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1. BEFORE USE

Thank you for choosing us. Before use, please check contents of the package you received as outlined below. If you have any problems or questions with the product, please contact our sales office or representatives.

■ PACKAGE INCLUDES:

Analog I/O module (body + base socket) (1)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTRUCTION MANUAL

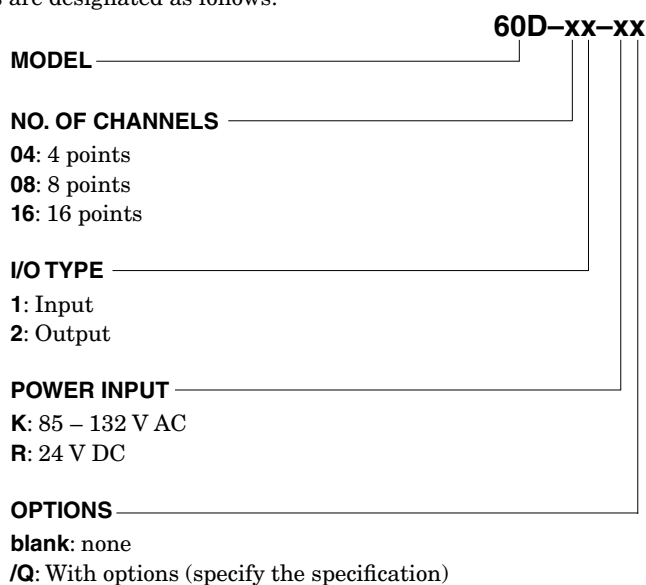
This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures.

■ EDS FILE

EDS files are downloadable at our web site.

2. GENERAL DESCRIPTION

The model 60D, Analog I/O Module, is used as remote device for DeviceNet. Model number and suffix codes are designated as follows:



SPECIFICATIONS OF OPTION : Q

COATING (For the detail, refer to our web site.)

/C01: Silicone coating
/C02: Polyurethane coating
/C03: Rubber coating

TERMINAL SCREW MATERIAL

/S01: Stainless steel

Various inputs and outputs are available by employing 10-RACK series, 18-RACK series or other signal conditioners. The 60D input module converts analog inputs (0 – 100%) proportionally into 16-bit binary signals. The one for output converts 16-bit binary signals proportionally into analog outputs (0 – 100%). This instruction manual explains hardware specifications, component identification, and wiring instructions, etc.

3. POINTS OF CAUTION

■ CONFORMITY WITH EU DIRECTIVES

- The equipment must be mounted inside a panel.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures to ensure the CE conformity.

■ POWER INPUT RATING & OPERATIONAL RANGE

- Locate the power input rating marked on the product and confirm its operational range as indicated below:
85 – 132V AC rating: 85 – 132V, 47 – 66 Hz, approx. 4VA
24V DC rating: 24V \pm 10%, approx. 4W

■ GENERAL PRECAUTIONS

- Before you remove the unit from its base socket or mount it, turn off the power supply, input signal and output signal for safety.

■ ENVIRONMENT

- Indoor use.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -5 to +55°C (23 to 131°F) with relative humidity within 30 to 90% RH in order to ensure adequate life span and operation.

■ WIRING

- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

■ AND

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

4. HARDWARE SPECIFICATIONS

4.1 60D-x1 (No. of channels code: 04, 08, or 16 in x)

ITEM	SPECIFICATIONS	
Analog input	1 – 5 V DC (input resistance $\geq 1 \text{ M}\Omega$)	
Digital output	16-bit binary	
I/O characteristics	Hexadecimal 0000 – 1770 (0 – 6000) in proportion to analog input range 0 – 100% *1	
Maximum resolution	1 mV for 1 – 5 V DC range	
Accuracy	$\pm 0.1\%$	
No. of analog input channels	60D-041	4
	60D-081	8
	60D-161	16
Isolation	Input to DeviceNet to power	
Connection	DeviceNet	Euro type connector terminal (applicable wire size: 0.2 – 2.5 mm ² , stripped length 7 mm)
	Input	34-pin connector (OMRON XG4A-3434)
	Power input	M3.5 screw terminals (torque 0.8 N·m)
Noise immunity	500 V p-p, 1 μ sec.	
Dielectric strength	1500 V AC @1 minute (input to DeviceNet to power) 2000 V AC @1 minute (input to DeviceNet or power to FG1)	
Insulation resistance	$\geq 100 \text{ M}\Omega$ with 500 V DC (input to DeviceNet to power to FG1)	
Weight	450 g (0.99 lb)	
Power input	60D-x1-K	85 – 132 V AC, 47 – 66 Hz
	60D-x1-R	24 V DC $\pm 10\%$
Power consumption	60D-x1-K	approx. 4 VA
Current consumption	60D-x1-R	approx. 160 mA
Supply voltage/current to network	11 – 25 V DC (supplied through the network terminal block); 60 mA max. at 24 V	

