

## GROUP 3 MECHATRONICS SYSTEM

### 1. CHECKING PROCEDURE OF CONTROLLER

Operation procedure and condition of machine		Items for confirmation (When normal)	
		Cluster	Controller
①	Turn starting switch OFF	· All LCDs and lamps OFF	· Diagnostic display OFF
②	Turn starting switch ON	· S mark, Auto decel and turtle mark are displayed · Battery charging lamp and engine oil pressure lamp light up	· <b>#B</b> is displayed ON and OFF three times → <b>S</b> → <b>00</b> or Error code is displayed
③	Turn starting switch to START	· Engine speed display low idle rpm (About 800rpm)	· <b>00</b> or Error code is displayed
④	Engine run If the coolant temperature is below 30°C, automatic warming up function is operated after 10seconds and increases engine speed	· Warming up lamp lights up · Mode display LED default (S) · Engine speed displays about 1200rpm	· <b>00</b> or Error code is displayed
⑤	Press mode selection switch (◀) one time  Press auto decel switch	· When carry out automatic warming up : Mode display LED transfer from F to L · When canceled automatic warming up : Mode display LED transfer from S to H · Auto decel display LED is OFF · Engine speed increases	· <b>00</b> or Error code is displayed  · After <b>Ad</b> is displayed for about 2 seconds, <b>00</b> or Error code is displayed
⑥	Select H mode by pressing mode selection switch (◀)	· H mode is displayed	· After <b>H</b> mode is displayed for about 2 seconds, <b>00</b> or Error code is displayed
⑦	Press mode selection switch (▶) one time	· Mode display LED transfer from H to S	· After <b>S</b> mode is displayed for about 2 seconds, <b>00</b> or Error code is displayed
⑧	Press power max switch about 10 seconds, and then release	· Mode display LED transfer from S to H (About 8 seconds)	· After <b>Po</b> mode is displayed for about 2 seconds, <b>00</b> or Error code is displayed
⑨	Press mode selection switch (▶) one time  Press auto decel switch	· Mode display LED transfer from S to L · Auto decel display LED is ON · Engine speed display about 1200rpm	· After mode transfer from <b>L</b> to <b>Ad</b> for about 2 seconds, <b>00</b> or Error code is displayed
⑩	Press travel speed switch	· Travel speed display LED transfer from turtle(Low) to rabbit(High)	· After <b>Hi</b> is displayed for about 2 seconds, <b>00</b> or Error code is displayed
⑪	Press engine speed switch (▲)	· Engine speed increases	· After <b>Su</b> is displayed while pressing the switch, <b>00</b> or Error code is displayed
⑫	Press engine speed switch (▼)	· Engine speed decreases	· After <b>Sd</b> is displayed while pressing the switch, <b>00</b> or Error code is displayed
⑬	Heavy lift switch ON	—	· After <b>Hi</b> is displayed for about 2 seconds, <b>00</b> or Error code is displayed
⑭	Turn starting switch OFF	· All lamps OFF	· All lamps OFF

## 2. JUDGMENT STANDARD OF NORMAL OR ABNORMAL FOR CONTROLLER RELATED PARTS

Components		Connector No.	Checking point	Standard		Checking condition	
Power source	Continuous power	CN-50 (Female)	Measure voltage(DC)	Pin(7) - (3)	20 ~ 30V	Starting switch OFF Separate connector	
	IG power			Pin(8) - (3)	20 ~ 30V	Starting switch ON Separate connector	
Governor motor	Potentiometer	CN-77 (Male)	Measure resistance	Pin(1) - (2)	0.25 ~ 6k $\Omega$	Starting switch OFF Separate connector	
				Pin(2) - (3)	0.25 ~ 6k $\Omega$		
				Pin(1) - (3)	4 ~ 6k $\Omega$		
	Motor	CN-76 (Male)	Measure resistance	Pin(1) - (2)	4 ~ 9 $\Omega$		
				Pin(3) - (4)	4 ~ 9 $\Omega$		
				Pin(1) - (3)	Min 1M $\Omega$		
EPPR Valve		CN-75 (Male)	Measure resistance	Pin(1) - (2)	20 ~ 30 $\Omega$	Starting switch OFF Separate connector	
				Pin(1) - Chassis	Min 1M $\Omega$		
Solenoid Valve	Swing lock	CN-86 (Male)	Measure resistance	Pin(1) - (2)	20 ~ 30 $\Omega$	Starting switch OFF Separate connector	
	Cut-off cancel	CN-87 (Male)		Pin(1) - Chassis	Min 1M $\Omega$		
	2 stage relief	CN-88 (Male)					
	Travel	CN-70 (Male)		Pin(1) - Chassis			
Engine speed sensor		CD-17 (Male)	Measure resistance	Pin(1) - (2)	200 ~ 400 $\Omega$	Starting switch OFF Separate connector	
				Pin(1) - Chassis	Min 1M $\Omega$		
			Measure voltage(AC)	Pin(1) - (2)	0.7 ~ 4V	Separate connector Engine run	
			Adjusting method (When voltage is too low)	Tighten until engine speed sensor touch to the ring gear, and then loosen about 135 degrees			
Pressure switch	Working	CD-24(Pin)	Measure resistance	Pin (1) - (2)	When lever is neutral	Min 1 $\Omega$	Separate connector Engine run
	Travel	CD-11(Pin)			When lever is operating	Max 1M $\Omega$	
	Boom up	CD-34(Pin)	Measure resistance	Pin (1) - (2)	When lever is stopped	Max 1M $\Omega$	
					When related lever is operating	Max 1 $\Omega$	
	Bucket in	CD-36(Pin)		Pin (1) , (2) - Chassis	Min 1 $\Omega$		

**3. TABLE OF FAILURE MODES AND CAUSES**

Failure mode		Causing parts											
		Cluster	Controller	Fuse	Governor motor	EPPR valve	2 stage relief solenoid valve	Swing lock solenoid valve	Travel solenoid valve	Pressure switch (Working or travel)	Pressure switch (Boom up, arm in or bucket in)	Engine speed sensor	Others
Cluster	LCD does not display (All OFF)	<input type="radio"/>		<input type="radio"/>									
	Mode does not change	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>								
	RPM does not display	<input type="radio"/>	<input type="radio"/>								<input type="radio"/>		
	RPM display is incorrect	<input type="radio"/>			<input type="radio"/>						<input type="radio"/>		
Diagnostic display of controller does not operate (All OFF)			<input type="radio"/>	<input type="radio"/>									
Auto decel does not operate			<input type="radio"/>						<input type="radio"/>				
Engine stall						<input type="radio"/>							<input type="radio"/>
Work equipment and swing speed are too slow			<input type="radio"/>			<input type="radio"/>					<input type="radio"/>		<input type="radio"/>
Engine speed up and down does not operate		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>								
Travel speed (Hi, Lo) function does not operate		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					<input type="radio"/>				
Power boost function does not operate			<input type="radio"/>	<input type="radio"/>			<input type="radio"/>						<input type="radio"/>
Heavy lift function does not operate			<input type="radio"/>				<input type="radio"/>			<input type="radio"/>			
Swing	Does not operate			<input type="radio"/>				<input type="radio"/>		<input type="radio"/>			<input type="radio"/>
	Does not lock		<input type="radio"/>					<input type="radio"/>		<input type="radio"/>			<input type="radio"/>

#### 4. DETAIL TABLE OF SELF DIAGNOSTIC FUNCTIONS

Error code	Abnormal system	Details of abnormality	Condition when normal (Voltage, resistance and current)	Action of controller when abnormality is detected	Symptoms shown by machine when there is abnormality												
01	Governor motor	1. Short circuit or defect inside of governor motor 2. Short circuit of wiring harness · Short circuit between CN-50(4) - (11) and (5) - (12) · Short circuit between CN-50(4), (5), (11), (12) and GND	· Resistance between CN-50(4)-(11) or (5)-(12) : 4 ~ 9 Ω · Resistance between CN-50(4)-(12) or (5)-(11) : Min 1MΩ · Resistance between CN-50(4), (5), (11), (12) and Chassis : Min 1MΩ · Motor drive current Stop : 0.3A, Drive : 0.7A	· Error code <b>01</b> is displayed · Warning buzzer sounds · Motor drive current is cut-off(0mA) · When you change mode after remedying short circuit, normal current(0.3~0.7A) outputs	· Error code <b>01</b> and <b>02</b> are displayed · Warning buzzer sounds continuously 1. Although mode is changed, engine speed does not change 2. After key off, cluster lamp does not turn off within 5 seconds(cluster lamp turn off after about 30seconds)												
02		1. Open circuit inside of governor motor 2. Open circuit of wiring harness between CN-50(4), (5), (11), (12) and Governor motor				· Error code <b>02</b> is displayed and warning buzzer sounds, but any other particular action does not taken · When you change mode after remedying open circuit, normal current(0.3~0.7A) outputs											
03	Potentiometer	1. Short circuit inside of potentiometer 2. Short circuit between CN-52(14) and 5 V	<table border="1"> <thead> <tr> <th>CN-52</th> <th>Resistance(kΩ)</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>(13) - (15)</td> <td rowspan="2">4 ~ 6</td> <td rowspan="2">4.5 ~ 5.5</td> </tr> <tr> <td>(13) - (14)</td> </tr> <tr> <td>(14) - (15)</td> <td>0.25 ~ 6</td> <td>0.2 ~ 5.5</td> </tr> </tbody> </table>	CN-52	Resistance(kΩ)	Voltage (V)	(13) - (15)	4 ~ 6	4.5 ~ 5.5	(13) - (14)	(14) - (15)	0.25 ~ 6	0.2 ~ 5.5	· Error code <b>03</b> or <b>04</b> is displayed · Warning buzzer sounds · The governor motor stop at the position of moment occurred abnormality	· Error code <b>03</b> and <b>04</b> is displayed · Warning buzzer sounds 1. Although mode is changed, engine speed does not change 2. After key off, cluster lamp does not turn off within 5 seconds(Cluster lamp turn off after about 30seconds)		
CN-52		Resistance(kΩ)		Voltage (V)													
(13) - (15)	4 ~ 6	4.5 ~ 5.5															
(13) - (14)																	
(14) - (15)	0.25 ~ 6	0.2 ~ 5.5															
04	1. Open circuit inside of potentiometer 2. Open circuit of wiring harness of CN-52(13), (14), (15) 3. Short circuit between CN-52(14) and GND																
05	EPPR valve	1. Short circuit or defect inside of EPPR valve 2. Short circuit of wiring harness between CN-50(6) and (13)	· Solenoid resistance : 20 ~ 30 Ω <table border="1"> <thead> <tr> <th>Mode</th> <th>Current (A)</th> <th>Checking condition</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>0.1 ~ 0.25</td> <td rowspan="4">                             · Engine run                              · Auto decel cancel                         </td> </tr> <tr> <td>S</td> <td>0.35 ~ 0.45</td> </tr> <tr> <td>L</td> <td>0.4 ~ 0.5</td> </tr> <tr> <td>F</td> <td>0.3 ~ 0.4</td> </tr> </tbody> </table>	Mode	Current (A)	Checking condition	H	0.1 ~ 0.25	· Engine run · Auto decel cancel	S	0.35 ~ 0.45	L	0.4 ~ 0.5	F	0.3 ~ 0.4	· Error code <b>05</b> is displayed · Warning buzzer sounds · Cut off the current of EPPR valve	· Error code <b>05</b> is displayed · Warning buzzer sounds Because the current of EPPR valve is cut off, engine load or stall is generated
Mode		Current (A)		Checking condition													
H	0.1 ~ 0.25	· Engine run · Auto decel cancel															
S	0.35 ~ 0.45																
L	0.4 ~ 0.5																
F	0.3 ~ 0.4																
06	1. Open circuit of wiring harness between CN-50(6) and (13) 2. In case prolix switch is located at the emergency position 3. Open circuit between CN-50(6) and GND	· Error code <b>06</b> is displayed and warning buzzer sounds, but any other particular action does not taken	· Error code <b>06</b> is displayed · Warning buzzer sounds continuously 1. In case of 1, It is the same as error code <b>05</b> 2. In case of 2, because the current(about 350 ~ 370mA) flow continuously, working speed at <b>H</b> mode decreases 3. In case of 3, because the maximum current(about 650mA ~ 1A) flow, working speed decreases prominently														

