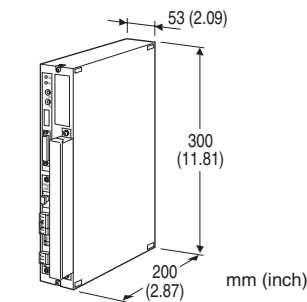## Telemetering System

TELEMETERING UNIT

Functions & Features
- Interfacing remote I/O devices with a modem for a telemetering system
- Process I/O

53 (2.09)
300 (11.81)
200 (2.87)
mm (inch)

MODEL: DLS-[1][2]–[3][4]

ORDERING INFORMATION
- Code number: DLS-[1][2]-[3][4]

Specify a code from below for each [1] through [4].
(e.g. DLS-1S1A4B4-K/M4A)

[1] TRANSMISSION MEDIA
1: Twisted-pair cable
2: Fiber optics cable
7: Twisted-pair – fiber optics (repeater incorporated)

[2] I/O SECTION
00: None
A1: Di 32 points
A2: Di 64 points
C1: Do 32 points (relay)
C2: Do 32 points (open collector)
C3: Do 64 points (relay)
C4: Do 64 points (open collector)
E1: Di 16 + Do 16 points (relay)
E2: Di 16 + Do 16 points (open collector)
G1x: Ai 32 points
M1x: Ao 32 points
P1x : Pi 16 + Ai 16 points
R1xx: Ai 16 + Ao 16 points
S1xx: Ai 8 + Ao 8 + Di 8 + Do 8 points
U1x : Po 16 + Ao 16 points

See data sheet for Standard Multi-Transmission Unit (model: DLA1) for specifications of I/O sections.

[3] POWER INPUT
AC Power
K: 85 – 132 V AC
(Operational voltage range 85 – 132 V, 47 – 66 Hz)
L: 170 – 264 V AC
(Operational voltage range 170 – 264 V, 47 – 66 Hz)
DC Power
S: 12 V DC
(Operational voltage range 12 V ±10 %, ripple 10 %p-p max.)
R: 24 V DC
(Operational voltage range 24 V ±10 %, ripple 10 %p-p max.)
Note: Modem /A1x not selectable for use with DC power input.

[4] MODEM
/A1A: M-System's 50 bps use modem (model: MOD); Station A
/A1B: M-System's 50 bps use modem (model: MOD); Station B
/M3A: M-System's 1200 bps use modem (model: MOD3); Station A
/M3B: M-System's 1200 bps use modem (model: MOD3); Station B
/M4A: M-System's 300 bps use voice/data modem (model: MOD4, MOD7); Station A
/M4B: M-System's 300 bps use voice/data modem (model: MOD4, MOD7); Station B
/M5A: M-System's 1200 bps use modem (model: MOD5, MOD8); Station A
/M5B: M-System's 1200 bps use modem (model: MOD5, MOD8); Station B
/M6A: M-System's 2400 bps use modem (model: MOD6); Station A
/M6B: M-System's 2400 bps use modem (model: MOD6); Station B
Note: Consult factory for modem specifications.

RELATED PRODUCTS
- Standard multi-transmission unit (model: DLA1)
- Connector terminal block (model: CNT)
- RS cable (model: DCN1)
- Special cable with 40-pin connector (model: FCN)
- 50 bps modem (model: MOD)
- 1200 bps modem (model: MOD3)
- Voice/data modem (model: MOD4, MOD7)
- 1200 bps modem (model: MOD5, MOD8)
- 2400 bps modem (model: MOD6)

GENERAL SPECIFICATIONS
Construction: Surface mounting; terminal access on the front
Connection
  Transmission line terminal: Euro type connector terminal; wire size 1.25 mm^2 max.
  Power supply terminal: Euro type connector terminal; wire

size 1.25 mm^2 max.

RUN contact output: Euro type connector terminal; wire size 1.25 mm^2 max.

I/O section:

•**32-point I/O (or less)**: 40-pin connector terminal; M3 × 6 screws (torque 0.7 N·m)

•**64-point I/O**: FCN 40-pin connector (two); (FUJITSU FCN-365P040-AU)

Housing material: Flame-resistant resin (beige)

Isolation: I/O to transmission section to power

DIP switch: Setting RS-232-C specifications or modem settings (except "/A1")

Station No. adjustment: 2 rotary switches; 00 – FF (256)

■ **Controller & Transmission Sections**

Power indicator: Red LED turns ON in normal conditions; OFF when the voltage level becomes low.

RUN indicator: Red LED turns OFF in error.

■ **I/O Section**

Contact I/O indicator LED: Red lights turn on when the respective I/O channels are ON.

Analog I/O CPU RUN indicator LED: Red LED turns ON when the CPU function proves normal, OFF in error.

■ **RUN Contact Output**: Contact opens in error.