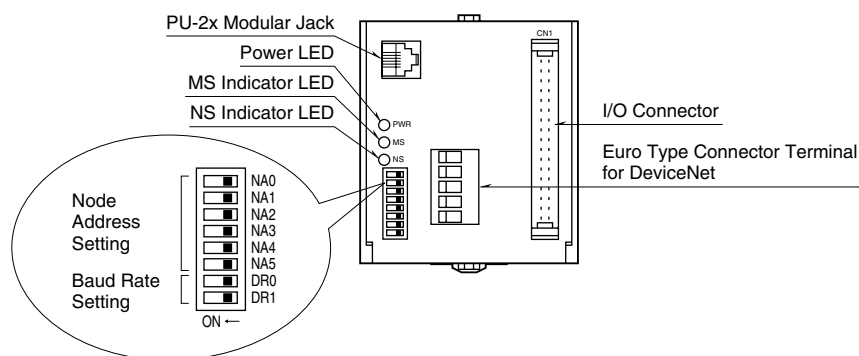
*1. In the firmware version 3.00 or later, analog input range 0 – 100% can be converted into hexadecimal 0000 – 2710 (0 – 10000).
In addition, negative values of analog input range -15 to 0% can be converted into signed absolute values.

4.2 60D-x2 (No. of channels code: 04, 08, or 16 in x)

ITEM	SPECIFICATIONS	
Analog output	1 – 5 V DC	
Digital input	16-bit binary	
I/O characteristics	Hexadecimal 0000 – 1770 (0 – 6000) in proportion to analog output range 0 – 100% *1	
Maximum resolution	1 mV for 1 – 5 V DC range	
Accuracy	$\pm 0.1\%$ excluding the accuracy of I/O modules	
No. of analog output channels	60D-042	4
	60D-082	8
	60D-162	16
Isolation	Output to DeviceNet to power	
Connection	DeviceNet	Euro type connector terminal (applicable wire size: 0.2 – 2.5 mm ² , stripped length 7 mm)
	Output	34-pin connector (OMRON XG4A-3434)
	Power input	M3.5 screw terminals (torque 0.8 N·m)
Noise immunity	500 V p-p, 1 μ sec.	
Dielectric strength	1500 V AC @1 minute (output to DeviceNet to power) 2000 V AC @1 minute (output to DeviceNet or power to FG1)	
Insulation resistance	$\geq 100 \text{ M}\Omega$ with 500 V DC (output to DeviceNet to power to FG1)	
Weight	450 g (0.99 lb)	
Power input	60D-x2-K	85 – 132 V AC, 47 – 66 Hz
	60D-x2-R	24 V DC $\pm 10\%$
Power consumption	60D-x2-K	approx. 4 VA
Current consumption	60D-x2-R	approx. 160 mA
Supply voltage/current to network	11 – 25 V DC (supplied through the network terminal block); 60 mA max. at 24 V	

*1. In the firmware version 3.00 or later, analog output range 0 – 100% can be converted into hexadecimal 0000 – 2710 (0 – 10000).
In addition, negative values of analog output range -15 to 0% can be converted into signed absolute values.

5. COMPONENT IDENTIFICATIONS & HARDWARE ADJUSTMENTS



■ DIP SWITCHES

• NA0 – NA5 (Node Address)

NA0	NA1	NA2	NA3	NA4	NA5
2^0	2^1	2^2	2^3	2^4	2^5

A node address is defined in 6-digit binary code. NA0 to NA5 correspond to the least to most significant digits.

DIP SW						NODE ADDRESS
NA5	NA4	NA3	NA2	NA1	NA0	
0	0	0	0	0	0	0
0	0	0	0	0	1	1
0	0	0	0	1	0	2
0	0	0	0	1	1	3
:	:	:	:	:	:	:
1	1	1	1	0	0	60
1	1	1	1	0	1	61
1	1	1	1	1	0	62
1	1	1	1	1	1	63

0 = OFF, 1 = ON

• DR0, DR1 (*Factory default)

BAUD RATE	DR0	DR1
125 kbps	OFF*	OFF*
250 kbps	ON	OFF
500 kbps	OFF	ON
N/A	ON	ON

■ INDICATORS

The following table defines the LED states of the PWR, MS, and NS indicators.

