

# SSI-1016J

## Specifications and Operation Manual



Warning: Product specifications and dimensions are subject to change without prior notice.

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## Revision History

2013/6/20 - First issued

2014/4/18 – p8 Connector information added

# 1. Overview

## SSI-1016J

The SSI-1016J unit converts serial SSI data output by Temposonics sensors to parallel data. SSI (Synchronous Serial Interface) is a serial communication protocol developed and widely used in Europe. By converting the SSI signal to a parallel signal with the SSI-1016J, Temposonics sensors can be used with a wider variety of controllers. Furthermore, the SSI-1016J provides the necessary clock signal for SSI communication.

## SSI Communication Protocol

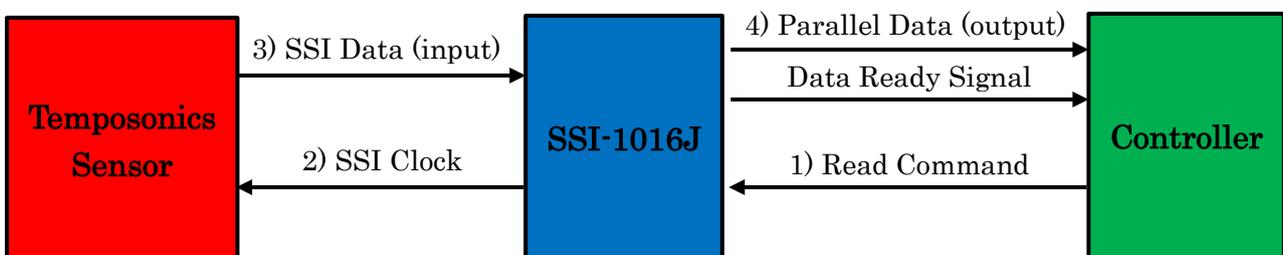
The SSI protocol is a serial transmission over a 4-wire, RS422-compliant wiring configuration. A clock pulse train from a controller is used to gate out sensor data. One bit of position data is transmitted to the controller for each clock pulse received by the sensor. The maximum SSI clock baud rate is dependent on the cable length and a minimum of 16 $\mu$ s dwell time is required between each clock pulse train.

The output data is formatted in either binary or gray code with either 24, 25, or 26 bits of data depending on Temposonics sensor settings. The most significant bit (MSB) comes first and the least significant bit (LSB) represents the resolution specified by sensor specifications. Each bit is transmitted synchronously with the rising edge of each clock pulse.

## SSI-1016J Operation

The SSI-1016J unit interfaces with 24, 25, and 26 bit SSI Temposonics sensors with no adjustment necessary and outputs parallel data via an open collector output. The SSI-1016J has two operation modes which are selectable via the rotary switch mounted on the SSI-1016 front panel.

Figure 1



### A) Automatic Mode

When set to automatic mode the SSI-1016J unit supplies a clock signal based at a set interval (cycle time). This cycle time can be selected via the rotary switch on the SSI-1016J front panel. Upon receiving this clock signal the Temposonics sensor outputs its measurement data as described above. This data is received by the SSI-1016J unit and immediately output to the controller as parallel output.

Automatic mode constitutes steps 2→3→4 shown in Figure 1 above.

※In automatic mode the Data Ready Signal is used to communicate the timing for reading out the parallel output. See page 11 for details.

### B) Read Command Mode

When set to read command mode the SSI-1016J unit waits for a read command from the controller. Once the read command is received, the SSI-1016J unit supplies a single SSI clock signal to the Temposonics sensor, which returns a single SSI data output. The SSI-1016J is immediately output to the controller as parallel output.

Read command mode constitutes steps 1→2→3→4 shown in Figure 1 above.

