

# Service Manual

## 01

### Multiplex Data Transmitter

Model **MDT-8**

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### 4.6 Check mode display

1. Press SW2 on the upper MDT twice within 2 seconds, and the system enters check mode to let all the segments mark up for 1 second.
2. The LED in the left of the error code display displays port Nos; and right side LED, bit Nos. The indication of "." (decimal point) explains the condition of the corresponding signal.  
(Refer to "Port/bit Nos. and corresponding signals" list.)  
Lit (both decimal points) : ON (Ex. "1.0.")  
Not lit : OFF (Ex. "1 0 ")
3. Press SW2 once to go to the next bit number. When you are through all the bit in one port, you will go to the next port by pressing the switch.
4. The order of indication, as shown in "Port/bit Nos. and corresponding signals" list, is upper unit input (port 1-8), upper unit output (port 1-3), lower unit input (port 1-6) and lower unit output (port 1-8).
5. Before each input and output display, display of  $U_i$ ,  $U_o$ ,  $L_i$  or  $L_o$  comes on first, and then port and bit nos. display follow.
6. Keep pressing SW2 for 1 second or longer, and port No. and bit No. display will progress one by one at every 0.2 seconds and will stop when SW2 is released.
7. Press SW1 once to go back to the previous bit. Keep pressing SW1 for 1 second or longer, and port No. and bit No. display will progress in reverse order one by one at every 0.2 seconds and will stop when SW1 is released.
8. To terminate check mode, keep pressing SW2 or press the system check switch.
9. Display example  
→ : SW2 is pressed once.  
⇒ : SW1 is pressed once.

After all the segments mark up (for 1 second):

$U_i \rightarrow 1.0. \rightarrow 1 1 \rightarrow \dots \rightarrow U_o \rightarrow 1 0 \Rightarrow U_o$   
 $\Rightarrow 8 7 \rightarrow U_o \rightarrow \dots \rightarrow L_i \rightarrow 1.0. \rightarrow \dots \rightarrow L_o$   
 $\rightarrow 1 0 \Rightarrow L_o \Rightarrow 6 7 \rightarrow L_o \rightarrow \dots \rightarrow 8 7 \rightarrow \text{End}$

### 4.7 Priority of display function

Display function is prioritized as follows:

1. Check mode display
2. Error history erasure, error history display
3. Error display

You can change the display of lower priority into that of higher priority, but the reverse alternation is unavailable. The alternation between error history erasure and error history displays is available.

### 4.8 Input and output transmission to AML

The condition of the signal corresponding to the input and output number (0-255) received from AML is transmitted to AML.

For digital input and output, 1 (ON) or 0 (OFF) is transmitted. Analog input and output is transmitted after being converted into 0-225.

The condition of the signal corresponding to the input and output number can be checked by "MDT monitor" display function in the AML maintenance mode.

(Refer to the "Input/output signal Nos. and corresponding signals" list.)

## Troubleshooting

Error code	Error (Details)	Condition	Cause	Remarks
			Countermeasure	
* 15	Upper unit RAM check error		Failure in the upper unit RAM	MDT action:  Upper unit output stops. [Sets the all OE (output enable signal) to ON.]  Upper unit system operation stops.
			Replace the upper unit CPU board.	
* 18	Upper unit ROM check error		Failure in the upper unit ROM	MDT action:  Upper unit output stops. [Sets the all OE (output enable signal) to ON.]  Upper unit system operation stops.
			Replace the upper unit CPU board.	
24	Actual transmission and gearshift lever position are not matched. (Failure in the transmission input signal combination)	Two or more transmission input signals (N, 1st, 2nd, 3rd, D and R) remains on for 1 second or longer.	Failure in the transmission input signals from the gearshift lever (terminals (3), (4), (5), (6), (7) and (8) of CN4)	MDT action:  Gearshift stays in the same position.
			Repair or replace the faulty part referring to the crane electrical circuit diagram.  Replace the upper unit CPU board.	
25	Actual transmission and gearshift lever position are not matched. (Failure in the transmission input signal)	All transmission input signals (N, 1st, 2nd, 3rd, D and R) remains off for 2 seconds or longer.	Failure in the transmission input signals from the gearshift lever (terminals (3), (4), (5), (6), (7) and (8) of CN4)	MDT action:  Gearshift stays in the same position.
			Repair or replace the faulty part referring to the crane electrical circuit diagram.  Replace the upper unit CPU board.	
27	Failure in steering mode input signal combination	Two or more steering mode input signals (of 2-wheel steering, 4-wheel steering and crab steering) remains on for 1 second or longer.	Failure in the steering input signals (terminals (1), (2) and (3) of CN5)	MDT action:  Follows the treatment by the steering system. (Refer to the steering function in the "Data table".)
			Repair or replace the faulty part referring to the crane electrical circuit diagram.  Replace the upper unit CPU board.	

