TOSHIBA
Leading Innovation

FILE NO. A08-015

SERVICE MANUAL

Model name:

TCS-NET Analog Interface
TCB-IFCB640TLE

SAFETY CAUTION

The important contents concerned to the safety are described on the product itself and on this Service Manual. Please read this Service Manual after understanding the described items thoroughly in the following contents (Indications/Illustrated marks), and keep them.

[Explanation of indications]

Indication	Explanation
⚠ **DANGER**	Indicates contents assumed that an imminent danger causing a death or serious injury of the repair engineers and the third parties when an incorrect work has been executed.
⚠ **WARNING**	Indicates possibilities assumed that a danger causing a death or serious injury of the repair engineers, the third parties, and the users due to troubles of the product after work when an incorrect work has been executed.
⚠ **CAUTION**	Indicates contents assumed that an injury or property damage (*) may be caused on the repair engineers, the third parties, and the users due to troubles of the product after work when an incorrect work has been executed.

* Property damage : Enlarged damage concerned to property, furniture, and domestic animal/pet

[Explanation of illustrated marks]

Mark	Explanation
	Indicates prohibited items (Forbidden items to do) The sentences near an illustrated mark describe the concrete prohibited contents.
	Indicates mandatory items (Compulsory items to do) The sentences near an illustrated mark describe the concrete mandatory contents.
	Indicates cautions (including danger/warning) The sentences or illustration near or in an illustrated mark describe the concrete cautious contents.

⚠ **WARNING**	
 Prohibition of modification.	**Do not modify the products.** Do not also disassemble or modify the parts. It may cause a fire, electric shock or injury.
 Use specified parts.	**For spare parts, use those specified (*).** If unspecified parts are used, a fire or electric shock may be caused. *: For details, refer to the parts list.
 Do not bring a child close to the equipment.	**Before troubleshooting or repair work, do not bring a third party (a child, etc.) except the repair engineers close to the equipment.** It causes an injury with tools or disassembled parts. Please inform the users so that the third party (a child, etc.) does not approach the equipment.
 Insulating measures	**Connect the cut-off lead cables with crimp contact, etc, put the closed end side upward and then apply a water-cut method, otherwise a leak or production of fire is caused at the users' side.**
 Assembly/Cabling	**After repair work, surely assemble the disassembled parts, and connect and lead the removed cables as before. Perform the work so that the cabinet or panel does not catch the inner cables.** If incorrect assembly or incorrect cable connection was done, a disaster such as a leak or fire is caused at user's side.

⚠ WARNING	
 Insulator check	**After the work has finished, be sure to use an insulation tester set (500V mugger) to check the resistance is 2MΩ or more between the charge section and the non-charge metal section (Earth position).** If the resistance value is low, a disaster such as a leak or electric shock is caused at user's side.
 Be attentive to electric shock	**When checking the circuit inevitably under condition of the power-ON, use rubber gloves and others not to touch to the charging section.** If touching to the charging section, an electric shock may be caused.
 Check after rerair	**After repair work has finished, check there is no trouble.** If check is not executed, a fire, electric shock or injury may be caused. For a check, turn off the power breaker.
	After repair work (installation of front panel and cabinet) has finished, execute a test run to check there is no generation of smoke or abnormal sound. If check is not executed, a fire or an electric shock is caused. Before test run, install the front panel and cabinet.
 Check after reinstallation	**Check the following items after reinstallation.** 1) The earth wire is correctly connected. 2) The power cord is not caught in the product. 3) There is no inclination or unsteadiness and the installation is stable. If check is not executed, a fire, an electric shock or an injury is caused.

⚠ CAUTION	
 Put on gloves	**Be sure to put on gloves (*) during repair work.** If not putting on gloves, an injury may be caused with the parts, etc. (*) Heavy gloves such as work gloves
 Cooling check	**When the power was turned on, start to work after the equipment has been sufficiently cooled.** As temperature of the compressor pipes and others became high due to cooling/heating operation, a burn may be caused.

