five foot cable prewired to the sender. The photoeye cables terminate at the S-net or a remote field junction box near the receiver assembly. The three receiver cables are labeled A, B, or C respectively. The sender photoeye has a single unlabeled cable.

The S-net provides a cage clamp connector for the Smarteye Reader connection.

Note:

1. Readers are delivered with the white signal wires of the receivers terminated to the reader connector. The black signal wires are logically inverse to the white wires and are not used.
2. All references to + and - refer to the 24 VDC supply of the Smarteye S-net. The S-net is powered by the DeviceNet Bus.

6.2 Local Reader Mounting

The Smarteye reader is typically wired for local mounting to the S-net. The three receiver photoeyes and the sender photoeye are routed through the four-hole reader cable grommet and terminated on the reader cage clamp connector. Connection details for local reader mounting can be found on drawing SP4000/01-410 in Appendix A.

6.3 Remote Reader Mounting

The Smarteye reader can also be remotely mounted from the S-net control unit. The remote field junction box must be located no more than six cable feet from the receiver assembly. The remote junction box should have eight terminals labeled: +, +, -, -, A, B, C, and SH (shield).

Belden 9773 (3 shielded pairs, 18 gauge) is recommended for connecting the S-net to the remote junction box. A remotely mounted reader will also need the four-hole reader cable grommet replaced with a single-hole grommet. Maximum remote mounting distance is 500 feet.

The shield (drain) wires of the Belden 9773 cable are normally connected to 24V ground at the S-net. This is accomplished with the jumper block (J1-8) on the S-net circuit card. If the environment is electrically noisy, then it may be necessary to connect the shield to 24V ground at the remote reader's junction box. This can be accomplished by installing a jumper wire from the 'SH' terminal to the '-' terminal in the remote junction box. Do not connect the shield at both ends of the cable. Remove the jumper block (J1-8) at the S-net if the jumper wire is used at the remote junction box. Never connect the shield to chassis ground.

An optional junction box for the sender can be used if extra cable length is required. This junction box should provide two terminals labeled: +, -. Cabling details for remote reader mounting can be found on drawing SP4000/01-411 in Appendix A.

7.0 S-net CPU Configuration

The intelligence of the Smarteye Reader is contained in the Smarteye S-net CPU circuit card. The following features are included in the CPU circuit card hardware:

- Interface to a single reader
- Interface to a DeviceNet bus (control port)
- Interface to a serial RS232 auxiliary port (monitor line)
- Switches to set operating parameters
- Jumper blocks to modify shield terminations

The diagrams on the following pages describe the function of the various jumper blocks and switches. Prior to shipment, the switches and jumpers are set to match the factory defaults and anticipated customer environment.

7.1 Switch and Jumper Location Diagram

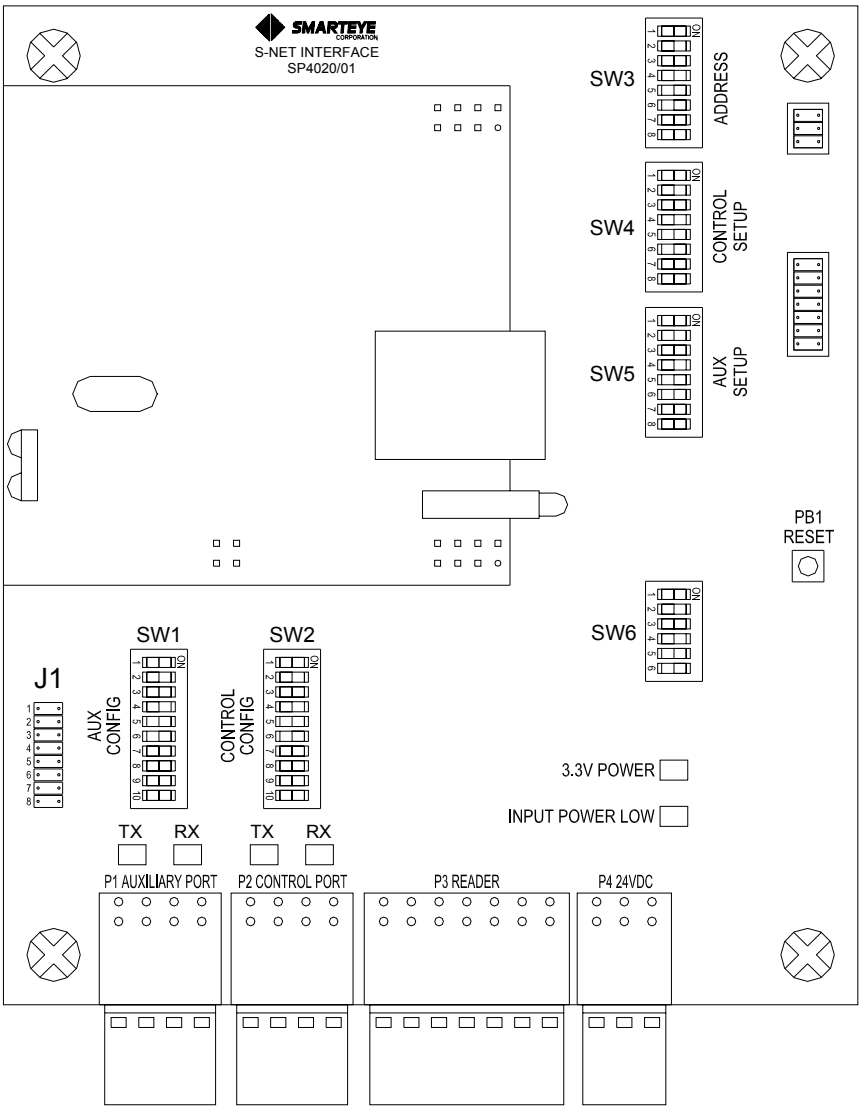


Figure 7-1

7.2 Dip Switch and Jumper Block Legend

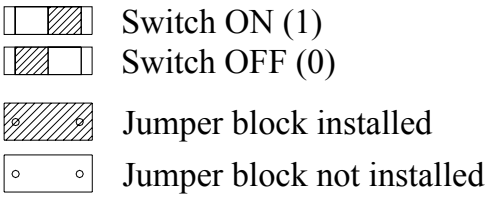


Figure 7-2

Notes:

- Do not change the settings of the factory-set Dip Switches. This could cause the S-net to stop operating.
- The S-net reads the state of the Configuration Dip Switches only at power-up. Cycle power to the S-net after changing any User-Selectable Dip Switches. The Diagnostic Dip Switch (SW4-8) can be modified without cycling power to the S-net.

7.3 Auxiliary Port Configuration (SW1)

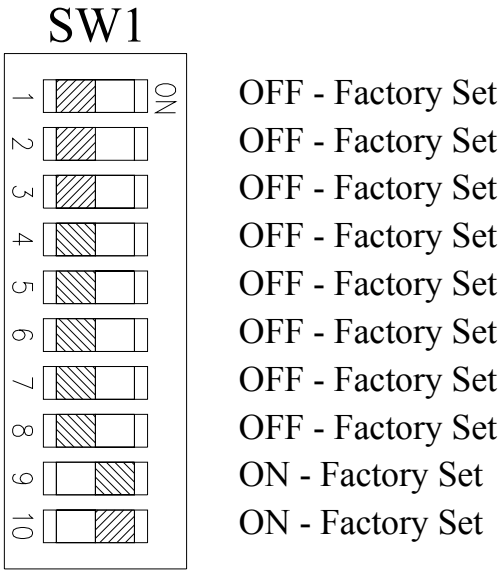


Figure 7-3

7.4 Control Port Configuration (SW2)

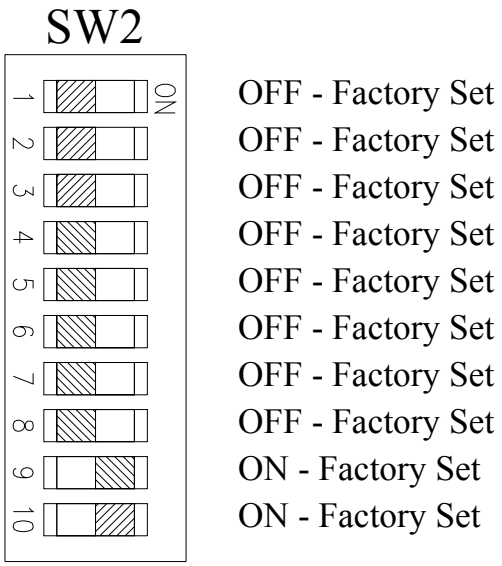


Figure 7-4

7.5 S-net Address Selection (SW3)

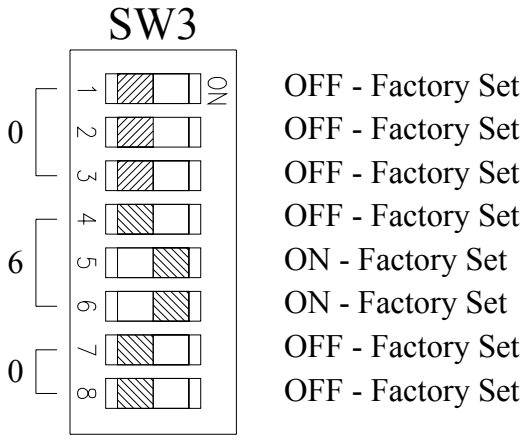
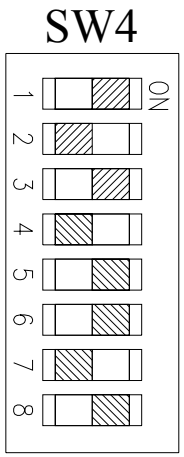


Figure 7-5

Note:

The control system uses the DeviceNet node address (MAC ID) for communication to the S-net. The S-net address is only used in the ASCII command packet, see the 'ASCII S-net Command Packet' section for details.

