

**Kawasaki Robot Controller  
E Series**

**Optional Harness  
Manual**

**(Option)**

**Robot**

**Kawasaki Heavy Industries, Ltd.**

## PREFACE

This manual describes the wiring of the optional harness and other optional parts such as solenoid valves and sensors on the arm. Select harness fit for your application specifications.

This manual is intended for use with the E series controller.

Refer to the E series External I/O Manual, Installation and Connection Manual and Arm ID Board Manual together with this manual.

- 
1. This manual does not constitute a guarantee of the systems in which the robot is utilized. Accordingly, Kawasaki is not responsible for any accidents, damages, and/or problems relating to industrial property rights as a result of using the system.
  2. It is recommended that all personnel assigned for activation of operation, teaching, maintenance or inspection of the robot attend the necessary education/training course(s) prepared by Kawasaki, before assuming their responsibilities.
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## SYMBOLS

The items that require special attention in this manual are designated with the following symbols.


Ensure proper and safe operation of the robot and prevent physical injury or property damage by complying with the safety matters given within the boxes with these symbols.

 **DANGER**

**Failure to comply with indicated matters can result in imminent injury or death.**

 **WARNING**


**Failure to comply with indicated matters may possibly lead to injury or death.**

 **CAUTION**

**Failure to comply with indicated matters may lead to physical injury and/or mechanical damage.**

[ **NOTE** ]

Denotes precautions regarding robot specification, handling, teaching, operation and maintenance.

 **WARNING**

- 1. The accuracy and effectiveness of the diagrams, procedures, and detail explanations given in this manual cannot be confirmed with absolute certainty. Should any unexplained questions or problems arise, please contact Kawasaki Robot Service.**
- 2. Safety related contents described in this manual apply to each individual work and not to all robot work. In order to perform every work in safety, read and fully understand the safety manual, all pertinent laws, regulations and related materials as well as all the safety explanation described in each chapter, and prepare safety measures suitable for actual work.**

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## 1.0 OPTIONAL HARNESS SYSTEM

1. There are following types of optional harnesses per arm type: Type B0 to Type E0, Type H0, valve and sensor harnesses as shown in Table 1-1 to 1-3 below.
2. For Types B0, E0, H0 and valve harness, the number of solenoids that can be driven directly from the robot controller is limited to 8 (a double solenoid valve has two coils). The coil voltage is DC24 V. Refer to “2.0 Signal Assignment” to see which clamp instruction given out in teach mode corresponds with which solenoid valve operation.
3. For Types B0, E0 and valve harness, wiring up to the solenoid valves is done prior to factory shipment only when the solenoid valves or solenoid valves built-in arm is ordered through Kawasaki. The solenoid is wired based on plus common in NPN specification and minus common in PNP specification.
4. Kawasaki uses the following solenoid valves manufactured by SMC as its standard for each of the robot models.

Model	Standard Solenoid Valves
Z, M, B series	VQ7-8 series
RS03/05/06/10/20/MC/BA	SY3000 series
RS30/50/80/15X	SY5000 series

**NOTE** The contents for RD, RA, RF, RC series, etc. are the same as RS series. In the following, all explanations are described with only RS series.

5. For Types C0 and D0, only the optional machine harness is provided and Kawasaki does not provide pre-wiring of it to the robot controller or the solenoid valves.
6. 0.3 mm<sup>2</sup> twisted cable is used as the optional harness. The maximum allowable current is 0.5 A. The maximum input voltage is DC48 V. Avoid applying alternating voltage and analog signals.
7. Mating connectors  
 The following mating connectors are included with optional harnesses.
  - X6A connector (Type B0, C0, D0)
  - X121 connector (Type D0)
 For type D0 harnesses on ZD series, a connector with a cable is attached to X121.

[ NOTE ]

Crimp tools\* for the contactor pins are not included at factory shipment. Prepare or order them separately.

\* Recommended crimp tools (either of the tools below):

- CCPZ MIL + CCTP10 Mfd. by ILME, or
- 0999-000-0001 + 0999-000-0311 Mfd. by Harting, or
- 0999-000-0110 + 0999-000-0111 Mfd. by Harting

8. Wiring numbers

Wiring numbers for the terminal box on the arm are shown in Figures 1 through 10. For the wires other than these, assign and number the wires as necessary.

Table 1-1 ZX/ZT/ZTX/ZH/MX/MT/BX/BT Optional Harness List

	Type B0		Type C0		Type D0		Type E0		Type H0	
ZX	40975-0163*	See fig. 2	40975-1961	See fig. 3	40975-1939	See fig. 4	40975-2264*	See fig. 5	40975-0019*	See fig. 6
	40975-0164						40975-2271		40975-0023	
ZT	40975-0165*	See fig. 2	40975-1993	See fig. 3	40975-1940	See fig. 4	40975-2265*	See fig. 5	40975-0020*	See fig. 6
	40975-0166						40975-2272		40975-0024	
ZTX	-	-	-	-	-	-	40975-0041*	See fig. 5	40975-0038*	See fig. 6
							40975-0042		40975-0039	
ZH	-	-	40975-2262	See fig. 3	-	-	40975-2266*	See fig. 5	40975-0021*	See fig. 6
							40975-2273		40975-0025	
MX	-	-	40975-1980	See fig. 3	-	-	40975-2267*	See fig. 5	40975-0022*	See fig. 6
							40975-2274		40975-0026	
MT	-	-	-	-	40975-0162	See fig. 4	-	-	-	-
BX Large	-	-	40975-0132	See fig. 3	40975-0176	See fig. 4	40975-0184*	See fig. 5	40975-0168*	See fig. 6
							40975-0185		40975-0169	
BX Small	-	-	40975-0131	See fig. 3	40975-0177	See fig. 4	40975-0236*	See fig. 5	40975-0170*	See fig. 6
							40975-0237		40975-0171	
BT Large	-	-	40975-0221	See fig. 3	-	-	-	-	-	-

**NOTE\*** Upper column: NPN specification  
Bottom column: PNP specification

Table 1-2 ZD/MD/CP Optional Harness List

	Optional valve/Sensor harness				Type D0
	Valve harness (8 channels)	Sensor harness (4 channels)	Sensor harness (12 channels)	Sensor harness (24 channels)	
ZD	NPN 50975-0129 PNP 50975-0160	NPN/PNP 50974-1132	NPN 50975-0384 50975-0383*	NPN 50975-0130 { 50975-0572 50975-0573*	40975-1978
			PNP 50975-0384 50975-0385*	PNP 50975-0132 { 50975-0572 50975-0574*	
MD			NPN 50975-0384 50975-0386*	NPN 50975-0131 { 50975-0572 50975-0575*	-
			PNP 50975-0384 50975-0398*	PNP 50975-0133 { 50975-0572 50975-0576*	
CP	NPN/PNP 50975-5487	-	NPN/PNP 50975-5486	-	40975-0342

**NOTE\*** To change the number of sensor channels, replace the existing sensor harness between 1JD/1JE board and wrist part with the one specified above.

For 4-/12-channel specifications, 24-channel specification, Type D0, see Figures 7, 8, 9 respectively.

Table 1-3 RS/Y/MC/MS/BA Optional Harness List

	Valve harness (8 channels)		Sensor harness (12 channels)		Type D0	
RS06/10/20	50974-2019	See fig. 10	50974-2020	See fig. 10	-	-
RS30/50/80	50975-0273	See fig. 10	50975-0274	See fig. 10	50975-0134	See fig. 12
RS15X	50975-0273	See fig. 10	50975-4298	See fig. 10	50975-4297	See fig. 12
YF	50975-0096 (inside) 50975-0221 (outside)	See fig. 10	50975-0220 (12 channels) 50975-0222 (2 channels)*	See fig. 10	-	-
RS05	(Standard equipment, 6 channels)	See fig. 10	50975-0093	See fig. 10	-	-
RS03	(Standard equipment, 4 channels)	See fig. 10	50975-2452	See fig. 11	-	-
YS	50975-4766	See fig. 10	50975-4767	See fig. 10	-	-
MC	50975-4733 (4 channels)	See fig. 10	50975-4732 (8 channels)	See fig. 10	-	-
MS	-	-	50975-5396 +50975-5395 (4 channels)	See fig. 10	-	-
BA	50975-4733 (4 channels)	See fig. 15	-	-	-	-

**NOTE\*\*** Harness for pressure switch, 2-channel input specification

For the connection with external devices, see Figure 1. Example of External Connection (p.13).



## 2.0 SIGNAL ASSIGNMENT

The solenoid valves are controlled via teach pendant clamp keys and output signals according to the following rules.

1. Eight (8) output signals, SIGNAL9 to SIGNAL16, are used. The wirings for these signals are fixed.
2. Refer to Table 2 for compatibility between clamp Nos.1 to 4 and output signals 9 to 16. In double solenoid valve, assign smaller output number to port A side.
3. Three-position double solenoid valve is considered as two pieces of single solenoid valves.
4. Refer to “Signal Setting” of “Arm ID Board Manual” (90210-1246DE\*) when changing signal assignment. For RS03, refer to Appendix 9. of “External I/O Manual” (90204-1023DE\*).

The following example demonstrates the above rules.

<Example of solenoid valve configuration>

2-position double solenoid valve (D) – 1 pc.  
Single solenoid valve (S) – 2 pcs.

<Signal assignment>

Coil	Clamp No.	Output signal
Port A on D	1	9
Port B on D	1	10
S1	2	11
S2	3	12

Table 2 Standard Clamp Settings at Factory Shipment (Output Signal Assignment Table)

Number of solenoids	Clamp 1- OFF	Clamp 1- ON	Clamp 2- OFF	Clamp 2- ON	Clamp 3- OFF	Clamp 3- ON	Clamp 4- OFF	Clamp 4- ON
Double 0, Single 1	-	9	-	-	-	-	-	-
Double 0, Single 2	-	9	-	10	-	-	-	-
Double 0, Single 3	-	9	-	10	-	11	-	-
Double 0, Single 4	-	9	-	10	-	11	-	12
Double 1, Single 0	10	9	-	-	-	-	-	-
Double 1, Single 1	10	9	-	11	-	-	-	-
Double 1, Single 2	10	9	-	11	-	12	-	-
Double 1, Single 3	10	9	-	11	-	12	-	13
Double 2, Single 0	10	9	12	11	-	-	-	-
Double 2, Single 1	10	9	12	11	-	13	-	-
Double 2, Single 2	10	9	12	11	-	13	-	14
Double 3, Single 0	10	9	12	11	14	13	-	-
Double 3, Single 1	10	9	12	11	14	13	-	15
Double 4, Single 0	10	9	12	11	14	13	16	15

### **3.0 Z, M AND B SERIES ROBOTS**

For Z, M and B series robots, following optional harnesses are available:

- Type B0 (Figure 2, Connect between terminal block box of upper arm and X6A connector of robot base, and connect controllable output signal line from robot controller at 8-channel terminal block)
- Type C0 (Figure 3, Connect between terminal block box of upper arm and X6A connector of robot base)
- Type D0 (Figure 4, Connect between X121 connector of upper arm and X6A connector of robot base)
- Type E0 (Figure 5, Connect controllable input/output signal line from robot controller at terminal block)
- Type H0 (Figure 6, Connect controllable input/output signal line from robot controller at connector)

For type H0, the type of connector to be connected is mentioned. Accordingly, it is possible to manufacture the harness by yourself.

#### 4.0 ZD AND MD SERIES ROBOTS

For ZD and MD series robots, following optional harnesses are available:

1. Valve/Sensor harnesses (Figure 7: 4-/12-sensor channel specifications, Figure 8: 24-sensor channel specification, Receives/Supplies input/output to/from controller from/to wrist part)
2. Type D0 (Figure 9, Connects between X121 connector of upper arm and X6A connector of robot base)

For type D0, install a terminal box on the hand and connect with X121. In ZD series robots, a cable is attached to the X121 connector for connection with the terminal box on the hand.

	Input	Output	Location to which optional harness is connected
Valve/Sensor harness (4 sensor channels)	4 channels	8 channels	Arm wrist part
Valve/Sensor harness (12 sensor channels)	12 channels *	8 channels	
Valve/Sensor harness (24 sensor channels)	24 channels **	8 channels	
Type D0	37 channels in base part connector X6A		Upper arm X121 connector

**NOTE\*** 12-sensor channel specification

The standard sensor harness(between 1PV+1JD/1JE board and the wrist section) is for 4-channel specification. It is possible to change to 12-channel specification by replacing the sensor harness with the one for 12-sensor channel specification.

**NOTE\*\*** 24-sensor channel specification

As in 12-channel specification, replace the sensor harness in the following procedures for 24-channel specification. Disconnect relay connector XJD/JE-CN3 and connect the optional sensor harness for 24-channel specification to CN3 of 1JD board (NPN spec.) or 1JE board (PNP spec.). Then, connect the relay connector with the existing connector XJD-CN3/XJE-CN3.

## 5.0 CP SERIES ROBOTS

For CP series robots, following optional harnesses are available:

1. Valve/Sensor harness (Figure 13: Receives/Supplies input/output to/from controller from/to wrist part)
2. Type D0 (Figure 14: Wires a cable from X6A connector of robot base up to wrist part)

	Input	Output	Location to which optional harness is connected
Valve/Sensor harness (12 sensor channels)	12 channels	8 channels	Arm wrist part
Type D0	37 channels in base part connector X6A		

## **6.0 RS, Y, MC, MS AND BA SERIES ROBOTS**

For RS, Y, MC, MS and BA series robots, following optional harnesses are available:

- RS05/06/10/20/30/50/80/Y/MC/MS

Valve and sensor harnesses (Figure 10)

- RS03

Valve and sensor harnesses (Figure 11)

- Type D0 (Figure 12, Cable which is connected to X6A connector of robot base and which comes out from upper arm, RS30/50/80/15X only)

- BA

Valve harness (Figure 15)

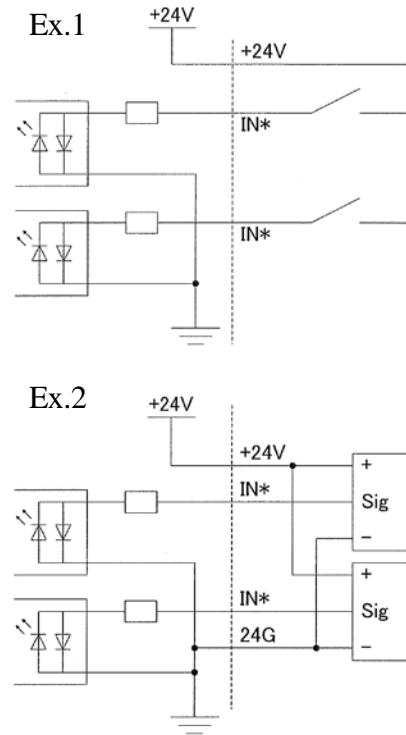
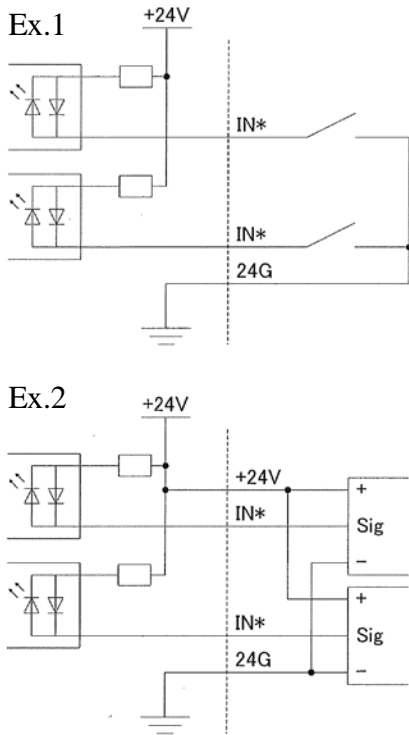
**FIGURE 1 EXAMPLES OF EXTERNAL CONNECTIONS**