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1. Outline

This document describes how to troubleshoot specific problems with the TCB-IFCB640TLE analog input interface. For information on Applications/Functions/Specifications, Installation, Connection of Power cable and Signal wires, Setting, Trial Operation Check, Connection to External Devices, and so on, see the Installation Manual of the TCB-IFCB640TLE.

2. Required Devices and Tools

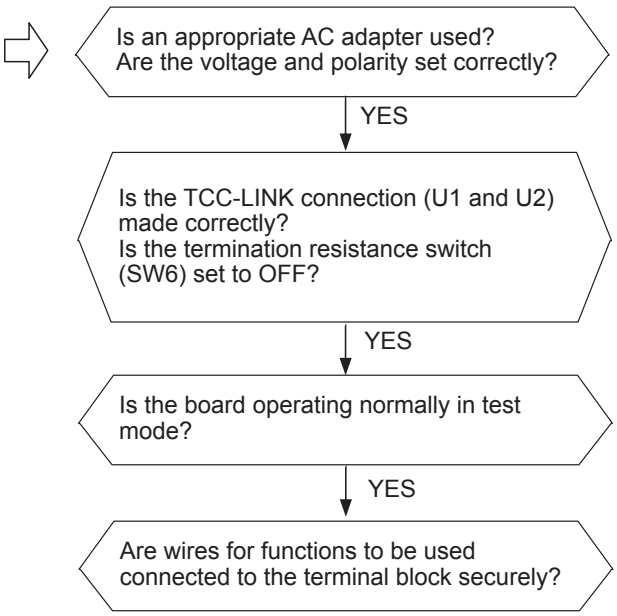
- Screw driver (for +M4 screw)
- TESTER

3. Checking the Board inside the TCB-IFCB640TLE

In troubleshooting procedures described in Section 4 or later, you need to check the settings, connections, and LEDs of the board inside the case.
Disconnect the DC plug of the AC adapter, remove the screws located in the four corners of the case lid, and remove the lid of the case. Connect the DC plug again, and turn on the unit.

4. Troubleshooting

Follow the flowchart below to perform common checks that apply to every kind of troubleshooting. For the details, refer to 4-1.



Troubleshoot your problem by using the applicable procedure shown below. For the details, refer to 4-2 and its following.

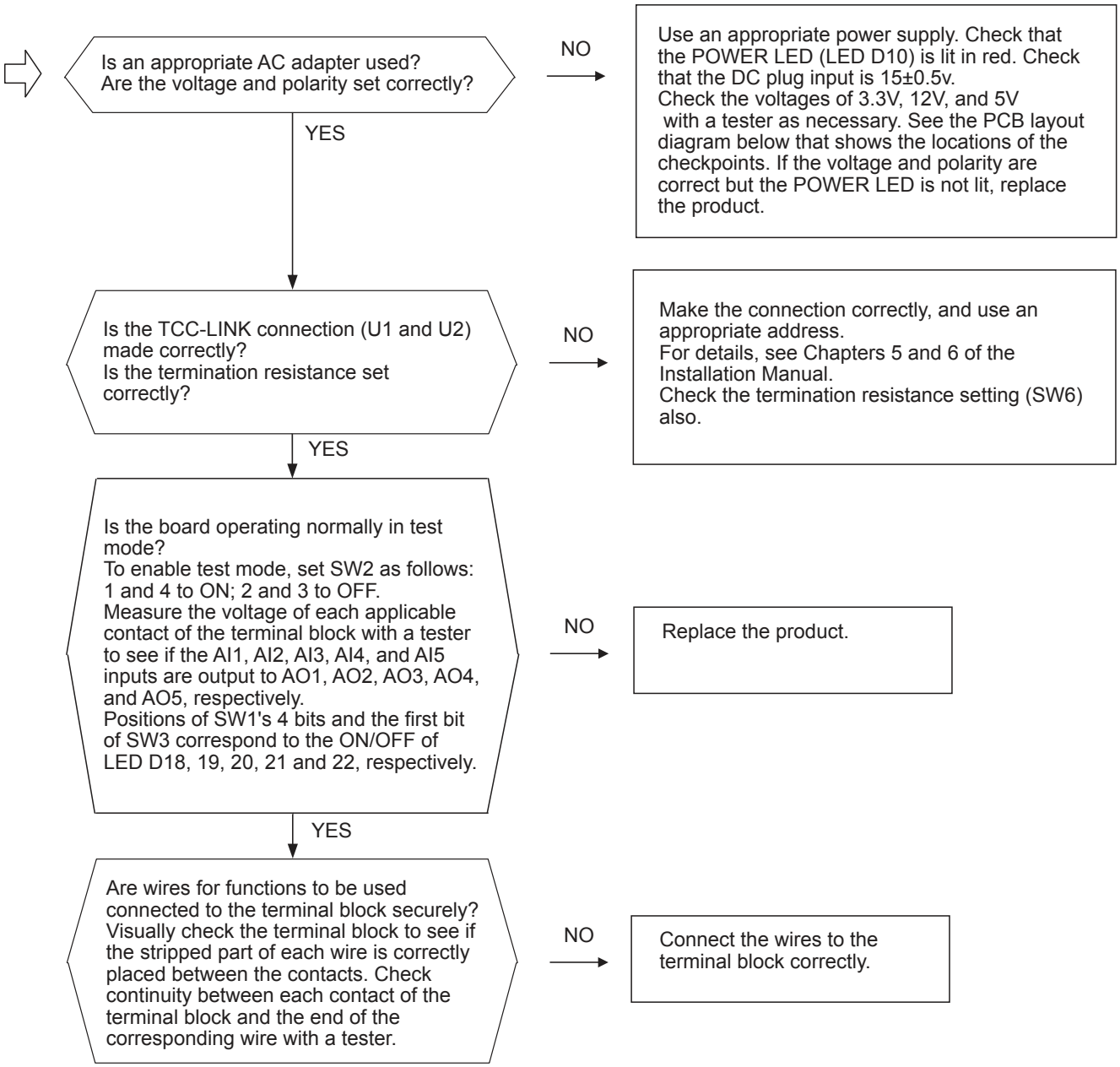
Air conditioner control cannot be set up, or operation status cannot be acquired. Refer to 4-2.