7.6 Control Port Communications Setup (SW4)



ON - Factory Set
OFF - Factory Set
ON - Factory Set
OFF - Factory Set
ON - Factory Set
Message Format (OFF = ASCII, ON = Binary)
OFF - Factory Set
Diagnostics (OFF = Disabled, ON = Enabled)

Figure 7-6

Notes:

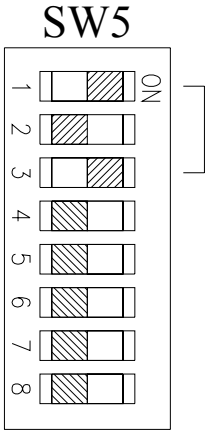
Message Format

- The Binary Message format sends the S-net reader data in a smaller DeviceNet packet, more suitable for a PLC application.
- The ASCII Message format sends the full ASCII S-net reader data string.

Diagnostics

- When enabled, the diagnostic data is sent to the Control Port. The diagnostic data is also saved for the Diagnostic Command on the Monitor Port.
- When disabled, the diagnostic data is only saved for the Diagnostic Command on the Monitor Port. The data is not sent to the Control Port.

7.7 Auxiliary Port Communications Setup (SW5)



Baud Rate - See Table 7-1 (below).

Parity (OFF = None, ON = Odd Parity)
OFF - Factory Set
OFF - Factory Set
OFF - Factory Set
OFF - Factory Set

Factory Default Shown (9600 Baud, No Parity)

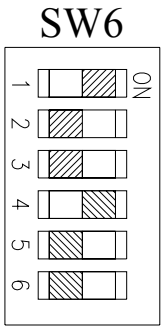
Figure 7-7

Baud Rate Table

Baud Rate	**Switch SW5 Position**		
	1	**2**	**3**
300	OFF	OFF	OFF
600	ON	OFF	OFF
1200	OFF	ON	OFF
2400	ON	ON	OFF
4800	OFF	OFF	ON
9600	ON	OFF	ON
19200	OFF	ON	ON
38400	ON	ON	ON

Table 7-1

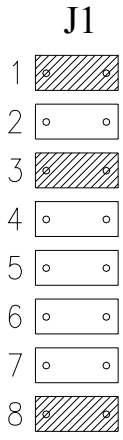
7.8 Receiver Configuration (SW6)



ON - Factory Set
OFF - Factory Set
OFF - Factory Set
ON - Factory Set
OFF - Factory Set
OFF - Factory Set

Figure 7-8

7.9 Drain Wire Terminations (J1)



Jumper installed - Factory Set
Jumper not installed - Factory Set
Auxiliary Port shield terminal to chassis ground.
Auxiliary Port shield terminal to 3.3V ground.
Control Port shield terminal to chassis ground.
Control Port shield terminal to 3.3V ground.
Reader Port shield terminal to chassis ground.
Reader Port shield terminal to 24V ground.

Figure 7-9

The jumper block (J1) is provided to allow drain wire terminations of the serial communication cables and the reader cables. Never connect a drain wire at both ends of a communication line.

The jumper block (J1-3) can be installed to terminate the auxiliary port communication cable's drain wire to chassis ground as necessary. The jumper blocks (J1-7 and 8) are provided to allow termination of the reader cable's drain wires. The drain wires of the reader cable (Belden 9773) are normally connected to 24V ground at the S-net. This is accomplished by installing jumper (J1-8). Jumper (J1-7) is provided for troubleshooting purposes only; normally it is not installed.

8.0 S-net Control Port Communication

The S-net Control Port connects to a DeviceNet bus and provides the control system with label inputs from the Smarteye Reader. The S-net communicates through a DeviceNet gateway module. The DeviceNet gateway module packages the S-net message into a DeviceNet packet and transmits it on the DeviceNet network.

8.1 Control Port Operation

The S-net operates in poll mode only. The control system will send a command packet to the S-net. The S-net will only respond to a command from the control system. When the S-net receives a command packet, it will send a response packet to the control system. The response packet will be a label, idle, error or diagnostic (if enabled) message.

A message transaction between the control system and the S-net is shown below:

Step	Control System Command	Message Direction	S-net Response
1	Restart ‘R’	>>>	
2		<<<	Idle message
3	Box Poll ‘B’	>>>	
4		<<<	Error 0 message
5	Box Poll ‘B’	>>>	
6		<<<	Idle message
7	**Label 225 Passes Reader**		
8	Box Poll ‘B’	>>>	
9		<<<	Label 225 message
10	Ack ‘A’	>>>	
11	Box Poll ‘B’	>>>	
12		<<<	Idle message
13	**Label 337 Passes Reader**		
14	Box Poll ‘B’	>>>	
15	[Transmission error detected by control system]	<<<	Label 337 message
16	NAK ‘N’	>>>	
17		<<<	Label 337 re-transmit message
18	Ack ‘A’	>>>	

Figure 8-1

Note:

When the S-net is first powered up, the control system must send a Restart 'R' or an Initialize 'I' command to the S-net. The S-net will not respond to any commands, until a Restart 'R' or an Initialize 'I' command is received. The Restart 'R' and Initialize 'I' are valid for the ASCII message format, while the Initialize 'I' is not valid for the binary message format.

8.2 Control Port Message Format

The S-net has two message formats: binary or ASCII form. The binary format is a compact binary number based format to keep the DeviceNet message size small. The ASCII format is a full ASCII character based format.

8.3 Binary Message Format

The binary S-net message is a compact form that consists of a command packet and a response packet.

8.3.1 Binary S-net Command Packet

The binary S-net command packet consists of four bytes. The Protocol Overhead (Bytes 1 & 2) is used for the DeviceNet gateway module and will be covered later. The command packet is sent from the control system to the S-net.

	Bit Position							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte 1	Protocol Overhead							
Byte 2								
Byte 3	S-net Command (See Table 8-2)							
Byte 4	Carriage Return (0Dh)							

Table 8-1

The following table lists the binary S-net Command (Byte 3) Values:

Command	S-net Command (Byte 3)		Description
	String Value	Hex Value	
Restart	R	52h	Initialize reader. Reader will respond with an idle message.
Box Poll	B	42h	Request message from reader. Reader will respond with a label, error, idle or diagnostic message.
ACK	A	41h	Acknowledge the previous S-net transmission. If a message was pending, the S-net will not respond, otherwise it will send an idle message.
NAK	N	4Eh	Negative acknowledge the previous S-net transmission. If a message was pending, the S-net will respond with a retransmission of the previous message, otherwise it will send an idle message.
Status	S	53h	Status inquiry for reader. Reader will respond with a label, error, idle or diagnostic message.

Table 8-2

8.3.2 Binary S-net Response Packet

The binary S-net response packet consists of six bytes. The Protocol Overhead (Bytes 1 & 2) is used for the DeviceNet gateway module and will be covered later. The response packet is sent from the S-net to the control system, in response to a command packet.

	Bit Position							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte 1	Protocol Overhead							
Byte 2								
Byte 3	Unused	Label Number/Error Number/Diagnostic Bits (Low Byte)						
Byte 4	Unused	Label Number/Error Number/Diagnostic Bits (High Byte)						
Byte 5	Packet Type							
Byte 6	Time							

Table 8-3

The following table lists the binary S-net Response Packet Description and Values:

Field	Byte	Format	Description/Values
Label Number	3 & 4	Integer	Label number: 1 - 16383
Error Number	3 & 4	Integer	S-net error number: 1 - 99
Diagnostic Bits	3 & 4	Bit	Diagnostic status: OK, High Alarm, Low Alarm
Packet Type	5	Bit	S-net packet type information
Time	6	Integer	Age of the event in tenths of a second: 1 - 99

Table 8-4

8.3.2.1 Binary S-net Packet Type (Byte 5) Bit Layout

The S-net response packet can only be one of six types.

	Bit Position							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Packet Type (Byte 5)	Unused	Unused	Retrans	Idle	Manual	Cal	Error	Label

Table 8-5

The following table lists binary S-net Packet Type Bit Descriptions:

Type	Description
Label	Label message
Error	S-net error message
Cal	Diagnostic status message
Manual	Manually entered Label Number on Manual Data Input (MDI) keypad
Idle	S-net is active but, no data available for transmission
Retrans	Retransmission of previously sent, but unacknowledged message

Table 8-6

Note:

When the S-net sends a retransmission message, it will also set the Label, Error, Cal or Manual bit. For example, if the S-net send a retransmission of an error message, the Retrans and Error bits will be set.

8.3.2.2 Binary S-net Label or Error Message (Byte 3 & 4) Bit Layout

If the response type is a label or an error message, the number is sent in two bytes, the low order bits in byte 3 and the high order bits in byte 4.

	Bit Position							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte 3	Unused	Data Bit 6	Data Bit 5	Data Bit 4	Data Bit 3	Data Bit 2	Data Bit 1	Data Bit 0
Byte 4	Unused	Data Bit 13	Data Bit 12	Data Bit 11	Data Bit 10	Data Bit 9	Data Bit 8	Data Bit 7

Table 8-7

The low order bits (byte 3) and the high order bits (byte 4) must be combined into a single 14-bit integer number. The mapping is shown below.