Rated load: 100 V AC or 30 V DC @ 1 A (resistive load)

Maximum switching voltage: 120 V AC or 30 V DC

Maximum switching power: 100 VA or 30 W

Minimum load: 5 V DC @ 10 mA

Error detection

•**Communication**: The receiver units detect loss of communication and wire break.

•**CPU**: Watch-dog timer

•**Power voltage**: Detects when the voltage supply to the CPU drops by 10 %.

MULTIPLEX COMMUNICATION

Communication: Half-duplex, synchronous

Transmission: Conform to RS-422, EIA

Transmission speed: 125 kbps

Protocol: SIN-NET (M-System's; data format conforms to SDLC)

Error check: CRC

■ **Twisted-pair Cable**

Cable: CPEV-0.9 dia.

Connection: Euro Type connector terminal; wire size 1.25 mm^2 max.

Transmission Distance: 1 kilometer max. with 16 units connected; 3 kilometers max. between 2 stations each of which consists of 3 units

Terminator: Incorporated (Remove the attached jumper pin when the unit is not located at the end of transmission line.)

■ **Fiber Optics Cable**

Link: JIS F07 connector (Consult factory for details)

Transmission distance: 1 kilometer max. with PCF

Transmission loss: 7 dB max.

■ **Twisted-pair – Fiber Optics**: Converting signals between two media and waveform shaping

MODEM / INTERFACE

Transmission: Conform to EIA RS-232-C

Communication: Asynchronous, half-duplex, non-procedure

DIP switch: Setting RS-232-C specifications

Transmission speed: 50 – 9600 bps

Data bit: 7 or 8 bits

Stop bit: 1, 1.5 or 2 bits

Parity: even or odd

RS-232-C connector: 25-pin D-sub connector (female) (M2.6 × 0.45 screw connector)

RS-232-C cable: straight (provided by the user) M-System's modems listed in Model & Suffix Code Selection section, for MOD, MOD4 and MOD5, include RS-232-C cables. For the MOD3, MOD6, MOD7 and MOD8, a RS-232-C cable, model DCN1 must be purchased separately.

Configuration: each station is composed of a DLS and a modem unit. The paired DLS's are adjusted at the factory as Station A and Station B.

INSTALLATION

Power consumption

•**AC**: Approx. 17.5 VA max.

•**DC**: Approx. 17 W max. (1.1 A with 24 V)

Grounding: Not required in normal environments; 100 Ω or less grounding resistance in noisy environments

Operating temperature: -5 to + 50°C (23 to 122°F)

Operating humidity: 30 to 90 %RH (non-condensing)

Atmosphere: No corrosive gas or heavy dust

Mounting: Surface; Rack Mounting Frame (model: BX-1DL) available

Weight: 2 kg (4.4 lb)

PERFORMANCE

Permissible power failure duration: ≤ 20 ms

Insulation resistance: ≥ 100 MΩ with 500 V DC

Dielectric strength: 1500 V AC @ 1 minute (I/O to transmission to power)

DESCRIPTIONS

■ RUN Contact (LED) Behaviors

The LED operates when both the communication line conditions and DLS units conditions are true.

Comm. line conditions

Input units (00, A1, A2, G1 and P1): The LED turns ON with the network configured; OFF in an abnormality; the network is reconfigured after an abnormality.

Output units (C1, C2, C3, C4, M1 and U1): The LED turns ON when data from the paired input unit is received normally, with the network configured; OFF when the data is lost; turns also OFF in an abnormality in the network.

I/O-mixed units (E1, E2, R1 and S1): Functions of both input and output units are used.

DLS units conditions: The LED turns ON when the transmission is normal between the DLS units; OFF after three retries in a transmission abnormality.

[CAUTION]

When the network is reconfigured e.g. by noise interference, the RUN LED and output for all units on the network turn briefly OFF until they are turned ON after the reconfiguration is complete.

■ How to Caculate Transmission Speed

1. Data Volume and Transmission Time of I/O Unit

I/O type of DLS (or DLA1) units determines each unit's multi-transmission time. The DLS collects data from each station and transmits to the other station.

(Input Model Suffix: Data Volume)

A1, E1: 30 bytes

A2: 60 bytes

G1, P1: 212 bytes

R1: 116 bytes

S1: 68 bytes

C1, C2, C3, C4, M1, U1: 0 bytes

Transmission time for 1 unit is calculated utilizing each unit's data volume.

Transmission time = (data volume) × (number of data bits per 1 byte ÷ transmission speed [bps]) + waiting time per unit (0.5 sec.)

[example] Transmission time of type A1, S1 and C1 units

•A1 unit (1200 bps)

$30 \times 12 \div 1200 + 0.5 = 0.8$ (sec.)

•S1 unit (1200 bps)

$68 \times 12 \div 1200 + 0.5 = 1.18$ (sec.)

•C1 unit 0 sec.

Transmission time for those units with 0 data volume equals 0.

2. Start / End of Transmission

The DLS transmits codes to the paired station at the start and end of transmission sequence respectively. The data volume differs according to modem type.