The TCB-IFCG1TLE general-purpose device cannot be set up, or its status values cannot be obtained. Refer to 4-3.

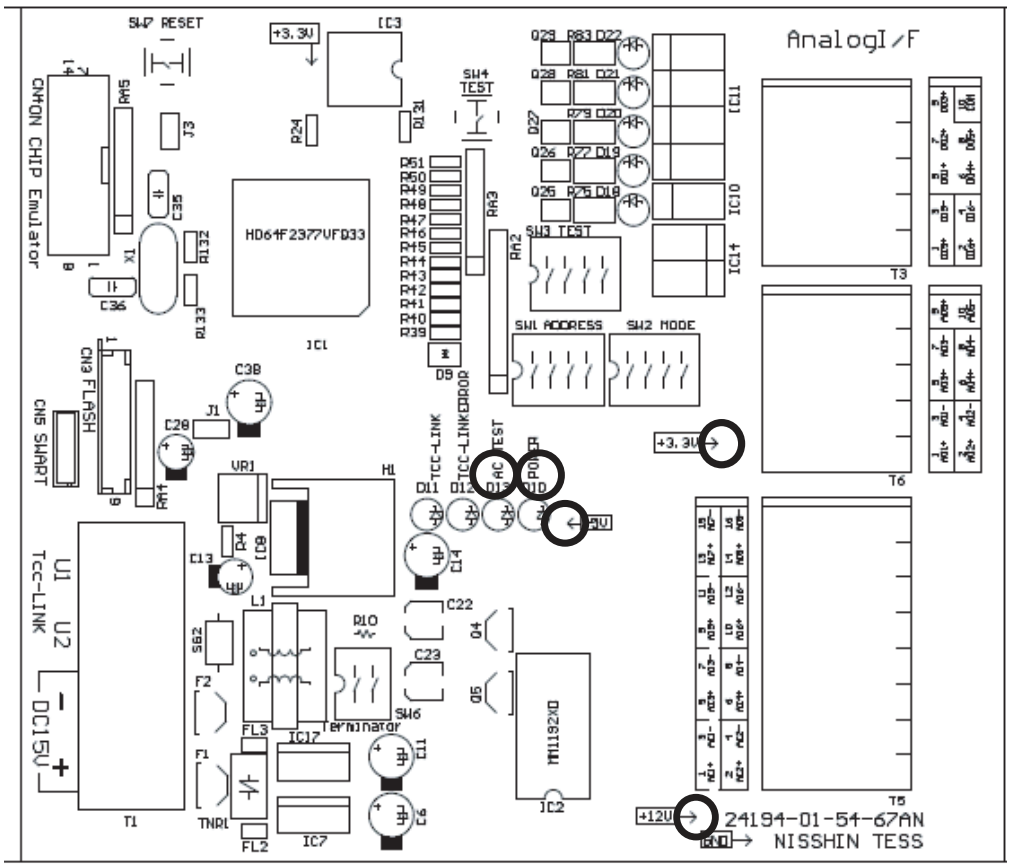
Details are described in the following sections using flowcharts.