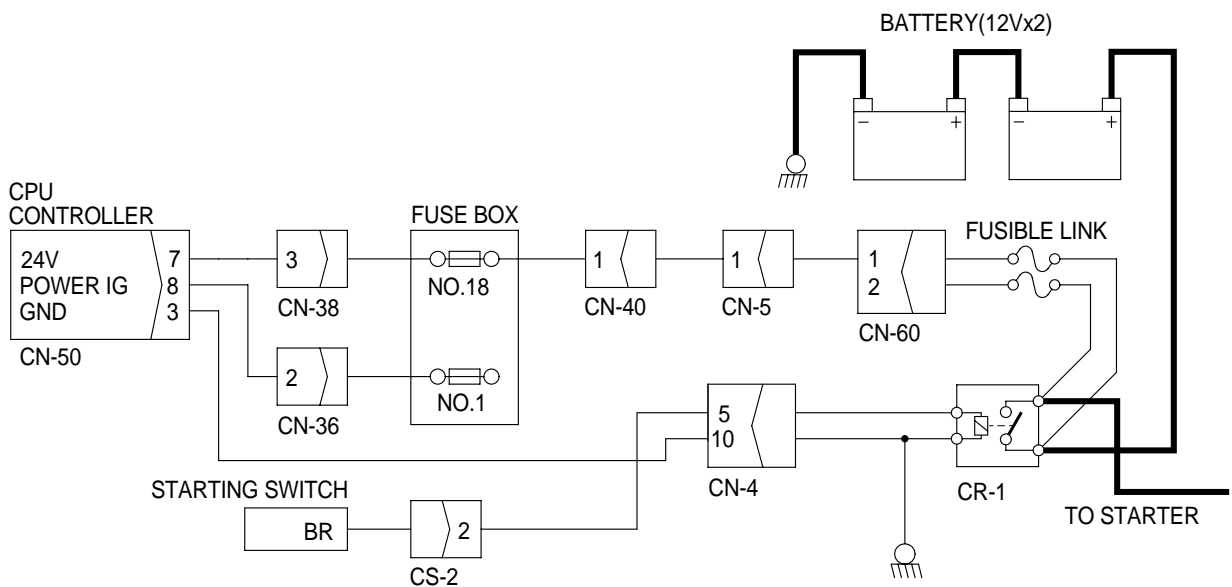
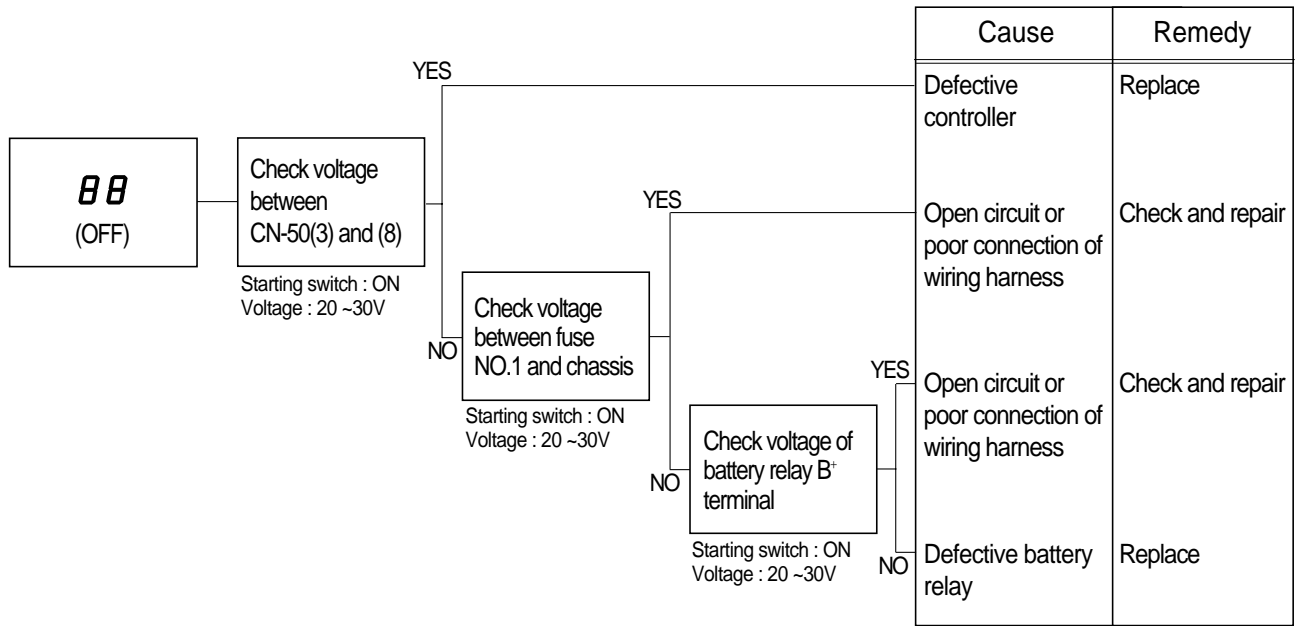
Error code	Abnormal system	Details of abnormality	Condition when normal (Voltage, resistance and current valve)	Action of controller when abnormality is detected	Symptoms shown by machine when there is abnormality
07	2 stage relief solenoid valve	1. Short circuit inside of solenoid 2. Short circuit because of connection of two wiring harness outside solenoid(24V-control) · Excessive current flows into controller	· Solenoid resistance : 20 ~ 30 Ω	· Related error code is displayed · Warning buzzer sounds · Cut off the current of solenoid (But, In case of returning to the normal state after instant open circuit, the current of solenoid valve return to the normal state, too)	1. The relief pressure is not increased when the power boost function is selected 2. The power boost function does not operate
09	Travel solenoid valve				1. Warning buzzer sounds continuously 2. Travel speed does not change(Stay in <b>low</b> ) when travel speed switch is operated
11	Swing lock solenoid valve				1. Warning buzzer sounds continuously 2. The motor brake is not released, so the machine does not swing(Stay in swing LOCK state)
15	Cut-off cancel solenoid valve				1. Warning buzzer sounds continuously 2. Cut-off cancel function does not operated, so the power boost does not function and the travel speed is low
08	2 stage relief solenoid valve	1. Open circuit inside of solenoid 2. Open circuit or defective connection of wiring harness between solenoid and controller 3. Connection between pin of wiring harness (Example : CN-52(1) ~ (5)) and GND	· Solenoid resistance : 20 ~ 30 Ω	· Related error code is displayed · Warning buzzer sounds In case of 1 and 2, because control current does not flow to the solenoid valve, solenoid valve does not operate In case of 3, the current flow to the solenoid valve continuously (Solenoid ON) However, the current is not controlled by the controller	1. Warning buzzer sounds continuously 2. In case 1 and 2, it is the same as error code <b>07</b>
10	Travel solenoid valve				1. Warning buzzer sounds continuously 2. In case of 1 and 2, It is the same as error code <b>09</b> 3. In case of 3, the solenoid becomes ON at any time, so machine maintain <b>High</b> speed
12	Swing lock solenoid valve				1. Warning buzzer sounds continuously 2. In case of 1 and 2, It is the same as error code <b>11</b> 3. In case of 3, the swing motor brake released at any time, so the upper structure will swing on slopes
16	Cut-off cancel solenoid valve				1. Warning buzzer sounds continuously 2. In case of 1 and 2, it is the same as error code <b>15</b>
17	Engine speed sensor	1. Defective sensor (Different resistance) 2. Open circuit of wiring harness between controller and sensor	· Speed sensor resistance : 200 ~ 400 Ω	· Error code is displayed · Warning buzzer sounds · The current of EPPR valve is increased	1. Warning buzzer sounds continuously 2. Engine speed display does not operate or inaccurate 3. Work equipment speed decreases prominently

Error code	Abnormal system	Details of abnormality	Condition when normal (Voltage, resistance and current valve)	Action of controller when abnormality is detected	Symptoms shown by machine when there is abnormality															
18	Input power	1. Open circuit of wiring harness between CN-50(7) and battery	· Voltage : 20 ~ 30V	· Error code <b>18</b> is displayed · Warning buzzer sounds	1. Warning buzzer sounds continuously 2. At once the starting switch turn off, engine stop and cluster lamp off															
19		1. Input voltage low : Below 18V				· Error code <b>19</b> is displayed · Warning buzzer sounds	1. Warning buzzer sounds continuously 2. Vibration noise generated from governor motor													
20	Cluster power	1. Open circuit of wiring harness between CN-50(9) and cluster	· Voltage : 20 ~ 30V	· Error code <b>20</b> is displayed · Warning buzzer sounds	1. Warning buzzer sounds continuously 2. Cluster lamp does not lights up when starting switch ON → All indicator lamp OFF															
21	Engine rpm setting	1. The deviation between setting idle rpm of each mode and speed sensing engine rpm is larger than $\pm 500$ rpm 2. Output current is below 0.7V because the engine speed sensor is incorrectly assembled	· Setting rpm of each mode <table border="1" data-bbox="846 628 1236 880"> <thead> <tr> <th>Mode</th> <th>RPM(Unload / load)</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>2200 / 2000</td> <td rowspan="3">· Auto Decel cancel</td> </tr> <tr> <td>S</td> <td>2200 / 2000</td> </tr> <tr> <td>L</td> <td>2000 / 1800</td> </tr> <tr> <td>F</td> <td>1600 / 1400</td> <td rowspan="2">· Auto Decel · RCV lever neutral</td> </tr> <tr> <td>Auto Decel</td> <td>1200 / 1200</td> </tr> </tbody> </table>	Mode	RPM(Unload / load)	Remark	H	2200 / 2000	· Auto Decel cancel	S	2200 / 2000	L	2000 / 1800	F	1600 / 1400	· Auto Decel · RCV lever neutral	Auto Decel	1200 / 1200	· Error code <b>21</b> is displayed · Warning buzzer sounds · The current of EPPR valve is increases	1. Warning buzzer sounds continuously 2. Engine rpm on the cluster is displayed higher or lower 500rpm than regulated value for each mode 3. Work equipment speed decreases prominently
Mode	RPM(Unload / load)	Remark																		
H	2200 / 2000	· Auto Decel cancel																		
S	2200 / 2000																			
L	2000 / 1800																			
F	1600 / 1400	· Auto Decel · RCV lever neutral																		
Auto Decel	1200 / 1200																			
22	Defective CPU	1. There is no EPROM inside of controller or EPROM is out of order 2. Defect or damage of CPU	· Judgment of defect : In case the set/reset signal from watch dog timer keeps same level more than 2 seconds	· Error code <b>22</b> is displayed, however any other particular action is not taken	1. Warning buzzer sounds continuously 2. The mode of the cluster does not change															

## 5. TROUBLESHOOTING

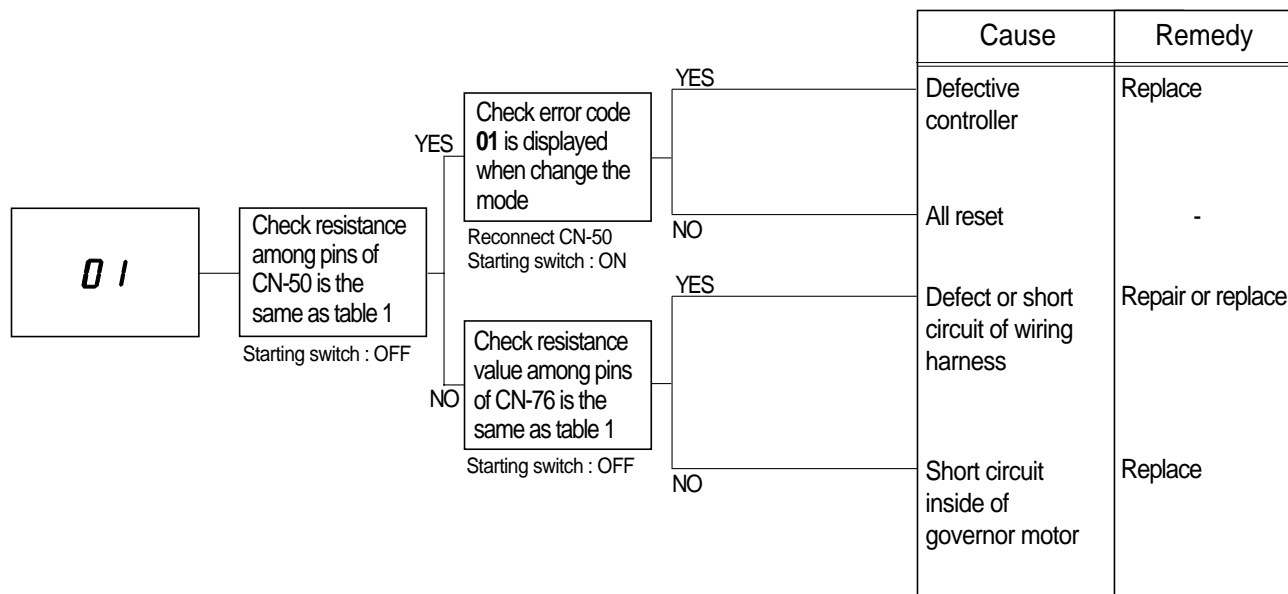
### 1) DIAGNOSTIC ERROR CODE 7-SEGMENT AND CLUSTER LAMP DOES NOT LIGHTS UP(Error code : OFF)

- Check fuse No.1 is normal.  
If fuse is damaged, check short circuit of wiring harness between fuse and controller.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- If battery voltage is normal(20 ~ 30V), carry out below troubleshooting.



## 2) SHORT CIRCUIT OF GOVERNOR MOTOR SYSTEM(Error code : 01)

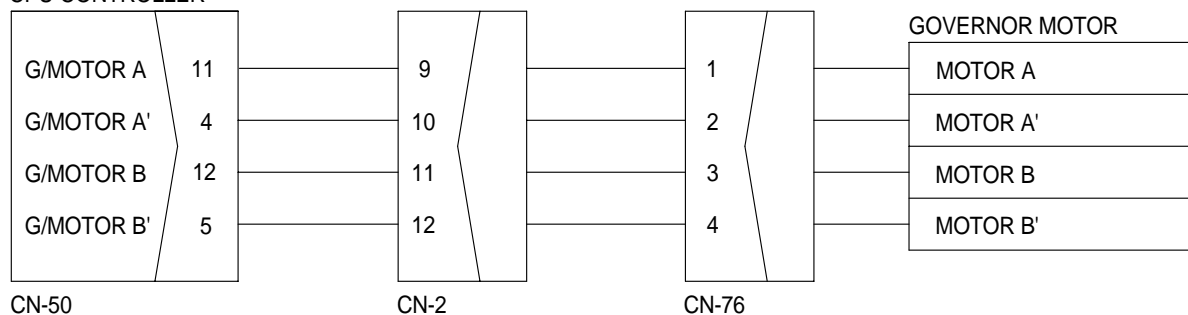
- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



**Table 1**

CN-50(Female)	CN-76(Male)	Resistance
(11) - (4)	(1) - (2)	4 ~ 9 Ω
(12) - (5)	(3) - (4)	4 ~ 9 Ω
(11) - (12)	(1) - (3)	Min 1MΩ
(11) - (5)	(1) - (4)	
Pin(4),(5),(11),(12) - Chassis	Pin (1),(2),(3),(4) - Chassis	