(Modem Type: MOD4/5; Others)

Start-of-transmission time: 7 bytes; 2 bytes

End-of transmission time: 6 bytes; 2 bytes

Start-of-Transmission time = (data volume) × (number of data bits per 1 byte ÷ transmission speed [bps]) + waiting time per unit (0.1 sec.)

Remark: Waiting time for MOD4 and MOD5 is 0.3 sec.

[example] Modem type /M5A (1200 bps)

$2 \times 12 \div 1200 + 0.1 = 0.12$ (sec.)

End-of-Transmission time = (data volume) × (number of data bits per 1 byte ÷ transmission speed [bps]) + waiting time per

unit (0.5 sec.)
[example] Modem type /M5A (1200 bps)
 $2 \times 12 \div 1200 + 0.5 = 0.52$ (sec.)

3. Total Transmission Time per Unit

The above (1) transmission time and (2) & (3) Start-/End-of transmission time must be added to calculate the total transmission time required by one DLS unit.
Total transmission time per unit = (start-of-transmission time) + (transmission time) + (end-of-transmission time)
[example] Station A: S1 and A1 units
  Station B: S1 and C1 units
  Modem type /M5A (1200 bps)
•Station A transmission time
 $0.12 + (1.18 + 0.8) + 0.52 = 2.62$ (sec.)
•Station B transmission time
 $0.12 + (1.18 + 0) + 0.52 = 1.82$ (sec.)

4. Overall Transmission Cycle

The overall transmission cycle is determined as the time required by one DLS unit starting transmission before the next transmission.
Overall transmission cycle = Station A total transmission time + Station B total transmission time
[example] Station A: S1 and A1 units
  Station B: S1 and C1 units
  Modem type /M5A (1200 bps)
 $2.62 + 1.82 = 4.44$ (sec.)
The time required for the input signals to be output at the output unit varies according to the exact moment of input.
•Minimum (Station A input to Station B output)
 = Station A total transmission time per unit
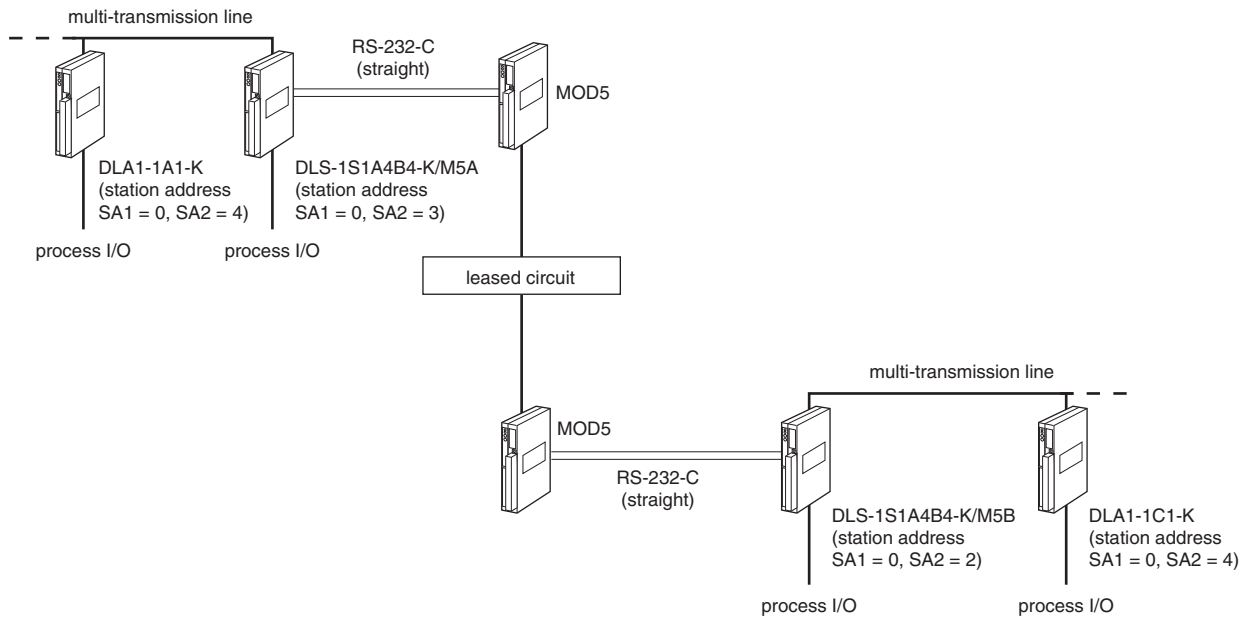 = 2.62 (sec.)
•Maximum (Station A input ot Station B output)
 = Overall transmission cycle
    + Station A total tansmission time per unit
 = 7.06 (sec.)
Therefore, the time required for a Station A input to be output at the Station B varies between 2.62 and 7.06 seconds as far as there is no transmission error.