4-1. Common Checks

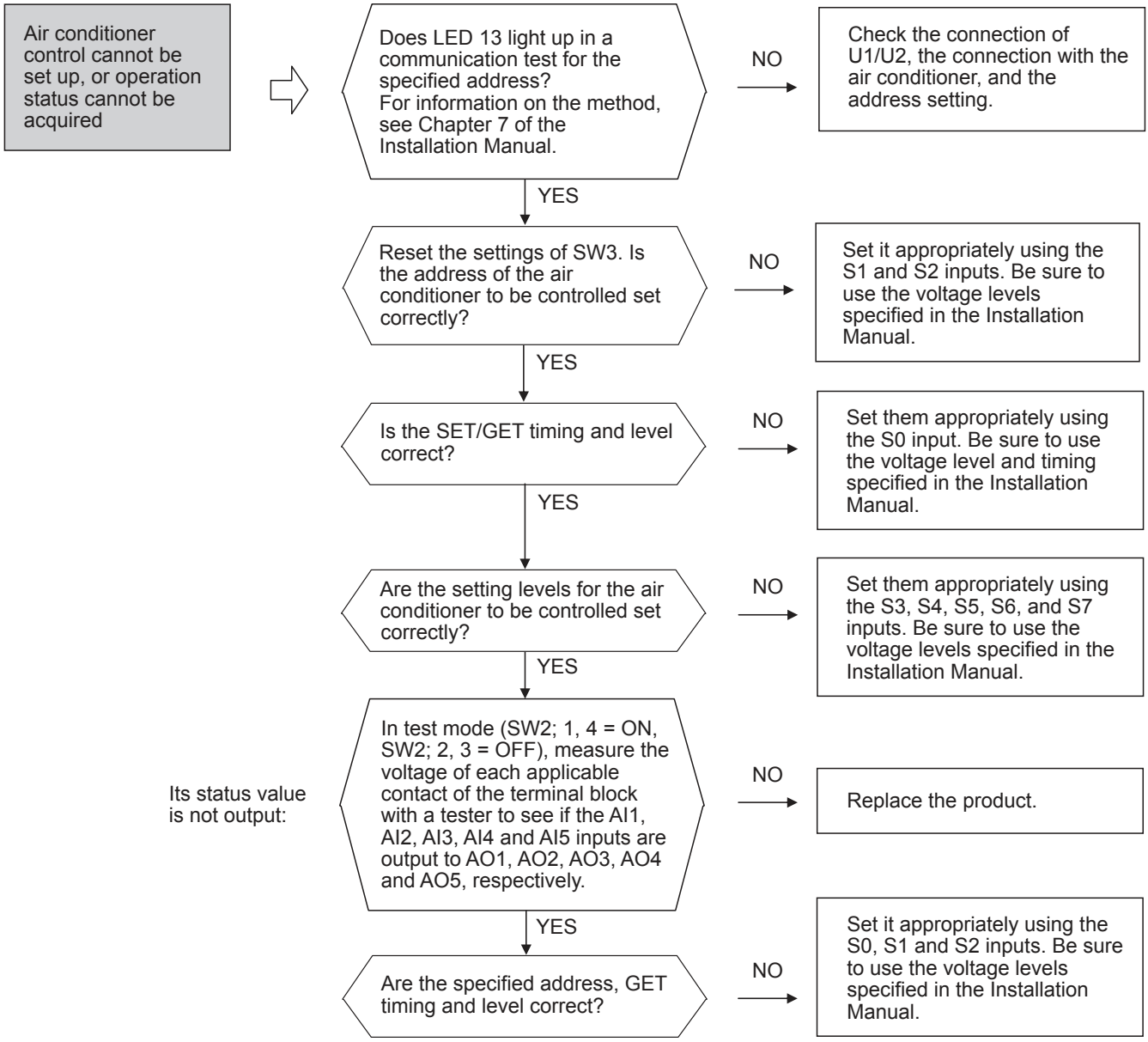
Be sure to perform the checks shown in the flowchart below when a problem occurs.