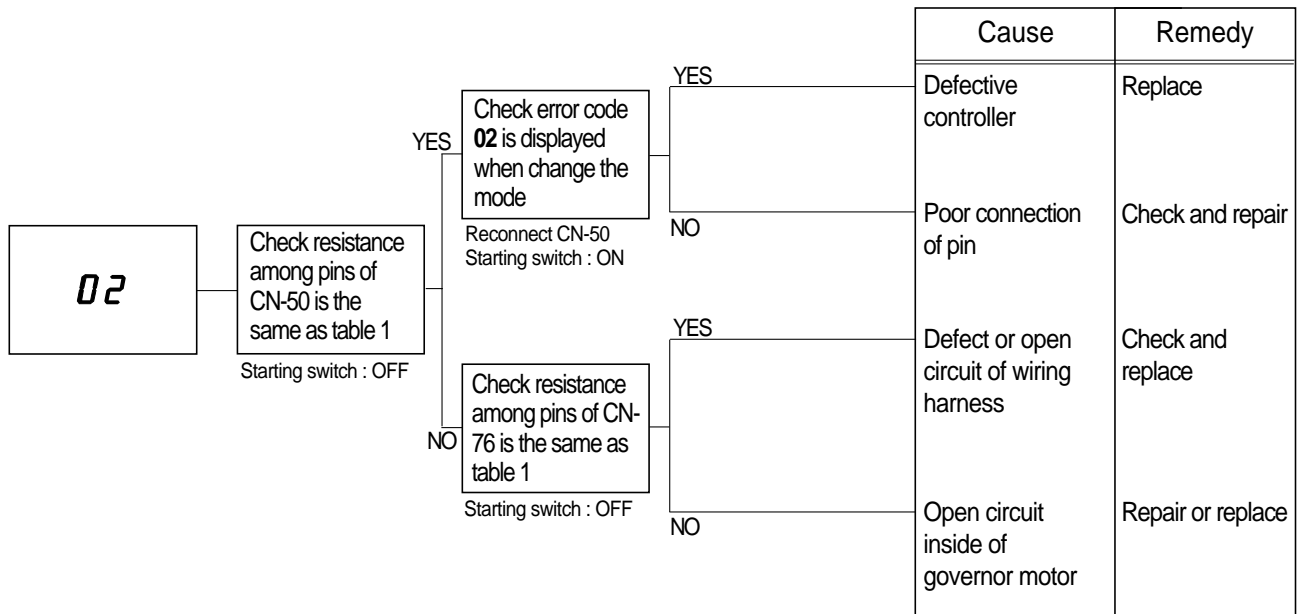
### CPU CONTROLLER





### 3) OPEN CIRCUIT OF GOVERNOR MOTOR SYSTEM(Error code : 02)

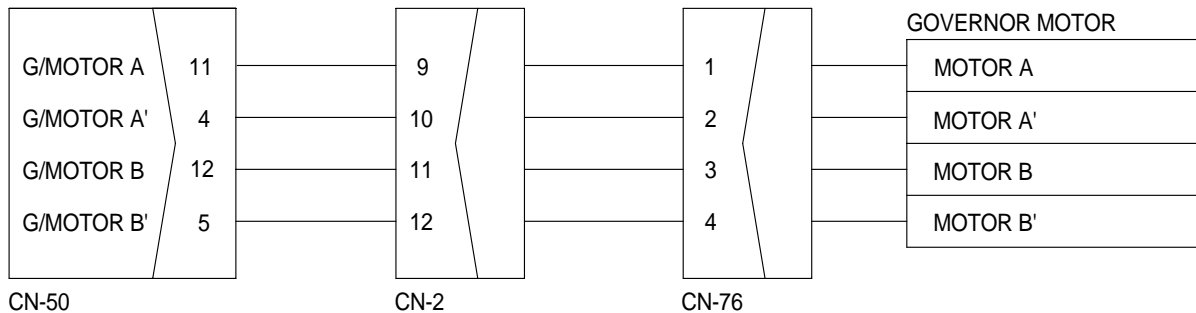
- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



**Table 1**

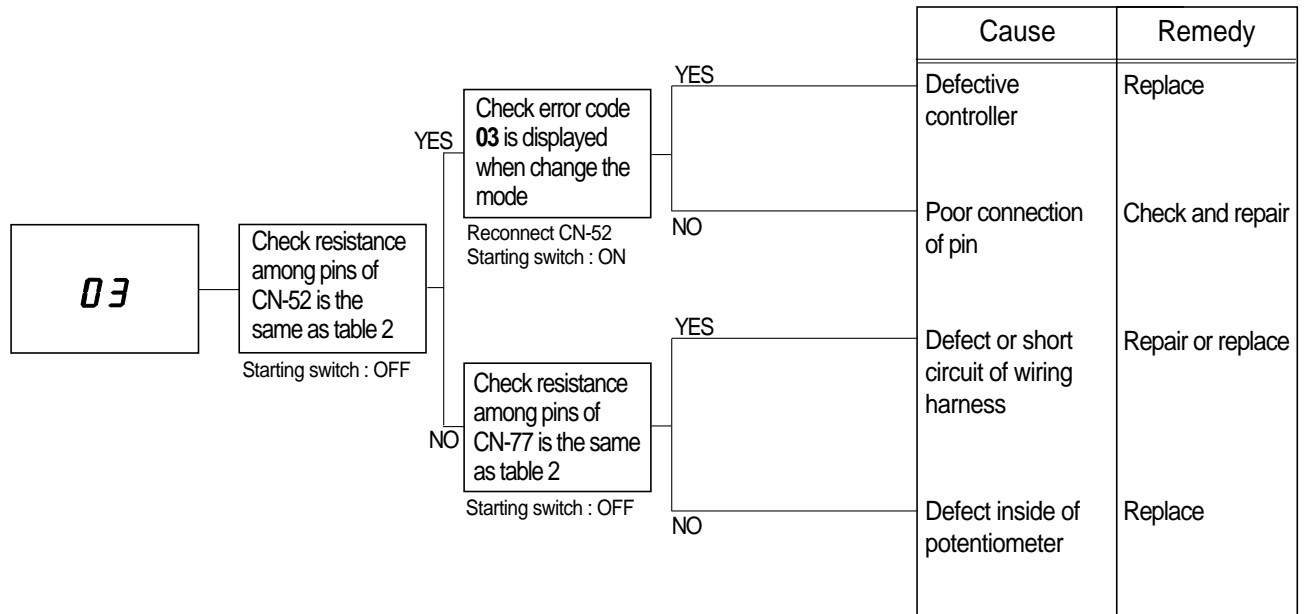
CN-50(Female)	CN-76(Male)	Resistance
(11) - (4)	(1) - (2)	4 ~ 9 Ω
(12) - (5)	(3) - (4)	4 ~ 9 Ω
(11) - (12)	(1) - (3)	Min 1MΩ
(11) - (5)	(1) - (4)	
Pin(4),(5),(11),(12) - Chassis	Pin (1),(2),(3),(4) - Chassis	

#### CPU CONTROLLER



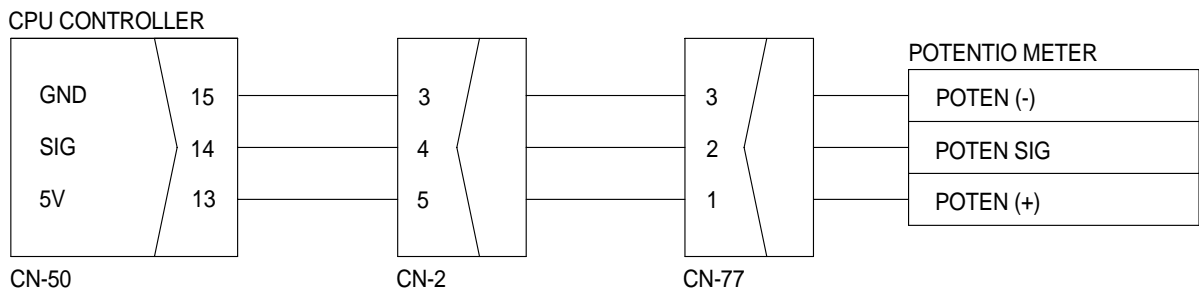
#### 4) SHORT CIRCUIT OF POTENTIOMETER SYSTEM(Error code : 03)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



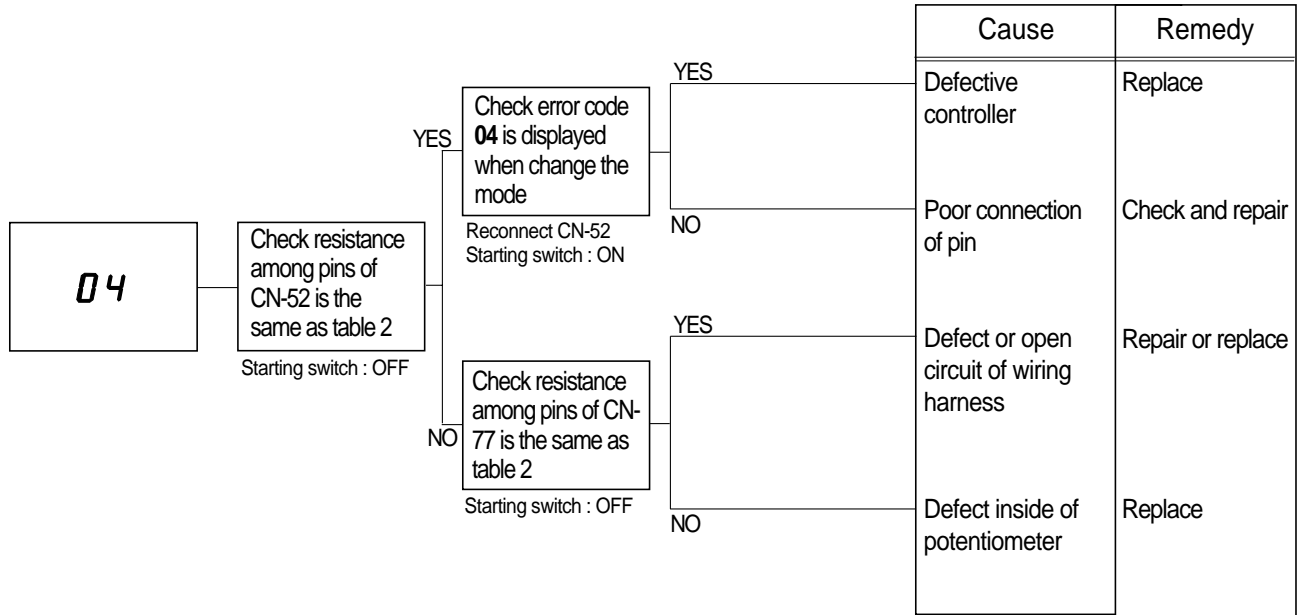
**Table 2**

CN-52(Female)	CN-77(Male)	Resistance
(13) - (14)	(1) - (2)	0.25 ~ 6kΩ
(13) - (15)	(1) - (3)	4 ~ 6kΩ
(14) - (15)	(2) - (3)	0.25 ~ 6kΩ



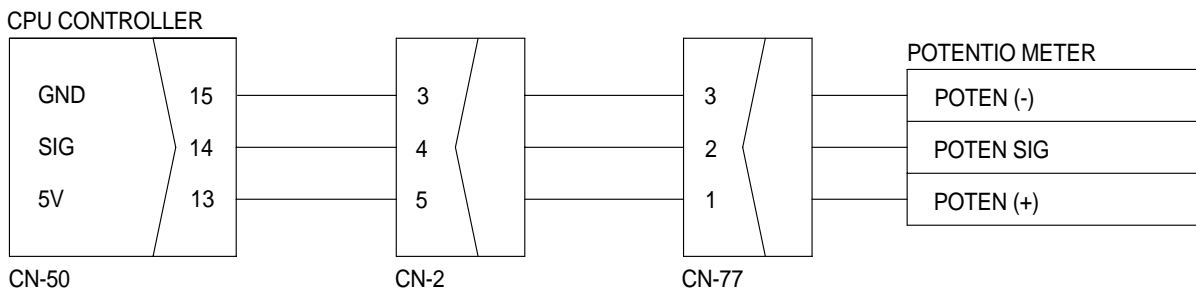
**5) OPEN CIRCUIT OF POTENTIOMETER SYSTEM(Error code : 04)**

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



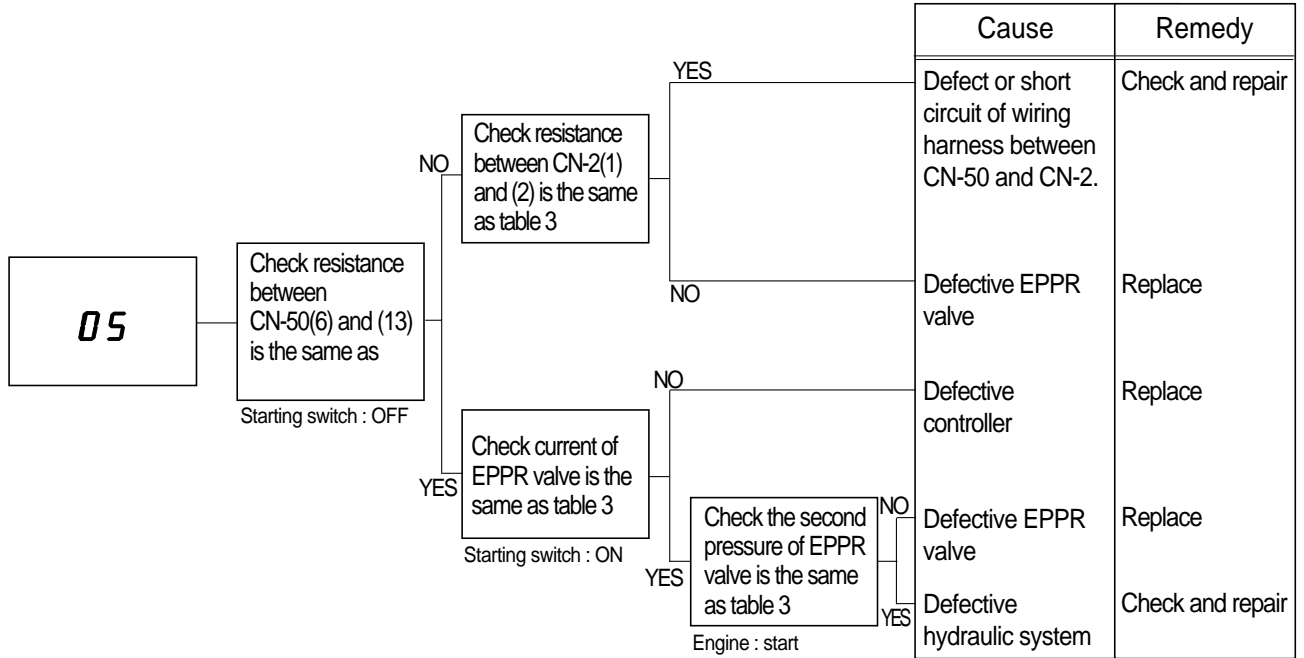
**Table 2**

CN-52(Female)	CN-77(Male)	Resistance
(13) - (14)	(1) - (2)	0.25 ~ 6kΩ
(13) - (15)	(1) - (3)	4 ~ 6kΩ