ID	STATE	TO INDICATE
PWR	Green	Power supplied
	OFF	No power supplied
MS	Green	Operating in a normal condition
	Blinking Green	Standby (needs commissioning)
	Red	Critical failure
	Blinking Red	Minor failure
NS	OFF	No power supplied
	Green	Link on-line and connections in the established state
	Blinking Green	Link on-line but no connections in the established state
	Red	Critical link failure
	Blinking Red	Minor link failure
	OFF	No power supplied

6. INSTALLATION

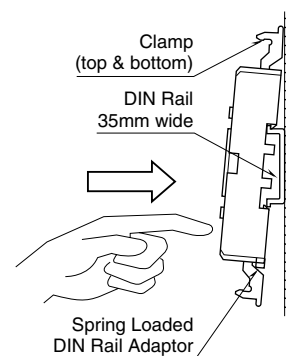
Detach the yellow clamps located at the top and bottom of the unit for separating the body from the base socket.

■ DIN RAIL MOUNTING

Set the base socket so that its DIN rail adaptor is at the bottom. Position the upper hook at the rear side of base socket on the DIN rail and push in the lower. When removing the socket, push down the DIN rail adaptor utilizing a minus screwdriver and pull.

■ WALL MOUNTING

Refer to “EXTERNAL DIMENSIONS.”

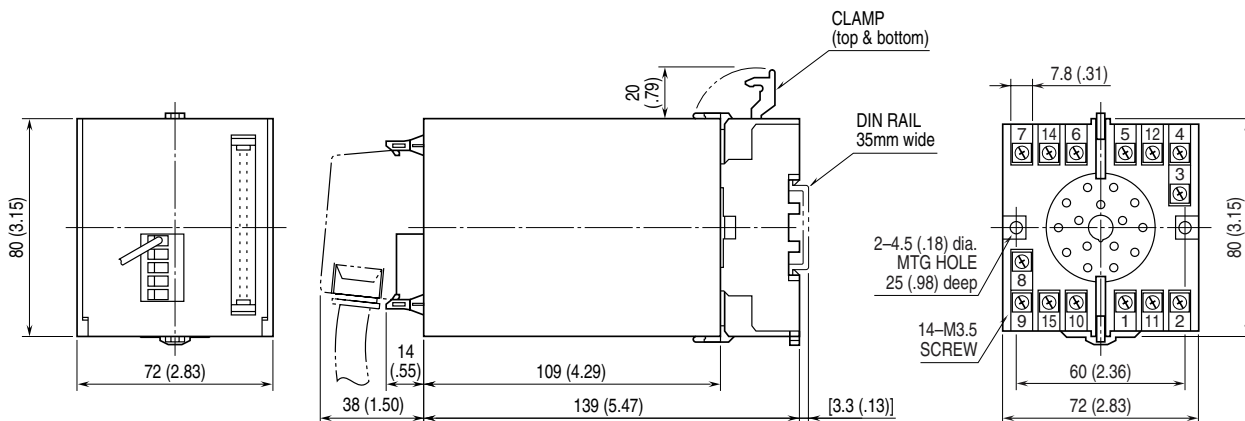


Shape and size of the base socket are slightly different with various socket types.

7. TERMINAL CONNECTIONS

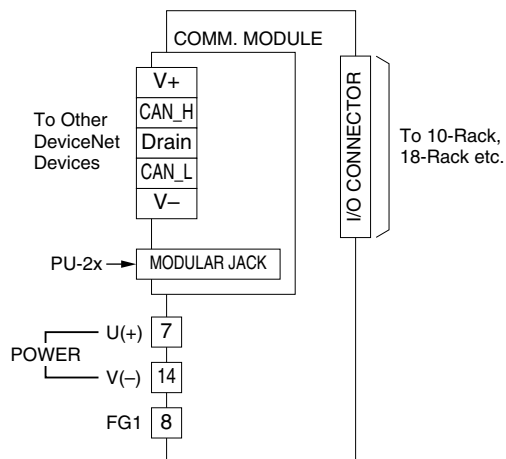
Connect the unit as in the diagram below or refer to the connection diagram on the side of the unit.