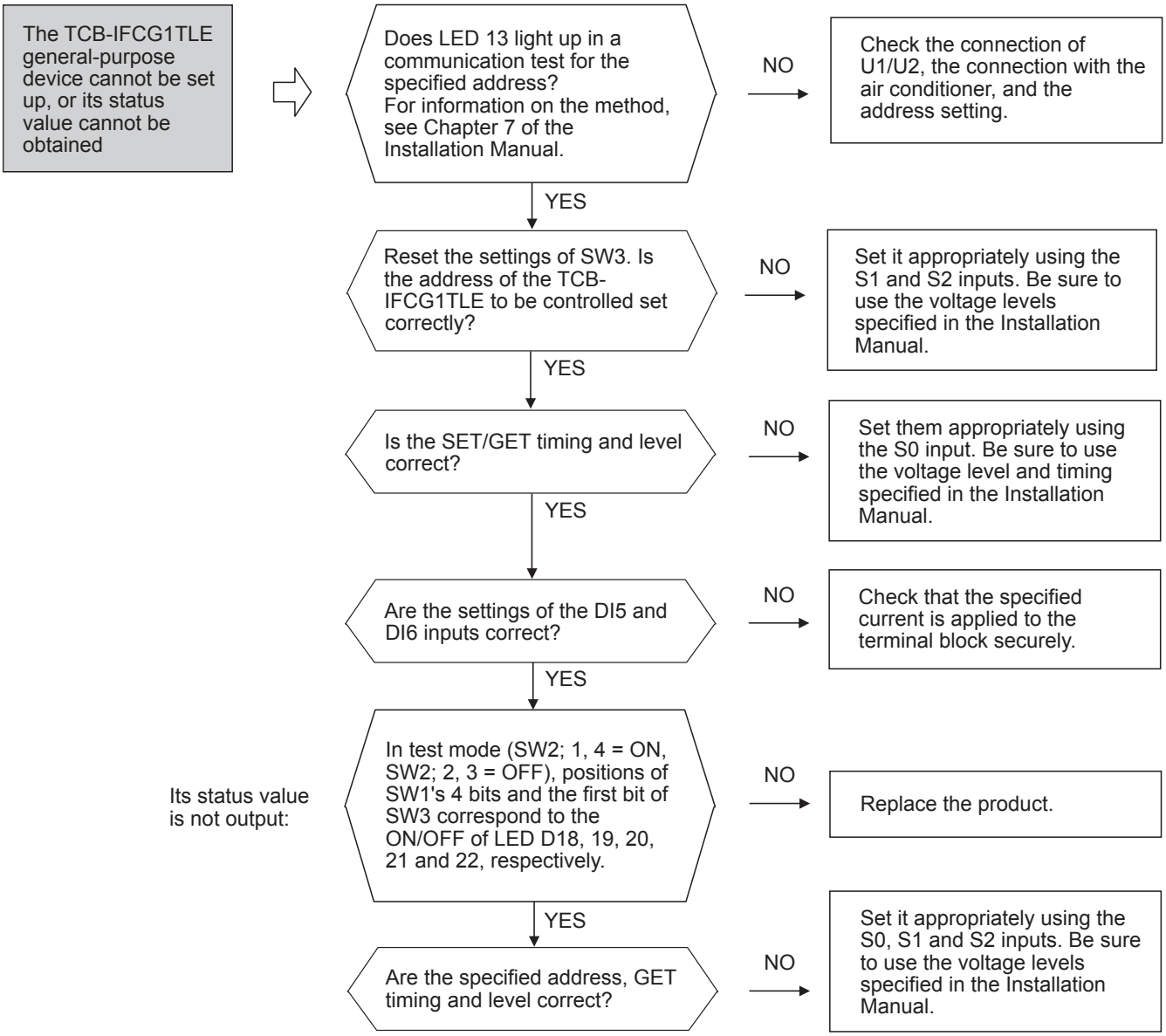
The PCB layout is shown below. Checkpoints are circled.