Figure 1-1 Sample connection for  
NPN, SINK specification

Figure 1-2 Sample connection for  
PNP, SOURCE specification

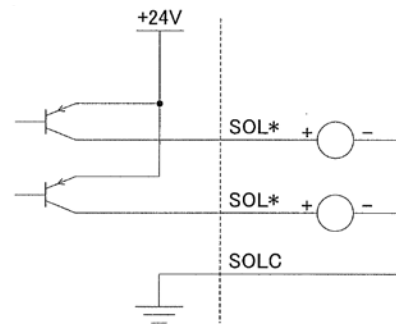
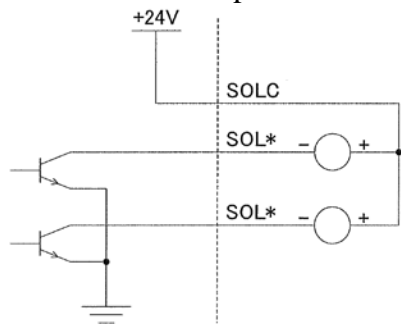
(1) Sensor input

(1) Sensor input



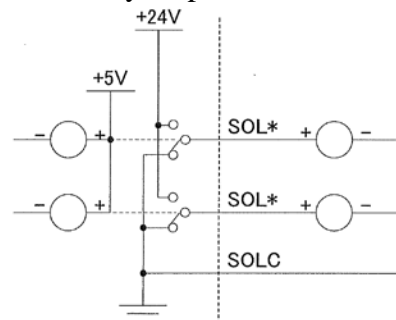
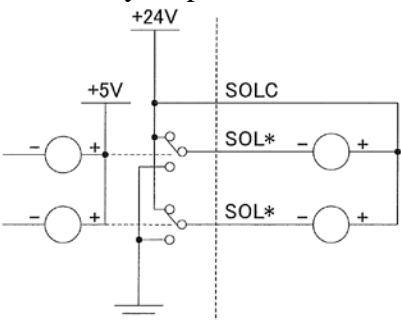
(2) Solenoid valve output  
Ex.: Transistor output

(2) Solenoid valve output  
Ex.: Transistor output



Ex.: Relay output

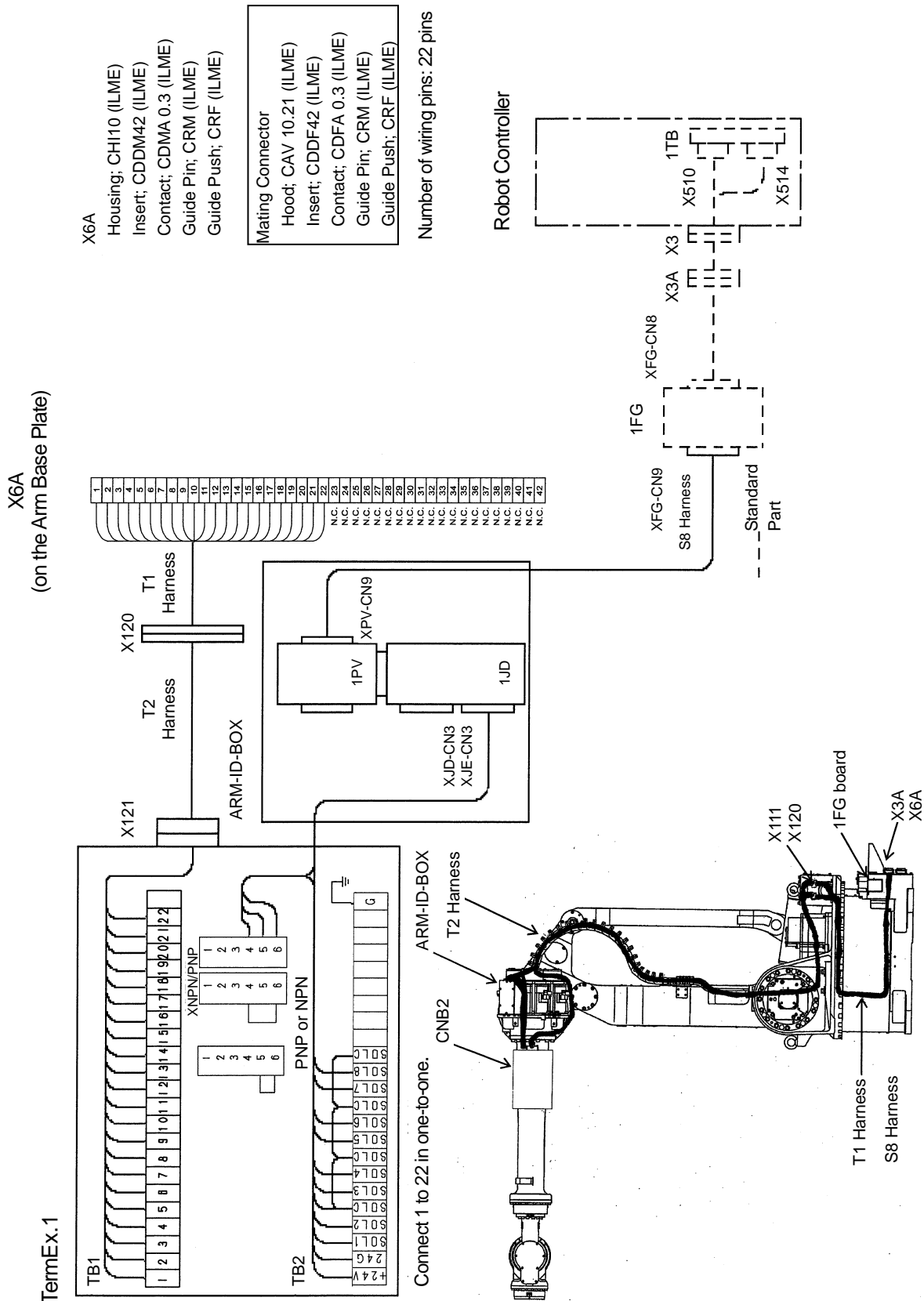
Ex.: Relay output



Input specifications	Output specifications
Method of input: Photo coupler input	Method of output: Transistor output (RS03: Relay output)
Input voltage: DC24 V $\pm$ 10 %	Voltage used: DC24 V $\pm$ 10 %
Input current: 10 mA $\pm$ 20 % per input	Maximum continuous load current: 100 mA or less per output
Method of connection: via connectors (RS03: via Faston)	Method of connection: via connectors
Total current: 700 mA or less, 400 mA or less for E7x controller without external axis*	

**NOTE\*** For E7x controller with external axis, the maximum current is limited by the total brake current of motor. Refer to “External Axis Addition Manual” for the limit.

FIGURE 2 OPTIONAL HARNESS - TYPE B0

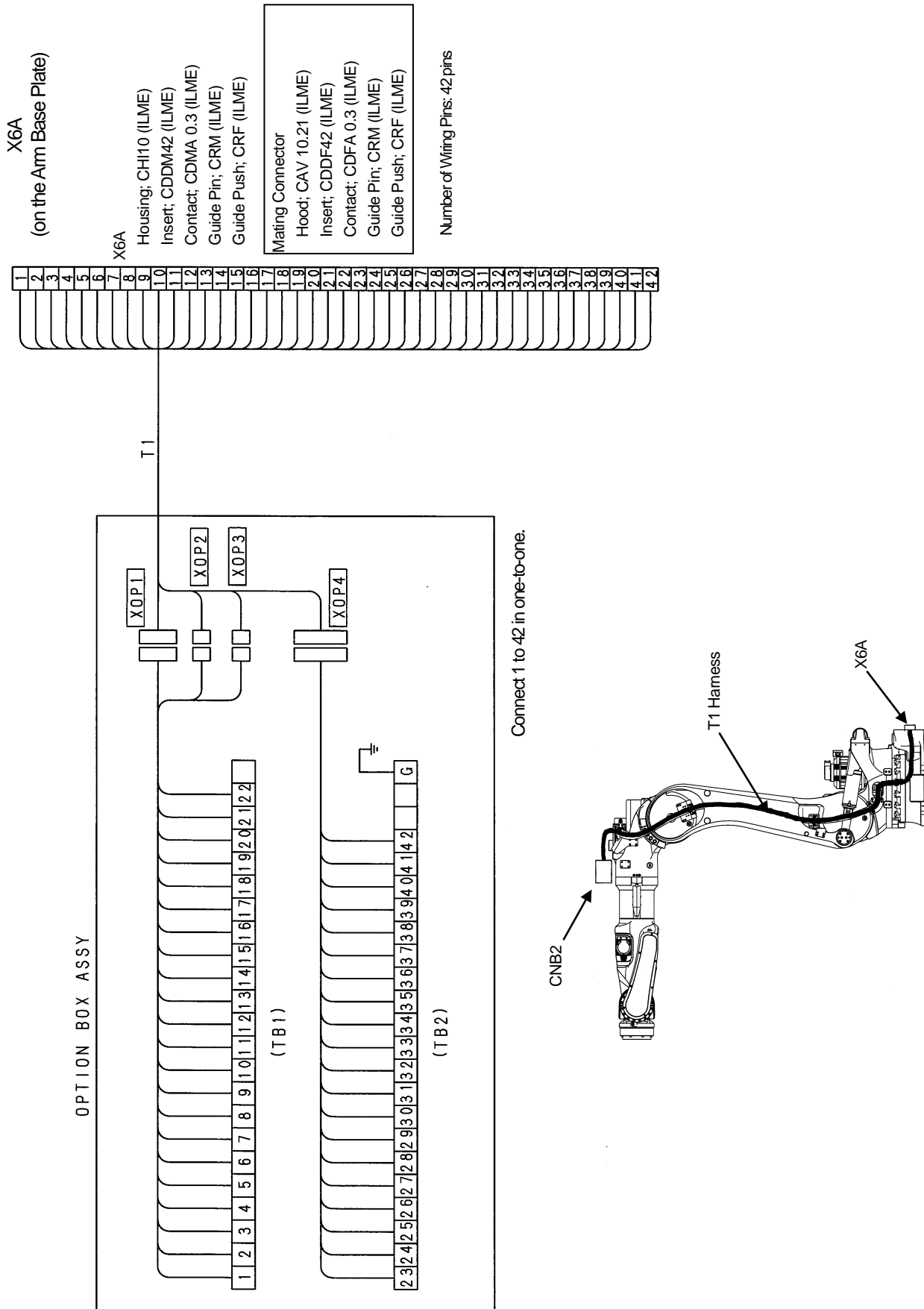


**NOTE** There are eight (8)  $\phi 22$  -openings of at the bottom of the terminal box on the arm.





FIGURE 3-2 For BX/BT

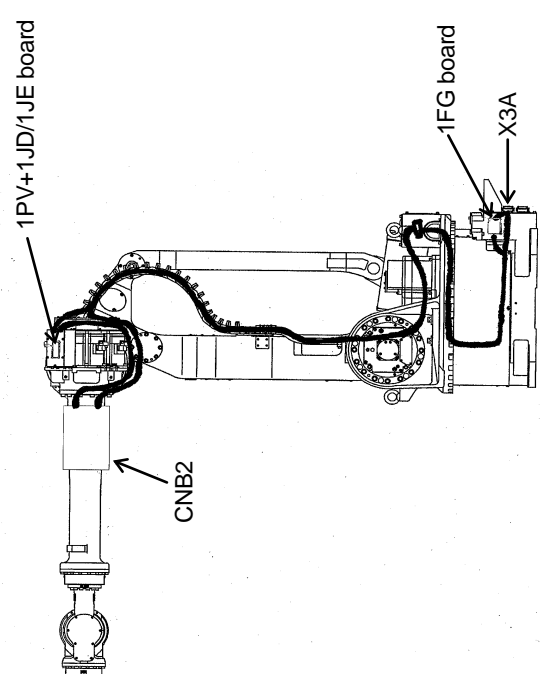
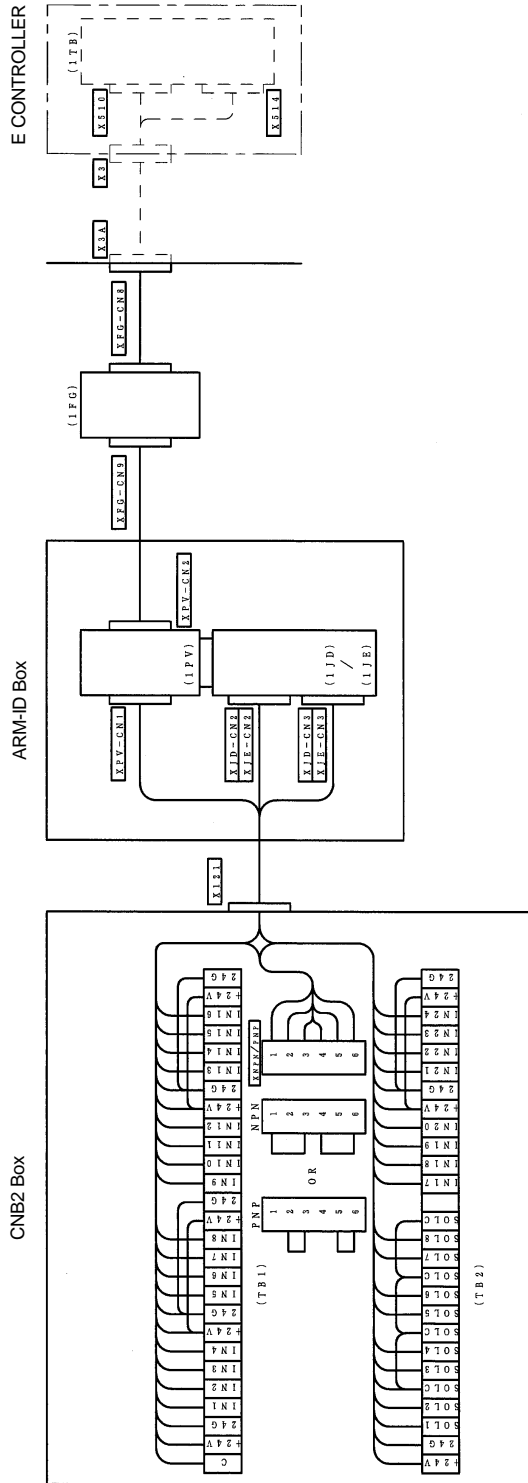