■**SYSTEM CONFIGURATION EXAMPLE**

multi-transmission line

RS-232-C
(straight)

MOD5

DLA1-1A1-K
(station address
SA1 = 0, SA2 = 4)

DLS-1S1A4B4-K/M5A
(station address
SA1 = 0, SA2 = 3)

process I/O

process I/O

leased circuit

MOD5

RS-232-C
(straight)

multi-transmission line

DLS-1S1A4B4-K/M5B
(station address
SA1 = 0, SA2 = 2)

DLA1-1C1-K
(station address
SA1 = 0, SA2 = 4)

process I/O

process I/O

■ **HOW TO SET STATION ADDRESSES**

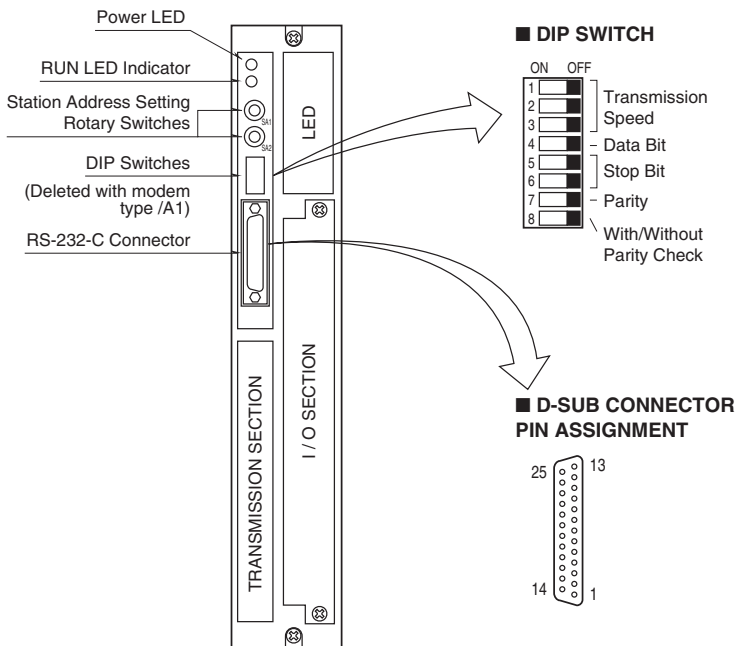The I/O units are connected in a series via a couple of modems.

Set the station address to DLA1 units as described in the DLA1 data sheet.

For the DLS with no process I/O, set a number remote from those for DLA1s (such like FF, FE). When the DLS has process input or output, set it the same way as the DLA1.
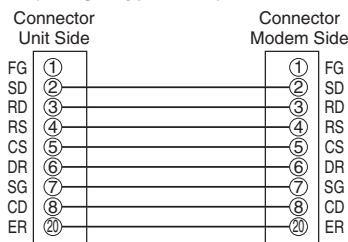
■ **HOW TO CONFIGURE MULTI-TRANSMISSION LINE**

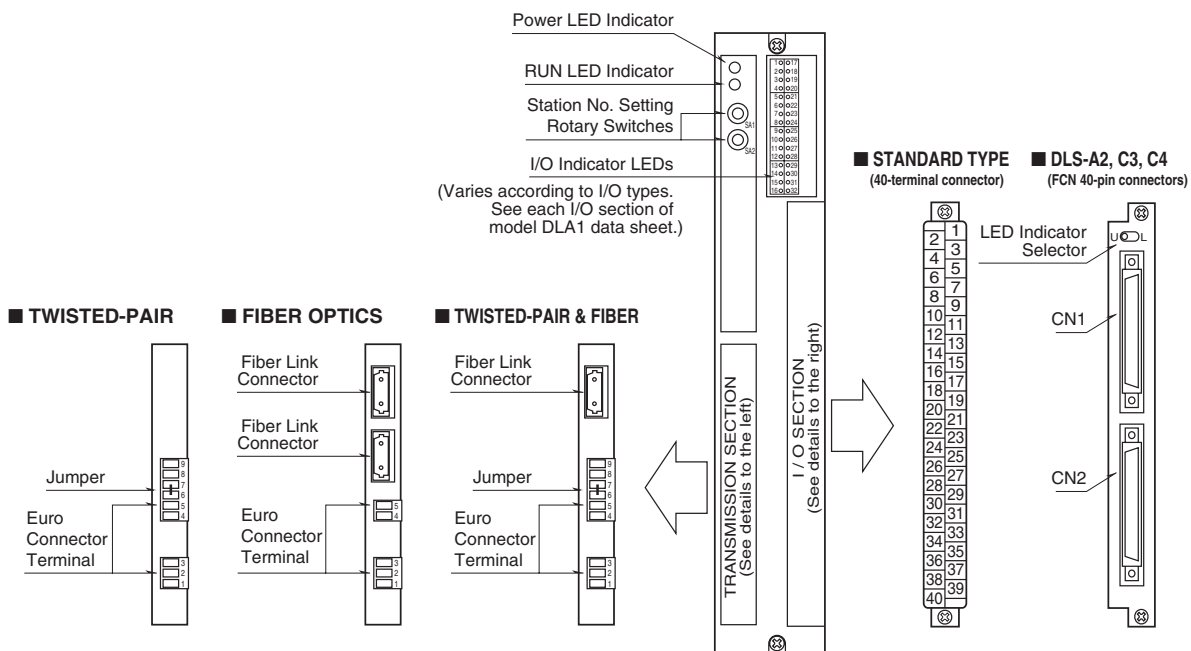Refer to the data sheet for DLA1 unit.