					Byte 3			**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
								X	D6	D5	D4	D3	D2	D1	D0
Byte 4	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	|	|	|	|	|	|	|
	X	D13	D12	D11	D10	D9	D8	D7	|	|	|	|	|	|	|
		|	|	|	|	|	|	|	|	|	|	|	|	|
		V	V	V	V	V	V	V	V	V	V	V	V	V	V
Label or	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Error Number	X	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

Figure 8-2

8.3.2.3 Binary S-net Diagnostic Message (Byte 3 & 4) Bit Layout

If the response type is a diagnostic message, the diagnostic bits are arrayed as follows:

	Bit Position							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte 3	Unused	Unused	C Diag Bit 1	C Diag Bit 0	B Diag Bit 1	B Diag Bit 0	A Diag Bit 1	A Diag Bit 0
Byte 4	Unused	Unused	Unused	Unused	Y Diag Bit 1	Y Diag Bit 0	X Diag Bit 1	X Diag Bit 0

Table 8-8

There are two bits used for each diagnostic field. The fields are:

A, B & C Diagnostic – Gain value for photoeye A, B & C

X Diagnostic – Phase relationship value between photoeye A and photoeye B

Y Diagnostic – Phase relationship value between photoeye B and photoeye C

The following table lists the S-net Binary Diagnostic Message Bit Descriptions:

Description	Diag Bit 1	Diag Bit 0	Meaning
Undefined state	0	0	No S-net diagnostic data available.
Low reader diagnostic alarm	0	1	The diagnostic value is below the acceptable values. The low limit value for the A, B and C diagnostic is –5. The low limit value for the X and Y diagnostic is –7. Reader adjustment may be necessary, see reader user manual.
High reader diagnostic alarm	1	0	The diagnostic value is above the acceptable values. The high limit value for the A, B and C diagnostic is +9. The high limit value for the X and Y diagnostic is +7. Reader adjustment may be necessary, see reader user manual.
Reader diagnostic OK	1	1	The diagnostic values are within the acceptable range. Reader adjustment is not necessary.

Table 8-9

8.4 ASCII Message Format

The ASCII S-net message is a full ASCII character format that consists of a command packet and a response packet.

8.4.1 ASCII S-net Command Packet

The ASCII S-net command packet consists of six bytes. The Protocol Overhead (Bytes 1 & 2) is used for the DeviceNet gateway module and will be covered later. The command packet is sent from the control system to the S-net.

	Description
Byte 1	Protocol Overhead
Byte 2	
Byte 3	Line Feed (0Ah)
Byte 4	S-net ID = 30h, 0 (zero) ASCII
Byte 5	S-net Command (See Table 8-11)
Byte 6	Carriage Return (0Dh)

Table 8-10

The following table lists the ASCII S-net Command (Byte 5) Values:

Command	**S-net Command Byte**		**Description**
	String Value	**Hex Value**	
Restart	R	52h	Initialize reader. Reader will respond with an idle message.
Box Poll	B	42h	Request message from reader. Reader will respond with a label, error, idle or diagnostic message.
ACK	A	41h	Acknowledge the previous S-net transmission. If a message was pending, the S-net will not respond, otherwise it will send an idle message.

(Continued next page)

Table 8-11

ASCII S-net Command Values (Continued)

Command	S-net Command Byte		Description
	String Value	Hex Value	
NAK	N	4Eh	Negative acknowledge the previous S-net transmission. If a message was pending, the S-net will respond with a retransmission of the previous message, otherwise it will send an idle message.
Status	S	53h	Status inquiry for reader. Reader will respond with a label, error, idle or diagnostic message.
Initialize	I	49h	Initialize the S-net reader online. Reader will respond with an Idle message.
Lock	L	4Ch	Lock S-net reader in diagnostic mode. Reader will respond with a label, error, idle or diagnostic message.
Unlock	U	55h	Unlock S-net diagnostic mode. Reader will respond with a label, error, idle or diagnostic message.
Offline	F	46h	Take the S-net reader offline. Reader will respond with an offline message. Reader will not respond until an Initialize (I) or Restart (R) command is received by the S-net.

Table 8-11 (Continued)

8.4.2 ASCII S-net Response Packet

The ASCII S-net response packet consists of 18 bytes (with diagnostics turned off, switch SW4-1 off) or 40 bytes (with diagnostics turned on, switch SW4-1 on). The Protocol Overhead (Bytes 1 & 2) is used for the DeviceNet gateway module and will be covered later. The response packet contains ASCII characters representing the label, error and diagnostic values. The response packet is sent from the S-net to the control system, in response to a command packet.

8.4.2.1 ASCII S-net Idle Message Response Packet

	Idle Message	Description
Byte 1	Protocol Overhead	Used by DeviceNet gateway module
Byte 2	Protocol Overhead	
Byte 3	Line Feed	Start of message indicator
Byte 4	S-net ID	S-net ID = 60d, 0 (zero) ASCII
Byte 5	Z	Checksum field indicator. Capital 'Z'
Byte 6	Checksum Byte 1	S-net calculated checksum byte 1
Byte 7	Checksum Byte 2	S-net calculated checksum byte 2
Byte 8	Carriage Return	End of message indicator
Byte 9		Unused bytes
…		
Byte 40		

Table 8-12

Example ASCII S-net Message

Idle Message:

<po><po><lf>0Zga<cr>

8.4.2.2 ASCII S-net Error Message Response Packet

	Error Message	Description
Byte 1	Protocol Overhead	Used by DeviceNet gateway module
Byte 2	Protocol Overhead	
Byte 3	Line Feed	Start of message indicator
Byte 4	S-net ID	S-net ID = 60 octal, 0 (zero) ASCII
Byte 5	E	Error message indicator. Capital 'E'
Byte 6	Error Char. 1	S-net error digit 1
Byte 7	Error Char. 2	S-net error digit 2
Byte 8	Retransmit Char.	'R' = retransmit message, otherwise a space.
Byte 9	T	Time field indicator. Capital 'T'
Byte 10	Timestamp Char 1	S-net timestamp digit 1
Byte 11	Timestamp Char 2	S-net timestamp digit 2
Byte 12	S	Sequence number field indicator. Capital 'S'
Byte 13	Sequence Number	S-net sequence number. Range 0 to 9.
Byte 14	Z	Checksum field indicator. Capital 'Z'
Byte 15	Checksum Byte 1	S-net calculated checksum byte 1
Byte 16	Checksum Byte 2	S-net calculated checksum byte 2
Byte 17	Carriage Return	End of message indicator
Byte 18		Unused bytes
…		
Byte 40		

Table 8-13

Example ASCII S-net Messages

Error 15:

<po><po><lf>0E15 T02S7Zdd<cr> - Normal error message

<po><po><lf>0E15RT02S7Zeb<cr>- Retransmit error message

8.4.2.3 ASCII S-net Label Message Response Packet

	Label Message	Description
Byte 1	Protocol Overhead	Used by DeviceNet gateway module
Byte 2	Protocol Overhead	
Byte 3	Line Feed	Start of message indicator
Byte 4	S-net ID	S-net ID = 60 octal, 0 (zero) ASCII
Byte 5	L	Label message indicator. Capital 'L' or Capital 'M' for a manual entered label on the Manual Data Input (MDI) keypad.
Byte 6	Label Char. 1	S-net label number digit 1
Byte 7	Label Char. 2	S-net label number digit 2
Byte 8	Label Char. 3	S-net label number digit 3
Byte 9	Label Char. 4	S-net label number digit 4
Byte 10	Label Char. 5	S-net label number digit 5
Byte 11	Retransmit Char.	'R' = retransmit message, otherwise a space.
Byte 12	T	Time field indicator. Capital 'T'
Byte 13	Timestamp Char 1	S-net timestamp digit 1
Byte 14	Timestamp Char 2	S-net timestamp digit 2
Byte 15	S	Sequence number field indicator. Capital 'S'
Byte 16	Sequence Number	S-net sequence number. Range 0 to 9.
Byte 17	Z	Checksum field indicator. Capital 'Z'
Byte 18	Checksum Byte 1	S-net calculated checksum byte 1
Byte 19	Checksum Byte 2	S-net calculated checksum byte 2
Byte 20	Carriage Return	End of message indicator
Byte 21		Unused bytes
…		
Byte 40		

Table 8-14

Example ASCII S-net Messages

Label 1234:

<po><po><lf>0L01234 T02S7Zak<cr> - Normal label message

<po><po><lf>0L01234RT02S7Zhj<cr> - Retransmit label message

MDI Label 1234:

<po><po><lf>0M01234 T02S7Zal<cr>

8.4.2.4 ASCII S-net Diagnostic Message Response Packet

	Diagnostic Message	Description
Byte 1	Protocol Overhead	Used by DeviceNet gateway module
Byte 2	Protocol Overhead	
Byte 3	Line Feed	Start of message indicator
Byte 4	S-net ID	S-net ID = 60 octal, 0 (zero) ASCII
Byte 5	C	Diagnostic message indicator. Capital 'C'
Byte 6	Space	
Byte 7	A	Photoeye A Diagnostic field indicator. Capital 'A'
Byte 8	Sign	Photoeye A diagnostic value sign. + or -
Byte 9	A Diagnostic Char. 1	Photoeye A diagnostic value digit 1
Byte 10	A Diagnostic Char. 2	Photoeye A diagnostic value digit 2
Byte 11	Space	
Byte 12	B	Photoeye B Diagnostic field indicator. Capital 'B'
Byte 13	Sign	Photoeye B diagnostic value sign. + or -
Byte 14	B Diagnostic Char. 1	Photoeye B diagnostic value digit 1
Byte 15	B Diagnostic Char. 2	Photoeye B diagnostic value digit 2
Byte 16	Space	
Byte 17	C	Photoeye C Diagnostic field indicator. Capital 'C'
Byte 18	Sign	Photoeye C diagnostic value sign. + or -
Byte 19	C Diagnostic Char. 1	Photoeye C diagnostic value digit 1
Byte 20	C Diagnostic Char. 2	Photoeye C diagnostic value digit 2
Byte 21	Space	
Byte 22	X	X diagnostic field indicator. Capital 'X'
Byte 23	Sign	X diagnostic value sign. + or -
Byte 24	X Diagnostic Char. 1	X diagnostic value digit 1
Byte 25	X Diagnostic Char. 2	X diagnostic value digit 2
Byte 26	Space	
Byte 27	Y	Y diagnostic field indicator. Capital 'Y'
Byte 28	Sign	Y diagnostic value sign. + or -
Byte 29	Y Diagnostic Char. 1	Y diagnostic value digit 1
Byte 30	Y Diagnostic Char. 2	Y diagnostic value digit 2
Byte 31	Retransmit Char.	'R' = retransmit message, otherwise a space.
Byte 32	T	Time field indicator. Capital 'T'
Byte 33	Timestamp Char 1	S-net timestamp digit 1
Byte 34	Timestamp Char 2	S-net timestamp digit 2
Byte 35	S	Sequence number field indicator. Capital 'S'
Byte 36	Sequence Number	S-net sequence number. Range 0 to 9.

(Continued next page)

Table 8-15

S-net Diagnostic Message Response Packet (Continued)

	Diagnostic Message	Description
Byte 37	Z	Checksum field indicator. Capital 'Z'
Byte 38	Checksum Byte 1	S-net calculated checksum byte 1
Byte 39	Checksum Byte 2	S-net calculated checksum byte 2
Byte 40	Carriage Return	End of message indicator

Table 8-15 (Continued)

Example ASCII S-net Message

Diagnostic Message:

<po><po><lf>0C A+00 B+00 C+00 X+00 Y+00 T04S2Zhi <cr>

8.4.2.5 ASCII S-net Offline Message Response Packet

	Idle Message	Description
Byte 1	Protocol Overhead	Used by DeviceNet gateway module
Byte 2	Protocol Overhead	
Byte 3	Line Feed	Start of message indicator
Byte 4	S-net ID	S-net ID = 60 octal, 0 (zero) ASCII
Byte 5	N	Offline message indicator. Capital 'N'
Byte 6	Z	Checksum field indicator. Capital 'Z'
Byte 7	Checksum Byte 1	S-net calculated checksum byte 1
Byte 8	Checksum Byte 2	S-net calculated checksum byte 2
Byte 9	Carriage Return	End of message indicator
Byte 10		Unused bytes
…		
Byte 40		

Table 8-16

Example ASCII S-net Message

Offline Message:

<po><po><lf>0NZco<cr>

8.4.2.6 ASCII S-net Message Checksum Calculation

The checksum field in the ASCII S-net message contains two lowercase ASCII bytes. The calculation for the values of these bytes is shown below:

	Error Message from S-net	Hex Value of character
Byte 1	Protocol Overhead	
Byte 2	Protocol Overhead	
Byte 3	Line Feed	0A
Byte 4	0	30
Byte 5	E	45
Byte 6	1	31
Byte 7	5	35
Byte 8	<space>	20
Byte 9	T	54
Byte 10	0	30
Byte 11	2	32
Byte 12	S	53
Byte 13	2	32
Byte 14	Z	5A
Byte 15	d	
Byte 16	g	
Byte 17	Carriage Return	
	Exclusive-OR of bytes 3 to 14	36

Figure 8-3

The result of the Exclusive-OR calculation of bytes 3 to 14 is 36.

Add an ASCII “a” to each digit of the Exclusive-OR calculation:

3	6
+ 61	+ 61
64 (ASCII ‘d’)	67 (ASCII ‘g’)

The resulting checksum characters are ‘d (byte 15) and ‘g’ (byte 16).

8.5 Control System/DeviceNet Gateway Message Synchronization

The DeviceNet gateway protocol requires the control system to acknowledge the receipt of an incoming message (S-net Response Packet). This protocol also requires the gateway to acknowledge the transmission of an outgoing message (S-net Command Packet). The protocol uses the Transmit Request Number and Receive Request Number to synchronize the message process. Valid numbers for the Transmit Request Number and Receive Request Number are 1 to 15, with zero used to reset the gateway's numbers.

S-net Command Packet Protocol Overhead Bytes

This packet is sent from the control system to the S-net.

	Bit Position							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte 1	Receive Acknowledge Number				Transmit Request Number			
Byte 2	Byte Count							
Byte 3	Command Data							
…								
Byte n								

Table 8-17

S-net Response Packet Protocol Overhead Bytes

This packet is sent from the S-net to the control system.

	Bit Position							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Byte 1	Receive Request Number				Transmit Acknowledge Number			
Byte 2	Byte Count							
Byte 3	Response Data							
…								
Byte n								

Table 8-18

The control system will initiate a message to the S-net by incrementing the Transmit Request Number. The DeviceNet gateway will receive the message, strip off the protocol overhead bytes (bytes 1 & 2) and transmit the command data to the S-net. The gateway will acknowledge the transmission by setting the Transmit Acknowledge Number equal to the Transmit Request Number. This will indicate to the control system that the message has been transmitted to the S-net.

The S-net will respond to the command by transmitting a response to the DeviceNet gateway, the gateway will add the protocol overhead bytes, increment the Receive Request Number and the packet will be sent to the control system. The control system will acknowledge the receipt of the response message by setting the Receive Acknowledge Number equal to the Receive Request Number. This will indicate to the gateway that the message has been received by the control system.

9.0 S-net Auxiliary Port Communication

The Auxiliary Port is used to monitor the control port and for S-net inquiries. The factory default settings for the Auxiliary Port are RS232 protocol, 9600 baud, 8 bits, 1 stop bit and no parity. For the Auxiliary Port interconnection diagram (cable pin out configuration), refer to drawing SP4000/01-413 in Appendix A.

The Auxiliary Port is programmed to respond to single character commands followed by a carriage return (enter key). The single character commands are:

- h Help - displays a list of valid commands
- m Monitor - toggles the monitor function on and off
- i Input - selects incoming messages only for the monitor function
- o Output - selects outgoing messages only for the monitor function
- b Both, selects both incoming and outgoing messages for the monitor function
- p Photoeyes - displays the state of the three photoeyes
- s Switches - displays the switch settings for switches SW3, SW4, and SW5
- l Label - displays the last label read
- e Error - displays the last error
- c Diagnostic - displays the last diagnostic values
- v Version - displays the software version number and build date

The command characters are case-sensitive and are lower-case. Typing a carriage return without a command character preceding it will result in the following message being displayed: "SMARTEYE – Type "h" for help". If a command character is typed that is not found in the above list of valid commands, then the message 'Invalid Command' will be displayed.

9.1 HELP – 'h<cr>'

The help command displays a list of valid command characters along with a brief description for each.

9.2 MONITOR – 'm<cr>'

The monitor command toggles the monitor function on and off. This function monitors the control port. The monitor function is off at power up.

When the monitor function is off typing the monitor command, activates the monitor and displays the "Monitor ON" message. When the monitor function is on, typing the monitor command disables the monitor and displays the "Monitor OFF" message.

The monitor function has three modes of operation:

1. Input only (see 'i' command)
2. Output only (see 'o' command)
3. Both (see 'b' command)

In input only mode, the monitor only displays messages that have been received by the control port. In output only mode, the monitor only displays messages that have been transmitted by the control port. In Both mode, all messages received and transmitted by the control port are displayed. The default setting (when activated) is to monitor both input and output from the control port.

Monitor messages are preceded by either an 'IN:' or an 'OUT:' header to distinguish whether the message was received or transmitted by the control port. The text message that follows either the 'IN:' or 'OUT:' header shows the actual characters received or transmitted by the control port. The hexadecimal character value is shown in brackets for all non-printable characters. A typical label message sequence would look like the following:

IN:	S[0D]	(the S is a status command and the 0D is carriage return)
OUT:	[E0],[01][01][09][E1]	(label message see details below)
IN:	A[0D]	(the A is an ack command and the 0D is carriage return)

Detail description for the label message, OUT:

Field	Description
[E0]	Receive pre-delimiter (224d) indicates start of text
,	Low byte of label number, 2Ch = 00101100 binary, only use low 7 bits
[01]	High byte of label number, 01h = 00000001 binary, only use low 7 bits
[01]	Label message type, 01h = 00000001 binary
[09]	Age of message in tenths of seconds
[E1]	Receive post-delimiter (225d) indicates end of text

Figure 9-1

A typical diagnostic message sequence would look like the following:

IN: S[0D] (the S is a status command and the 0D is carriage return)

OUT: [E0]?[0F][04][09][E1] (Diagnostic message see details below)

IN: A[0D] (the A is an ack command and the 0D is carriage return)

Detail description for the diagnostic message, OUT:

Field	Description
[E0]	Receive pre-delimiter (224d) indicates start of text
?	Diagnostic bits, 3Fh = 00111111 binary Bits 0, 1 = 11 - Photoeye A Gain OK Bits 2, 3 = 11 - Photoeye B Gain OK Bits 4, 5 = 11 - Photoeye C Gain OK Bits 6 & 7 - Unused
[0F]	Diagnostic bits, 0Fh = 00001111 binary Bits 0, 1 = 11 – X alignment OK Bits 2, 3 = 11 – Y alignment OK Bits 4 to 7 - Unused
[04]	Diagnostic message type, 04h = 00000100 binary
[09]	Age of message in tenths of seconds
[E1]	Receive post-delimiter (225d) indicates end of text

Figure 9-2

9.3 INPUT – 'i<cr>'

The input command sets the monitor mode to input only. In this mode, only characters received by the control port are displayed. Characters that are transmitted by the control port are not shown. When the 'i' command is entered an "Input Only" message will be displayed.