**NOTE** There are eight (8)  $\phi 22$  -openings of at the bottom of the terminal box on the arm.



**FIGURE 5 OPTIONAL HARNESS - TYPE E0**

FIGURE 5-1 For ZX/ZT/ZTX/ZH/MX, same in both NPN/PNP



**Note** For connection with external devices in NPN and PNP specifications, see p.13 Example of External Connections.

**NOTE** There are eight (8)  $\phi 22$  -openings of at the bottom of the terminal box on the arm.



**FIGURE 6 OPTIONAL HARNESS - TYPE H0**

FIGURE 6-1 SCHEMATIC DIAGRAM For ZX/ZT/ZTX//ZH/MX/MT, same in both NPN/PNP

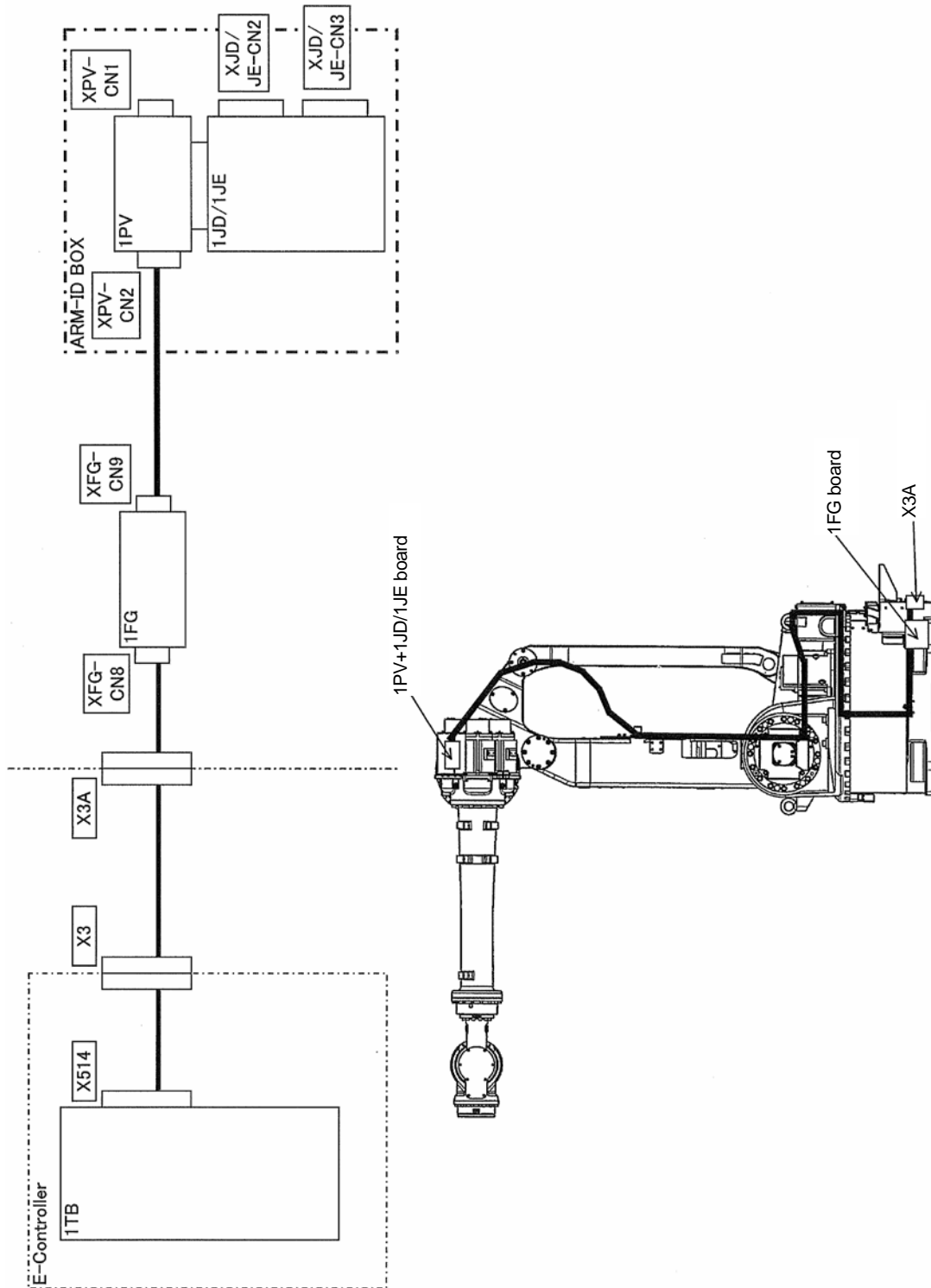


FIGURE 6-2 SCHEMATIC DIAGRAM For BX, same in both NPN/PNP

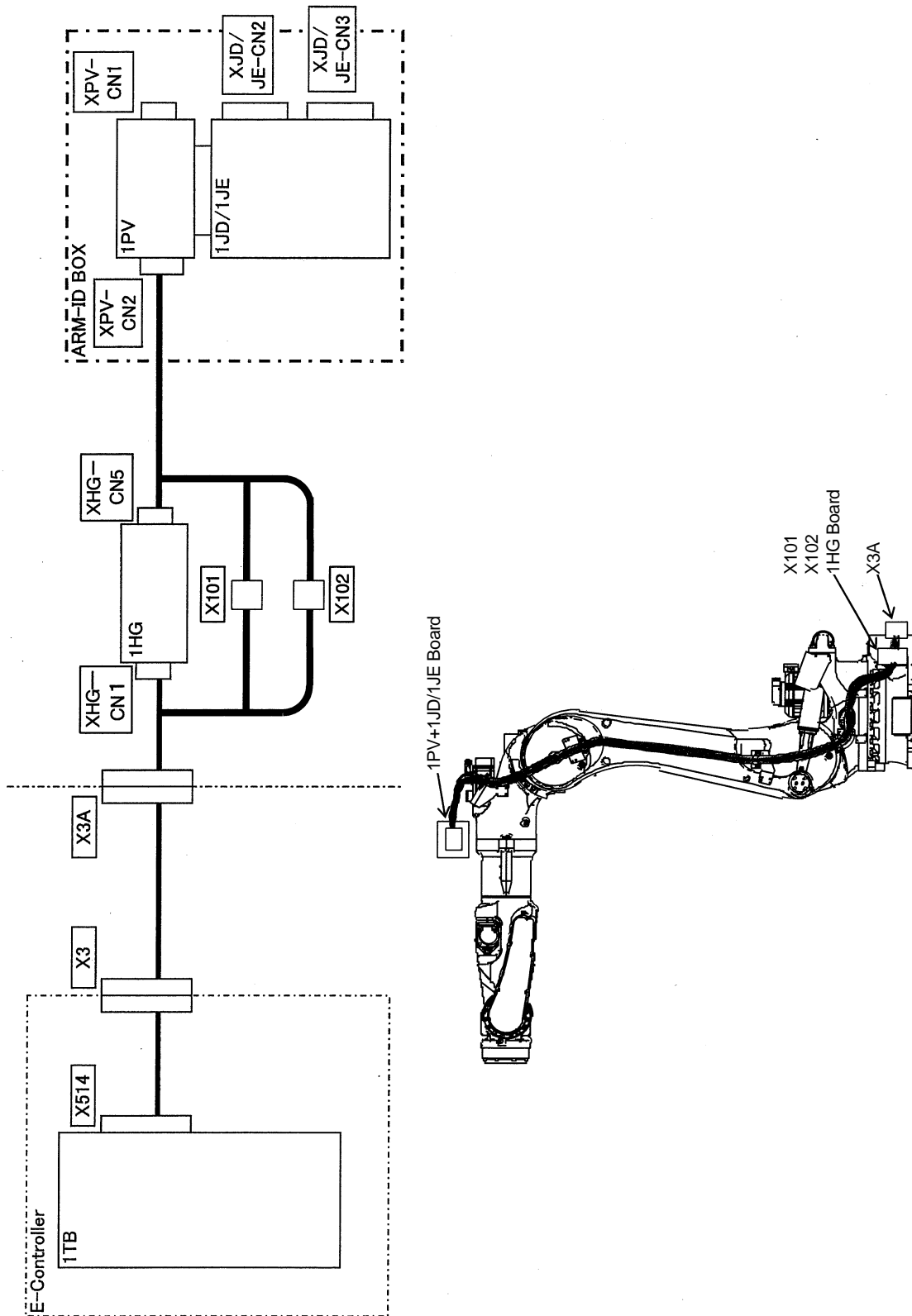
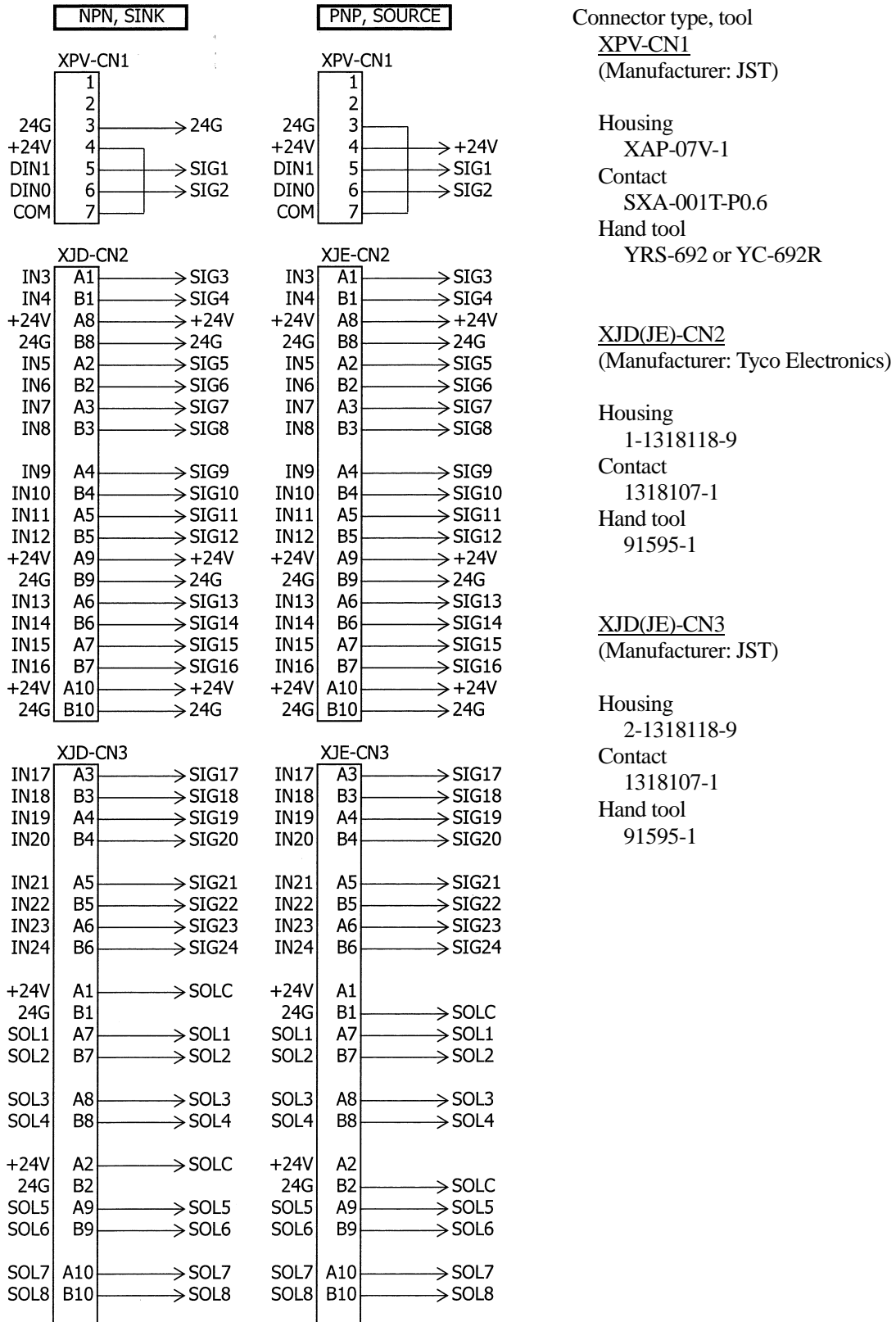