## 2. Specifications

Power Supply	Voltage: 24VDC (+20%/-15%) Ripple: <1%PP Current Consumption: 160mA (typ.)
Communication Protocol	SSI ( Synchronous Serial Interface )
Output Data Format	Binary or gray code (sensor dependent)
Output Data Length	24, 25, or 26 bits (sensor dependent)
SSI Clock Baud Rate	100 kHz
Output	Transistor open collector with positive or negative logic <i>Sustaining voltage:</i> +40VDC(max) <i>Sink Current:</i> 20mA(max) <i>Cycle Time:</i> 1ms, 5ms, 10ms, 50ms
Output Connector	FCN 40pin connector (Model #:FCN-365P040-AU)
Read Command Input	24V ( 16mA ) Photocoupler input Falling and rising time (0 to 100%): <5μs
Sensor Connector	9pin D-Sub connector
Power Supply Connector	Bipolar screw terminal block Wire size: 0.2~1.25mm <sup>2</sup> ( AWG 24~16 )
LED	Green LED: Power On Yellow LED: Not Used
Mount	DIN rail (35mm width)
Operating Temperature	0°C ~ +70°C (No condensation)

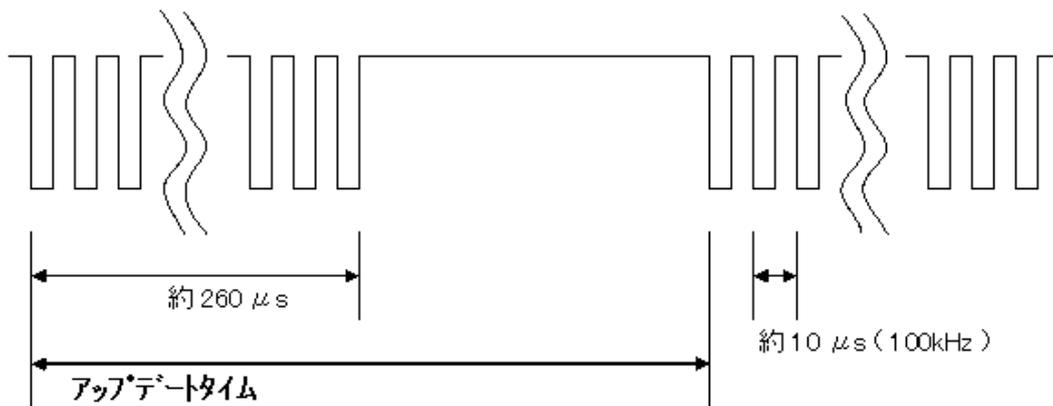
### Mode Select / Cycle Time Select Rotary Switch (mounted on SSI-1016J face)

Number	Mode / Cycle Time
0	Automatic Mode: 1ms (Default)
1	Automatic Mode: 5ms
2	Automatic Mode: 10ms
3	Automatic Mode: 50ms
4 - B	Reserved
C	Read Command Mode
D - F	Reserved

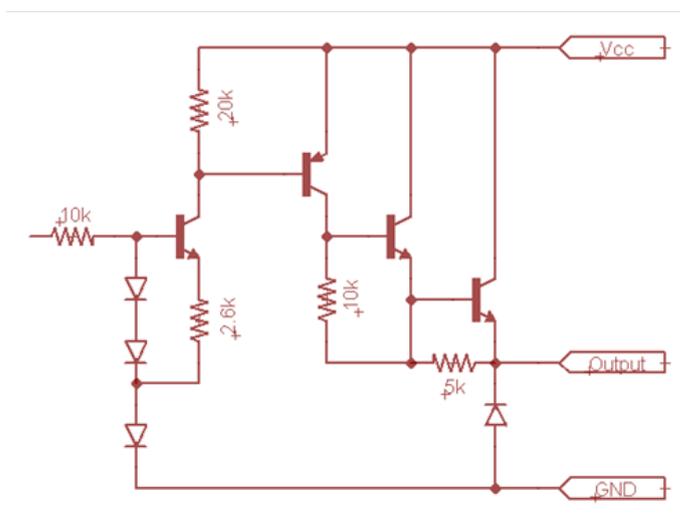
Note: Changes to mode or cycle time are not active until the SSI-1016J power has been reset.