## Troubleshooting

Error code	Error (Details)	Condition	Cause	Remarks
			Countermeasure	
75	Failure in lower unit output power supply 15	Monitored data on the lower unit output power supply 15 stays off for 100 ms.	1. Blowout of the corresponding fuse 2. Broken wire or failure in circuit connecting to terminal (1) of the lower unit CN7	MDT action:  Only the error code is displayed.
			Repair or replace the faulty part referring to the crane electrical circuit diagram.	
76	Failure in lower unit output power supply 16	ON or OFF state of the monitored data of the lower unit output power supply 16 is contrary to the normal state, and this state continues for 100ms. (In the normal state, when the lower unit output Tr3 state is ON [OFF], the monitored data is ON [OFF].)	1. Blowout of the corresponding fuse 2. Broken wire or failure in circuit connecting to terminal (2) of the lower unit CN7	MDT action:  Only the error code is displayed.
			Repair or replace the faulty part referring to the crane electrical circuit diagram.	
* 80	Monitored lower unit output data is unstable.	The sample monitored data of the lower unit output (RY1-RY56) at every 10ms do not match the latest data 50 consecutive times.	Failure in the relay output monitor circuit in the lower unit	MDT action:  Sets the corresponding OE (output enable signal) to ON.
			Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)	
* 90	Faulty RY1 output	The monitored data continue ON for 100ms while RY1 output data is OFF.	1. Circuit connected with terminal (5) of lower unit CN11 is short-circuited with the 24-V circuit. 2. Failure in relay output circuit in the lower unit	MDT action:  RY1-RY8 is set are OFF.
			Repair or replace the faulty part referring to the crane electrical circuit diagram.  Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)	

## Troubleshooting

Error code	Error (Details)	Condition	Cause	Remarks
			Countermeasure	
* b4	Faulty RY21 output	The monitored data continue ON while RY21 output data is OFF.	<p>1.Circuit connected with terminal (11) of lower unit CN10 is short-circuited with the 24-V circuit.</p> <p>2.Failure in relay output circuit in the lower unit</p>	MDT action: RY21 is set to OFF.
			<p>Repair or replace the faulty part referring to the crane electrical circuit diagram.</p> <p>Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)</p>	
* b5	Faulty RY22 output	The monitored data continue ON while RY22 output data is OFF.	<p>1.Circuit connected with terminal (12) of lower unit CN10 is short-circuited with the 24-V circuit.</p> <p>2.Failure in relay output circuit in the lower unit</p>	MDT action: RY22 is set to OFF.
			<p>Repair or replace the faulty part referring to the crane electrical circuit diagram.</p> <p>Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)</p>	
* b6	Faulty RY23 output	The monitored data continue ON while RY23 output data is OFF.	<p>1.Circuit connected with terminal (13) of lower unit CN10 is short-circuited with the 24-V circuit.</p> <p>2.Failure in relay output circuit in the lower unit</p>	MDT action: RY23 is set to OFF.
			<p>Repair or replace the faulty part referring to the crane electrical circuit diagram.</p> <p>Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)</p>	

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## Troubleshooting

Error code	Error (Details)	Condition	Cause	Remarks
			Countermeasure	
dC	Faulty RY37 output	<p>The monitored data continue OFF while RY37 output data is ON.</p> <p>◆ Failure is not detected when the output power supply 11 is OFF.</p>	Failure in relay output circuit in the lower unit	<p>MDT action:</p> <p>Only the error code is displayed.</p>
			<p>Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)</p>	
dd	Faulty RY38 output	<p>The monitored data continue OFF while RY38 output data is ON.</p> <p>◆ Failure is not detected when the output power supply 11 is OFF.</p>	Failure in relay output circuit in the lower unit	<p>MDT action:</p> <p>Only the error code is displayed.</p>
			<p>Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)</p>	
dE	Faulty RY39 output	<p>The monitored data continue OFF while RY39 output data is ON.</p> <p>◆ Failure is not detected when the output power supply 12 is OFF.</p>	Failure in relay output circuit in the lower unit	<p>MDT action:</p> <p>Only the error code is displayed.</p>
			<p>Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)</p>	
dF	Faulty RY40 output	<p>The monitored data continue OFF while RY40 output data is ON.</p> <p>◆ Failure is not detected when the output power supply 12 is OFF.</p>	Failure in relay output circuit in the lower unit	<p>MDT action:</p> <p>Only the error code is displayed.</p>
			<p>Replace the lower unit relay board. (Replace the CPU board, if the failure is not recovered even after the relay board is replaced.)</p>	

# Troubleshooting

## 3. Check chart

### Initial conditions before checking

1. Stop the engine.
2. Set the starter switch to ON.
3. Make sure that the emergency transmission switch is OFF.
4. Check that the upper and lower MDTs are energized.