FIGURE 6-3 WIRING DIAGRAM - TYPE H0, CONNECTOR TYPE



**NOTE\*** For connection with external devices, see Figure 1. Example of External Connections (p.13).



**FIGURE 7 OPTIONAL HARNESS - ZD/MD, 4/12 SENSOR CHANNELS**

FIGURE 7-1 SCHEMATIC DRAWING, SAME IN BOTH NPN/PNP

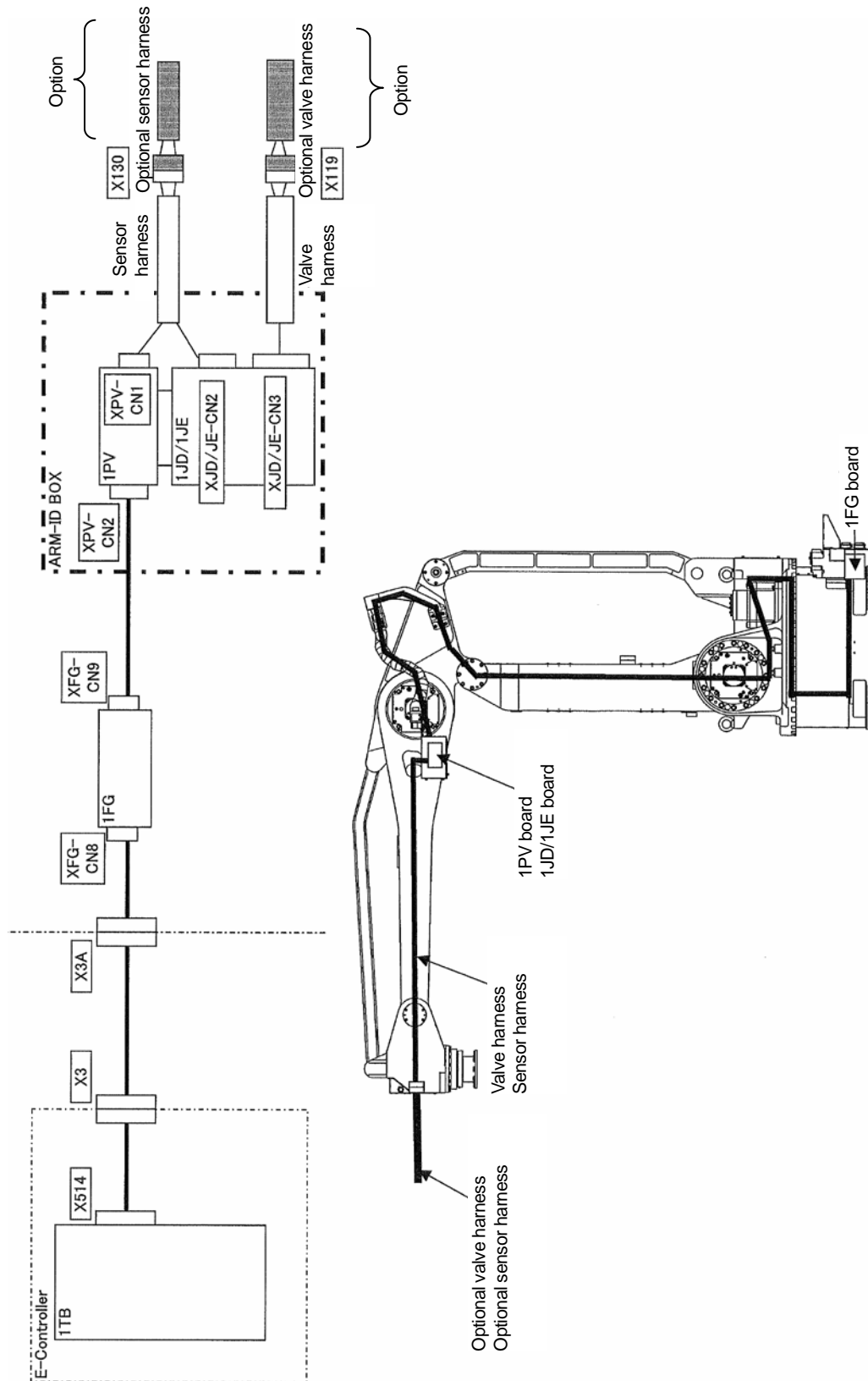
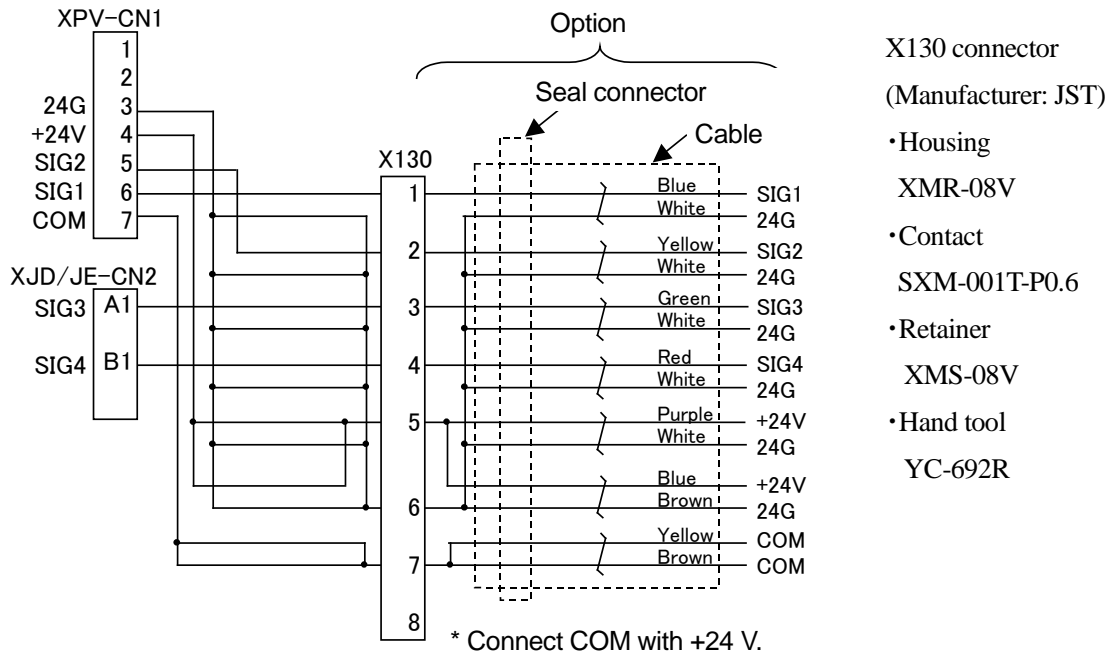
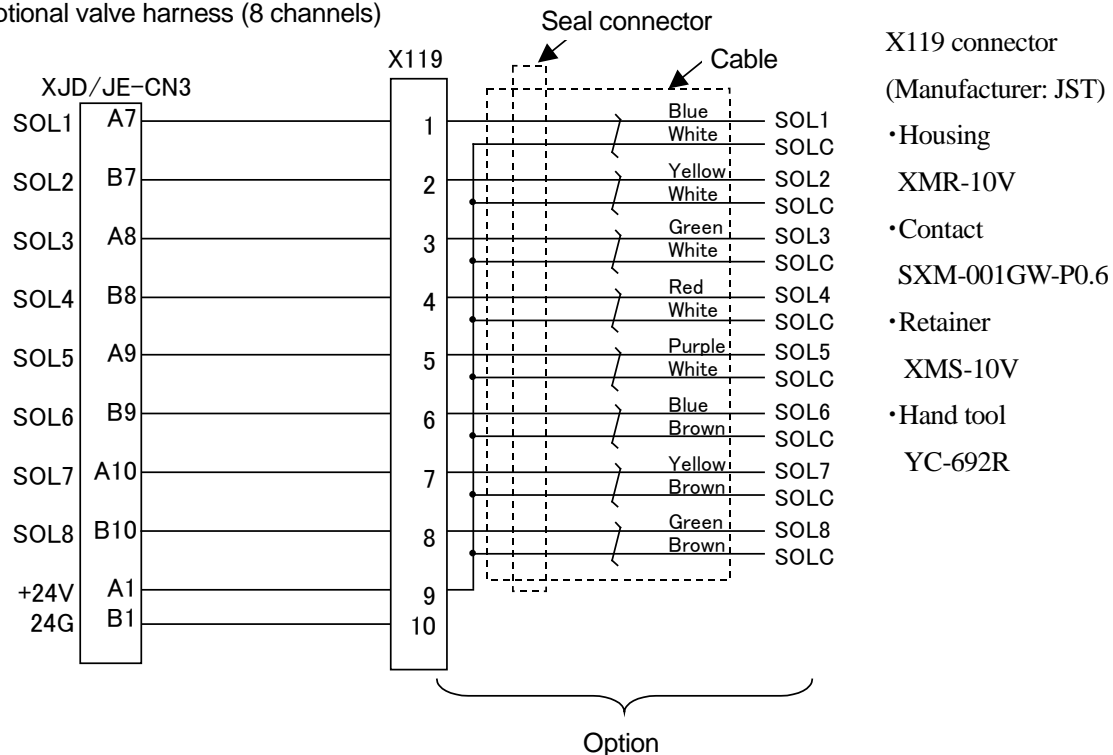


FIGURE 7-2 WIRING DIAGRAM - ZD/MD, 4 SENSOR CHANNELS, NPN

Optional sensor harness (4 channels)

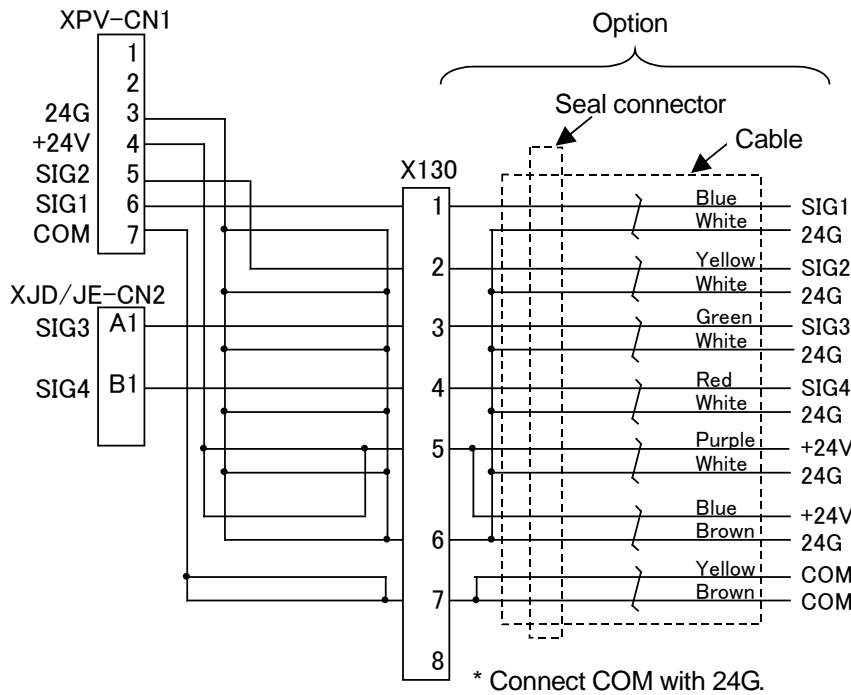


Optional valve harness (8 channels)

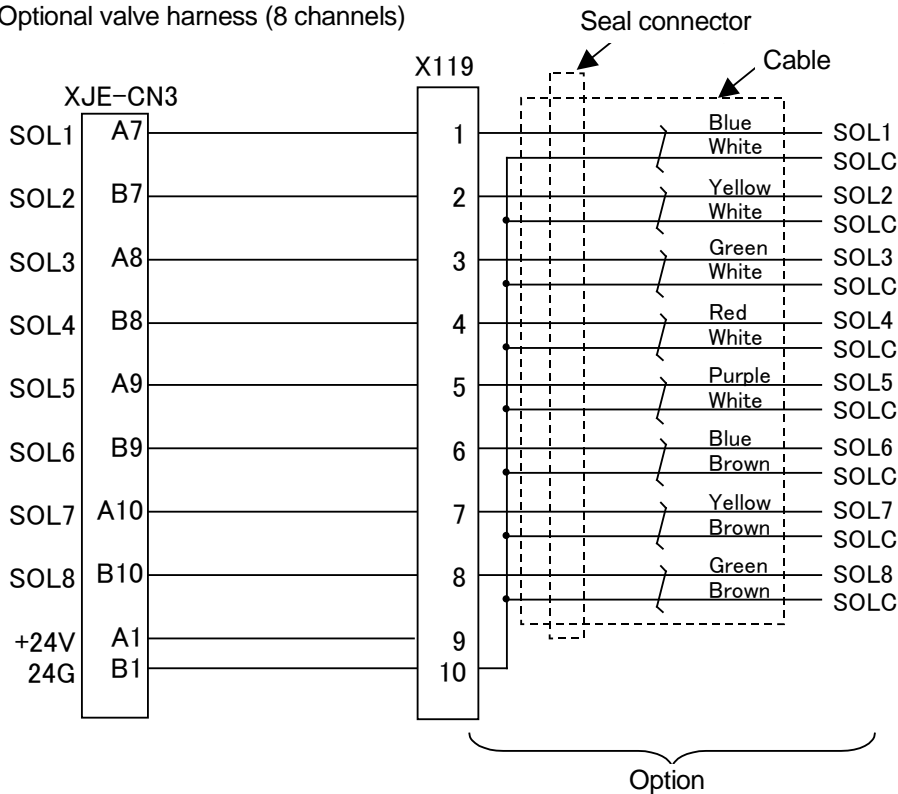


**NOTE** For the connection with external devices, see Figure 1. Example of External Connection (p.13).

FIGURE 7-3 WIRING DIAGRAM - ZD/MD, 4 SENSOR CHANNELS, PNP  
 Optional sensor harness (4 channels)

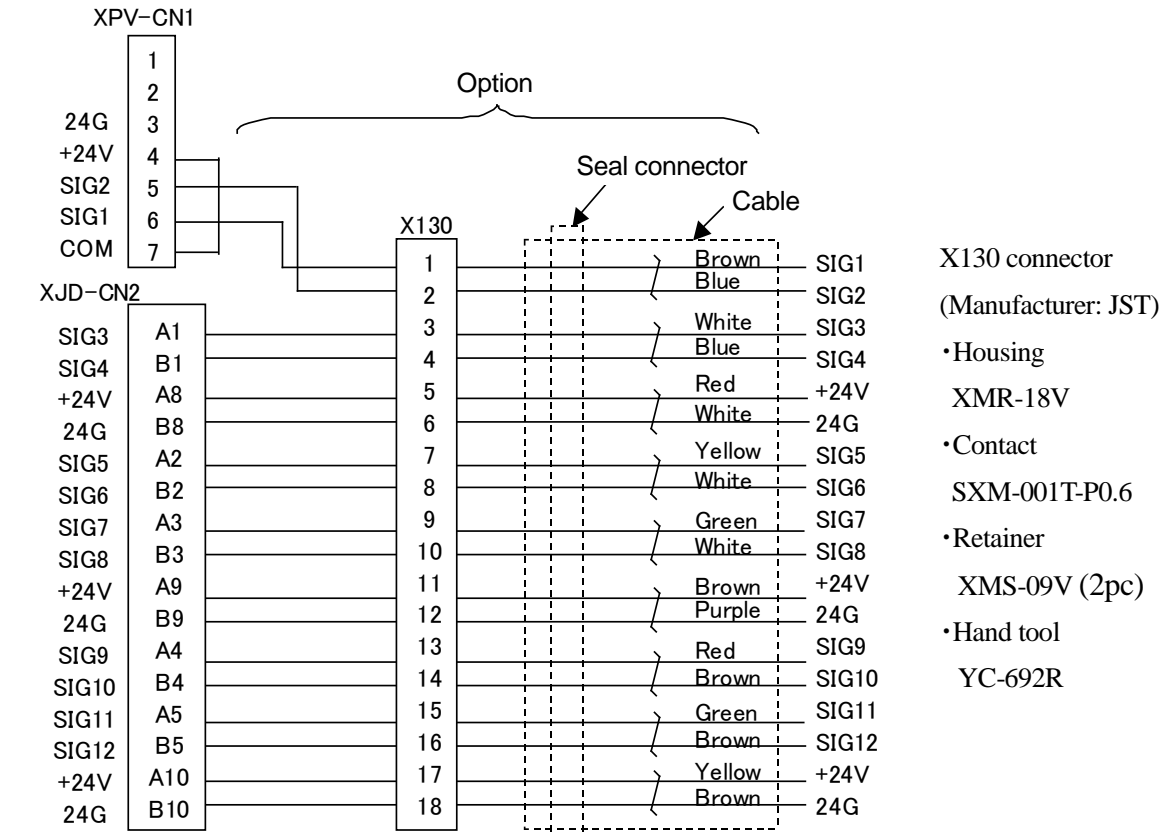


Optional valve harness (8 channels)

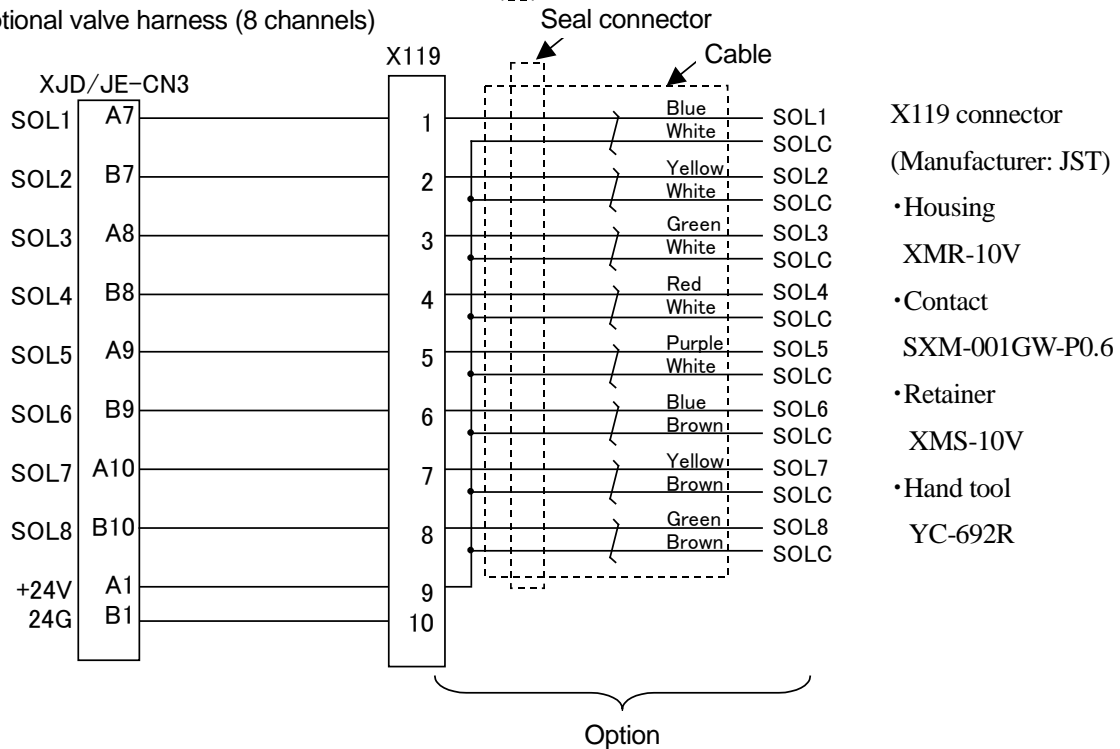


**NOTE** For the connection with external devices, see Figure 1. Example of External Connection (p.13).

FIGURE 7-4 WIRING DIAGRAM - ZD/MD, 12 SENSOR CHANNELS, NPN  
 Optional sensor harness (12 channels)