9.4 OUTPUT – 'o<cr>'

The output command sets the monitor mode to output only. In this mode, only characters transmitted by the control port are displayed. Characters that are received by the control port are not shown. When the 'o' command is entered, an "Output Only" message will be displayed.

9.5 BOTH – 'b<cr>'

The both command sets the monitor mode to input and output. In this mode, all characters received or transmitted by the control port are displayed. When the 'b' command is entered, an "Input and Output ON" message will be displayed.

9.6 PHOTOEYES – 'p<cr>'

The photoeyes command displays the current state of the reader input port. The reader port is an 8 bit input port. Since only 3 photoeyes are used in a SMARTEYE S-net reader, only the last 3 bits of the displayed data are relevant. The other 5 bits will always be zero. If we number the input port bits from 0-7, then bit 2 is for photoeye 'A', bit 1 is for photoeye 'B' and bit 0 is for photoeye 'C'. A few examples are:

- PE:00000111 – All photoeyes blocked (red light on back of photoeye off)
- PE:00000000 – All photoeyes unblocked (red light on back of photoeye on)
- PE:00000100 – Photoeye A is blocked, B and C unblocked

The photoeye command can be used to verify that the reader has been wired correctly. While blocking each of the three photoeyes individually enter the 'p' command and note the result. When only photoeye A is blocked, the 'p' command should return a result of PE:00000100. If the 'p' command returned a result of PE:00000010 in this scenario, you would know that photoeye A and B were wired incorrectly and need to be switched. If there are 2 ones in the 'p' command result while only one photoeye is blocked, then you would know that two photoeyes are shorted together. The correct 'p' command results are:

- PE:00000100 – with photoeye A blocked
- PE:00000010 – with Photoeye B blocked
- PE:00000001 – with Photoeye C blocked

9.7 SWITCHES – 's<cr>'

The switches command displays the current state of the three S-net setup switches. The three setup switches are SW3, SW4 and SW5. SW3 is used to setup the S-net address. SW4 is used to set the S-net control port parameters. SW5 is used to setup the S-net auxiliary port parameters. The display format for the 's' command is "SWX:87654321". Where SW signifies the switch block and the X denotes the switch block number 3, 4 or 5. Each switch block has 8 individual switches numbered from 1 to 8. The '87654321' designates which bit the individual switches refer to. The output from the 's' command looks like this:

SW3:00110000

SW4:10110101

SW5:00000101

Switch 3 in the above example has individual switches 5 and 6 turned on (box address 60 in octal)

9.8 LABEL – 'l<cr>'

The label command displays the last label read by the S-net reader. The output from the 'l' command looks like this:

'Label 000172'

If the reader has not read a valid label prior to the 'l' command, the message "No Data Found" will be displayed.

9.9 ERROR – 'e<cr>'

The error command displays the last error read by the S-net reader. The output from the 'e' command looks like this:

'Error 00'

If the reader has not had an error prior to the 'e' command, the message "No Data Found" will be displayed.

See 'S-net Troubleshooting' section for a complete list of error codes.

9.10 DIAGNOSTIC – 'c<cr>'

The diagnostic command displays the last diagnostic message. The output from the 'c' command looks like this:

'Cal A-05 B+03 C-02 X+01 Y-01'

If the reader has not generated any diagnostic values prior to the 'c' command, the message "No Data Found" will be displayed.

A diagnostic message contains five numbers, which indicate if the reader needs maintenance. A perfect diagnostic reading is:

A	B	C	X	Y
+5	+5	+5	0	0

Diagnostic numbers are acceptable if they are within ±5 of the perfect reading shown above. If an acceptable reading is unobtainable, check the Smarteye Reader User Manual for alignment information.

The Smarteye S-net calculates a diagnostic message each time a label passes by its reader. The diagnostic message is transmitted to the host only if the S-net is placed in diagnostic mode (factory default SW4-8). Each time a label passes the reader, a diagnostic message is transmitted to the host. The diagnostic message comes in addition to any label or error messages.

9.11 VERSION – 'v<cr>'

The version command displays the current software revision along with the build date. The output from the 'v' command looks like this:

'Version 1.0.5 Build Date 14-April-2005'

10.0 S-net DeviceNet Configuration

The S-net uses a DeviceNet gateway module to communicate on a DeviceNet network. The gateway packages the S-net messages into a DeviceNet message packet for transmission on the network.

10.1 Setting the Data Rate and MAC ID of the S-net

The DeviceNet gateway is housed inside the S-net enclosure. Rotary switches for setting MAC ID, DeviceNet Baud, and Serial Baud are on the inside cover of the S-net reader. There are two Bi-color LED's for DeviceNet status and two Bi-color LED's for serial status on the S-net.

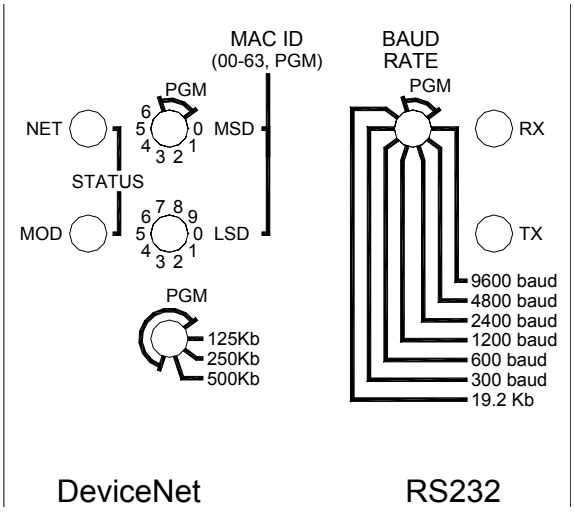


Figure 10-1

The RS232 baud rate must be set to 9600 baud. This is the communication rate between the gateway and the S-net CPU. The DeviceNet baud rate must be set to match the network application baud rate. Set the rotary switch on the S-net to the appropriate setting (125kb, 250kb or 500kb).

The DeviceNet address or MAC ID is set using two rotary switches. One rotary switch is for the most significant digit (MSD) of the address and the other rotary switch is for the least significant digit (LSD) of the address.

Example S-net DeviceNet Node address = 42.

MSD rotary switch setting: 4

LSD rotary switch setting: 2

10.2 Register the S-net EDS file into the DeviceNet Software

Before configuring the DeviceNet parameters in the S-net with the DeviceNet software, the EDS file for S-net (CDN066) must be registered. The current EDS file is on the CD included with the S-net reader. The file can also be downloaded from the Smarteye website at www.smarteyecorporation.com. Refer to the manufacturer's DeviceNet software User Manual for details concerning the registering of the S-net (CDN066) EDS file.

10.3 Configure the Device Parameters for S-net

The S-net can be configured with the following EDS parameters:

ID	Parameter Description	Binary Message Format Parameter Value	ASCII Message Format Parameter Value
1	Status	<Read Only>	
2	Baud Rate	9600 Baud	
3	Parity	No Parity	
4	Data Size	8	
5	Stop Bit	1	
6	Flow Control	No Flow Control	
7	Receive Count	<Read Only>	
8	Transmit Count	<Read Only>	
9	Maximum Receive Size	4	40 with diagnostics 18 without diagnostics
10	Maximum Transmit Size	2	6
11	Data Format	00: String Format = 0 01: Strip Parity = 0 02: Pad Left/Right= 0 03: Pad = 1	
12	Block Mode	00:Pre/Post Delimiter = 1	00:Pre/Post Delimiter = 0
		01:Strip Delimiter = 1	
		02:Delimeter Enable = 1	
		03:Rcv. Seq. Number = 1	
		04:Enable Xmit Seq Number = 1	
		05: Resend = 1	
		06: Sync = 1	
13	Receive Delimiter	224	13
14	Pad Character	32	
15	Status Enable	<Read Only>	
16	Status Clear Enable	<Read Only>	

Table 10-1

11.0 S-net Troubleshooting

11.1 S-net Error Codes

The error messages defined below will be sent out the control port unless otherwise noted.

Note: Errors 04, 05, 06 and 15 may be caused by improper installation or alignment of the reader assembly. Refer to the reader installation drawings and User Manual for details.