EXTERNAL DIMENSIONS unit: mm (inch)



•When mounting, no extra space is needed between units.

CONNECTION DIAGRAM



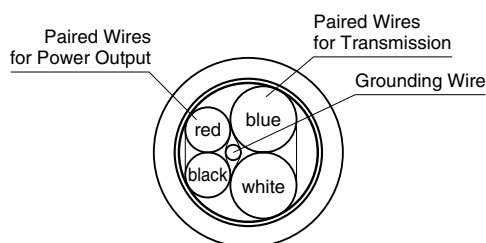
8. CONNECTING DATA LINK WIRES

The following explanations apply to the wires connecting the 60D to the Master Unit.

8.1 COMMUNICATION WIRE

The following types of wire are recommended for connecting the 60D to the Master Unit.

OMRON	DCA1-5C10 (THIN) DCA2-5C10 (THICK)
KURAMO ELECTRIC	KND-SB (THIN) KND-SB (THICK)
SHOWA ELECTRIC WIRE & CABLE	TDN24U-100G (THIN) TDN18U-100G (THICK)
SUMITOMO WIRING SYSTEMS	DN-24P1+20P1 SBS (THIN) DN-18P1+15P1 SBS (THICK)



8.2 POINTS OF CAUTION IN HANDLING WIRES

DO NOT apply extraordinary forces to the wires as explained in the following:

- 1) DO NOT SQUEEZE the wires with a sharp-edged tool.
- 2) DO NOT TWIST the wires extraordinarily.
- 3) DO NOT PULL the wires extraordinarily tight.
- 4) DO NOT TRAMPLE on the wires.
- 5) DO NOT PUT objects onto the wires.
- 6) DO NOT DAMAGE the insulation tube of wires.

8.3 WIRE IDENTIFICATION

The following table defines wire insulation colors and designations. The 60D terminal block is labeled also in the same colors so that the correct assignment can be confirmed.

COLOR	DESIG.	DESCRIPTION
black	V -	Power (-)
blue	CAN_L	Signal Low
bare	Drain	Shield
white	CAN_H	Signal High
red	V +	Power (+)

9. WIRING & CONNECTIONS

9.1 POINTS OF CAUTION IN CONNECTING WIRES

Appropriate precautions are required such as follows for protecting the system from external noise interference:

- 1) Separate analog I/O and communication wires from others in order to prevent surge or induction noises.
- 2) Separate power input wires (AC) from those for driving motors.
- 3) Do not install these wires next to main supply circuits or high voltage cables.
Never bind them to these circuits.
- 4) Ground the shield of communication wires at one point.
Consideration about locations of the ground may be necessary according to external noise interference.

9.2 CONNECTOR PIN ASSIGNMENTS

■ INPUT CONNECTOR FOR 60D-x1

PIN NO.	ASSIGNMENT	PIN NO.	ASSIGNMENT
1	Input 1	2	COM
3	Input 2	4	COM
5	Input 3	6	COM
7	Input 4	8	COM
9	Input 5	10	COM
11	Input 6	12	COM
13	Input 7	14	COM
15	Input 8	16	COM
17	Input 9	18	COM
19	Input 10	20	COM
21	Input 11	22	COM
23	Input 12	24	COM
25	Input 13	26	COM
27	Input 14	28	COM
29	Input 15	30	COM
31	Input 16	32	COM
33	No connection	34	No connection

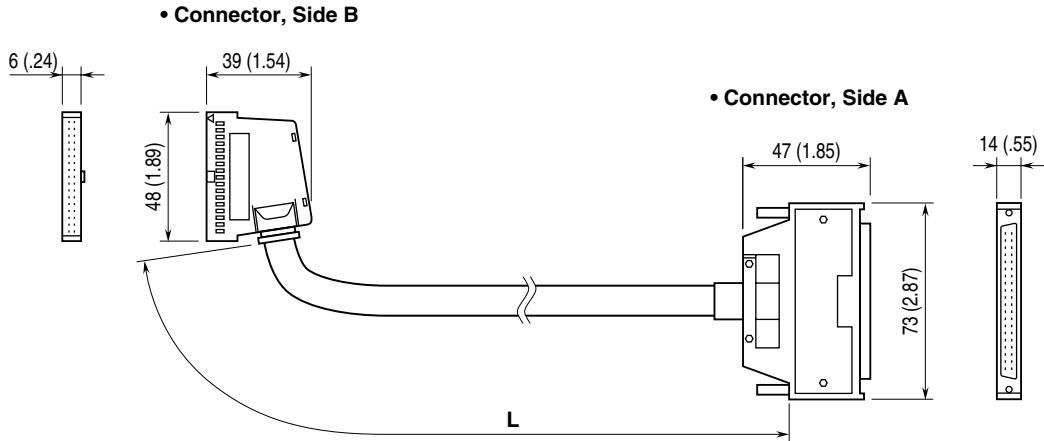
Input 1 – 4 for 4 points, 1 – 8 for 8 points.