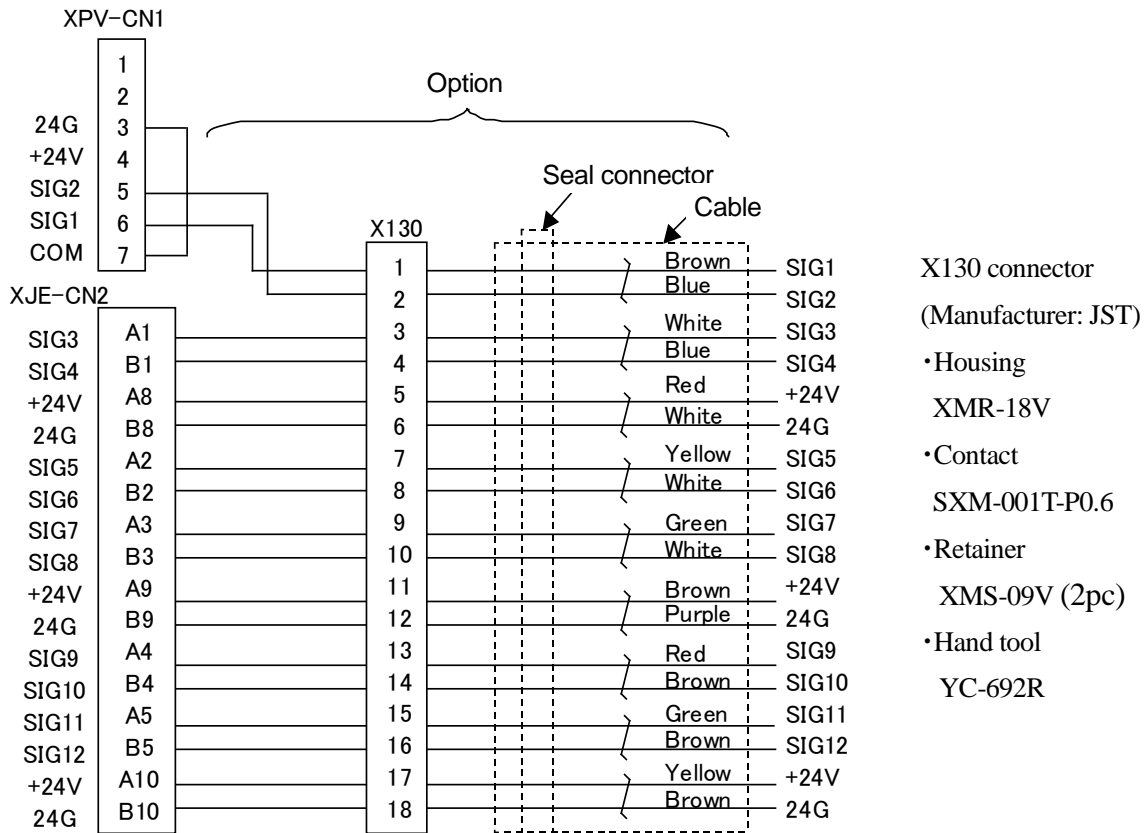


Optional valve harness (8 channels)

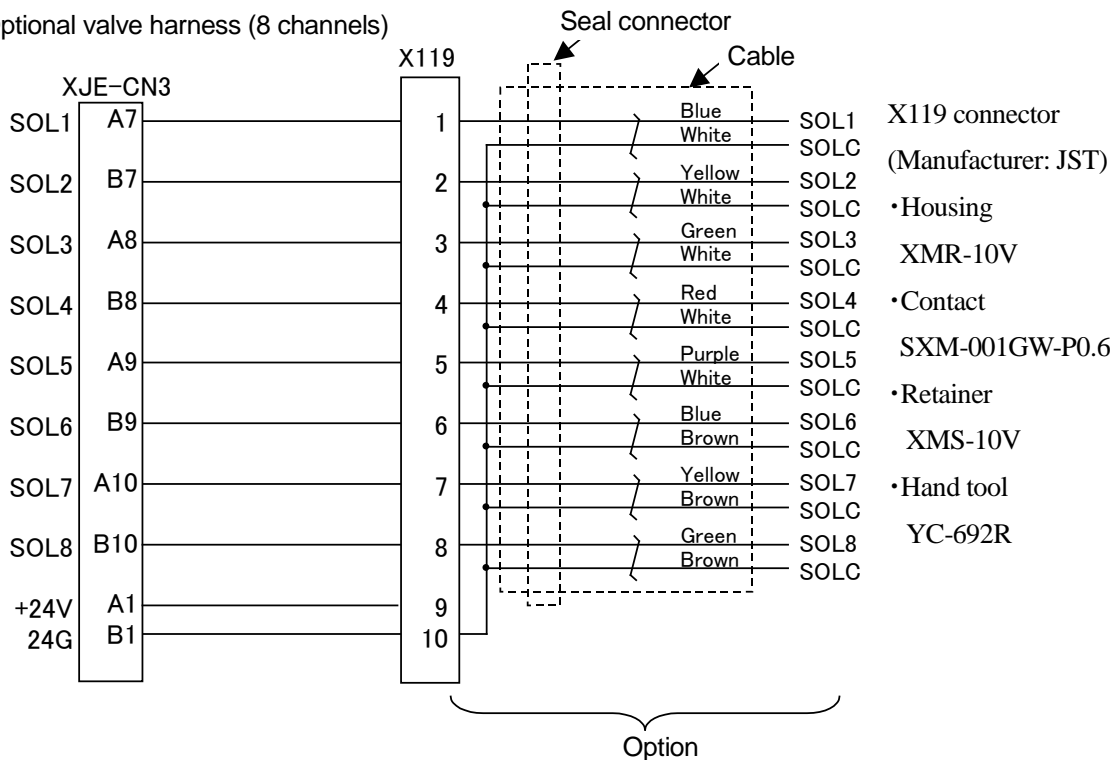


**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

FIGURE 7-5 WIRING DIAGRAM - ZD/MD, 12 SENSOR CHANNELS, PNP  
 Optional sensor harness (12 channels)



Optional valve harness (8 channels)



**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

**FIGURE 8 OPTIONAL HARNESS - ZD/MD, 24 SENSOR CHANNELS**

FIGURE 8-1 SCHEMATIC DIAGRAM - ZD/MD, 24 SENSOR CHANNELS, SAME IN NPN/PNP

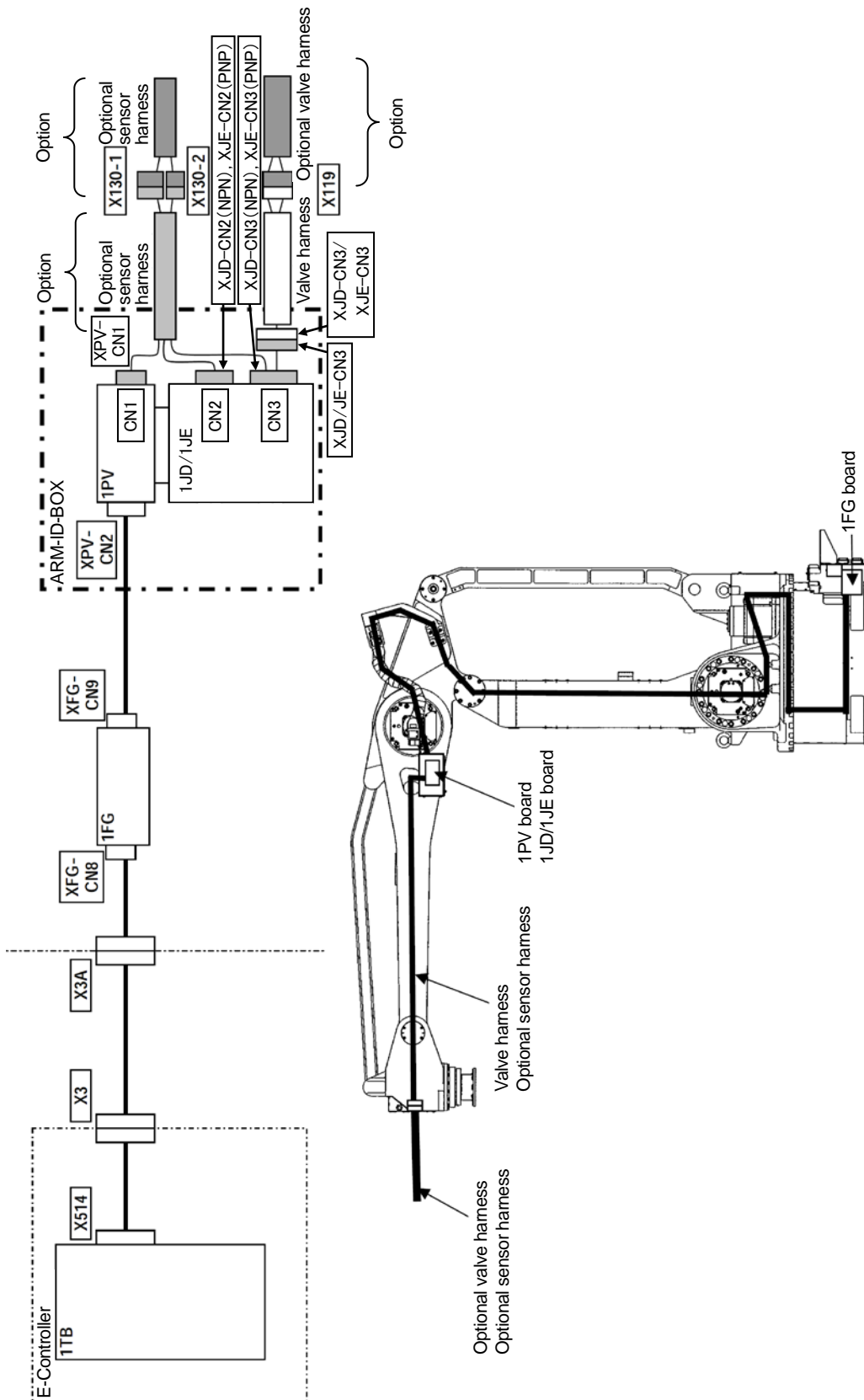
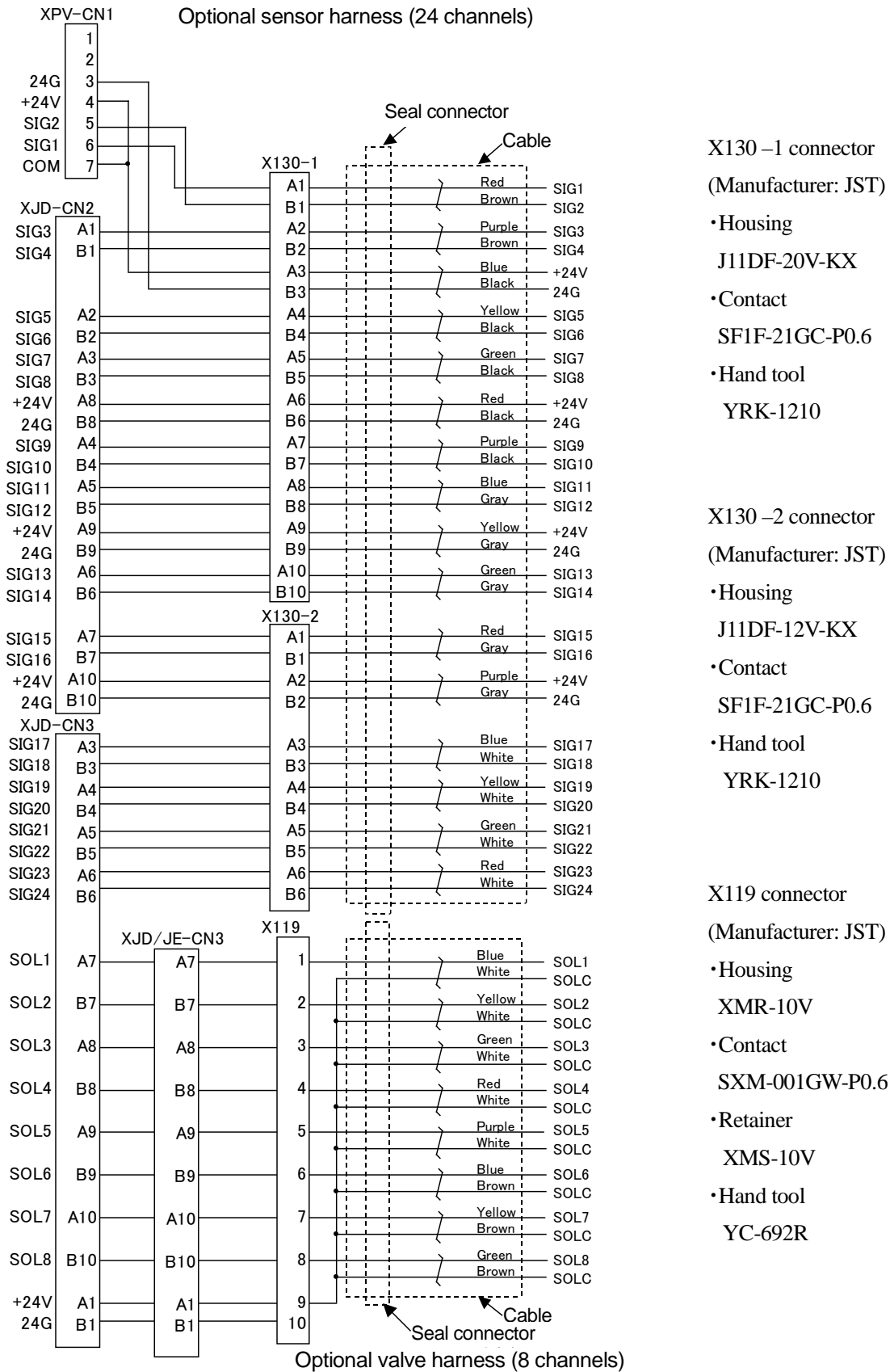


FIGURE 8-2 WIRING DIAGRAM - ZD/MD, 24 SENSOR CHANNELS, NPN



X130-1 connector  
(Manufacturer: JST)

- Housing  
J11DF-20V-KX
- Contact  
SF1F-21GC-P0.6
- Hand tool  
YRK-1210

X130-2 connector  
(Manufacturer: JST)