EXTERNAL VIEW

Power LED
RUN LED Indicator
Station Address Setting Rotary Switches
DIP Switches (Deleted with modem type /A1)
RS-232-C Connector

LED
TRANSMISSION SECTION
I / O SECTION

■ DIP SWITCH

ON   OFF
1
2   Transmission Speed
3
4   - Data Bit
5   - Stop Bit
6
7   - Parity
8
With/Without Parity Check

■ D-SUB CONNECTOR PIN ASSIGNMENT

25   13
14   1

•RS-232-C Connection Example (straight type cable)

Connector Unit Side   Connector Modem Side

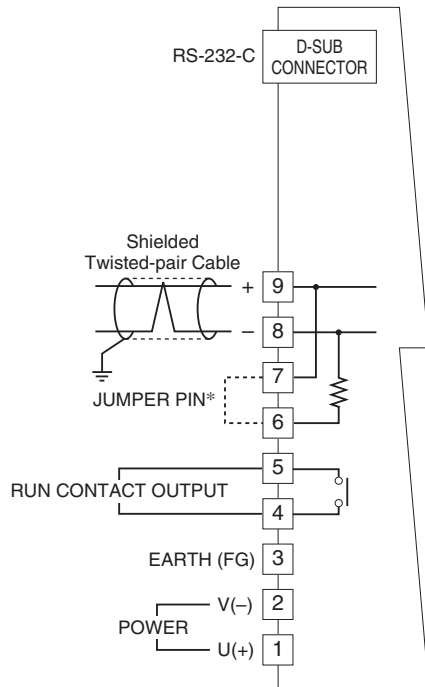|				
FG	①		①	FG
SD	②		②	SD
RD	③		③	RD
RS	④		④	RS
CS	⑤		⑤	CS
DR	⑥		⑥	DR
SG	⑦		⑦	SG
CD	⑧		⑧	CD
ER	⑳		⑳	ER

■ MULTI-TRANSMISSION SECTION, PROCESS I/O SECTION & INDICATOR LED SECTION

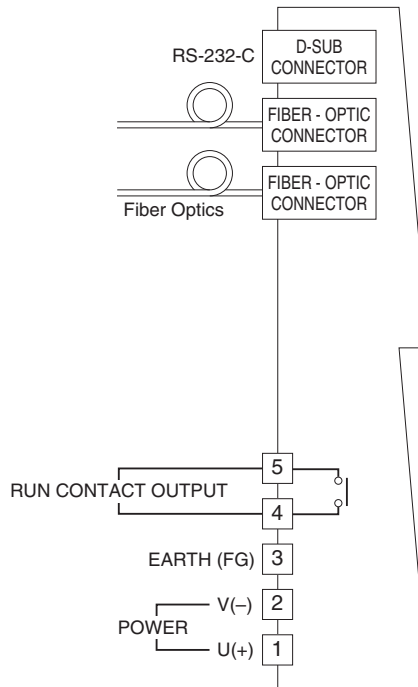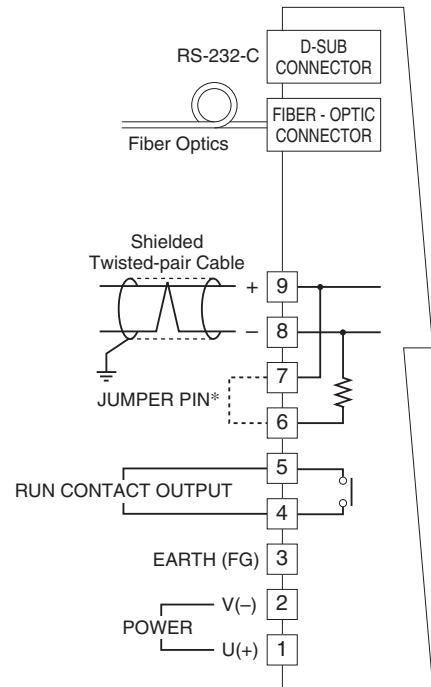(Process I/O and indicator LED sections are provided only for process I/O type)

Power LED Indicator
RUN LED Indicator
Station No. Setting Rotary Switches
I/O Indicator LEDs
(Varies according to I/O types. See each I/O section of model DLA1 data sheet.)