#### 4.1 Upper MDT

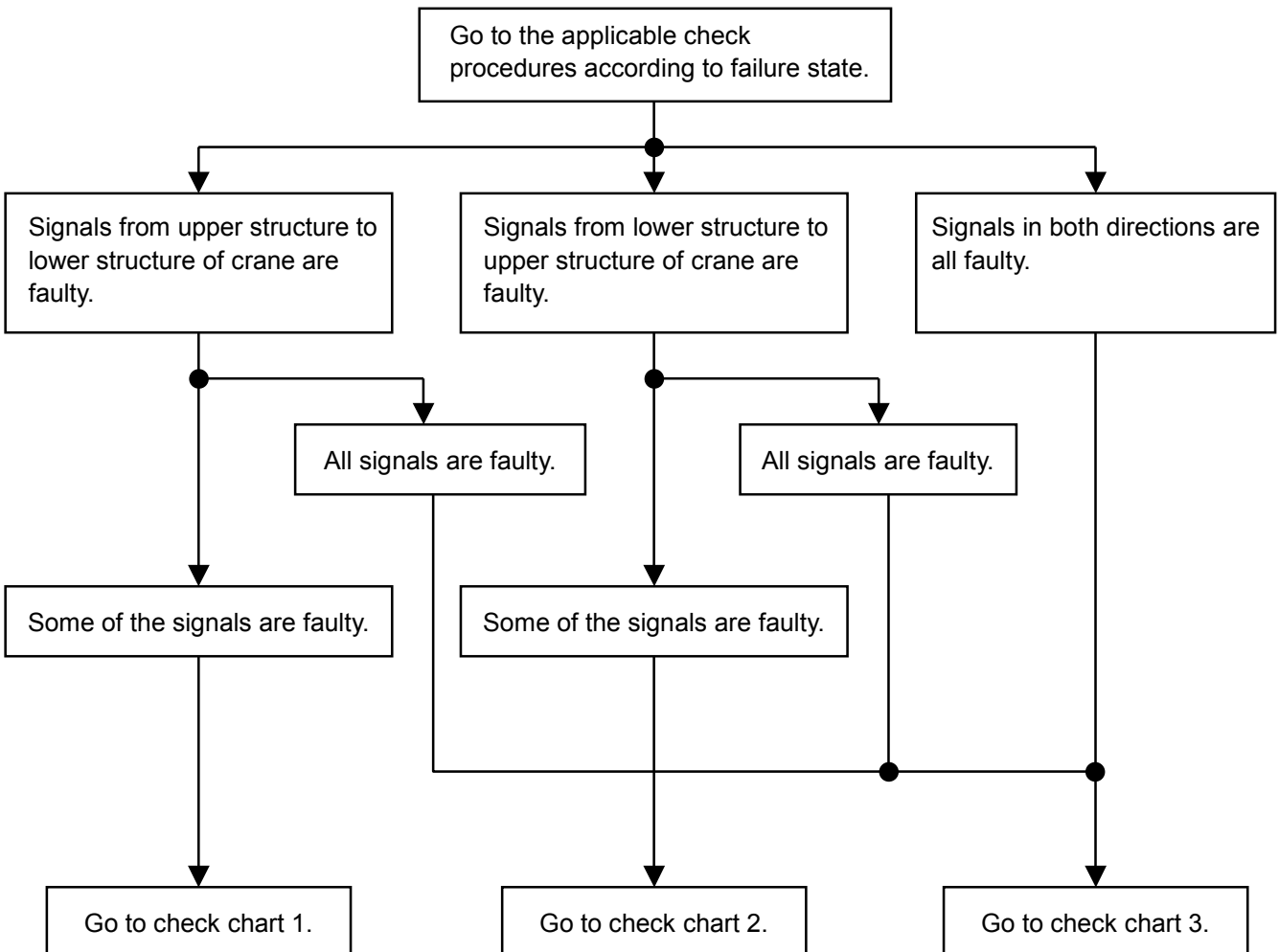
Each voltage between power supply terminals (1), (2), (3) and ground terminals (4), (5), (6) respectively of CN1 is approx. 24V.