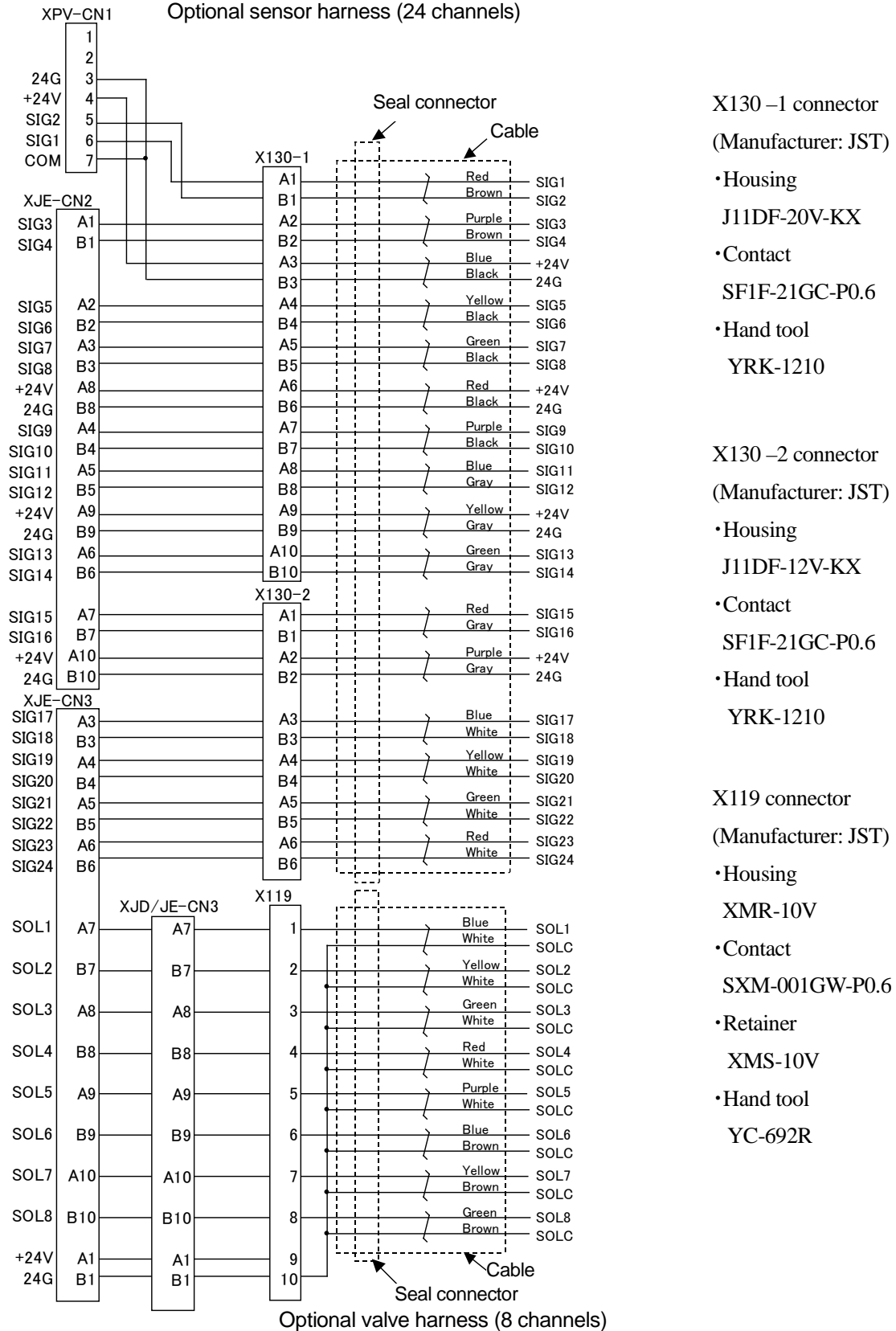
- Housing  
J11DF-12V-KX
- Contact  
SF1F-21GC-P0.6
- Hand tool  
YRK-1210

X119 connector  
(Manufacturer: JST)

- Housing  
XMR-10V
- Contact  
SXM-001GW-P0.6
- Retainer  
XMS-10V
- Hand tool  
YC-692R

**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

FIGURE 8-3 WIRING DIAGRAM - ZD/MD, 24 SENSOR CHANNELS, PNP  
Optional sensor harness (24 channels)



**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).



**FIGURE 9 OPTIONAL HARNESS - TYPE D0 (ZD)**

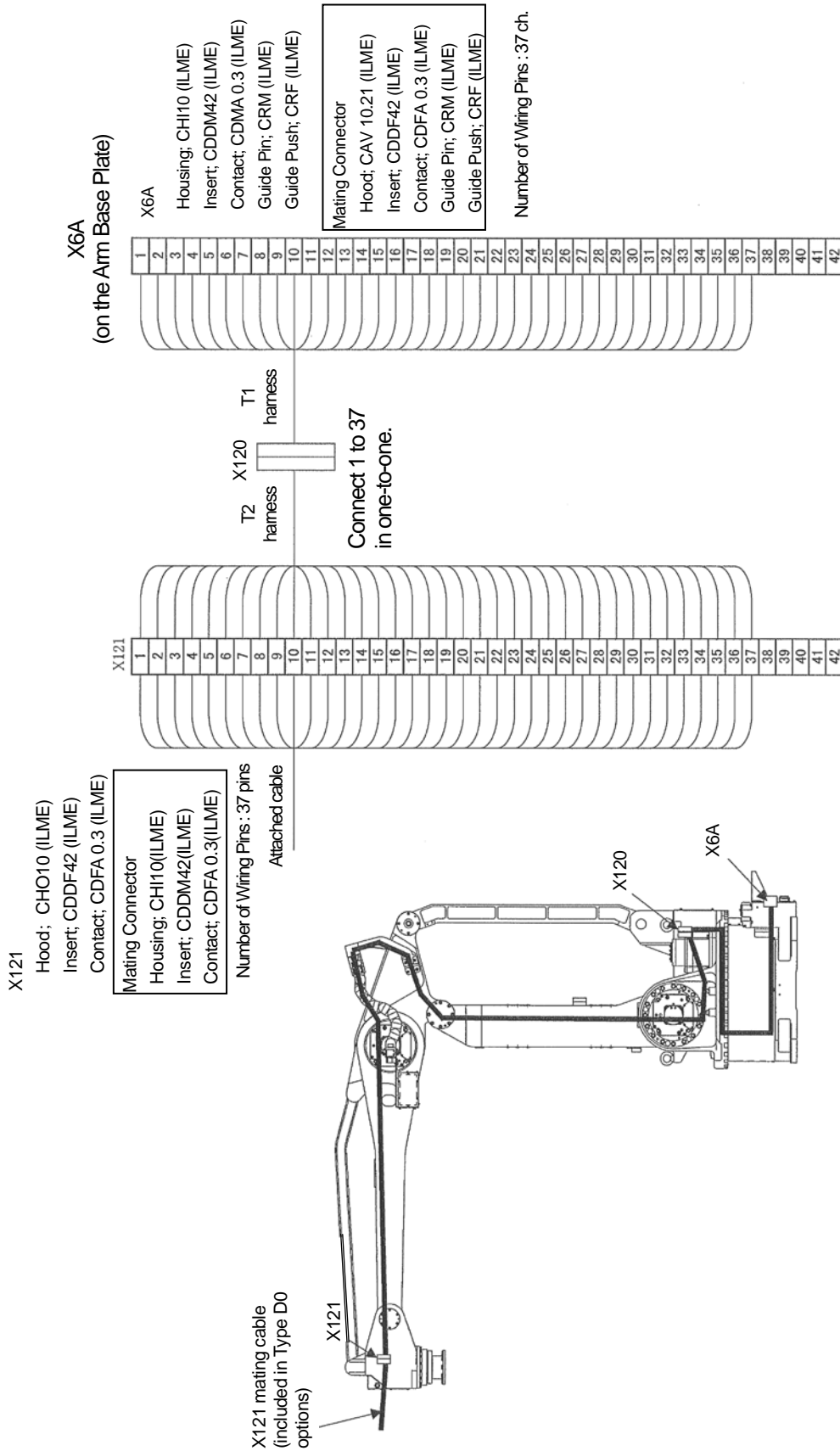
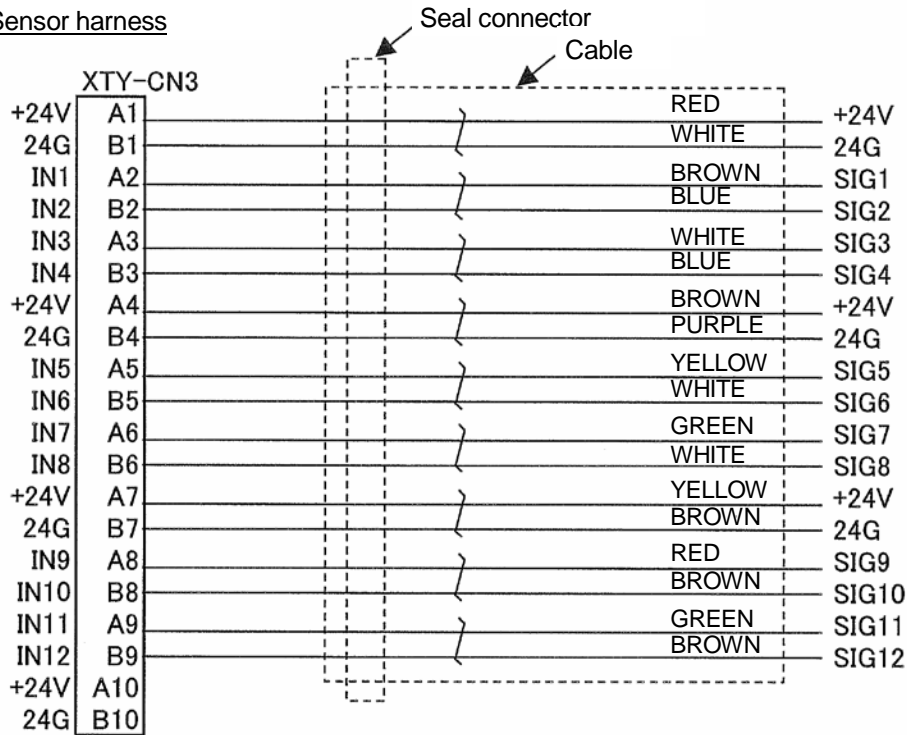


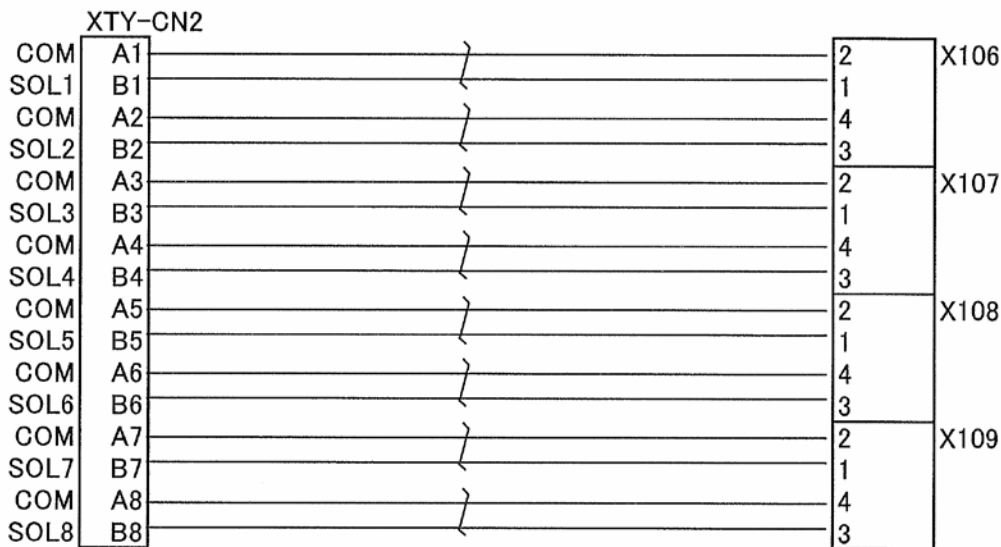


FIGURE 10-2 WIRING DIAGRAM - RS06/10/20/30/50/80/15X/Y,  
 SAME IN BOTH NPN/PNP

Sensor harness



Valve harness

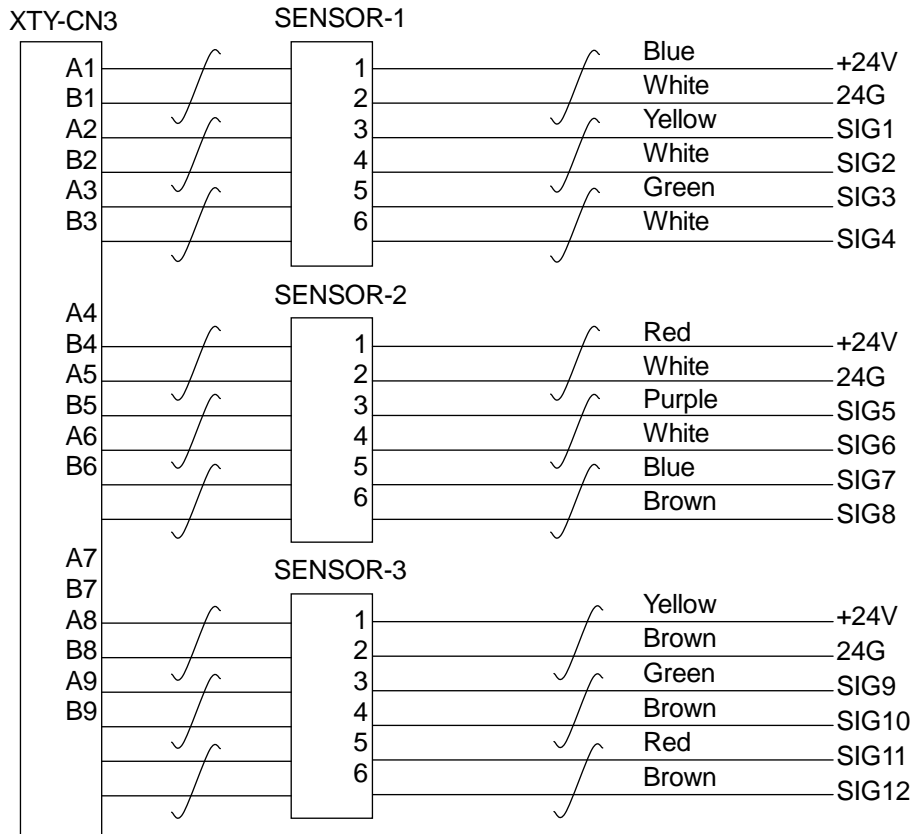


There are two types of 1TY board: for NPN (SINK) and for PNP (SOURCE). Same type of harness is used for both.

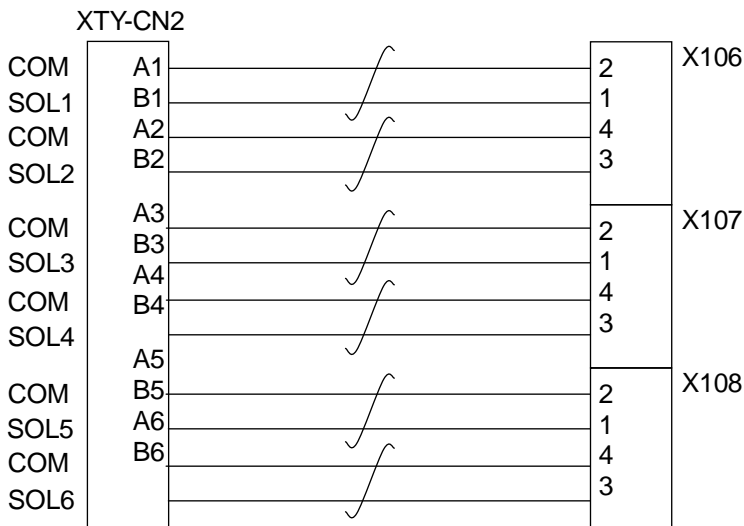
**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

FIGURE 10-3 WIRING DIAGRAM - RS05, SAME IN BOTH NPN/PNP

Sensor harness



Valve harness

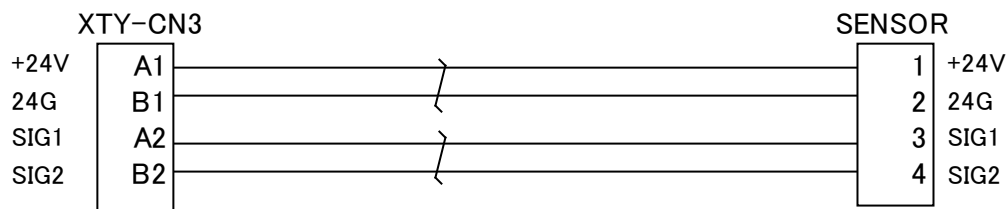


There are two types of 1TY board: for NPN (SINK) and for PNP (SOURCE). Same type of harness is used for both.