TRANSMISSION SECTION (See details to the left)
I / O SECTION (See details to the right)

■ TWISTED-PAIR

Jumper
Euro Connector Terminal

■ FIBER OPTICS

Fiber Link Connector
Fiber Link Connector
Euro Connector Terminal

■ TWISTED-PAIR & FIBER

Fiber Link Connector
Jumper
Euro Connector Terminal

■ STANDARD TYPE (40-terminal connector)

■ DLS-A2, C3, C4 (FCN 40-pin connectors)

LED Indicator Selector
U L
CN1
CN2

CONNECTION DIAGRAM

■ TWISTED-PAIR CABLE
(transmission media code: 1)

■ FIBER OPTICS CABLE
(transmission media code: 2)

■ TWISTED-PAIR & FIBER OPTICS
(transmission media code: 7)

RS-232-C | D-SUB CONNECTOR

Shielded Twisted-pair Cable

+ 9
– 8
7
JUMPER PIN*
6
5
RUN CONTACT OUTPUT
4
EARTH (FG) 3
V(–) 2
POWER
U(+) 1

RS-232-C | D-SUB CONNECTOR
FIBER - OPTIC CONNECTOR
Fiber Optics | FIBER - OPTIC CONNECTOR

5
RUN CONTACT OUTPUT
4
EARTH (FG) 3
V(–) 2
POWER
U(+) 1

RS-232-C | D-SUB CONNECTOR
FIBER - OPTIC CONNECTOR
Fiber Optics

Shielded Twisted-pair Cable

+ 9
– 8
7
JUMPER PIN*
6
5
RUN CONTACT OUTPUT
4
EARTH (FG) 3
V(–) 2
POWER
U(+) 1

*When the unit is located at the end of transmission line via twisted-pair cable (= no cross-wiring),
short across the terminals 6 – 7 with the jumper pin (or wire) provided with the unit.
Remove the jumper pin for all the unit not located at the end.
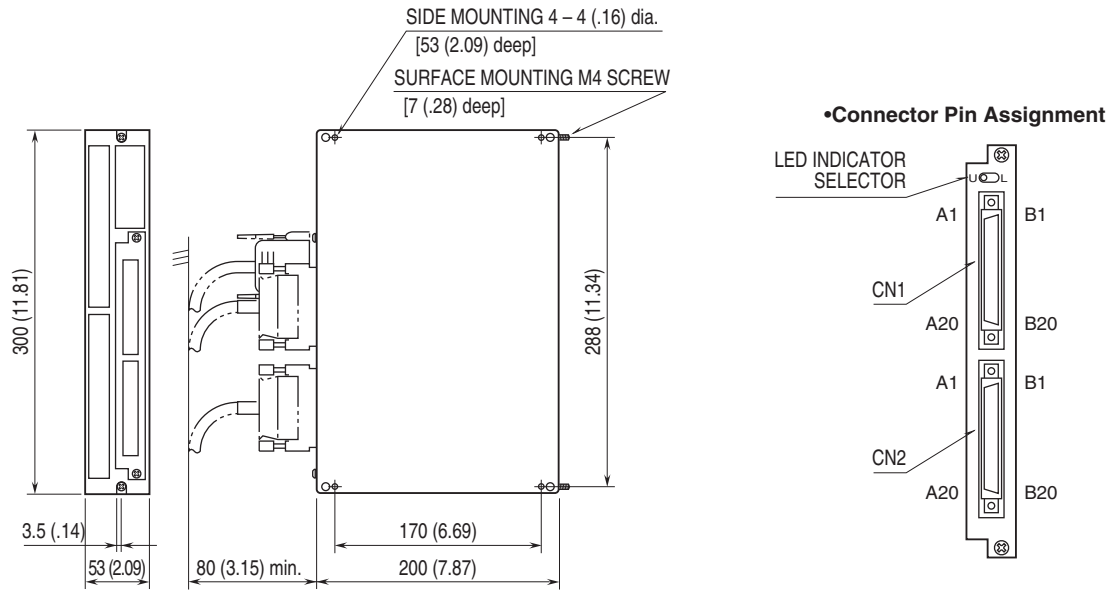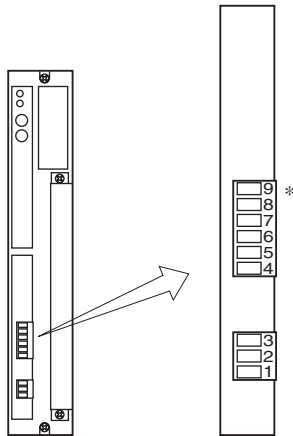
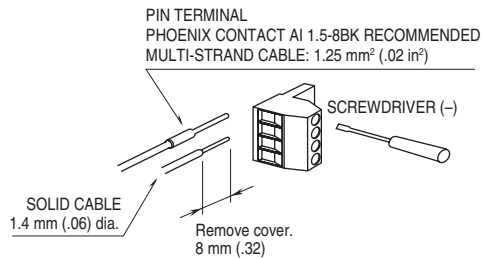## DIMENSIONS unit: mm (inch)

