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1. BEFORE USE

Thank you for choosing M-System. 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 M-System's Sales Office or representatives.

■ PACKAGE INCLUDES:

Analog I/O module (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.

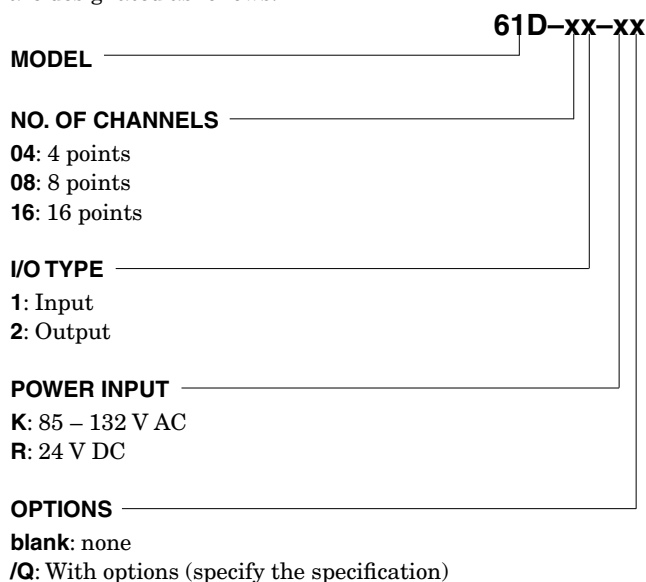
■ EDS FILE

EDS files are downloadable at M-System's web site: <http://www.m-system.co.jp>

2. GENERAL DESCRIPTION

The model 61D, 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 M-System's web site.)

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

Various inputs and outputs are available by employing Mini-M series, Pico-M series or other signal conditioners. The 61D 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, approx. 160mA

■ GENERAL PRECAUTIONS

- Before you remove the unit 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. INSTALLATION

Use the Installation Base (model: MxBS2).

5. HARDWARE SPECIFICATIONS

5.1 61D-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	61D-041	4
	61D-081	8
	61D-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	Via the Installation Base (model: MxBS2)
	Power input	Via the Installation Base (model: MxBS2)
Noise immunity	500 V p-p, 1 μ sec.	
Dielectric strength	1500 V AC @ 1 minute (input to DeviceNet to power)	
Insulation resistance	$\geq 100 \text{ M}\Omega$ with 500 V DC (input to DeviceNet to power)	
Weight	250 g (0.55 lb)	
Power input	61D-x1-K	85 – 132 V AC, 47 – 66 Hz
	61D-x1-R	24 V DC $\pm 10\%$
Power consumption	61D-x1-K	approx. 4 VA
Current consumption	61D-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	

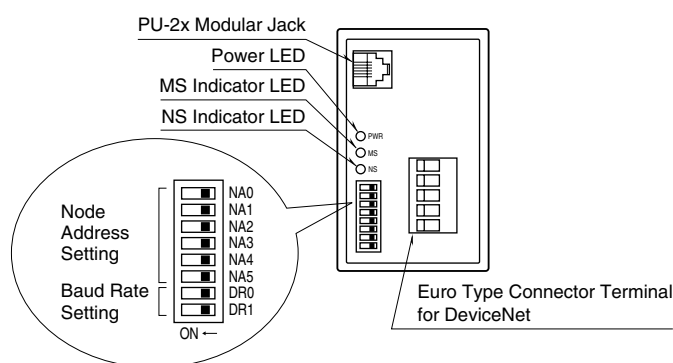
*1. In the firmware version 3.00 or later, analog input range 0 – 100% can be converted into hexadecimal 0000 – 2710 (0 – 10000).
In addition, negative values of analog input range -15 to 0% can be converted into signed absolute values.

5.2 61D-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	61D-042	4
	61D-082	8
	61D-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	Via the Installation Base (model: MxBS2)
	Power input	Via the Installation Base (model: MxBS2)
Noise immunity	500 V p-p, 1 μ sec.	
Dielectric strength	1500 V AC @ 1 minute (output to DeviceNet power)	
Insulation resistance	$\geq 100 \text{ M}\Omega$ with 500 V DC (output to DeviceNet to power)	
Weight	250 g (0.55 lb)	
Power input	61D-x2-K	85 – 132 V AC, 47 – 66 Hz
	61D-x2-R	24 V DC $\pm 10\%$
Power consumption	61D-x2-K	approx. 4 VA
Current consumption	61D-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.