### SSI-1016J SSI Clock Signal – Figure 2

クロック信号



### Parallel Output Equivalent Circuit – Figure 3



### 3. Connection

**Parallel Output FCN 40pin Connector – Figure 4**

Pin Number	Signal		
	24 Bit Sensor	25 Bit Sensor	26 Bit Sensor
A1	FG	FG	FG
A2	VCC	VCC	VCC
A3	Read Command+	Read Command+	Read Command+
A4	Read Command-	Read Command-	Read Command-
A5	Output Bit23 (MSB)	Output Bit24(MSB)	Output Bit23(MSB)
A6	Output Bit22	Output Bit23	Output Bit22
A7	Output Bit21	Output Bit22	Output Bit21
A8	Output Bit20	Output Bit21	Output Bit20
A9	Output Bit19	Output Bit20	Output Bit19
A10	Output Bit18	Output Bit19	Output Bit18
A11	Output Bit17	Output Bit18	Output Bit17
A12	Output Bit16	Output Bit17	Output Bit16
A13	Output Bit15	Output Bit16	Output Bit15
A14	Output Bit14	Output Bit15	Output Bit14
A15	Output Bit13	Output Bit14	Output Bit13
A16	Output Bit12	Output Bit13	Output Bit12
A17	Output Bit11	Output Bit12	Output Bit11
A18	Output Bit10	Output Bit11	Output Bit10
A19	Output Bit9	Output Bit10	Output Bit9
A20	Output Bit8	Output Bit9	Output Bit8
B1	GND	GND	GND
B2	GND	GND	GND
B3	GND	GND	GND
B4	GND	GND	GND
B5	Output Bit7	Output Bit8	Output Bit7
B6	Output Bit6	Output Bit7	Output Bit6
B7	Output Bit5	Output Bit6	Output Bit5
B8	Output Bit4	Output Bit5	Output Bit4
B9	Output Bit3	Output Bit4	Output Bit3
B10	Output Bit2	Output Bit3	Output Bit2
B11	Output Bit1	Output Bit2	Output Bit1
B12	Output Bit0(LSB)	Output Bit1	Output Bit0(LSB)
B13	Reserved	Output Bit0(LSB)	Output Alarm
B14	Reserved	Reserved	Output Parity
B15	Data Ready (Output)	Data Ready (Output)	Data Ready (Output)
B16	Reserved	Reserved	Reserved
B17	Reserved	Reserved	Reserved
B18	Reserved	Reserved	Reserved
B19	Reserved	Reserved	Reserved
B20	Reserved	Reserved	Reserved

Warning: Do not connect pins labeled “Reserved”

B1, B2, B3, and B4 are common

**Power Supply Connector (Bipolar screw terminal block) – Figure 5**

Terminal	Signal
1	+24VDC
2	GND

**Sensor Connector (9pin D-Sub connector) – Figure 5**

Pin Number	Signal
1	+24VDC
2	Reserved
3	Reserved
4	Clock+
5	Clock-
6	GND
7	Reserved
8	Data+ ※
9	Data- ※

※Positive Logic → Pin8: Data+, Pin9: Data-  
 Negative Logic → Pin8: Data- Pin9: Data+