■ STANDARD TYPE

SIDE MOUNTING 4 – 4 (.16) dia.
[53 (2.09) deep]
SURFACE MOUNTING M4 SCREW
[7 (.28) deep]

•40-pin Connector Terminal Block

300 (11.81)

288 (11.34)

3.5 (.14)

53 (2.09)

52 (2.05)* 28
min. (1.10)

170 (6.69)
200 (7.87)

7 (.28)

40–M3 SCREW TERMINAL
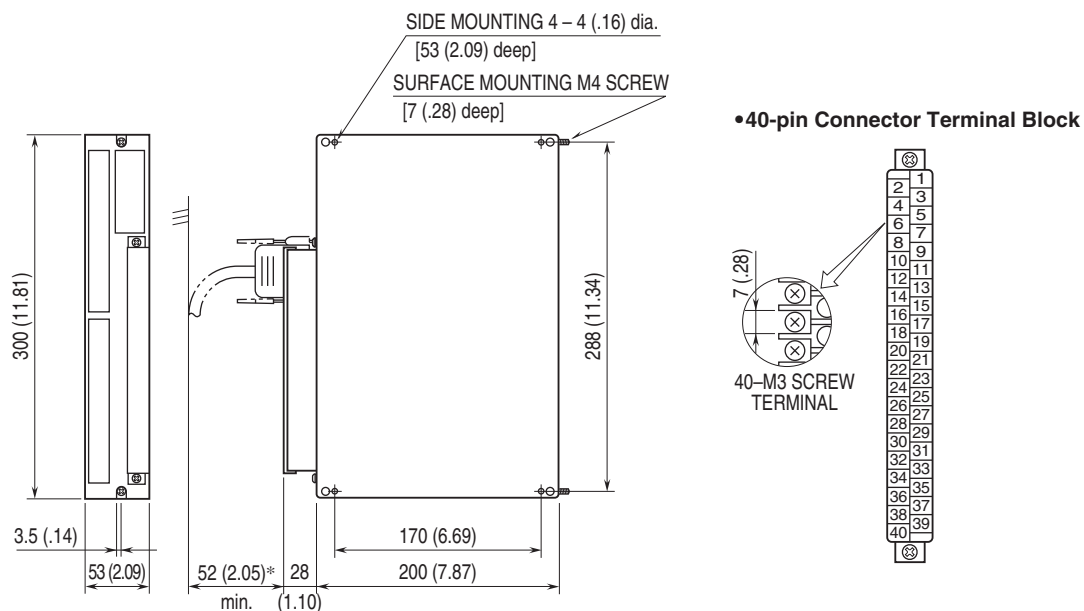
*For M-System's modem

■ WITH I/O CONNECTORS

SIDE MOUNTING 4 – 4 (.16) dia.
[53 (2.09) deep]

SURFACE MOUNTING M4 SCREW
[7 (.28) deep]

•Connector Pin Assignment

LED INDICATOR SELECTOR

U○L

CN1 A1 B1 ... A20 B20

CN2 A1 B1 ... A20 B20

300 (11.81)

288 (11.34)

3.5 (.14)

53 (2.09)

80 (3.15) min.

170 (6.69)

200 (7.87)

•Terminal Assignment, Euro Type Connector Terminals

•Wiring Procedure of Euro Type Connector Terminals

PIN TERMINAL
PHOENIX CONTACT AI 1.5-8BK RECOMMENDED
MULTI-STRAND CABLE: 1.25 mm² (.02 in²)

SCREWDRIVER (–)

SOLID CABLE
1.4 mm (.06) dia.

Remove cover.
8 mm (.32)

9 8 7 6 5 4 *

3 2 1

*Not provided for fiber optics (Transmission media code 2)
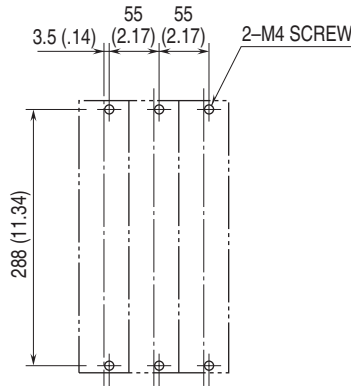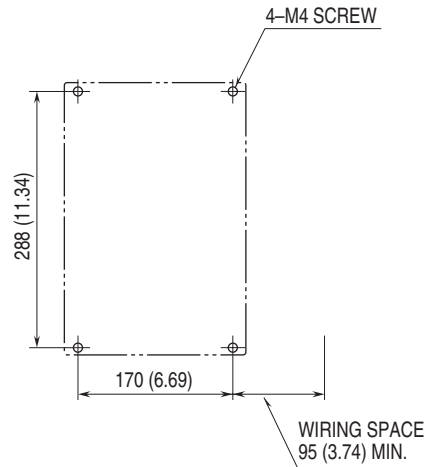Note : There is no specific order for connecting fiber optics.