6. 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	NA2	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

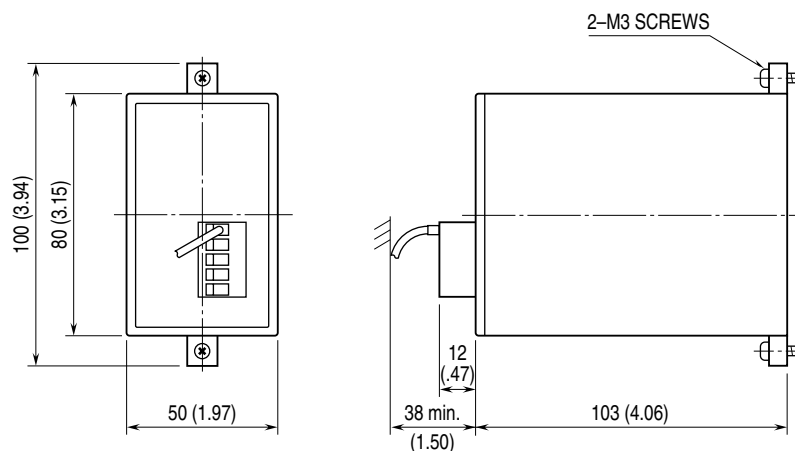
The following table defines the LED states of the PWR, MS, and NS indicators.

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

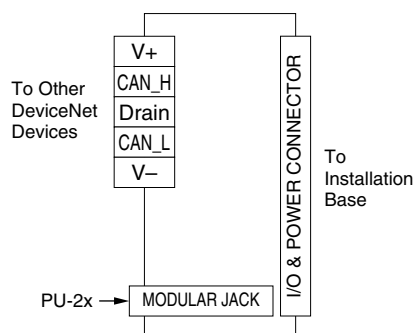
7. TERMINAL CONNECTIONS

Connect the unit as in the diagram below.

EXTERNAL DIMENSIONS unit: mm (inch)



CONNECTION DIAGRAM



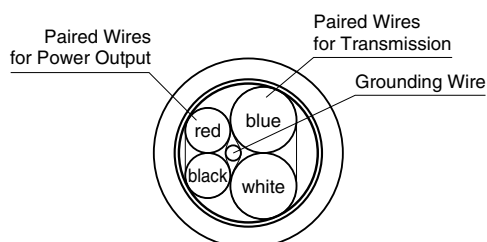
8. CONNECTING DATA LINK WIRES

The following explanations apply to the wires connecting the 61D to the Master Unit.

8.1 COMMUNICATION WIRE

The following types of wire are recommended for connecting the 61D 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 61D 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. POINTS OF CAUTION IN CONNECTING WIRES

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

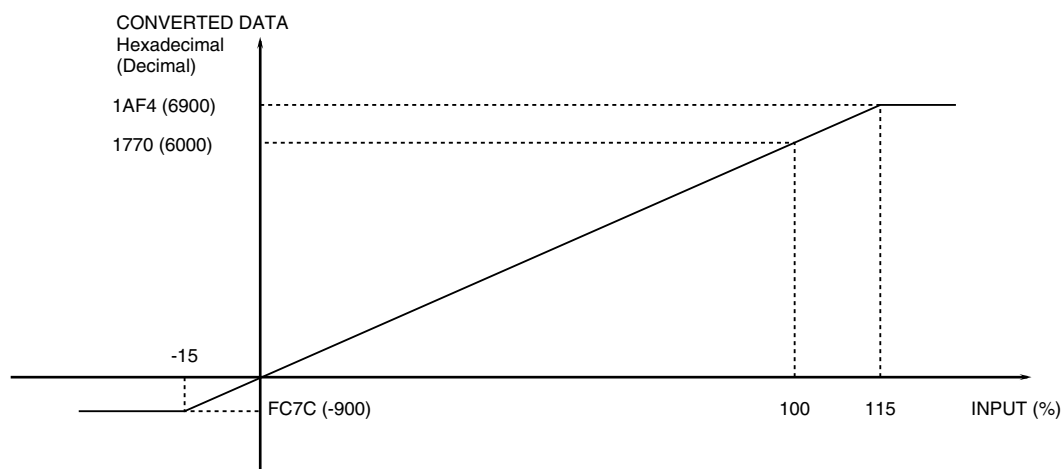
- 1) Separate analog I/O and communication wires from others in order to prevent surge or induction noises.
- 2) Separate power input wires (AC) from those for driving motors.
- 3) Do not install these wires next to main supply circuits or high voltage cables.
Never bind them to these circuits.
- 4)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