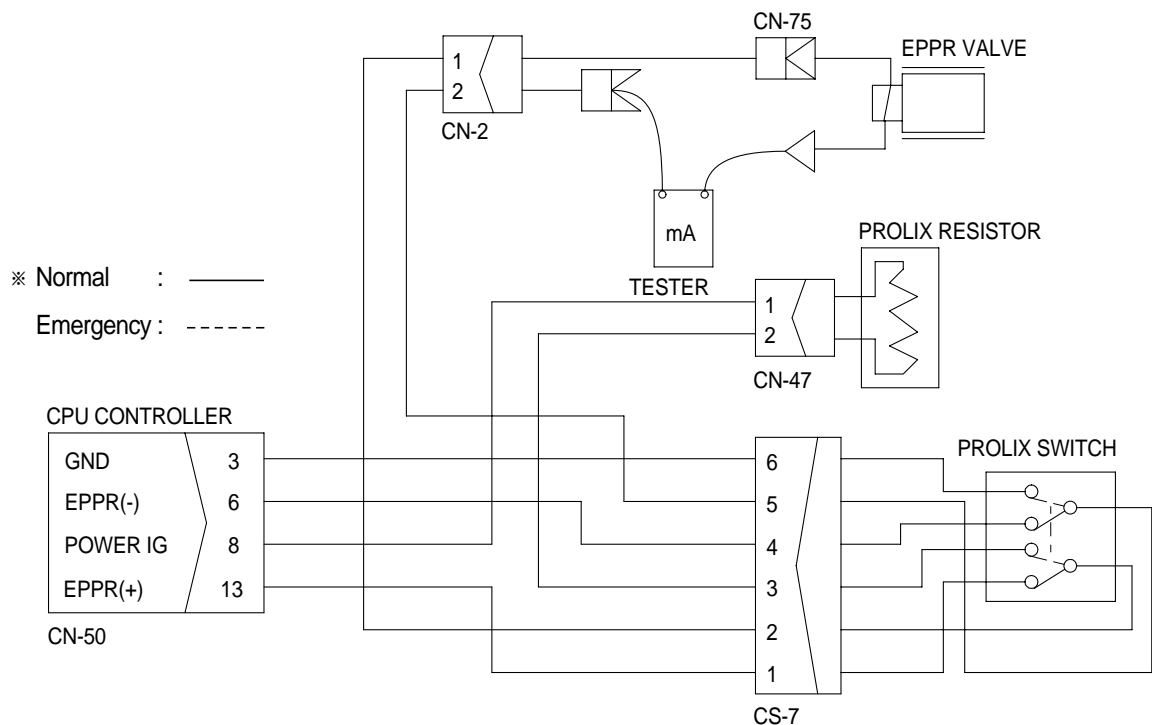
## 6) SHORT CIRCUIT OF EPPR VALVE(Error code : 05)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



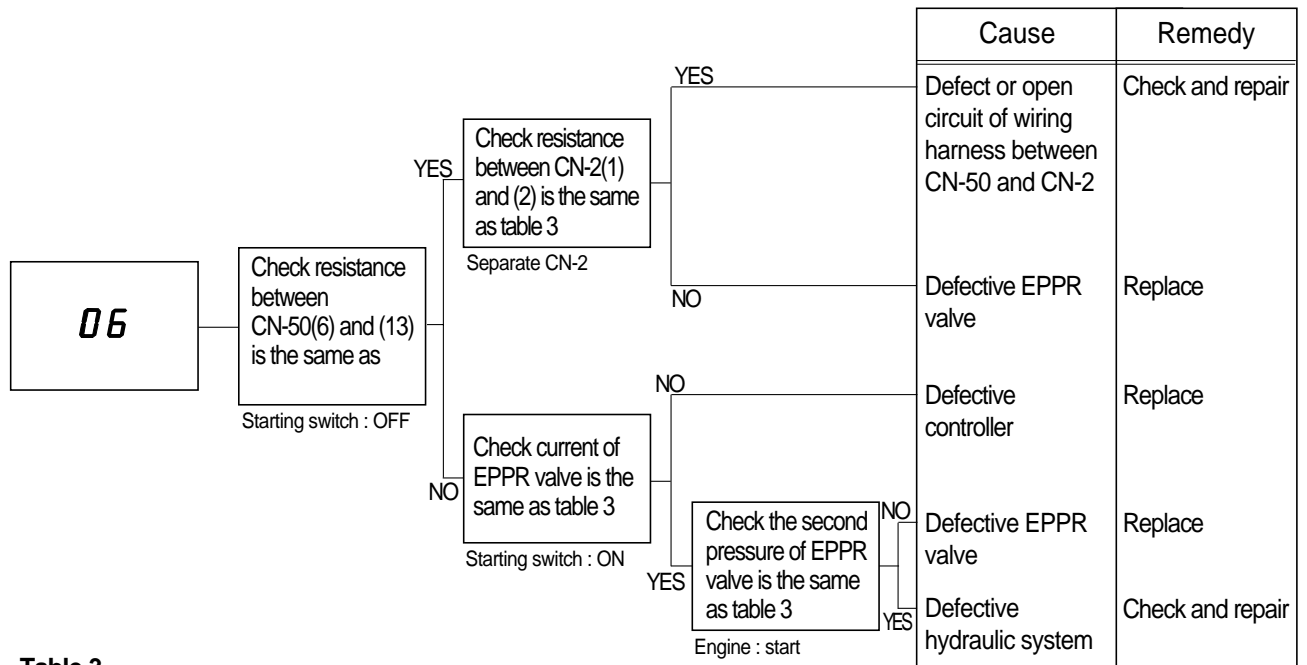
**Table 3**

CN-50(Female)	CN-2(Male)	Normal value
(6) - (13)	(1) - (2)	20 ~ 30 Ω
Current of EPPR valve		400 ~ 700mA
Second pressure of EPPR valve		20 ~ 40bar



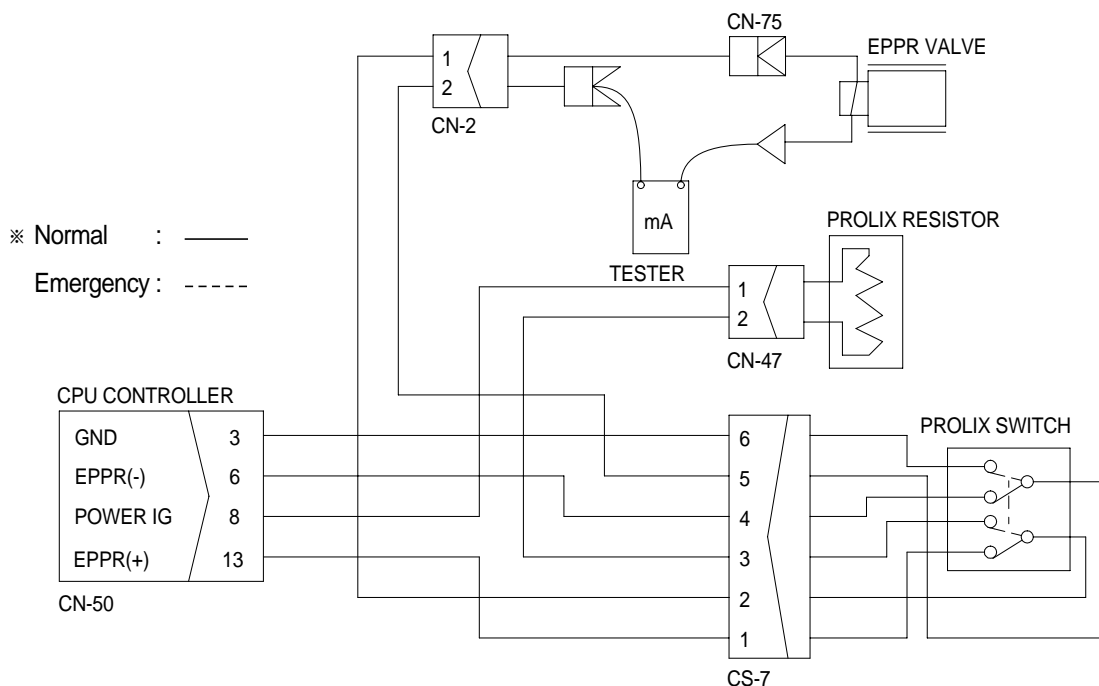
## 7) OPEN CIRCUIT OF EPPR VALVE SYSTEM(Error code : 06)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.
- Check the prolix switch is in the OFF(Normal) position.



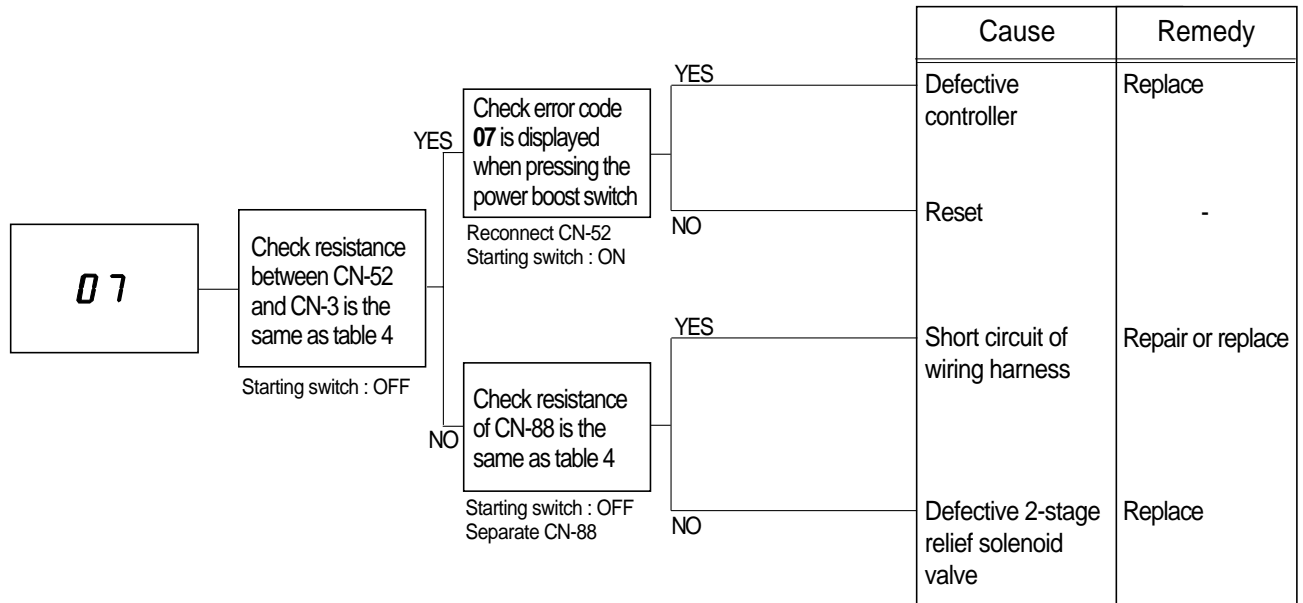
**Table 3**

CN-50(Female)	CN-2(Male)	Normal value
(6) - (13)	(1) - (2)	20 ~ 30 $\Omega$
Current of EPPR valve		400 ~ 700mA
Second pressure of EPPR valve		20 ~ 40bar



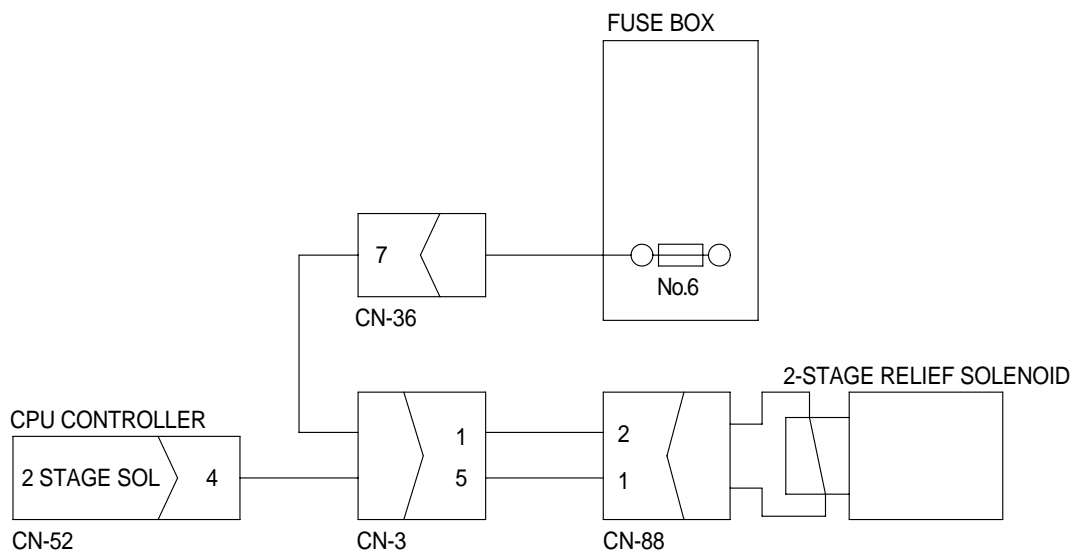
### 8) SHORT CIRCUIT OF 2-STAGE RELIEF SOLENOID SYSTEM(Error code : 07)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