Voltage between power supply terminal (1) and ground terminals (9), (10) of CN7 is approx. 12V.

#### 4.2 Lower MDT

Each voltage between power supply terminal (1), (2), (3) and ground terminals (4), (5), (6) respectively of CN2 is approx. 24V.

Voltage between power supply terminal (9) and ground terminals (16) of CN4 is approx. 12V.



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## Disassembly and reassembly

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### 3. EXTRACTION OF CONTACTS:

Insert tip end of the tool into the housing cavity from the mating side of housing, so as to raise the locking lance of housing. This will make contact unlocking.

Proceed as follows (Fig.4):

1. Push back the contact into the housing in the direction "A". This will result relaxing of locking tension prior to unlocking.
2. Insert extraction tool into the housing cavity.
3. Raise the locking lance in housing.
4. Pull back the contact from the housing.

Note:

Avoid inserting tool tip from reaching the contact leaf area for prevention from contact deformation and damage.

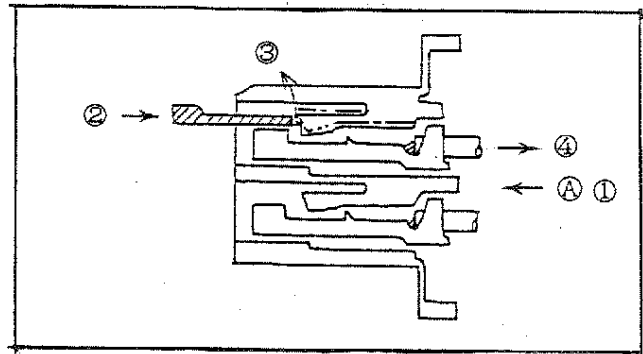
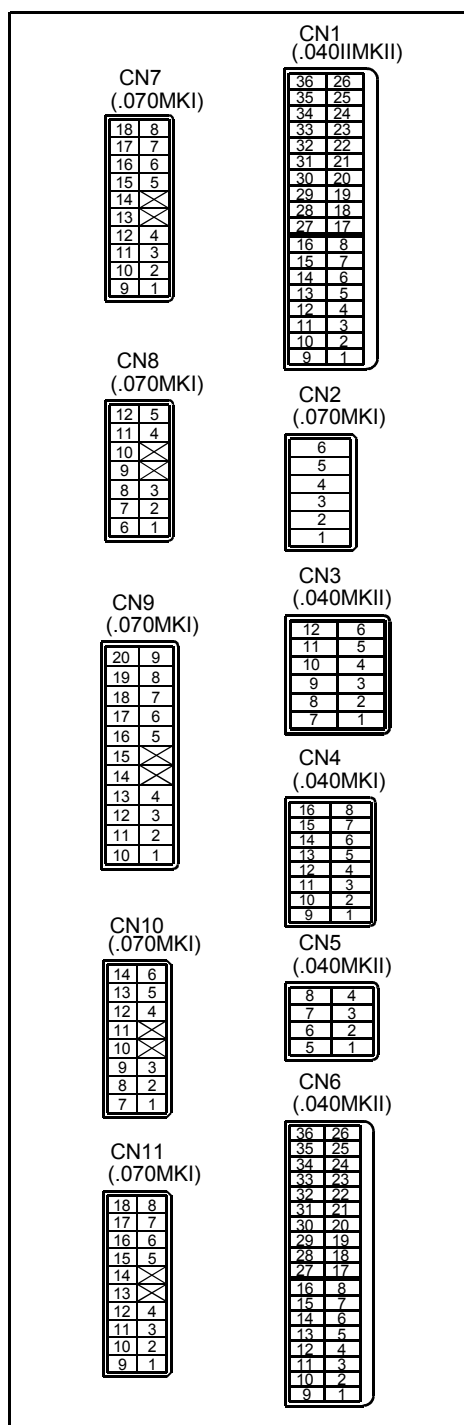


Fig. 4

IW303-0251E34

## Connection diagram for connectors

### 2. Lower MDT



Relay board

CPU board

IW303-0251E16

**Note:**

Inside the parentheses in the connector arrangement are AMP connector type.