Error Code	Meaning	Cause
00	Smarteye S-net power up message.	S-net just powered up.
01	Unrecognizable label. Excessive transitions of photoeyes detected.	Possible Sources: - Induced electrical noise on the photoeye cables - Damaged or dirty label - Faulty photoeye - Erroneous error caused by the fixtures on a carrier breaking the photoeye beams
04	Unrecognizable label, front and back bits = 0.	These errors can be the result of fixtures on a carrier breaking the photoeye beams.
05	Unrecognizable label, front and back bits = 1.	
06	Unrecognizable label, incorrect parity.	Check label for obstructions.
07	Parity error in character of command message received.	Check command message structure or parity.
10	Unrecognizable command message received.	Check command message content.
15	Unrecognizable label, incorrect Hamming code.	Check label for obstructions.
17	Command message received w/o <cr> terminator.	Command message was missing the carriage return <cr> at the end.
19	Overload of input data from reader.	Possible Sources: - Induced electrical noise on the photoeye cables - Damaged or dirty label - Faulty photoeye - Erroneous error caused by the fixtures on a carrier breaking the photoeye beams
20	Checksum error in command message received.	Check command message content.

(Continued next page)

Table 11-1

S-net Error Codes (continued)

Error Code	Meaning	Cause
30-39	Unrecognizable label, incorrect number of data bits. LSD (least significant digit) of error is the number of data bits in the label read.	Check label for obstructions or incorrect label size (# of data bits) in system.
77	Firmware watchdog timeout.	If error persists, replace the S-net.
Errors 91 through 99 are detected during diagnostic check (if Diagnostic Enable switch SW4-8 is on), the reader may still read the label.		
91	Photoeye A, insufficient number of transitions in time allowed.	These errors indicate that 1 or more photoeyes are not transitioning while the other photoeyes are. Check for Check label for obstructions, reader height, photoeye operation, and reader wiring.
92	Photoeye B, insufficient number of transitions in time allowed.	
93	Photoeyes A and B, insufficient number of transitions in time allowed.	
94	Photoeye C, insufficient number of transitions in time allowed.	
95	Photoeyes A and C, insufficient number of transitions in time allowed.	
96	Photoeyes B and C, insufficient number of transitions in time allowed.	
99	Diagnostic attempt aborted; acceptable hole pattern not found. E99 is sent to the control system if diagnostic mode is locked on for the reader and the S-net is in ASCII mode.	Possible label speed variation.

Table 11-1 (continued)

11.2 S-net CPU Board Indicator Lights

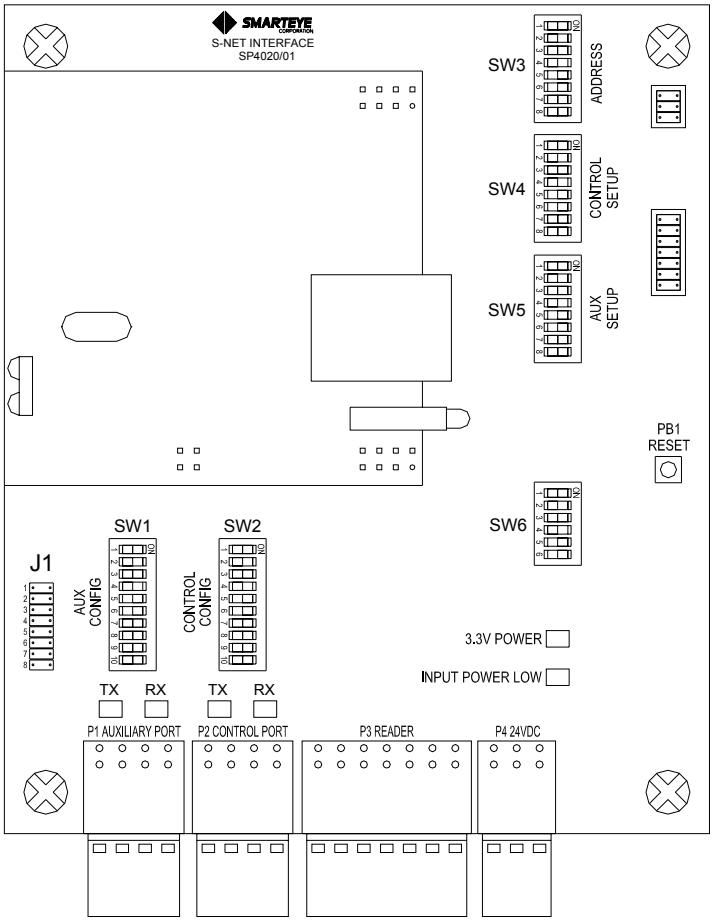


Figure 11-1

The S-net CPU board indicators lights are explained below.

Indicator Light	State	Description
3.3V POWER	Off	No power to S-net.
	On Green	Power on. Normal indication.
INPUT POWER LOW	Off	Input power within parameters. Normal indication.
	On Red	Low input power warning. LED will illuminate when input voltage is less than 10.5 volts. Check input power.
TX (Red), RX (Green) (Aux. Or Control Port)	Off	No data being transmitted or received. Normal indication.
	Flashing	Data being transmitted or received. Normal indication.

Table 11-2

11.3 DeviceNet Gateway Module Indicator Lights

The DeviceNet gateway module has four tri-color indicator lights:

NET: DeviceNet status LED

MOD: Module status LED

RX: Receive status LED

TX: Transmit status LED

The indicator lights are shown in Figure 11-2.

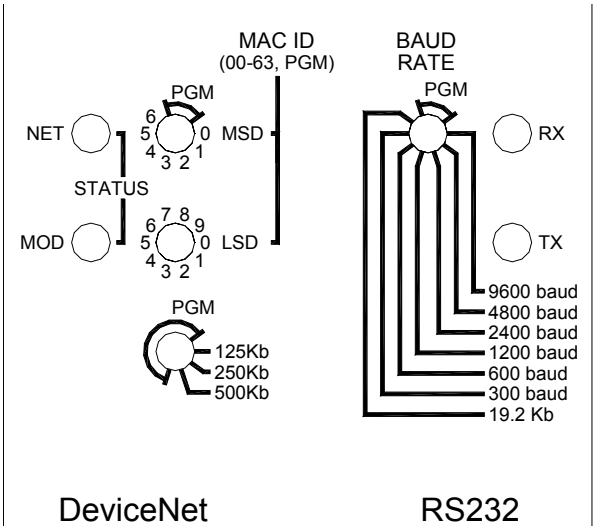


Figure 11-2

The DeviceNet Gateway indicators lights are explained below.

Indicator Light	State	Description
NET	Off	No power to S-net.
	On Green	Normal indication.
	Flashing Green	Gateway module not allocated to DeviceNet master.
	On Red	MAC ID is already used on network. Check for duplicated MAC ID addresses. Unrecoverable error. Cycle power to S-net, if state persists, replace S-net.
	Flashing Red	Device removed from network. Check DeviceNet master scan list. DeviceNet configuration error. Check and correct DeviceNet parameter settings.
MOD	Off	No power to S-net.
	On Green	Normal indication.
	Flashing Green	Not defined.
	On Red	Unrecoverable error, cycle power. If state persists, replace S-net.
	Flashing Red	DeviceNet configuration error. Check and correct DeviceNet parameter settings.
TX	Off	No data being transmitted. Normal indication.
	On Green	Not defined.
	Flashing Green	Data being transmitted. Normal indication.
	On Red	Transmit parity or overrun error. Check Status byte for transmit errors. Cycle power to S-net.
	Flashing Red	Not defined.
RX	Off	No data being received. Normal indication.
	On Green	Not defined.
	Flashing Green	Data being received. Normal indication.
	On Red	Receive parity or overrun error. Check Status byte for receive errors. Cycle power to S-net.
	Flashing Red	Not defined.

Table 11-3

Appendix A Drawings

Sender/Receiver Cable Details for S-net Local Mounting Applications – SP4000/01-410

This drawing shows the wiring details for a locally mounted reader.

Sender/Receiver Cable Details for S-net Remote Mount Applications –SP4000/01-411

This drawing shows the wiring details for a remotely mounted reader using a customer supplied junction box.

S-net Communication Cable Details – SP4000/01-412

This drawing shows the location and wiring details for the DeviceNet connection.

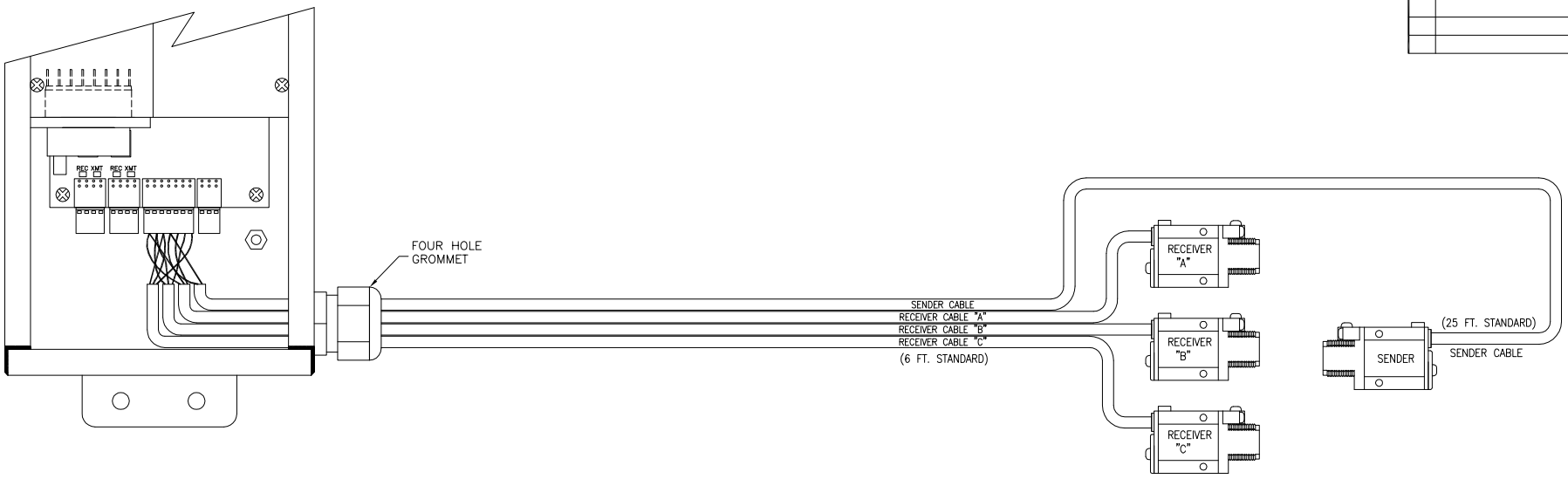
S-net Auxiliary Port Wiring Details – SP4000/01-413

This drawing shows the wiring details for the auxiliary port.