■ OUTPUT CONNECTOR FOR 60D-x2

PIN NO.	ASSIGNMENT	PIN NO.	ASSIGNMENT
1	Output 1	2	COM
3	Output 2	4	COM
5	Output 3	6	COM
7	Output 4	8	COM
9	Output 5	10	COM
11	Output 6	12	COM
13	Output 7	14	COM
15	Output 8	16	COM
17	Output 9	18	COM
19	Output 10	20	COM
21	Output 11	22	COM
23	Output 12	24	COM
25	Output 13	26	COM
27	Output 14	28	COM
29	Output 15	30	COM
31	Output 16	32	COM
33	No connection	34	No connection

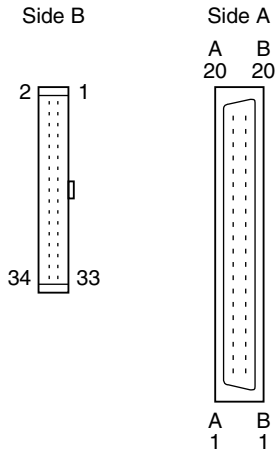
Output 1 – 4 for 4 points, 1 – 8 for 8 points.

9.3 CABLE (MODEL: MCN34) PIN ASSIGNMENTS

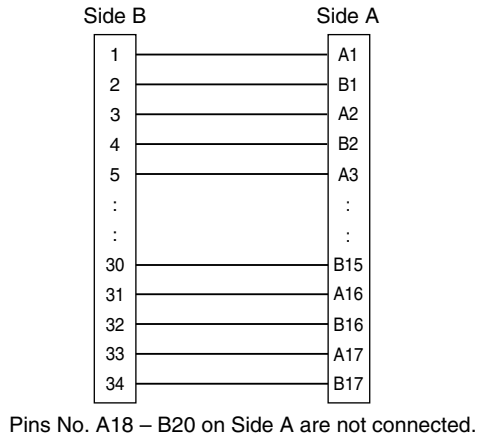


	MCN34-03	MCN34-05	MCN34-10	MCN34-30
L	30 cm (11.8 in.)	50 cm (19.7 in.)	1 m (3.3 ft.)	3 m (9.8 ft.)