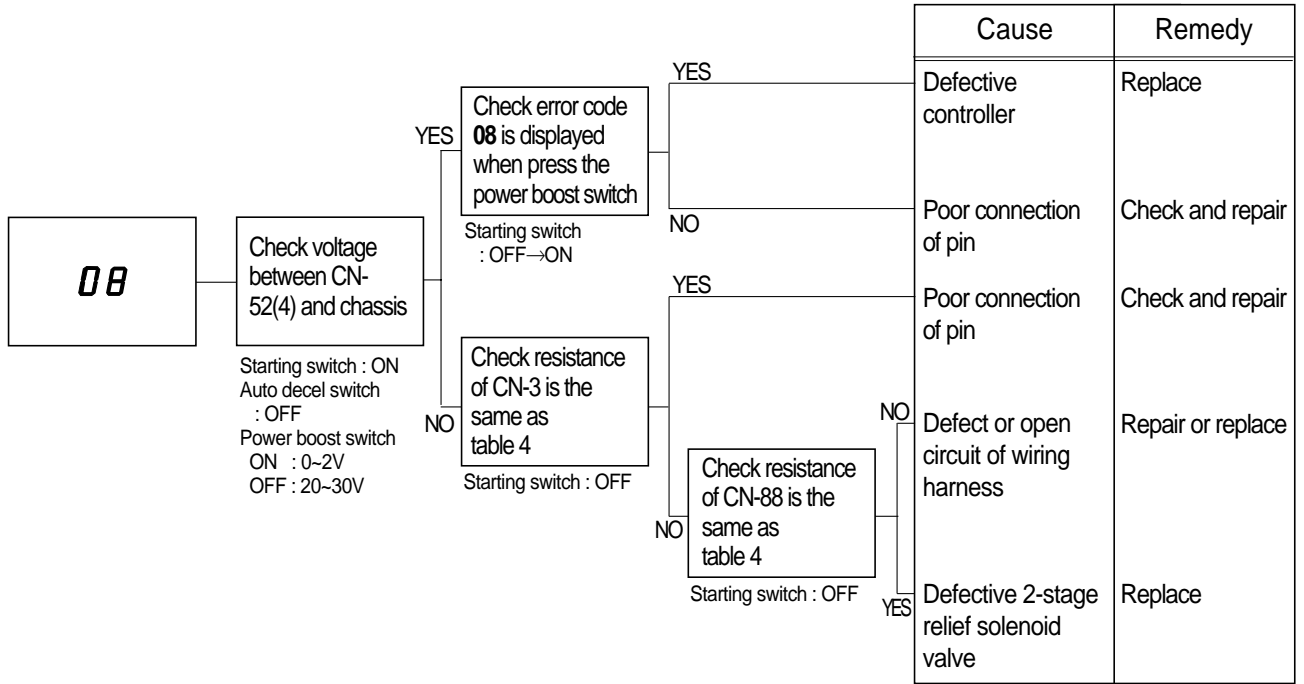
**Table 4**

CN-52(Female)	CN-3(Male)	CN-88(Male)	Resistance
-	(1) - (5)	(1) - (2)	20 ~ 30 Ω
(4) - Chassis	(5) - Chassis	(1) - Chassis	Min 1MΩ



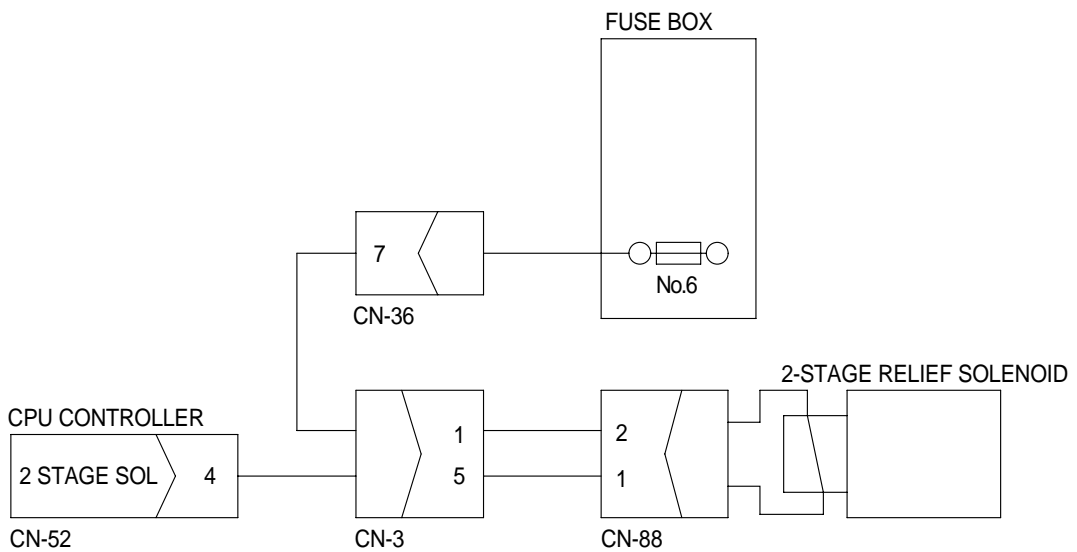
**9) OPEN CIRCUIT OF 2-STAGE RELIEF SOLENOID SYSTEM(Error code : 08)**

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



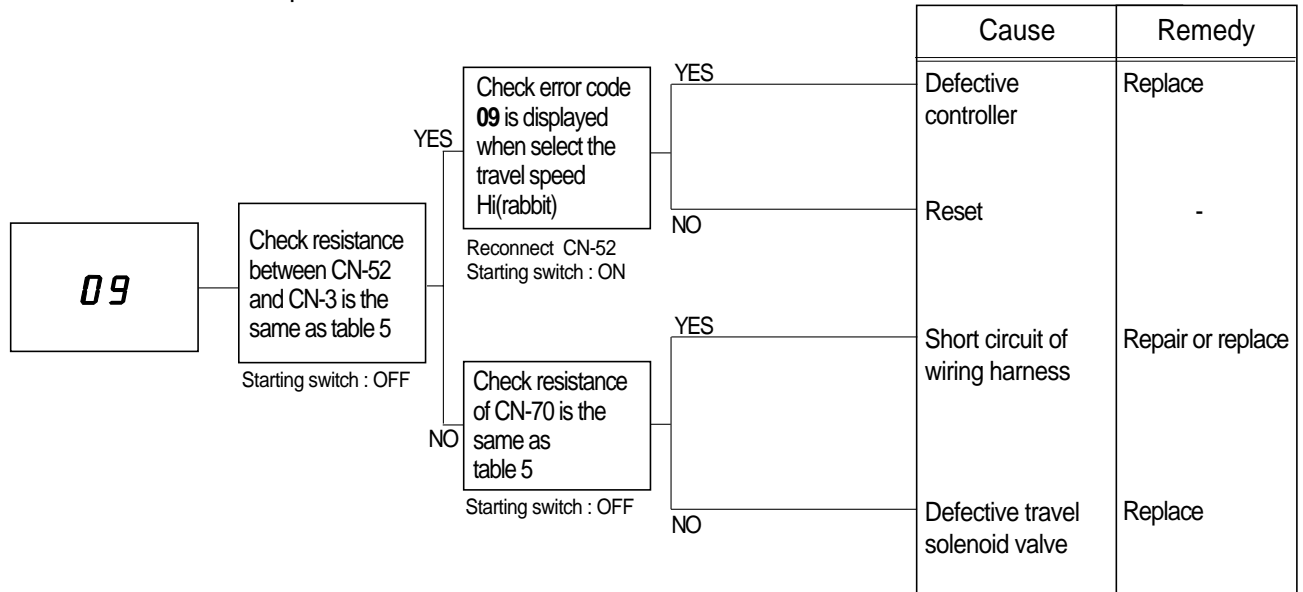
**Table 4**

CN-52(Female)	CN-3(Male)	CN-88(Male)	Resistance
-	(1) - (5)	(1) - (2)	20 ~ 30 Ω
(4) - Chassis	(5) - Chassis	(1) - Chassis	Min 1MΩ



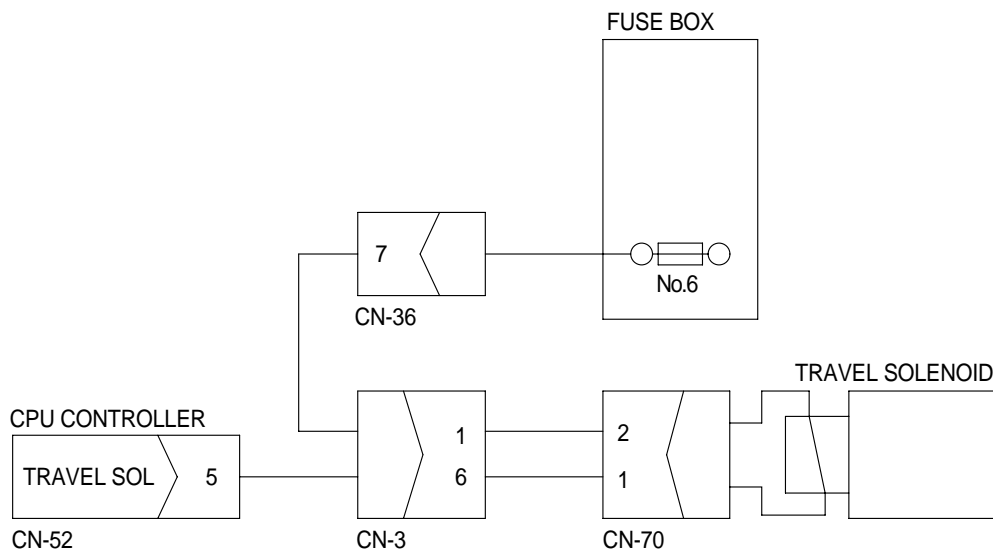
**10) SHORT CIRCUIT OF TRAVEL SPEED SOLENOID SYSTEM(Error code : 09)**

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



**Table 5**

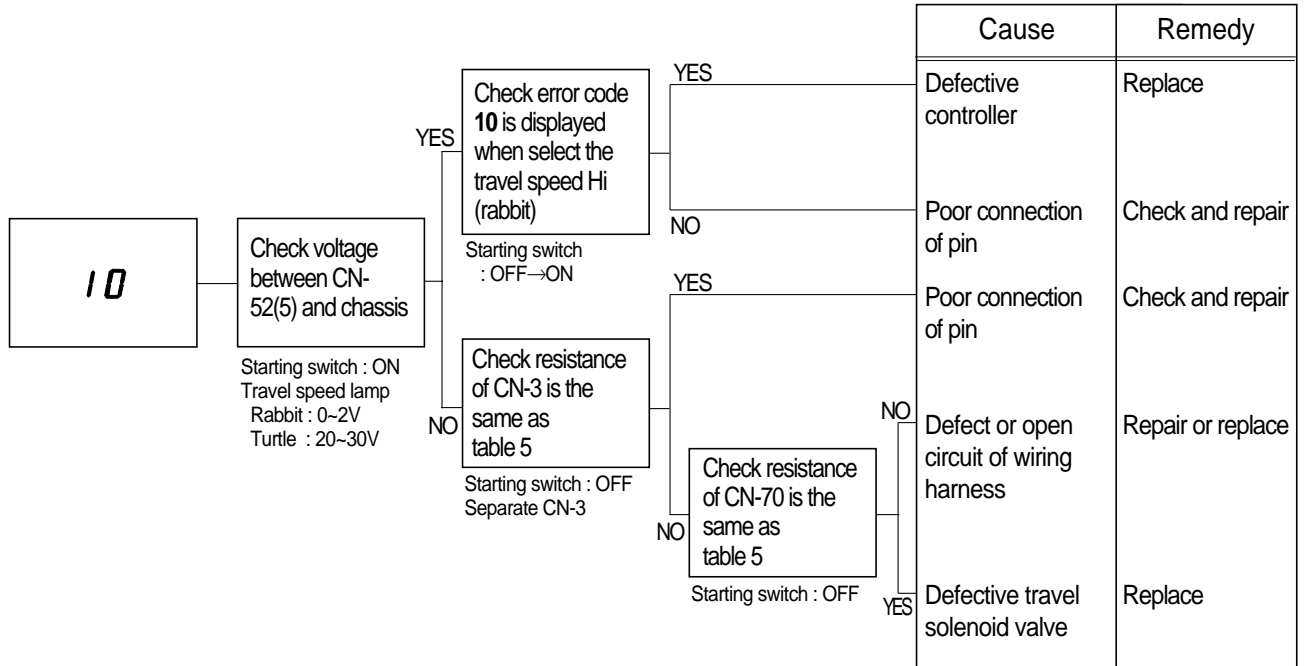
CN-52(Female)	CN-3(Male)	CN-70(Male)	Resistance
-	(1) - (6)	(1) - (2)	20 ~ 30 Ω
(5) - Chassis	(6) - Chassis	(1) - Chassis	Min 1MΩ





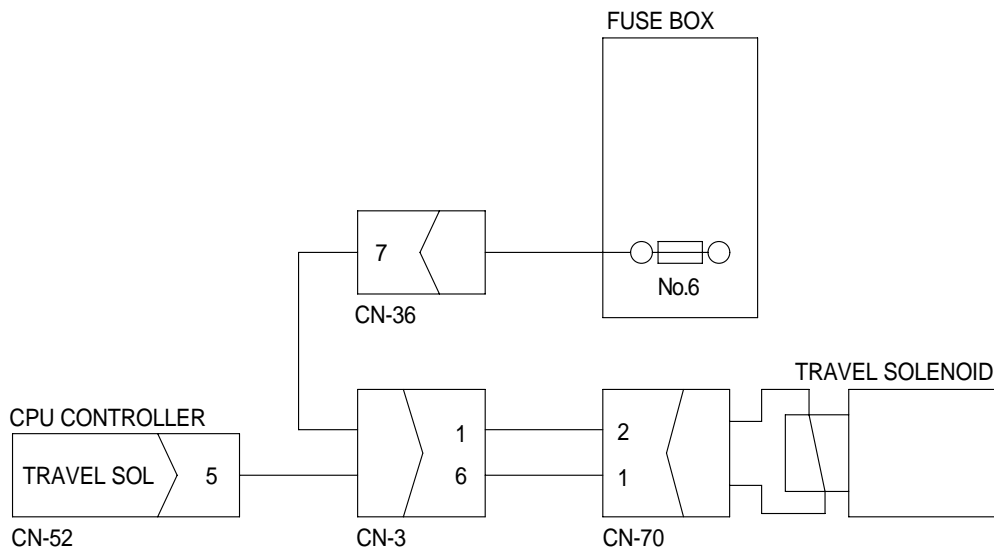
**11) OPEN CIRCUIT OF TRAVEL SPEED SOLENOID SYSTEM(Error code : 10)**