10.INPUT/OUTPUT DATA

10.1 DATA CONVERSION

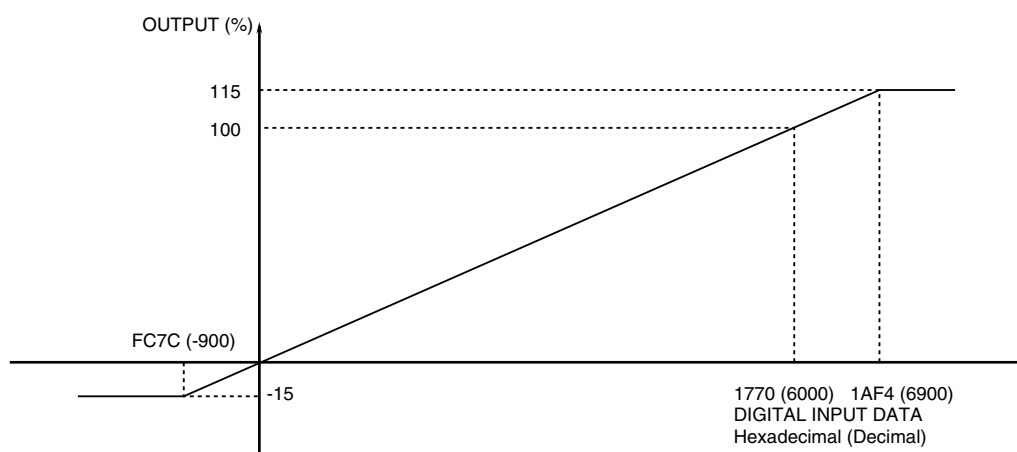
(1) 61D-x1

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



(2) 61D-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 61D unit using the programming unit (model: PU-2x).

Connect the programming unit to the 61D 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 61D, 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 61D unit to apply the setting.

■ Scaling data to 0 – 10000

- 1) Connect the programming unit to the 61D, 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 61D 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 61D, 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 61D unit to apply the setting.

■ Negative representation in signed absolute values

- 1) Connect the programming unit to the 61D, 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 61D 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 Data	Communication Rates Supported	125 kbit/s, 250 kbit/s, 500 kbit/s
	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
61D-161-x	13	61D-161
61D-162-x	14	61D-162
61D-081-x	15	61D-081
61D-082-x	16	61D-082
61D-041-x	17	61D-041
61D-042-x	18	61D-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 1	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		
	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	No	
						0000 (OUT) 0600 (IN)
		14	Produced connection path	Yes	No	
						No data (OUT) 20_04_24_65_30_03 (IN)
15		Consumed connection path length	Yes	No		
					0000 (IN) 0600 (OUT)	
16	Consumed connection path	Yes	No			
				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
61D-161-x	20H	00H
61D-081-x	10H	00H
61D-041-x	08H	00H
61D-162-x	00H	20H
61D-082-x	00H	10H
61D-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 61D 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 61D error.
Red blink	OFF	Invalid switch setting	Invalid DIP SW setting.	Check DIP SW setting and restart the 61D.
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 61D.
Green ON	Red ON	Busoff	Busoff (abnormal data transmission)	Check the following points and restart the 61D. <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 61D. <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

M-System offers a series of lightning surge protectors for protection against induced lightning surges. Please contact M-System to choose appropriate models.