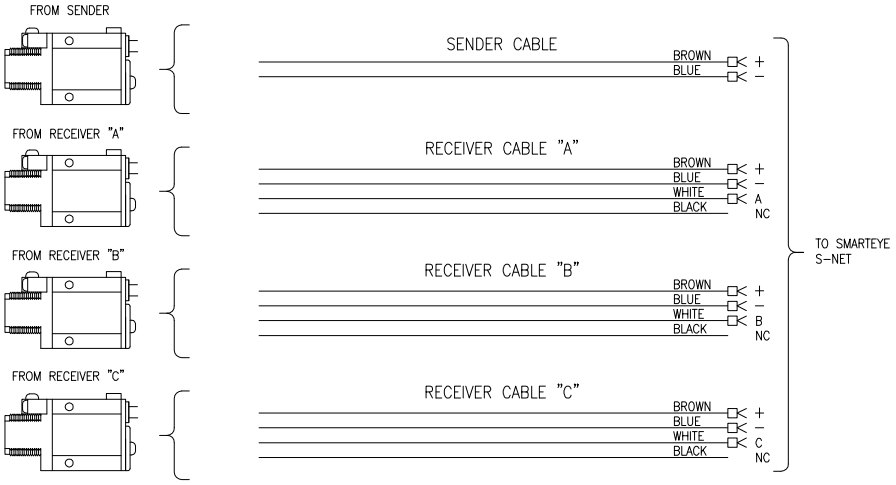
S-net Installation Details – SP4000/01-420

This drawing shows the mounting dimensions of the S-net.

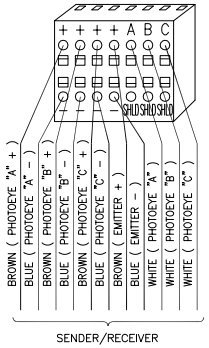
REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	9/12/03	CCL
1	REVISED SENDER LENGTH	06/08/04	RSA
2	GENERAL REVISIONS	05/11/05	MDB



CABLE DETAILS



S–NET CONNECTION DETAILS



LEGEND

– PLUG–IN CAGE CLAMP TERMINATION

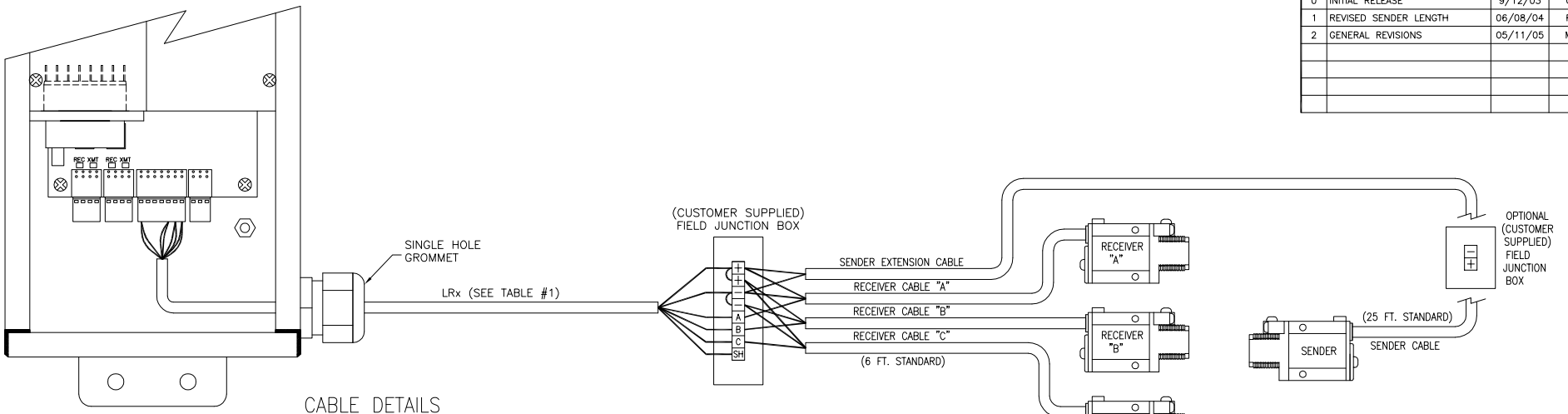
NC – NO CONNECTION

SMARTEYE CORPORATION

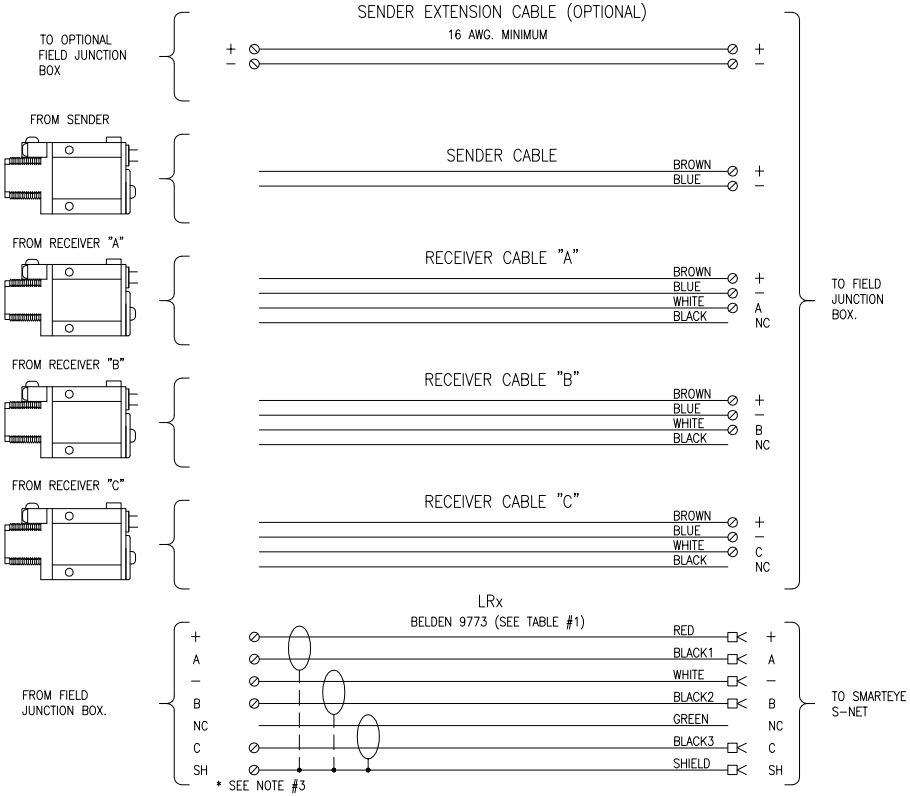
2637 BOND STREET ROCHESTER HILLS, MICHIGAN 48309
PHONE (248) 853–4495 FAX (248) 853–8539

DRAWN BY: JKM	TITLE:
CHECKED BY: MDB	SMARTEYE SENDER / RECEIVER
ENGINEER: MDB	CABLE DETAILS FOR S–NET
DATE: 08/19/03	LOCAL MOUNTING
SHEET 1 OF 1	
SCALE: NTS	DRAWING NO. SP4000/01–410
SIZE: D	

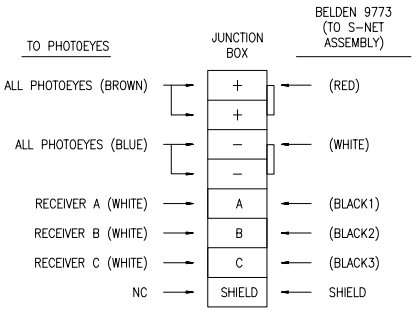
REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	9/12/03	CCL
1	REVISED SENDER LENGTH	06/08/04	RSA
2	GENERAL REVISIONS	05/11/05	MDB



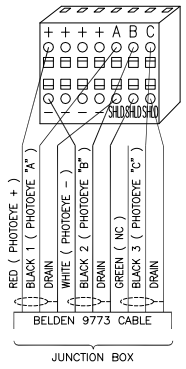
CABLE DETAILS



JUNCTION BOX DETAILS



S-NET CONNECTION DETAILS



LEGEND

⦸ – SCREW TERMINATION
⊏× – PLUG-IN CAGE CLAMP TERMINATION
NC – NO CONNECTION

TABLE #1
CABLE TYPE AND
LRx MAX. DISTANCE

AWG	BELDEN#	DISTANCE FEET
18	9773	500

NOTES:

1) BELDEN 9773 CABLE PAIRED AS FOLLOWS:

   BLACK 1 IS PAIRED WITH RED
   BLACK 2 IS PAIRED WITH WHITE
   BLACK 3 IS PAIRED WITH GREEN

2) GREEN IS NOT USED (SEE CABLE DETAIL LRx)

3) THE SHIELD OF CABLE LRx MUST BE CONNECTED AT ONE END ONLY. THE SH TERMINAL IN THE REMOTE JUNTION BOX IS FOR LANDING THE SHIELD WIRE ONLY. IT IS NOT CONNECTED TO GROUND.