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



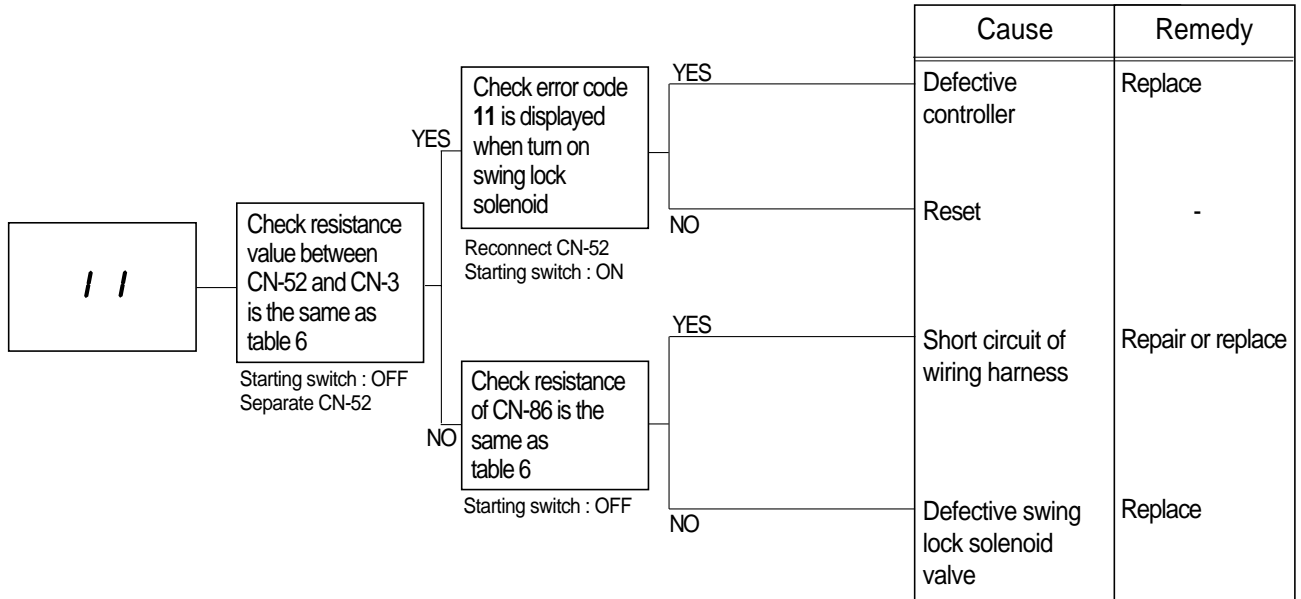
**Table 5**

CN-52(Female)	CN-3(Male)	CN-70(Male)	Resistance
-	(1) - (6)	(1) - (2)	20 ~ 30 Ω



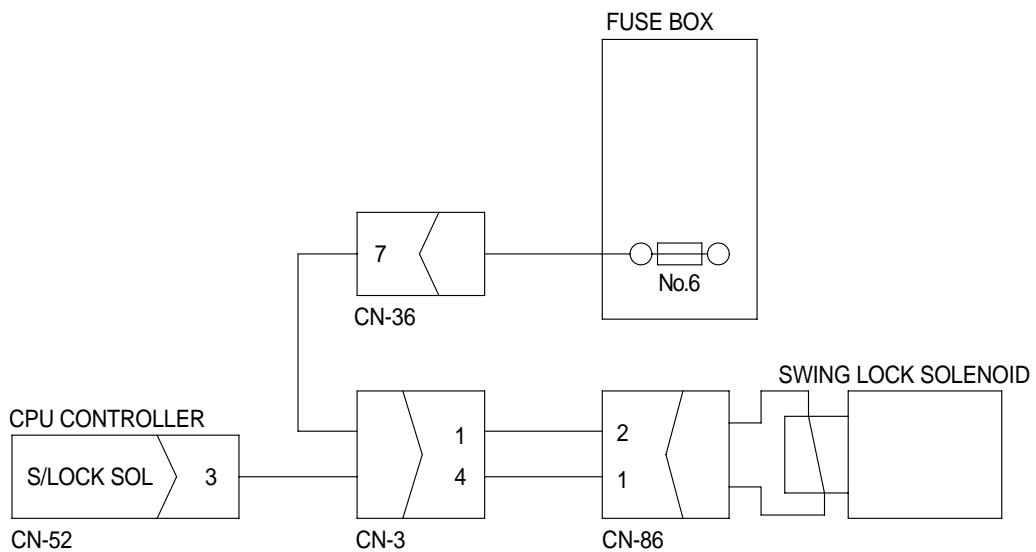
**12) SHORT CIRCUIT OF SWING LOCK SOLENOID SYSTEM(Error code : 11)**

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



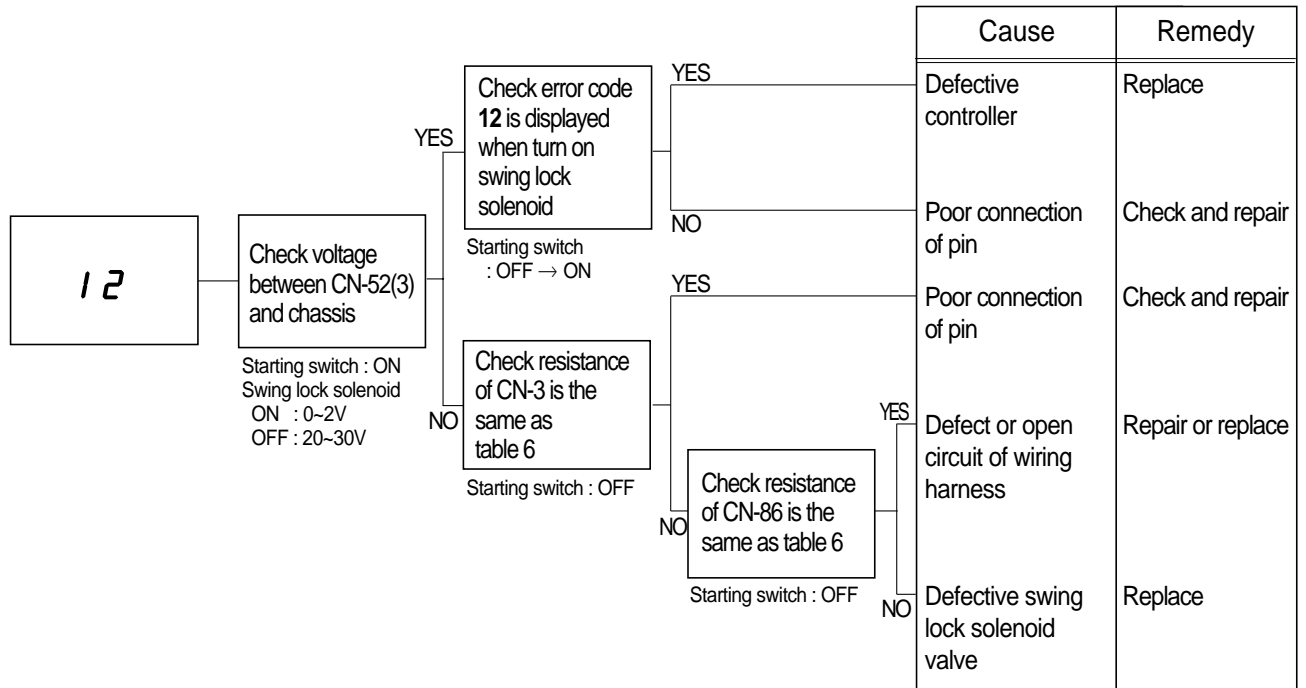
**Table 6**

CN-52(Female)	CN-3(Male)	CN-86(Male)	Resistance
-	(1) - (4)	(1) - (2)	20 ~ 30 Ω
(3) - Chassis	(4) - Chassis	(1) - Chassis	Min 1MΩ



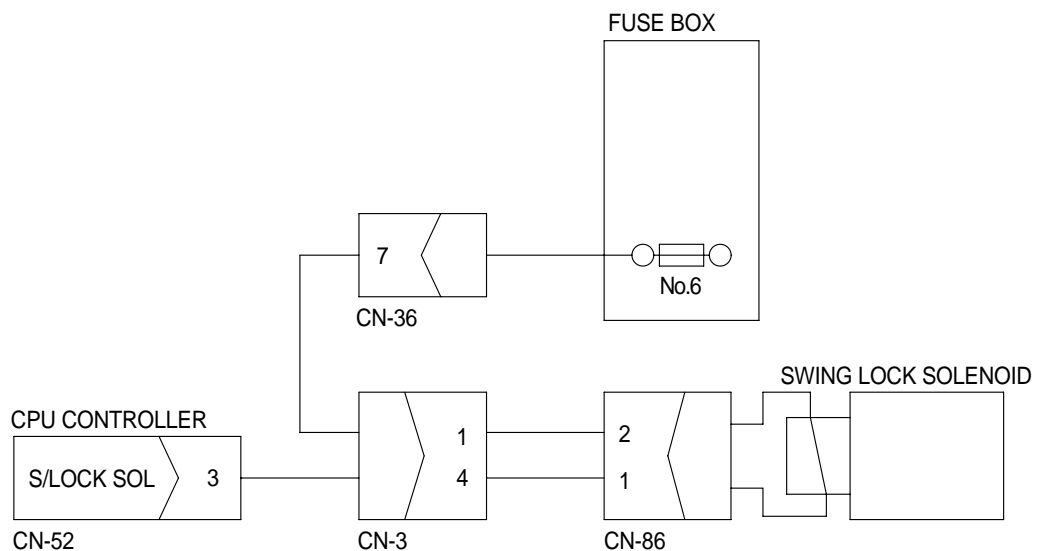
### 13) OPEN CIRCUIT OF SWING LOCK SOLENOID SYSTEM(Error code : 12)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.
- Check the swing lock prolix switch is in the OFF position.



**Table 6**

CN-52(Female)	CN-3(Male)	CN-86(Male)	Resistance
-	(1) - (4)	(1) - (2)	20 ~ 30 Ω



#### 14) SHORT CIRCUIT OF CUT-OFF CANCEL SOLENOID SYSTEM(Error code : 15)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.

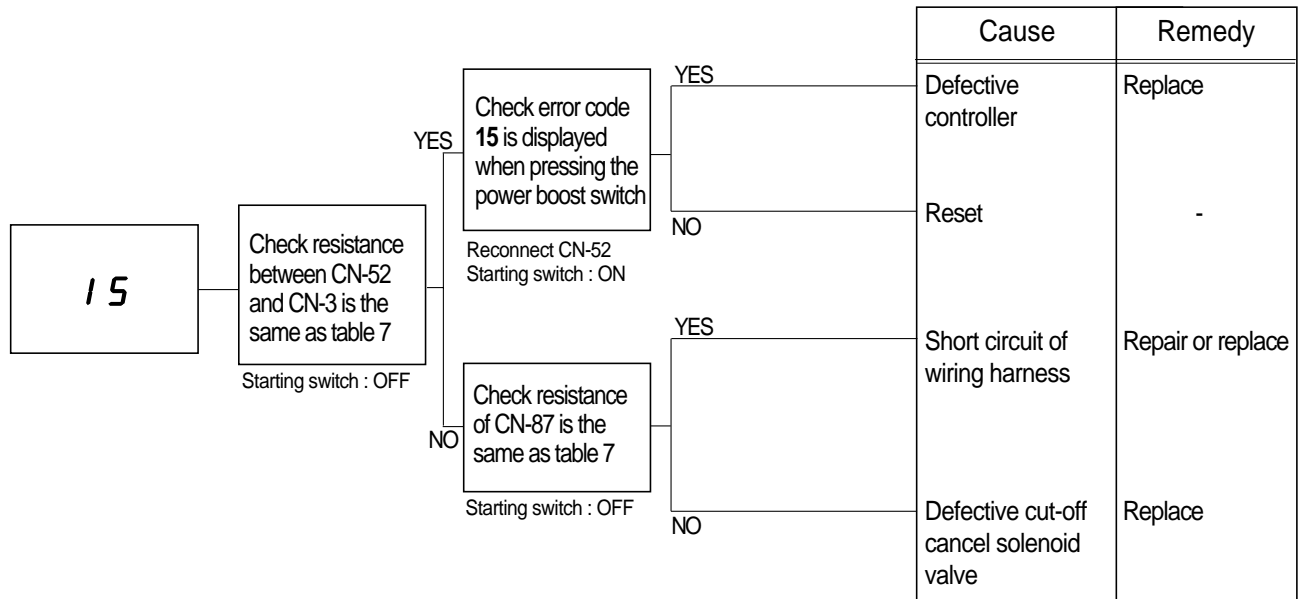
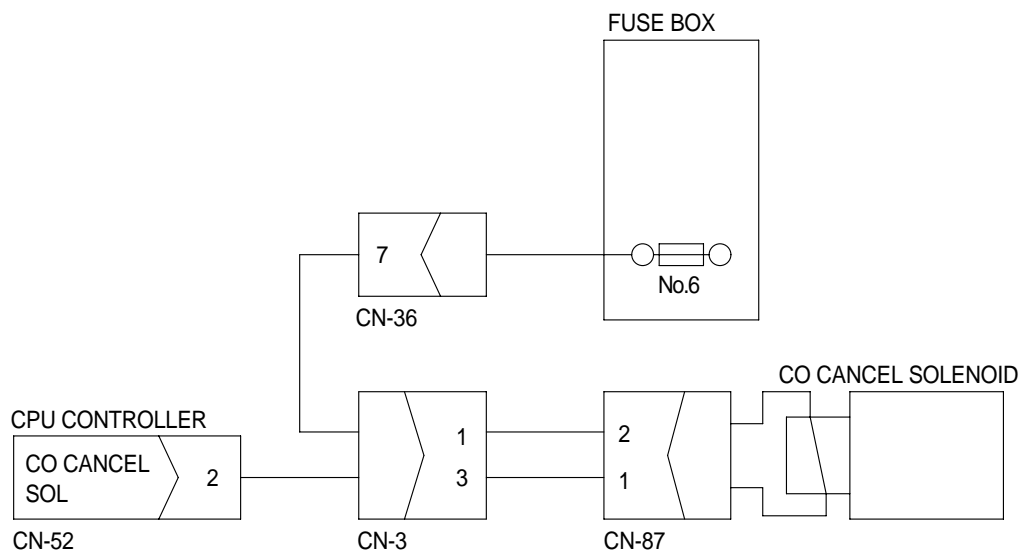