■ WITHOUT PROCESS I/O

SIDE MOUNTING 4 – 4 (.16) dia.
[53 (2.09) deep]

SURFACE MOUNTING M4 SCREW
[7 (.28) deep]

300 (11.81)

288 (11.34)

3.5 (.14)

53 (2.09)

80 (3.15) min.*

170 (6.69)

200 (7.87)
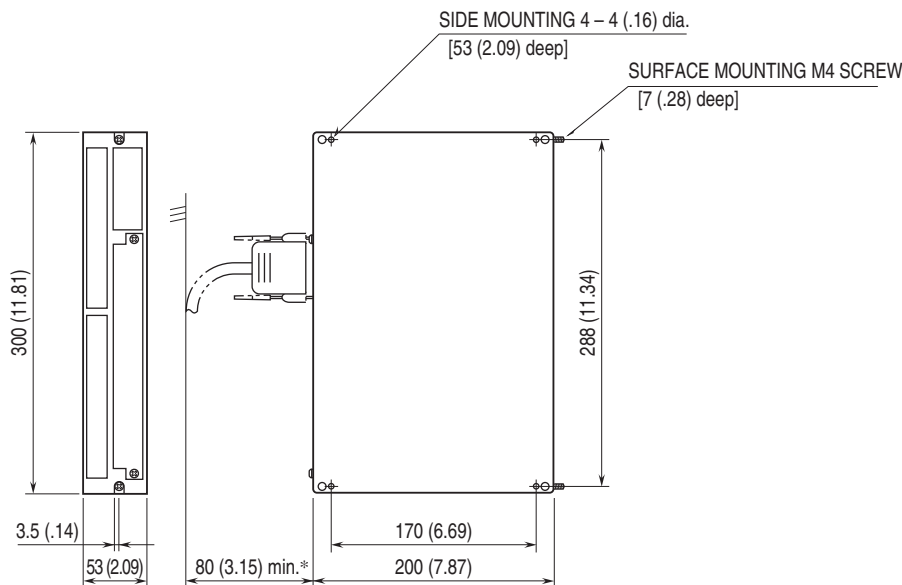
*For M-System's modem

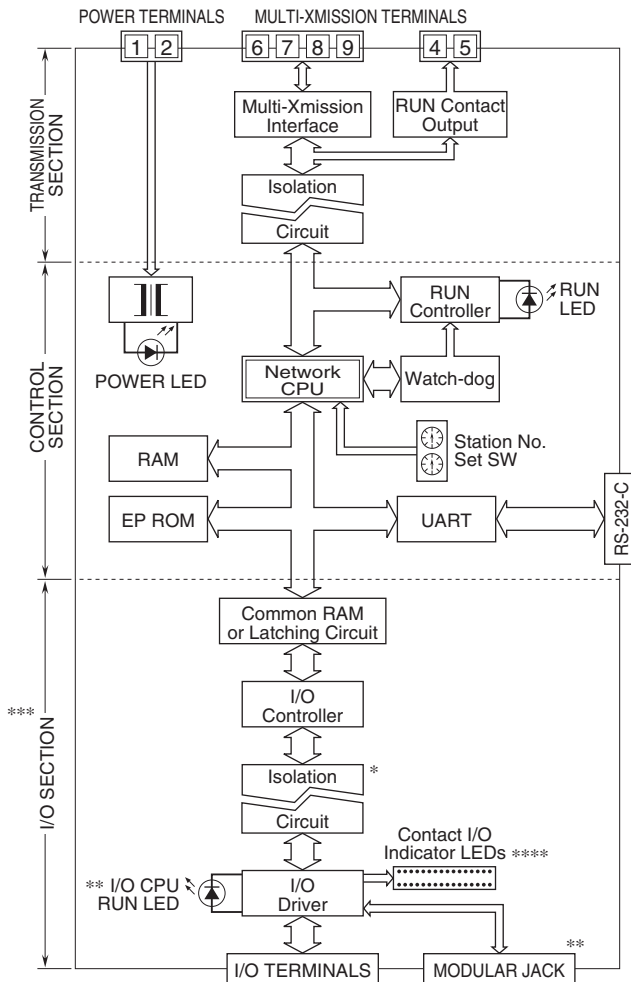## MOUNTING REQUIREMENTS unit: mm (inch)

■ **SURFACE MOUNTING**

■ **SIDE MOUNTING (terminal block at the right side)**

FUNCTION BLOCK DIAGRAM

*   Not included with codes G1, P1, R1 or S1.
**   Not included with codes A1, A2, C1, C2, C3, C4, E1 or E2.
*** Not included when there is no process I/O.
**** Not included with codes G1, M1 or R1.

⚠ Specifications are subject to change without notice.