### CN1 (IN)

No.	Signal	Signal name	Wire color (No.)
1	Di1(-)	Brake fluid level detection	BW (82)
2	Di2(-)	Engine oil low-pressure	BR (85)
3	Di3(-)	Air low-pressure (parking brake)	BL (83)
4	Di4(-)	Spare input(-) 17	
5	Di5(-)	Spare input(-) 16	
6	Di6(-)	Straight ahead detection	Y (78)
7	Di7(-)	Fuel level detection	YO (244)
8	Di8(-)	4WD detection	GB (70)
9	Di9(-)	Air low-pressure	GW (175)
10	Di10(-)	Spare input(-) 15	
11	Di11(-)	Spare input(-) 14	
12	Di12(-)	Spare input(-) 13	
13	Di13(-)	Spare input(-) 12	
14	Di14(-)	Spare input(-) 11	
15	GND	GND	B (0)
16	GND	GND	B (0)
17	Di15(-)	Spare input(-) 10	
18	Di16(-)	Spare input(-) 9	
19	Di17(-)	Spare input(-) 8	
20	Di18(-)	Spare input(-) 7	
21	Di19(-)	Spare input(-) 6	
22	Di20(-)	Spare input(-) 5	
23	Di21(-)	Spare input(-) 4	
24	Di22(-)	Spare input(-) 3	
25	Di23(-)	Spare input(-) 2	
26	Di24(-)	Spare input(-) 1	
27	Di25(+)	Engine start	LG (21)
28	Di26(+)	Spare input(+) 7	
29	Di27(+)	Spare input(+) 6	
30	Di28(+)	Spare input(+) 5	
31	Di29(+)	Spare input(+) 4	
32	Di30(+)	Spare input(+) 3	
33	Di31(+)	Spare input(+) 2	
34	Di32(+)	Spare input(+) 1	
35	GND	GND	B (0)
36	GND	GND	B (0)

### CN2 (power supply)

No.	Signal	Signal name	Wire color (No.)
1	MPOW	24V power supply	W (105)
2	MPOW	24V power supply	W (105)
3	MPOW	24V power supply	W (105)
4	GND	GND	B (0)
5	GND	GND	B (0)
6	GND	GND	B (0)

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## Data table

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### 2. Parking lamp

1. The parking lamp lights up when the parking brake switch is ON or the parking brake is applied.
2. The parking lamp goes out when the parking brake is released while the parking brake switch is OFF. However, the parking lamp does not go out when the parking brake is released with the brake fluid amount insufficient.

Upper unit input status		Lower unit input status		Serial signal output status to combination meter
Di37 (parking brake)		Di3 [air low-pressure (parking brake)]	Di1 (brake fluid level detection)	Do9 (parking brake)
0		1	—	1
0		0		
1		1		
1		0	1	1
			0	0
Remarks	1 : switch contact ... closed (H) 0 : switch contact ... open (L)	1 : switch contact ... closed (L) 0 : switch contact ... open (H)		1 : level "H" 0 : level "L"

## Data table

### 13. Speed warning and overrun warning

1. If vehicle speed or engine speed which will not occur during normal traveling on a flat ground is detected, alarm buzzer sounds and speed warning indicator or overrun warning indicator will light up.
2. For speed warning, the alarm buzzer sounds intermittently or continuously depending on the vehicle speed. For overrun warning, it sounds intermittently.

	Upper unit input status	Upper unit output status	Serial signal output status to combination meter
	Pi2 (main speed)	Tr1 (alarm buzzer)	Do31 (speed warning)
	$57 \leq V_s < 60$	1/0	1
	$V_s \geq 60$	1	
	$52 < V_s \leq 58$	1/0	
	$V_s \leq 52$	0	0
Remarks	Vs : vehicle speed (km/h)	1 : transistor ON 0 : transistor OFF 1/0 : alternates ON and OFF in 0.6-second cycles.	1 : level "H" 0 : level "L"
	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">                     Tr1 (alarm buzzer)                 </div> <div style="margin-left: 20px;">                     Continuous Intermittent No sound                 </div> </div>		

	Upper unit input status	Upper unit output status	Serial signal output status to combination meter
	Pi1 (tachometer sensor)	Tr1 (alarm buzzer)	Do32 (engine overrun warning)
	$E_{rev} \geq 3030$	1/0	1
	$E_{rev} < 2800$	0	0
Remarks	Erev : engine speed ( $\text{min}^{-1}$ )	1 : transistor ON 0 : transistor OFF 1/0 : alternates ON and OFF at 0.6-second intervals	1 : level "H" 0 : level "L"
	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">                     Tr1 (alarm buzzer)                 </div> <div style="margin-left: 20px;">                     Intermittent No sound                 </div> </div>		

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