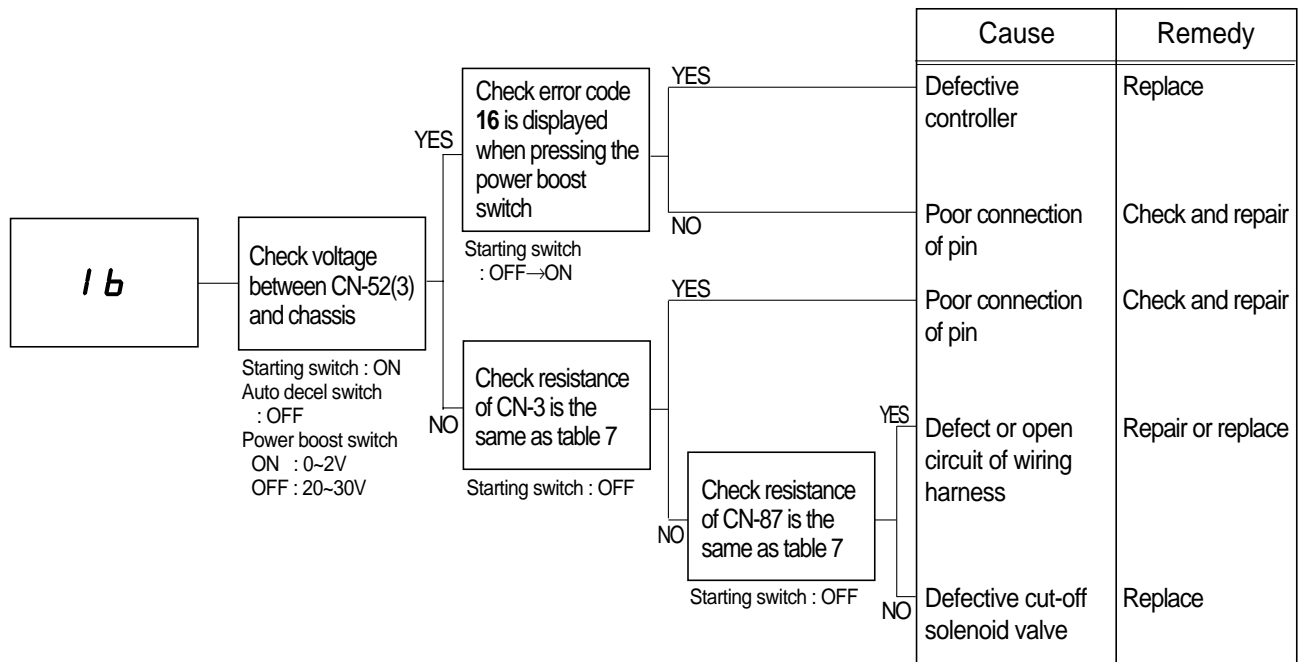
Table 7

CN-52(Female)	CN-3(Male)	CN-87(Male)	Resistance
-	(1) - (3)	(1) - (2)	20 ~ 30 Ω
(2) - Chassis	(3) - Chassis	(1) - Chassis	Min 1MΩ



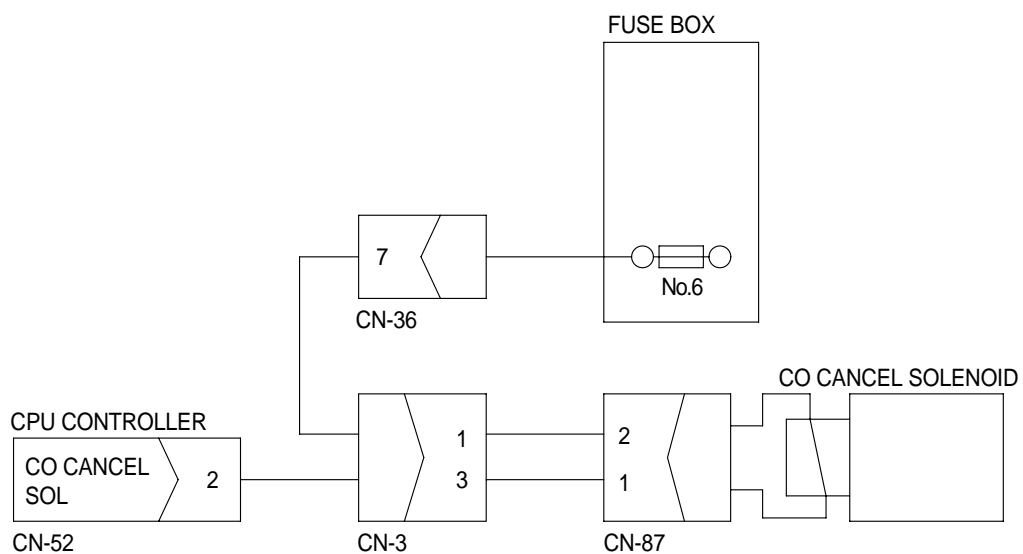
### 15) OPEN CIRCUIT OF CUT-OFF CANCEL SOLENOID SYSTEM(Error code : 16)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



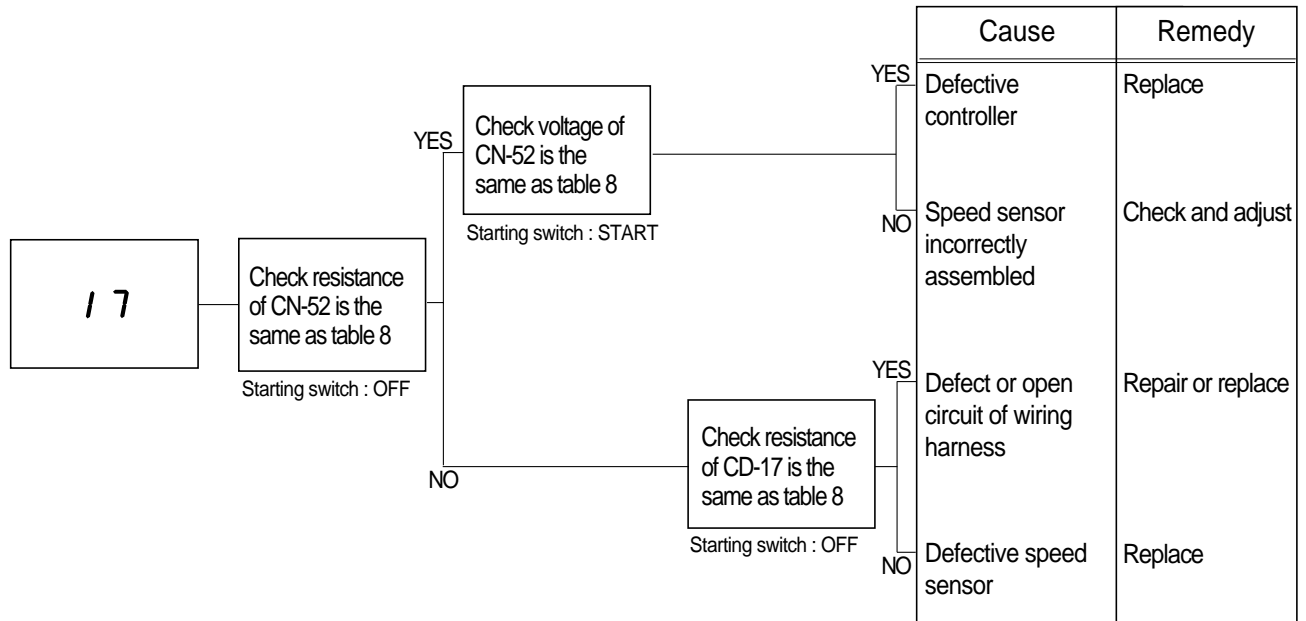
**Table 7**

CN-52(Female)	CN-3(Male)	CN-87(Male)	Resistance
-	(1) - (3)	(1) - (2)	20 ~ 30 Ω
(2) - Chassis	(3) - Chassis	(1) - Chassis	Min 1MΩ



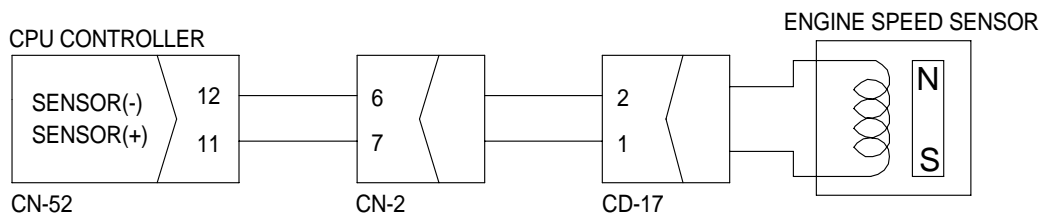
**16) DEFECT OF ENGINE SPEED SENSOR SYSTEM(Error code : 17)**

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



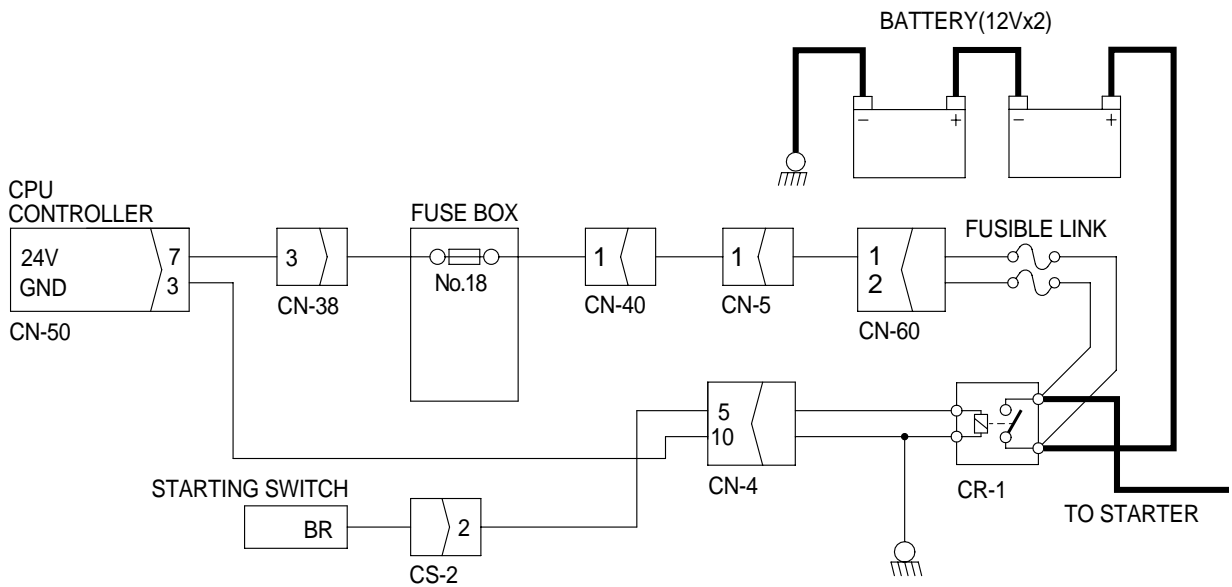
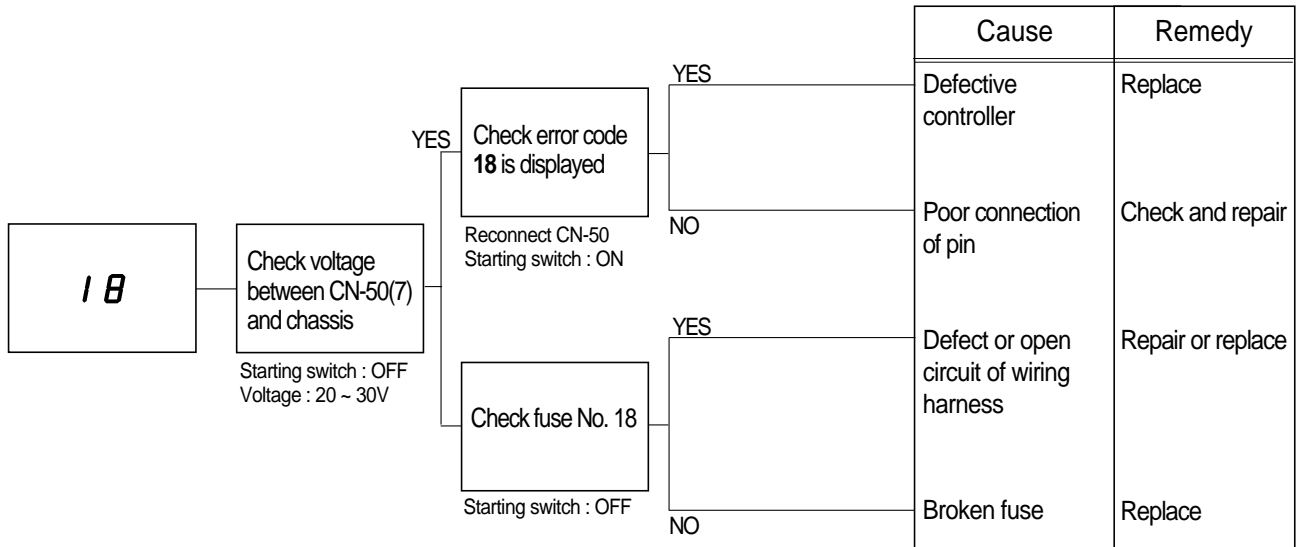
**Table 8**