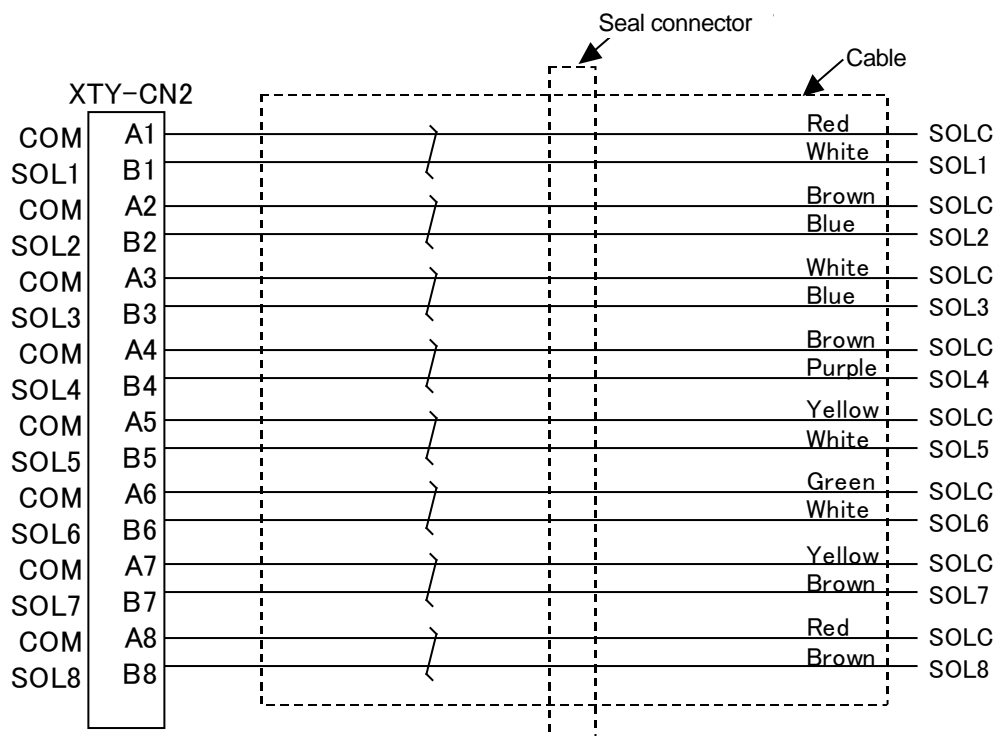
**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

FIGURE 10-4 WIRING DIAGRAM - Y, HARNESS FOR PRESSURE SWITCH, VALVE HARNESS FOR OUTSIDE INSTALLATION

Harness for pressure switch



Valve harness for outside installation

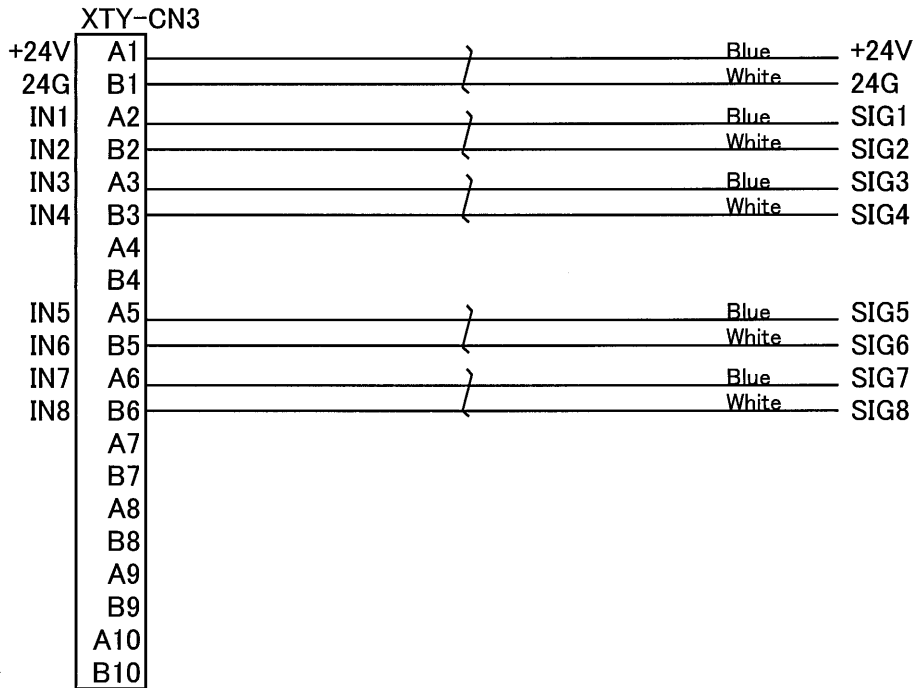


There are two types of 1TY board: for NPN (SINK) and for PNP (SOURCE). Same type of harness is used for both.

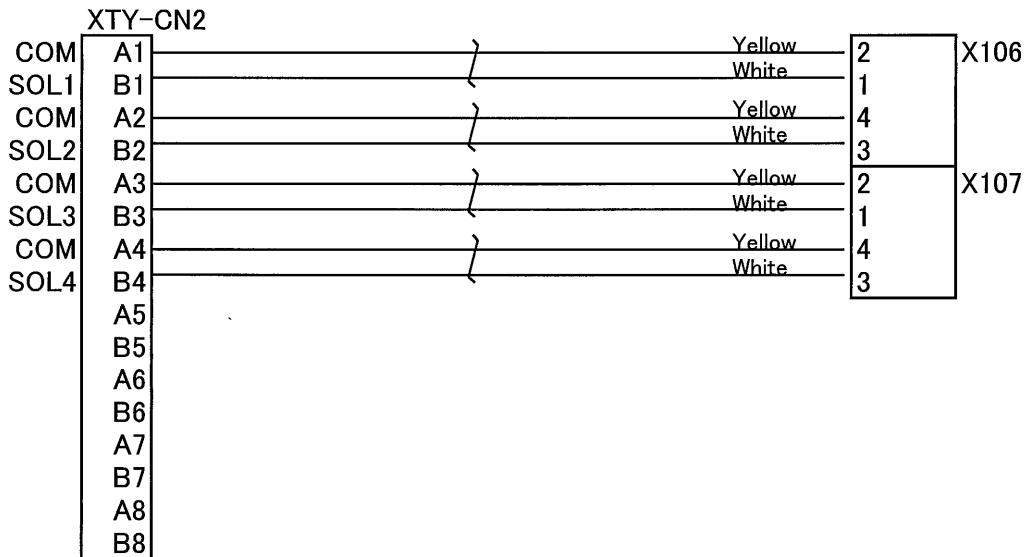
**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

FIGURE 10-5 WIRING DIAGRAM – MC

Sensor harness



Valve harness

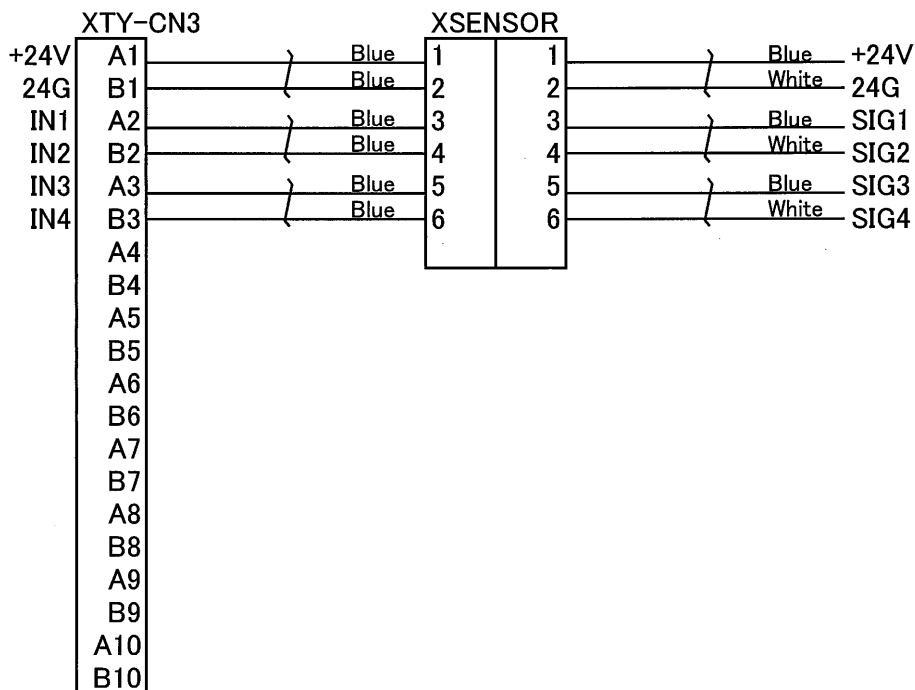


There are two types of 1TY board: for NPN (SINK) and for PNP (SOURCE). Same type of harness is used for both.

**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

FIGURE 10-6 WIRING DIAGRAM – MS

Sensor harness

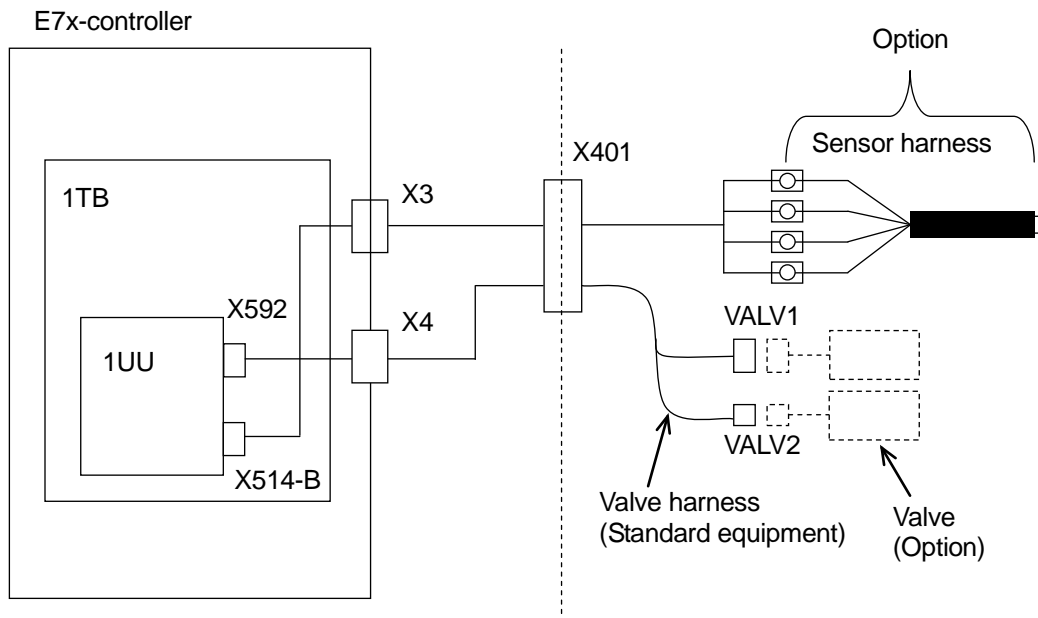


There are two types of 1TY board: for NPN (SINK) and for PNP (SOURCE). Same type of harness is used for both.

**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

**FIGURE 11 OPTIONAL HARNESS - RS03**

FIGURE 11-1 SCHEMATIC DIAGRAM - RS03



Two types of 1UU board: for NPN (SINK) and for PNP (SOURCE) can be set. Refer to “External I/O Manual” for details of the setting. Same type of harness is used for both.