Figure 4

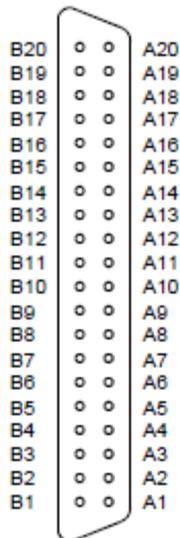
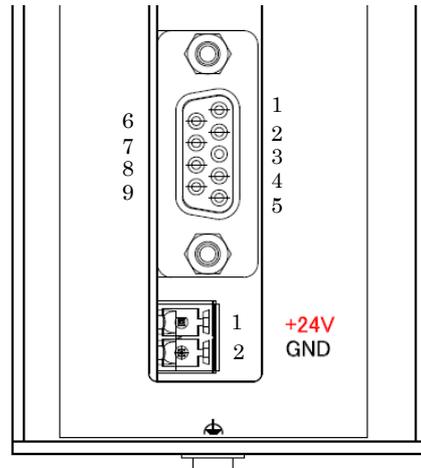
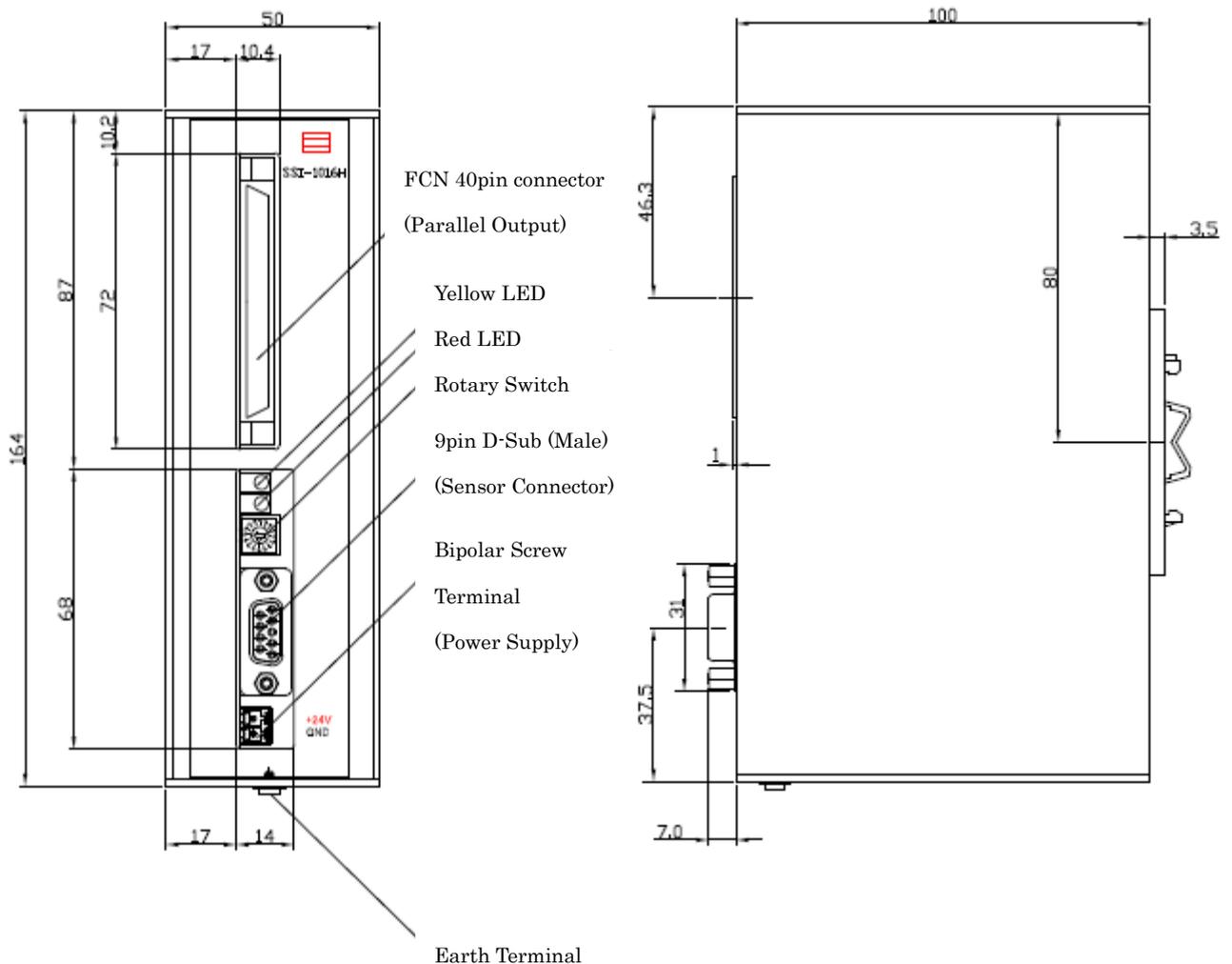


Figure 5



## 4. Outline Dimensions



## 5. Mating Connectors

The 40pin parallel output connector of the SSI-1016J unit is a Fujitsu FCN-365P040-AU plug with M2.6 lock screws. Its mating connector is any jack from the Fujitsu FCN-36xJ series and matching FCN-36 series housing.

The 9pin D-Sub sensor connector of the SSI-1016J unit is an Omron XM3C-0922-112 plug with M2.6 lock screws. Its mating connector is any Omron XM3 socket and hood or any other compatible 9pin D-sub connector.

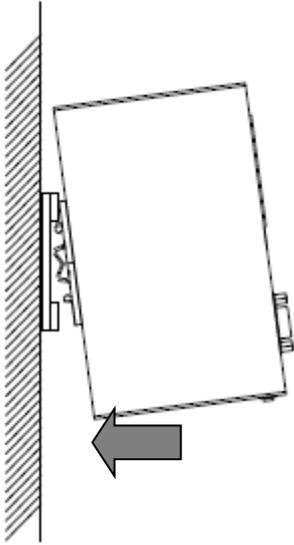
※Mating connectors are not included with the SSI-1016J unit and must be purchased separately.