■ CONNECTOR PIN ASSIGNMENT



■ WIRING DIAGRAM

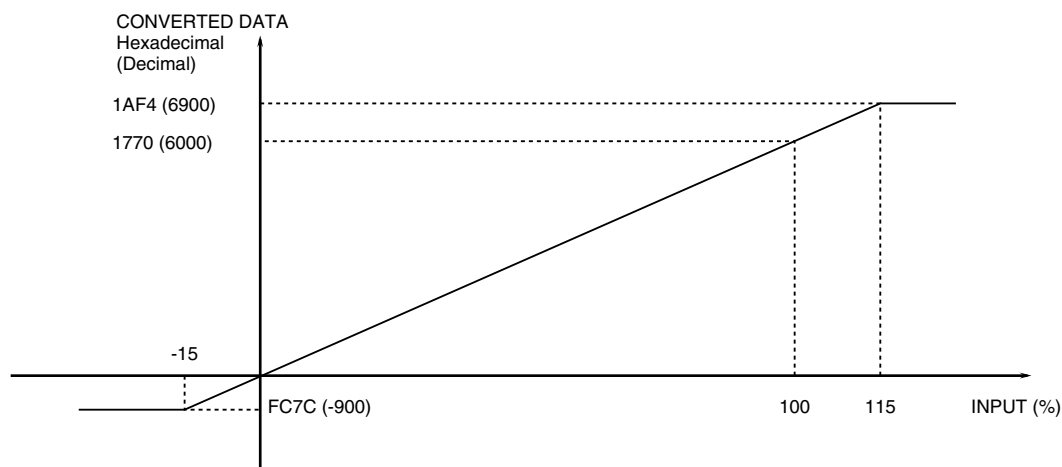


10. INPUT/OUTPUT DATA

10.1 DATA CONVERSION

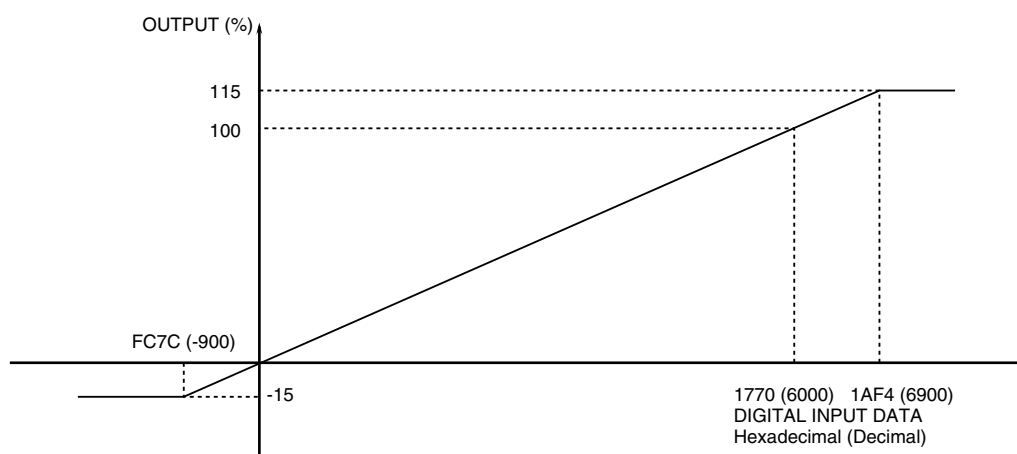
(1) 60D-x1

Analog signal range 0 – 100% is converted into hexadecimal and provided to the Master Unit.



(2) 60D-x2

Hexadecimal from the Master Unit is converted into analog signal range 0 – 100%.



In the firmware version 3.00 or later, digital input and output data in hexadecimal can be scaled and negative representation can be changed.

Confirm the firmware version of the 60D unit using the programming unit (model: PU-2x).

Connect the programming unit to the 60D and press [GROUP] 00 and [ITEM] 99, to display the firmware version number.

10.2 SCALING SETTING (firmware version 3.00 or later)

Scaling of converted data is selectable between 0 – 6000 (default) and 0 – 10000 using the programming unit.

■ Scaling data to 0 – 6000

- 1) Connect the programming unit to the 60D, press [GROUP] 02, [ITEM] 01, [DATA] 1, and [ENTER] to shift to PROGRAM mode.
- 2) Press [GROUP] 02, [ITEM] 03, [DATA] 0, and [ENTER].
Confirm that [SCALE: 0 – 6000] is displayed.
- 3) Turn off and on the power supply to the 60D unit to apply the setting.

■ Scaling data to 0 – 10000

- 1) Connect the programming unit to the 60D, press [GROUP] 02, [ITEM] 01, [DATA] 1, and [ENTER] to shift to PROGRAM mode.
- 2) Press [GROUP] 02, [ITEM] 03, [DATA] 1, and [ENTER].
Confirm that [SCALE: 0 – 10000] is displayed.
- 3) Turn off and on the power supply to the 60D unit to apply the setting.

10.3 NEGATIVE REPRESENTATION SETTING (firmware version 3.00 or later)

Representation of negative values can be selected between 2's complement and signed absolute values using the programming unit.

■ Negative representation in 2's complement

- 1) Connect the programming unit to the 60D, press [GROUP] 02, [ITEM] 01, [DATA] 1, and [ENTER] to shift to PROGRAM mode.
- 2) Press [GROUP] 02, [ITEM] 02, [DATA] 2, and [ENTER].
Confirm that [MINUS: 2's comp] is displayed.
- 3) Turn off and on the power supply to the 60D unit to apply the setting.

■ Negative representation in signed absolute values

- 1) Connect the programming unit to the 60D, press [GROUP] 02, [ITEM] 01, [DATA] 1, and [ENTER] to shift to PROGRAM mode.
- 2) Press [GROUP] 02, [ITEM] 02, [DATA] 1, and [ENTER].
Confirm that [MINUS: Signed abs] is displayed.
- 3) Turn off and on the power supply to the 60D unit to apply the setting.