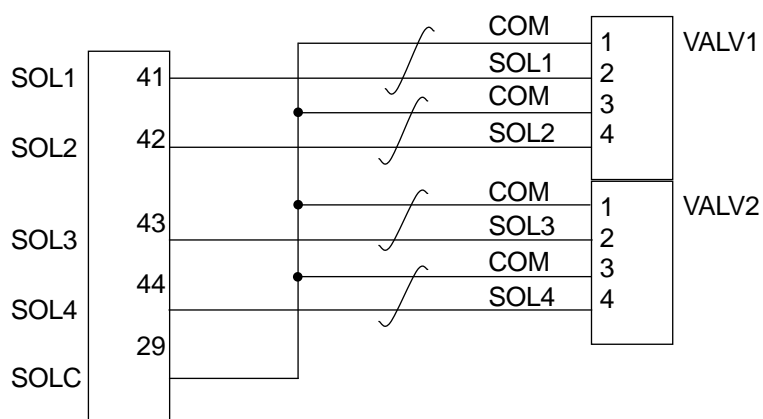


FIGURE 11-2 WIRING DIAGRAM - RS03

Sensor harness

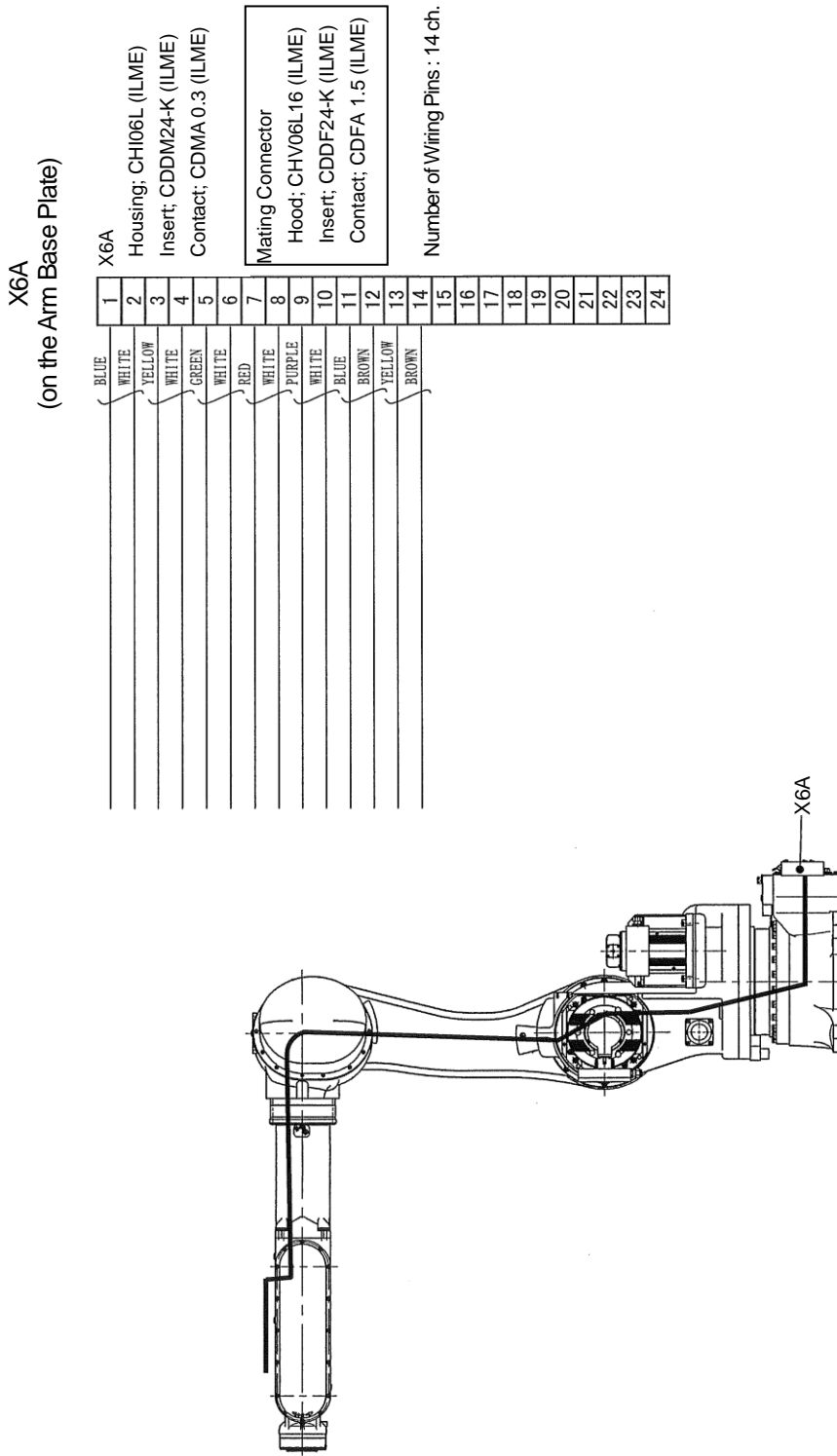


Valve harness



**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

**FIGURE 12 OPTIONAL HARNESS - TYPE D0 (RS50/80/15X)**



**FIGURE 13 OPTIONAL HARNESS - CP**

FIGURE 13-1 SCHEMATIC DIAGRAM, SAME IN BOTH NPN/PNP

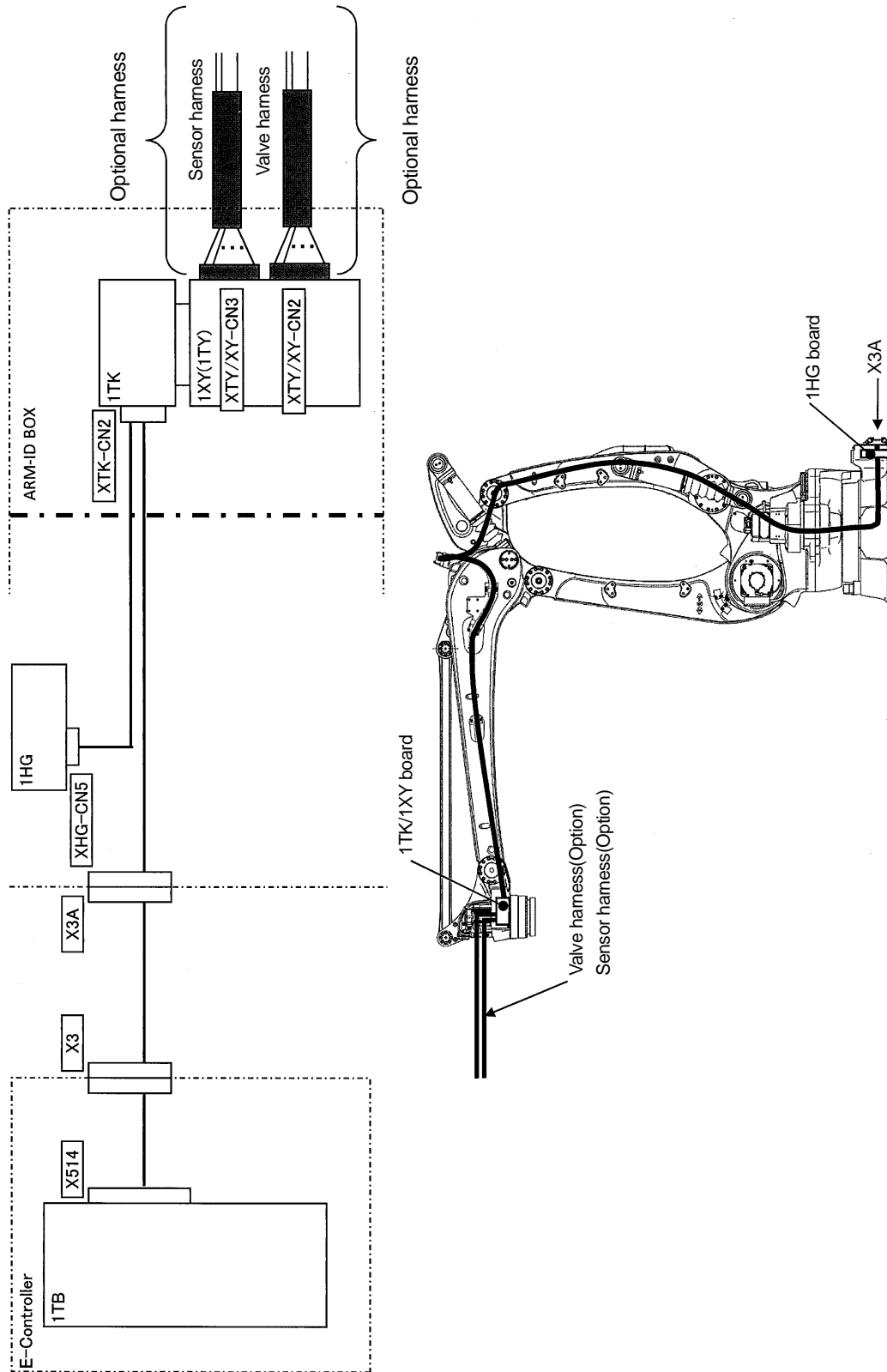
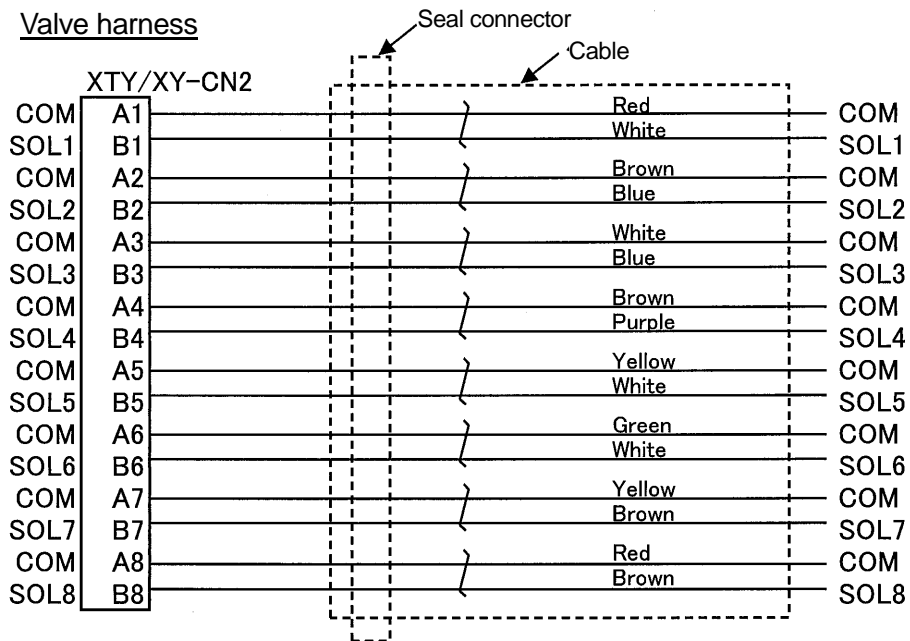
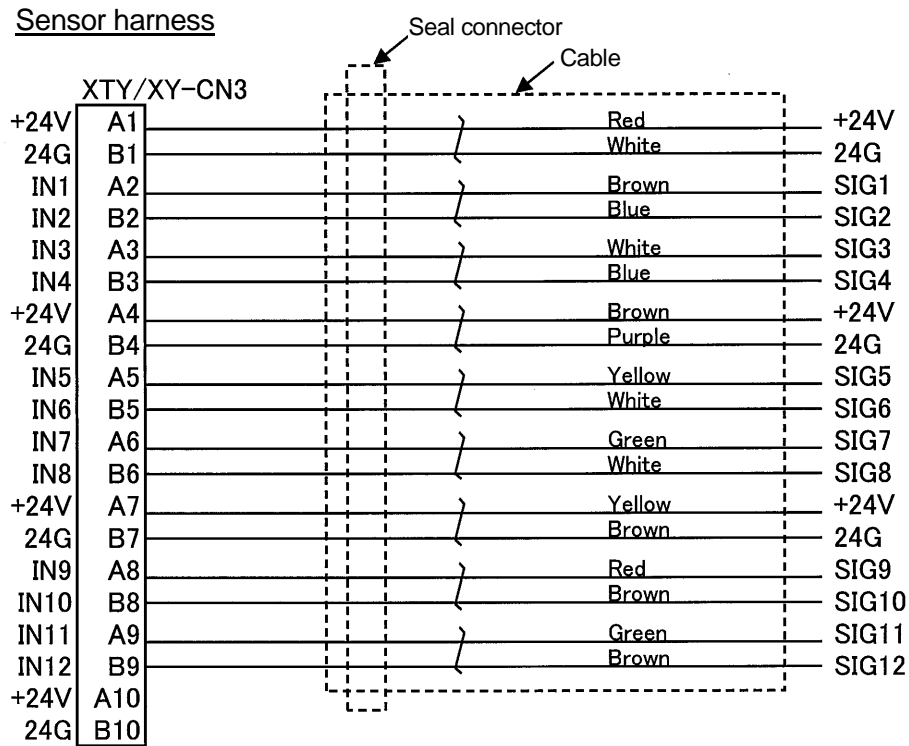


FIGURE 13-2 WIRING DIAGRAM - CP, SAME IN BOTH NPN/PNP



There are two types of 1TY board: for NPN (SINK) and for PNP (SOURCE). Same type of harness is used for both.

For 1XY board, NPN (SINK) and PNP (SOURCE) are switched with a switching connector.

**NOTE** For NPN (SINK), connect a switching connector to CN5 on 1XY board.

For PNP (SOURCE), connect a switching connector to CN4 on 1XY board.

Same type of harness is used for both.

**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).

**FIGURE 14 OPTIONAL HARNESS - TYPE D0 (CP)**

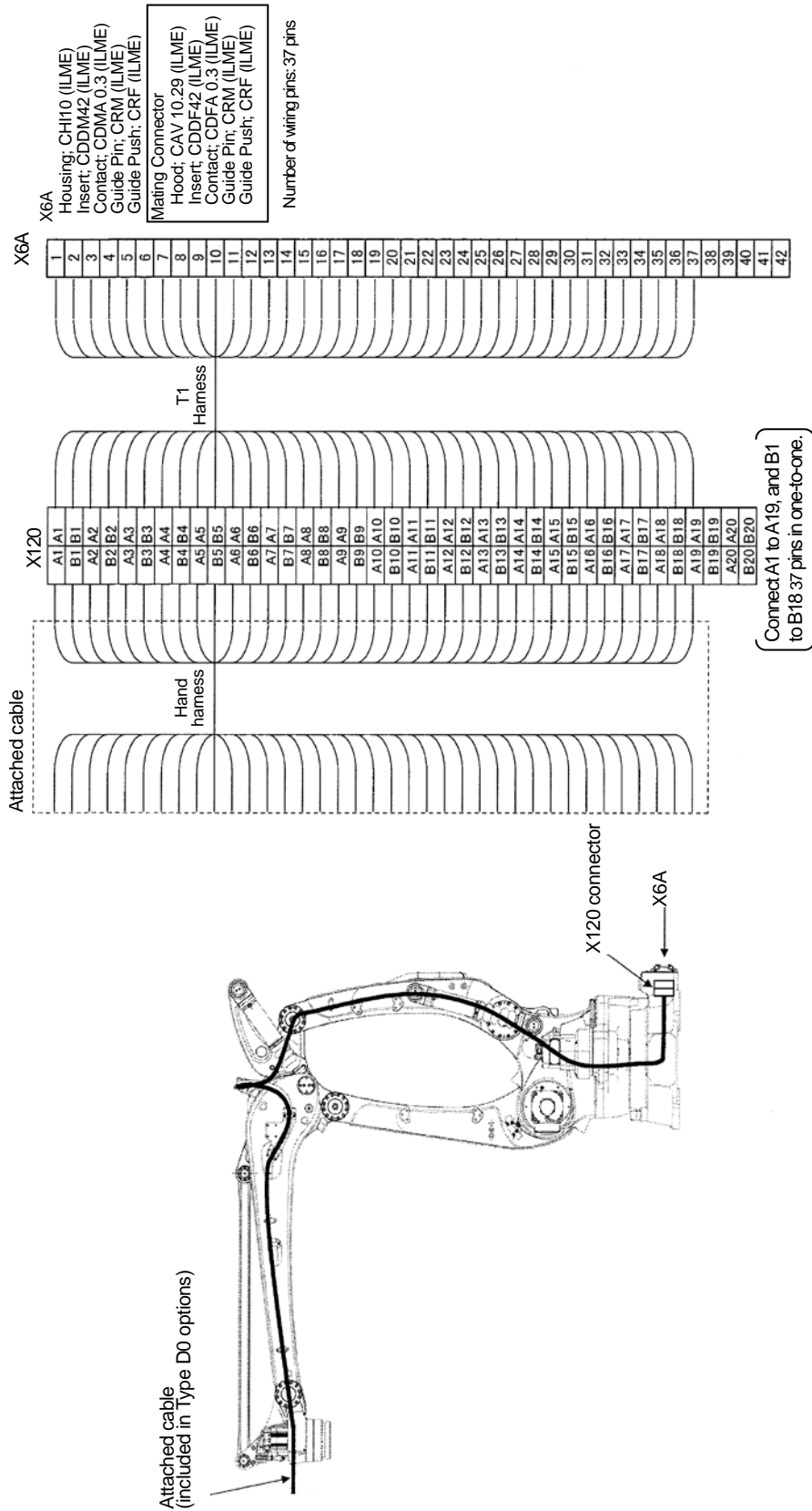
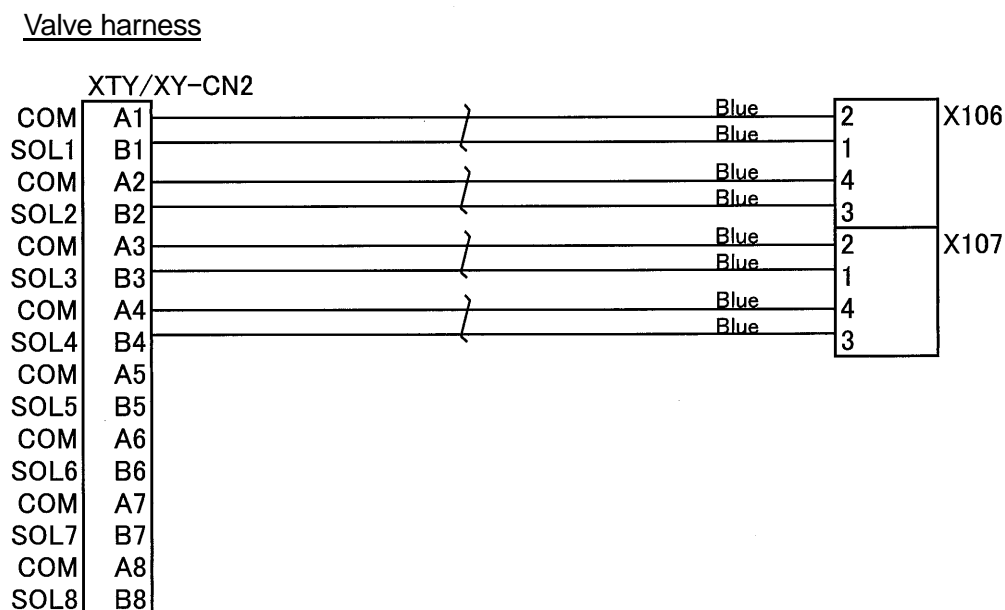




FIGURE 15-2 WIRING DIAGRAM - BA, SAME IN BOTH NPN/PNP



There are two types of 1TY board: for NPN (SINK) and for PNP (SOURCE). Same type of harness is used for both.

For 1XY board, NPN (SINK) and PNP (SOURCE) are switched with a switching connector.

**NOTE** For NPN (SINK), connect a switching connector to CN5 on 1XY board.

For PNP (SOURCE), connect a switching connector to CN4 on 1XY board.

Same type of harness is used for both.

**NOTE** For connection with external devices, see Figure 1. Example of External Connections (p.13).





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Optional Harness Manual**

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