## 6. Earth Terminal

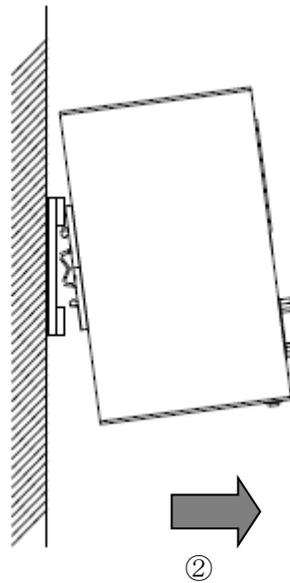
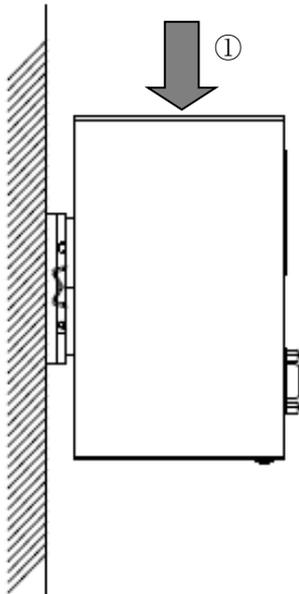
Connect the SSI-1016J earth terminal to avoid unstable signals due to noise, etc.

## 7. Mounting and Dismounting

### Mounting



### Dismounting

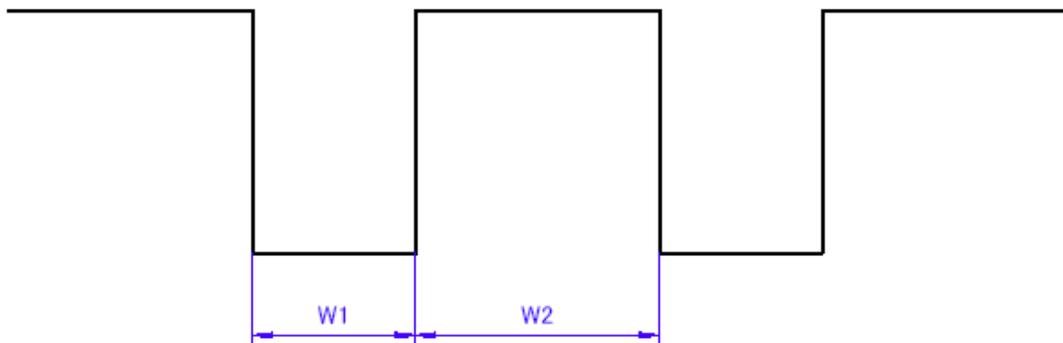


## 8. Data Ready Signal

When serial data received from the Temposonics sensor is ready to be output as parallel data by the SSI-1016J unit, the SSI-1016J sends a Data Ready Signal to the controller. The parallel output may be read while the Data Ready Signal is low (output transistor is on). The parallel output is being updated and may not be read while the Data Ready Signal is high (output transistor is off).

When using Automatic Mode, the Data Ready Signal depends on the cycletime setting.