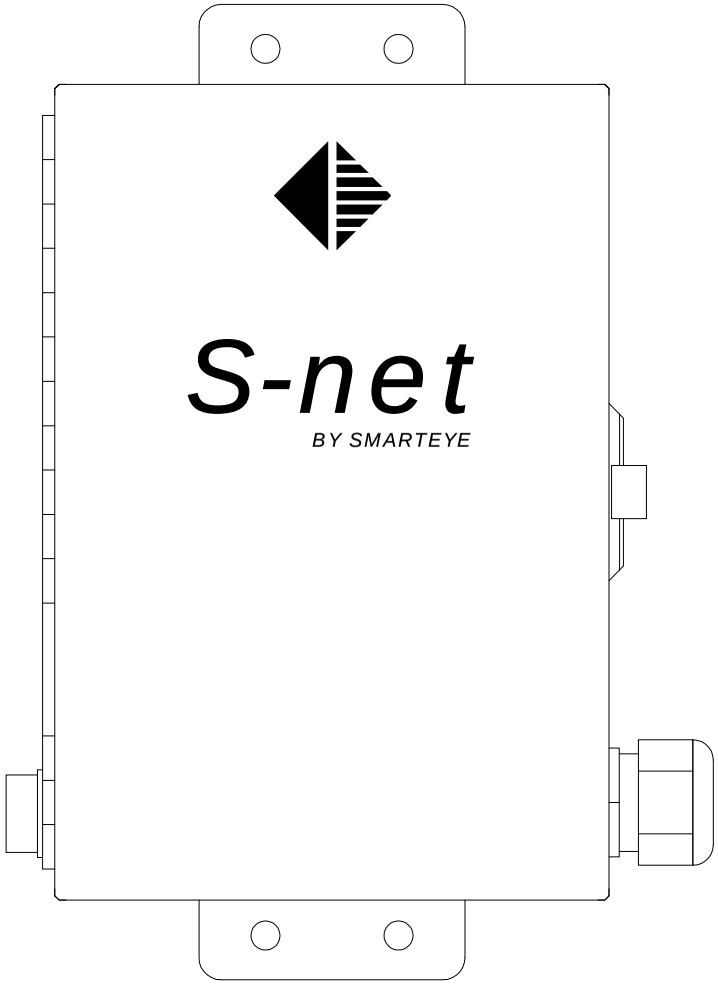
   THE SHIELD OF CABLE LRx NORMALLY CONNECTED TO 24V GROUND AT THE S-NET CIRCUIT BOARD VIA JUMPER J1-8. IN A NOISY ELECTRICAL ENVIRONMENT, IT MAY BE NECESSARY TO GROUND THE SHIELD AT THE REMOTE JUNCTION BOX. REFER TO THE 'REMOTE READER MOUNTING' SECTION OF THE USER MANUAL FOR DETAILS.

SMARTEYE CORPORATION
2637 BOND STREET ROCHESTER HILLS, MICHIGAN 48309
PHONE (248) 853-4495 FAX (248) 853-8539

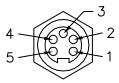
DRAWN BY:	JKM	TITLE:	
CHECKED BY:	MDB	SMARTEYE SENDER / RECEIVER	
ENGINEER:	MDB	CABLE DETAILS FOR S-NET	
DATE:	08/19/03	REMOTE MOUNT	
SHEET	1 OF 1		
SCALE:	NTS	DRAWING NO.	SP4000/01-411
SIZE:	D		

I:\PRODUCTS\SP4000-01 S-NET - DEVICENET\SP4000-01-411-1-2.DWG PLOTTED: 05-11-05 AT 11:19 BY: RONA

REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	8/22/03	CCL



5 PIN MALE
MINI–RECEPTACLE



1 – DRAIN
2 – BUS+
3 – BUS–
4 – CAN.H
5 – CAN.L

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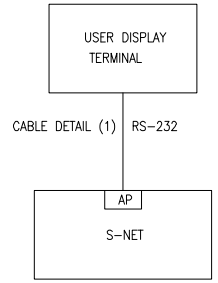
PHONE (248) 853–4495 FAX (248) 853–8539

DRAWN BY: RSA	TITLE:
CHECKED BY: MDB	SMARTEYE S–NET
ENGINEER: MDB	DEVICENET CONNECTION
DATE: 08–20–03	
SHEET 1 OF 1	
SCALE: 1" = 1"	DRAWING NO. SP4000/01–412
SIZE: D	

REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	9/12/03	CCL
1	UPDATED COMMUNICATION TYPE	1/27/03	CCL
	TO RS-232		

S-NET AUXILIARY PORT

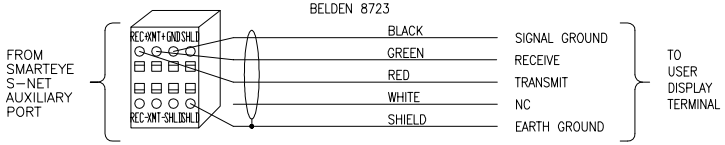


LEGEND

NC – NO CONNECTION
AP – AUXILIARY PORT (S-NET)

NOTE: MAXIMUM LENGTH OF RS-232 IS 50'

CABLE DETAIL (1)
RS-232
BELDEN 8723



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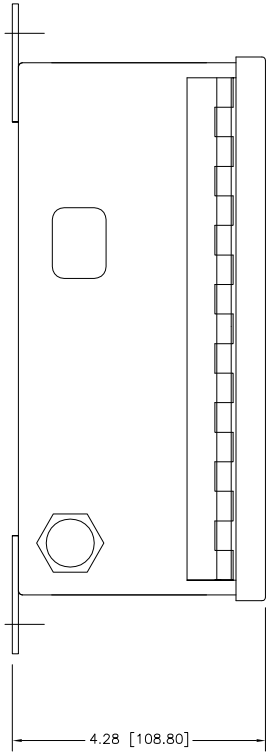
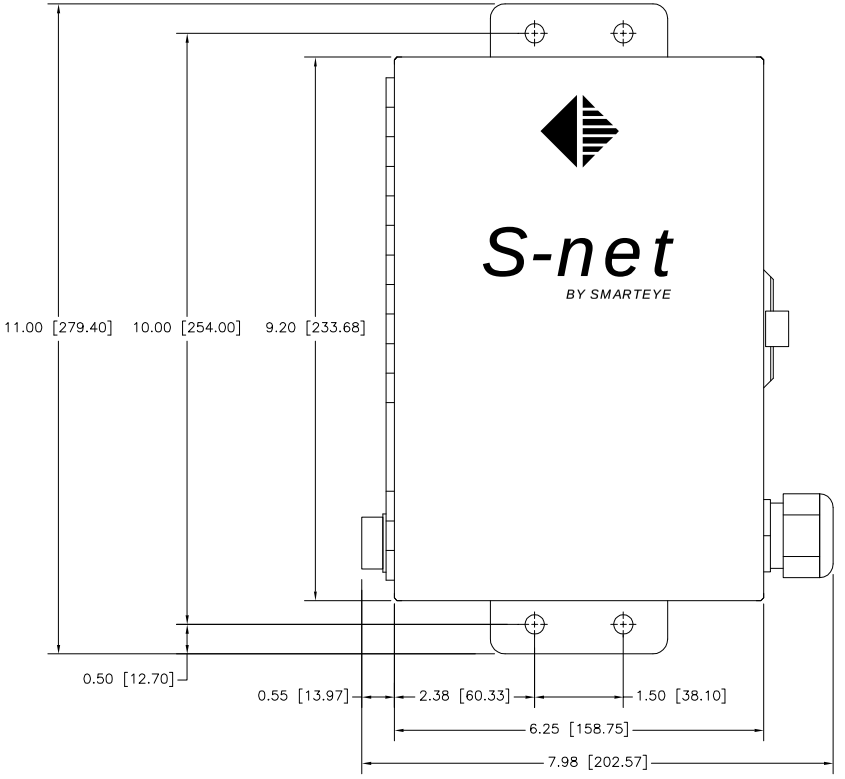
PHONE (248) 853-4495 FAX (248) 853-8539

DRAWN BY: RSA	TITLE:
CHECKED BY: MDB	SMARTEYE S-NET CONTROL UNIT
ENGINEER: MDB	AUXILIARY COMMUNICATION PORT
DATE: 08/20/03	-CABLE DETAILS
SHEET 1 OF 1	
SCALE: NTS	DRAWING NO. SP4000/01-413
SIZE: D	

REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	9/4/03	CCL





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PHONE (248) 853-4495 FAX (248) 853-8539

DRAWN BY: RSA	TITLE:
CHECKED BY: MDB	SMARTEYE S-NET W/ DEVICENET
ENGINEER: MDB	CONTROL UNIT
DATE: 08-20-03	NEMA-12 ENCLOSURE
SHEET 1 OF 1	- INSTALLATION DETAILS
SCALE: 1" = 1"	DRAWING NO. SP4000/01-420
SIZE: D	

SMARTEYE
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