11. DEVICE PROFILE & OBJECT IMPLEMENTATION

11.1 SLAVE DEVICE PROFILE

General Device Data	Conform to DeviceNet Specification	Volume I - Release 2.0 Volume II - Release 2.0
	Vendor Name	M-SYSTEM CO., LTD. Vendor ID = 184
	Device Profile Name	Slave: Generic Profile No. = 0
	Device Type	0
Physical Conformance Data	Network Power Consumption	60 mA
	Connector Style	Open-Pluggable
	Isolated Physical Layer	Yes
	LEDs Supported	MS (Module Status) NS (Network Status)
	MAC ID Setting	DIP Switch
	Default MAC ID	0
	Communication Rate Setting	DIP Switch
	Communication Rates Supported	125 kbit/s, 250 kbit/s, 500 kbit/s
Communication Data	Predefined Master/Slave Connection Set	Group Only 2 Server
	Dynamic Connections Supported (UCMM)	No
	Fragmented Explicit Message Implemented	Yes

11.2 OBJECT IMPLEMENTATION

(1) Identity Object (01H)

Object Class	Attributes	None Supported
	Services	None Supported

Object Instance	Attributes	ID	Description	Get	Set	Value Limit
		1	Vendor	Yes	No	184
2	Device type	Yes	No	0		
3	Product code	Yes	No	*		
4	Revision	Yes	No	1.5		
5	Status (bits supported)	Yes	No	bit 0, bit 10		
6	Serial number	Yes	No	Each unit		
7	Product name	Yes	No	*		
8	State	No	No			
9	Configuration consistency value	No	No			
10	Heartbeat interval	No	No			
Services	DeviceNet Services	Parameter Options				
	05H	Reset	No			
	0EH	Get_Attribute_Single	No			

* Depending upon model numbers as in the table below.

Model	Product Code	Product Name
60D-161-x	7	60D-161
60D-162-x	8	60D-162
60D-081-x	9	60D-081
60D-082-x	10	60D-082
60D-041-x	11	60D-041
60D-042-x	12	60D-042

(2) Message Router Object (02H)

Object Class	Attributes	None Supported
	Services	None Supported
Object Instance	Attributes	None Supported
	Services	None Supported
Vendor Specific Additions		None

(3) DeviceNet Object (03H)

Object Class	Attributes	ID	Description	Get	Set	Value Limit
		1	Revision	Yes	No	02H
	Services	DeviceNet Services		Parameter Options		
		0EH	Get_Attribute_Single	No		
Object Instance	Attributes	ID	Description	Get	Set	Value Limit
		1	MAC ID	Yes	No	
		2	Baud rate	Yes	No	
		3	BOI	Yes	No	00H
		4	Bus-off counter	Yes	No	
		5	Allocation information	Yes	No	
		6	MAC ID switch changed	No	No	
		7	Baud rate switch changed	No	No	
		8	MAC ID switch value	No	No	
	9	Baud rate switch value	No	No		
	Services	DeviceNet Services		Parameter Options		
		0EH	Get_Attribute_Single	No		
		4BH	Allocate M/S connection set	No		
		4CH	Release M/S connection set	No		

(4) Assembly Object (04H)

Object Class	Attributes	None Supported		
	Services	None Supported		
Object Instance	Section	Information	Max Instance	
	Instance Type	Static I/O	1	
	Attributes	ID	Description	Get Set Value Limit
		1	Numbers of members in list	No No
		2	Member list	No No
	Services	3	Data	Yes Yes
		DeviceNet Services		Parameter Options
		0EH	Get_Attribute_Single	No
		10H	Set_Attribute_Single	No

(5) Connection Object (05H)

Object Class	Attributes	None Supported
	Services	None Supported
	Total Active Connections Possible	1