See page 12 for information about Read Command Mode



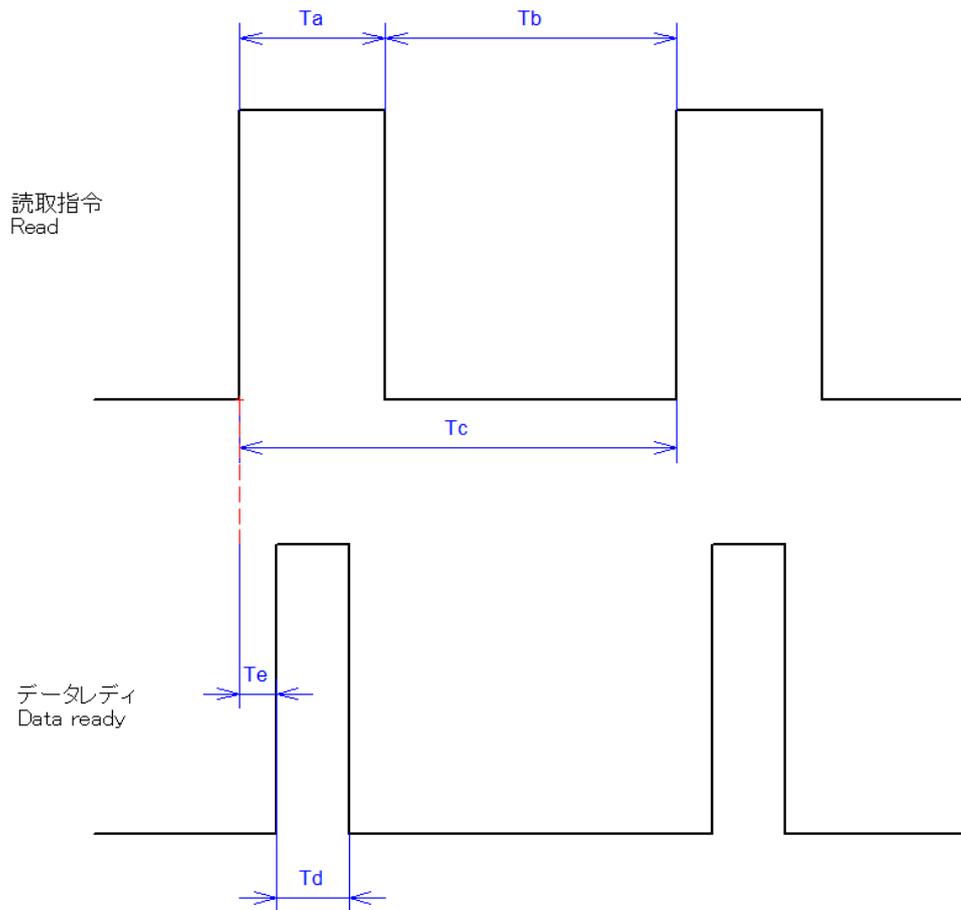
### Data Ready Signal and Cycle Time

Cycle Time [ms]	W1 [ms]	W2 [ms]
1	0.5	0.5
5	2.5	2.5
10	5	5
50	25	25

## 9. Read Command Mode

When the Mode Select / Cycle Time Select Rotary Switch (mounted on SSI-1016J face) is set to “C”, the SSI-1016J unit switches to Read Command Mode. The Read Command + Signal looks like Figure 6 below. The SSI-1016J unit outputs an SSI signal to the Temposonics sensor on the rising edge of the Read Command Signal.

Figure 6



$T_a$ :  $>100\mu\text{s}$

$T_b$ :  $>100\mu\text{s}$

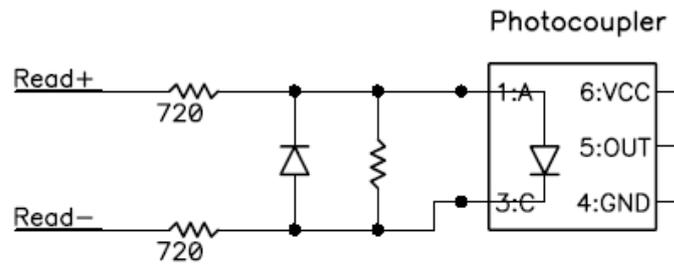
$T_c$ :  $>1\text{ms}$

$T_d$ :  $500\mu\text{s}$

$T_e$ :  $10\mu\text{s}$

The Data Ready Signal goes high for an interval of  $500\mu\text{s}$  after the Read Command Signal's rising edge. When the Data Ready Signal is high (output transistor is off), the SSI-1016J parallel output data is being updated. The parallel output data can be read once the Data Ready Signal returns to low.

Figure 7



Read Command Signal Input Circuit

## 10. Handling Instructions

- Use a shielded, twisted-pair cable to connect the SSI-1016J and Temposonics sensor. A voltage drop in the power supply voltage may occur due to the impedance of this cable. Check that the supply voltage at the sensor is within the specifications (+24Vdc, +20%/-15%).
- Check that the use environment is within the SSI-1016J operating temperature ( $0^{\circ}\text{C}$ - $70^{\circ}\text{C}$ ). When mounting the SSI-1016J unit in a control panel near other devices that produce heat, use a fan or other cooling devices.
- To avoid induced noise and other signal quality issues, place all connections away from cables carrying heavy currents.

**END**