CN-52(Female)	CD-17(Male)	Normal value
(11) - (12) : Resistance	(1) - (2) : Resistance	200 ~ 400 Ω
(11) - (12) : Voltage	(1) - (2) : Voltage	Min AC 1V



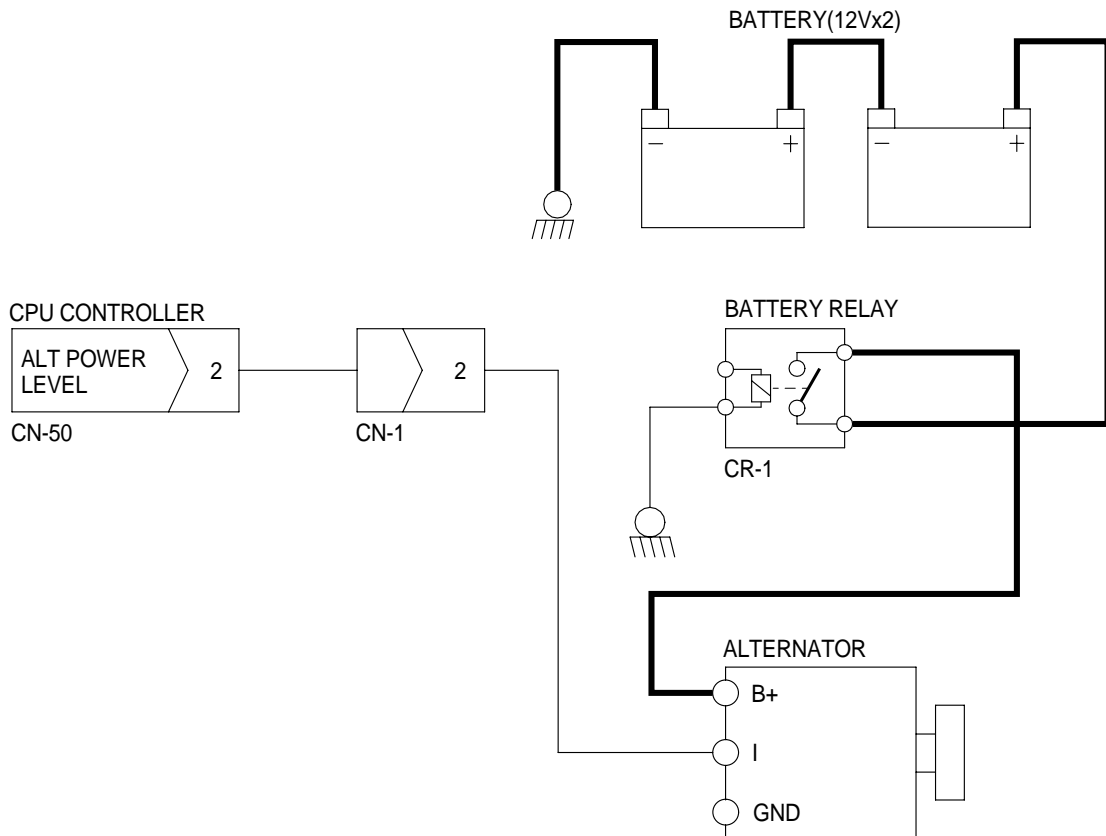
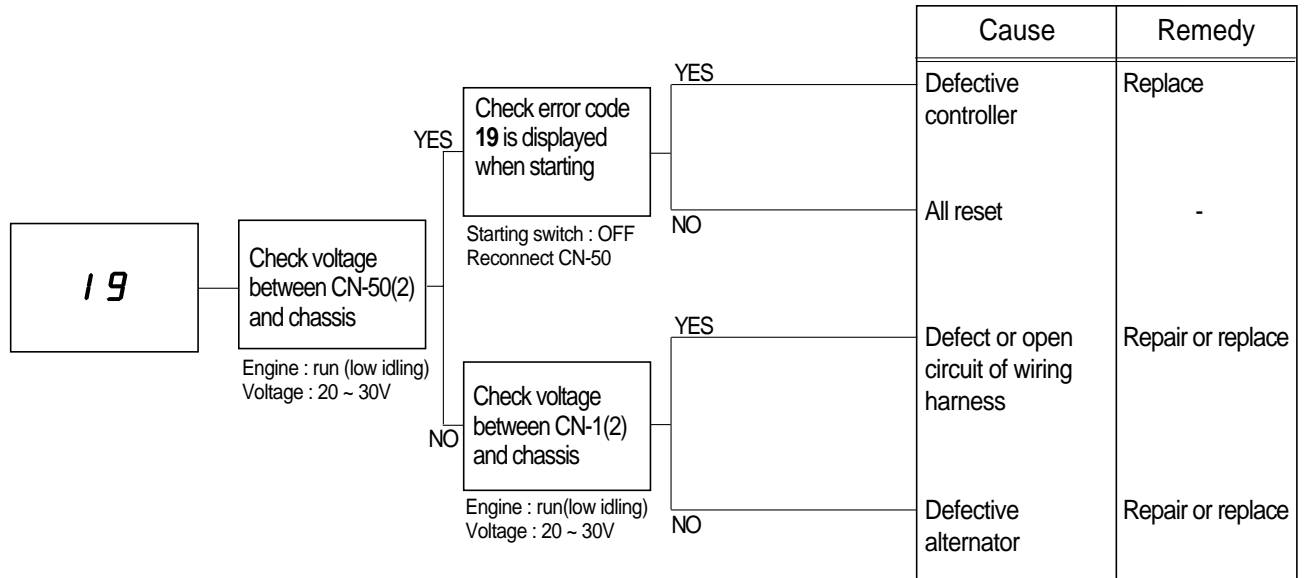
**17) OPEN CIRCUIT OF CONTINUOUS POWER SYSTEM(Error code : 18)**

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



**18) INPUT POWER IS BELOW 18V**(Error code : 19)

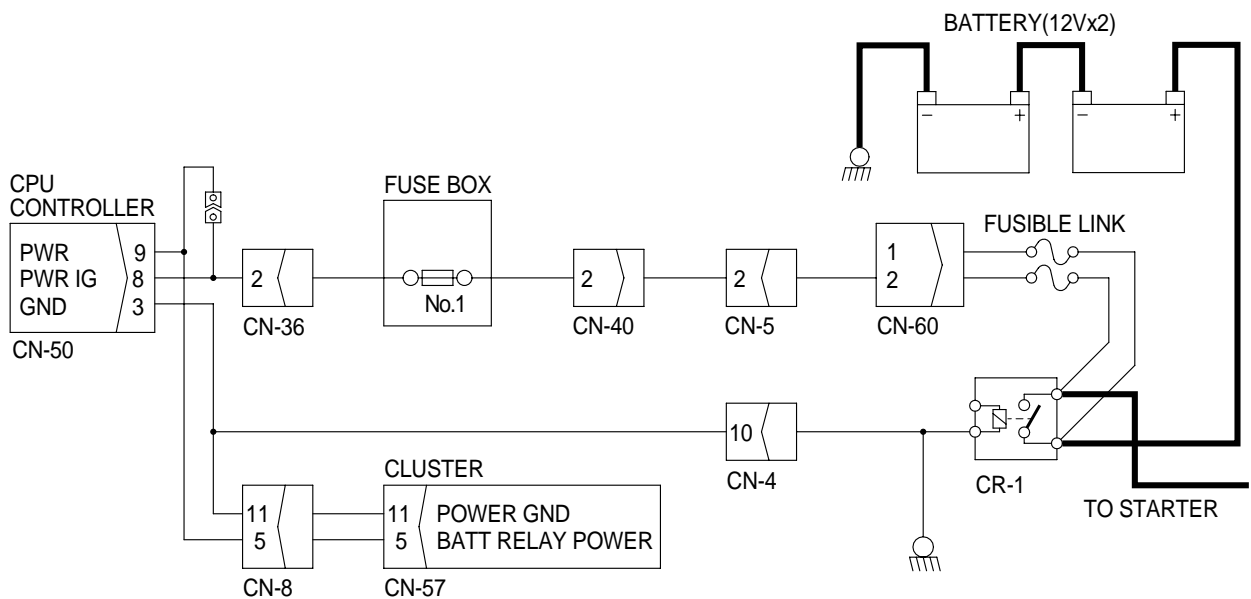
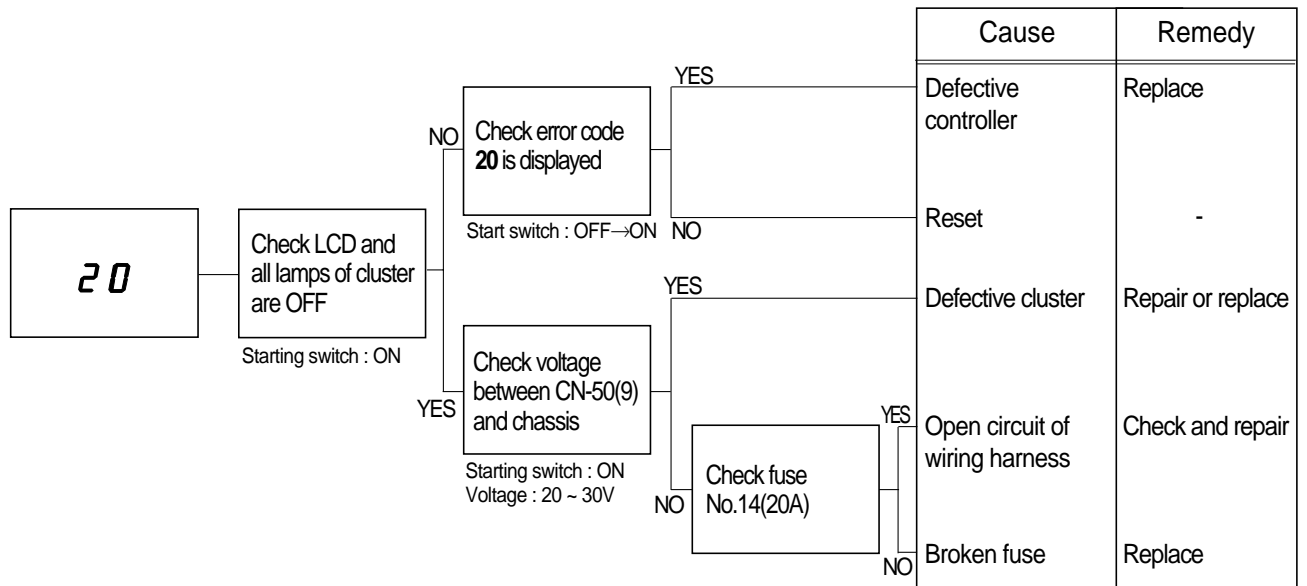
- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.





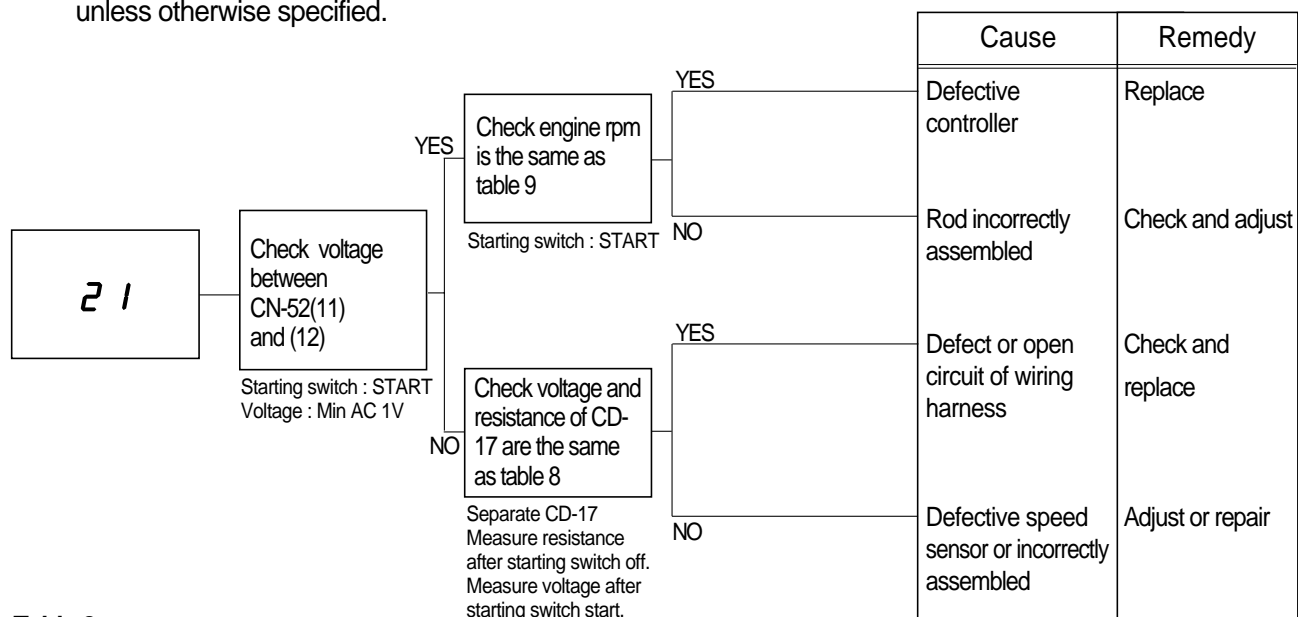
### 19) OPEN CIRCUIT OF CLUSTER INPUT POWER(Error code : 20)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



## 20) DEFECTIVE ENGINE RPM SETTING (Error code : 21)

- Before checking, check all the related connectors are properly inserted.
- Before carrying out next procedure, connect the disconnected connectors again immediately unless otherwise specified.



**Table 8**

CN-52(Female)	CD-17(Male)	Normal value
(11) - (12) : Resistance	(1) - (2) : Resistance	200 ~ 400 Ω

**Table 9**

Mode	RPM(unload)	Remarks
H	2200 ± 50	• Auto Decel : Cancel
S	2200 ± 50	
L	2000 ± 50	
F	1600 ± 50	
Auto Decel	1200 ± 100	• Auto Decel : Select
Start	800 ± 100	• RCV Lever : Neutral