Object Instance 1	Section	Information		Max Instance			
Object Instance 1	Instance Type	Explicit Message		1			
	Production Trigger	Cyclic					
	Transport Type	Server					
	Transport Class	3					
	Attributes	ID	Description		Get	Set	Value Limit
		1	State		Yes	No	
		2	Instance type		Yes	No	00H
		3	Transport class trigger		Yes	No	83H
		4	Produced connection ID		Yes	No	
		5	Consumed connection ID		Yes	No	
		6	Initial comm. characteristics		Yes	No	21H
		7	Produced connection size		Yes	No	FE00H
		8	Consumed connection size		Yes	No	FE00H
		9	Expected packet rate		Yes	Yes	
		12	Watchdog time-out action		Yes	Yes	One of 01, 03
		13	Produced connection path length		Yes	No	0000
		14	Produced connection path		Yes	No	
15		Consumed connection path length		Yes	No	0000	
16		Consumed connection path		Yes	No		
Services		DeviceNet Services		Parameter Options			
	05H	Reset	No				
	0EH	Get_Attribute_Single	No				
	10H	Set_Attribute_Single	No				
Object Instance 2	Section	Information		Max Instance			
	Instance Type	Polled I/O		1			
	Production Trigger	Cyclic					
	Transport Type	Server					
	Transport Class	2					
	Attributes	ID	Description		Get	Set	Value Limit
		1	State		Yes	No	
		2	Instance type		Yes	No	01H
		3	Transport class trigger		Yes	No	82H
		4	Produced connection ID		Yes	No	
		5	Consumed connection ID		Yes	No	
		6	Initial comm. characteristics		Yes	No	01H
		7	Produced connection size		Yes	No	**
		8	Consumed connection size		Yes	No	**
		9	Expected packet rate		Yes	Yes	
		12	Watchdog time-out action		Yes	No	00
		13	Produced connection path length		Yes		0000 (OUT)
0600 (IN)							
14		Produced connection path		Yes		No data (OUT)	
						20_04_24_65_30_03 (IN)	
15		Consumed connection path length		Yes		0000 (IN)	
	0600 (OUT)						
16	Consumed connection path		Yes		No data (IN)		
					20_04_24_64_30_03 (OUT)		
17	Production inhibit time		Yes	No	00		
Services	DeviceNet Services		Parameter Options				
	05H	Reset	No				
	0EH	Get_Attribute_Single	No				
	10H	Set_Attribute_Single	No				

**Depending upon model numbers as in the table below. The actual data is composed of two bites, of which the MSB (00H) and LSB (table below) are inverted.

Model	Produced Connection Size	Consumed Connection Size
60D-161-x	20H	00H
60D-081-x	10H	00H
60D-041-x	08H	00H
60D-162-x	00H	20H
60D-082-x	00H	10H
60D-042-x	00H	08H

12. TROUBLESHOOTING

Basic troubleshooting methods using MS and NS indicator LEDs are explained in this section. For problems concerning the PLC CPU and Master Unit, consult users manuals for these units.

12.1 MS & NS INDICATORS

ID	STATE	TO INDICATE
MS	Green	Operating in a normal condition
	Blinking Green	Standby (needs commissioning)
	Red	Critical failure
	Blinking Red	Minor failure
	OFF	No power supplied
NS	Green	Link on-line and connections in the established state
	Blinking Green	Link on-line but no connections in the established state
	Red	Critical link failure
	Blinking Red	Minor link failure
	OFF	No power supplied

12.2 TROUBLESHOOTING

MS LED	NS LED	STATUS		NOTES & TROUBLESHOOTING
Green ON	Green ON	Communicating	Communicating	The 60D is in communication with Master Unit.
Green ON	OFF	Node address is already used. Checking.	Waiting for the Master Unit to check node address.	
Green ON	Green blink	Standby for commissioning.	Standby for the Master Unit to establish connection.	
Red ON	OFF	Watch-dog timer error	Watch-dog timer error	The 60D error.
Red blink	OFF	Invalid switch setting	Invalid DIP SW setting.	Check DIP SW setting and restart the 60D.
Green ON	Red ON	Node address is already used.	The same node address is used for the Master Unit.	Change the node address and restart the 60D.
Green ON	Red ON	Busoff	Busoff (abnormal data transmission)	Check the following points and restart the 60D. <ul style="list-style-type: none"> • Are the baud rate for both Master and Slave the same? • Is the wire length (main and sub) appropriate? • No breakdown or loosening of wires? • Are the terminators only at the both ends of transmission line? • No excessive noise?
Green ON	Red blink	Timeout	---	Check the following points and restart the 60D. <ul style="list-style-type: none"> • Are the baud rate for both Master and Slave the same? • Is the wire length (main and sub) appropriate? • No breakdown or loosening of wires? • Are the terminators only at the both ends of transmission line? • No excessive noise?

13. LIGHTNING SURGE PROTECTION

We offer a series of lightning surge protectors for protection against induced lightning surges. Please contact us to choose appropriate models.