4-2. Air conditioner control cannot be set up, or operation status cannot be acquired



4-3. The TCB-IFCG1TLE general-purpose device cannot be set up, or its status value cannot be obtained



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Leading Innovation

TCS-NET ANALOG INTERFACE

Installation Manual

Model name:

TCS-NET Analog Interface

TCB-IFCB640TLE

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- Thank you very much for purchasing this TOSHIBA TCB-IFCB640TLE.
- Please read this manual carefully beforehand for proper installation of the TCB-IFCB640TLE.

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1 Precautions for Safety

■ Manual readers

This manual is intended for those who have the required knowledge/Qualifications for electric or control and are in charge of any of the following:

- Installation of the product
- Design of the control system
- Management of the site

■ Agreements for use of this product

(1) Scope of warranty

If a failure occurs in this product as a result of our fault or negligence we will provide replacement or repair of the product.

We will not be responsible if the fault occurs as a result of any of the following.

- The product was handled or used under conditions/environment that are not specified in this manual.
- The failure was caused by aspects outside of this product.
- The product was altered or repaired by persons other than Toshiba Carrier.
- The product was not used in accordance with its original purpose.
- The cause of the failure was not foreseeable with our scientific and technical levels at the time of shipping.
- The failure is due to a natural calamity, disaster, or the like.

The warranty mentioned here shall cover only this product, and any damage and losses resulting from the failure of this product shall be excluded from the scope of warranty.

(2) Restrictions of liability

In no event shall we be liable for any special, indirect, or consequential damage arising out of or in connection with the use of this product.

(3) Conditions for use of this product

- When this product is to be used in combination with other products, the dealer or qualified professional shall check the applicable standards, specifications, laws, and regulations beforehand. The dealer or qualified professional shall also verify that this product conforms to the customer's system, machines, and/or equipment in which this product is to be used. If the dealer or qualified professional fails to do so, we shall not be responsible for the conformity of this product.
- When you wish to use this product for any of the following purposes, be sure to consult our sales staff and use this product with a margin of rating and performance, as well as take appropriate safety measures for safety circuit, mechanism, etc. that will minimize danger in case of a failure.
  * Use this product outdoors or for purposes that may cause latent chemical contamination or electrical interference or use under conditions/environment that are not specified in this manual.
  * Use this product in nuclear power control facilities, incineration facilities, railway/airline/vehicle facilities, medical equipment, amusement machines, safety devices, and equipment/facilities that are restricted by administrative organizations and/or respective industries.
  * Use this product in systems, machines, or equipment that may pose a danger to human life or properties.
  * Use this product in systems or facilities that require high reliability, such as gas/water/electricity supply systems and non-stop operation systems.
  * Use this product for other purposes that require a high level of safety.
- Thoroughly understand and strictly observe all prohibitions and precautions for use stated in this manual to prevent contingent damage or losses to you or other persons due to improper use of this product.

(4) Changes to specifications

The specification described in this manual is subject to change for improvement or other reasons without notice. Contact our sales staff to confirm the latest specifications of this product.

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- Read these “Precautions for Safety” carefully before installation.
- The precautions described below include important items regarding safety. Observe them without fail.
- After the installation work, perform a trial operation to check for any problem. Explain how to use and maintain the unit to the customer. Ask the customer to keep this Installation Manual.

⚠ WARNING

- **Ask an authorized dealer or qualified installation professional to install or reinstall the TCB-IFCB640TLE.**
  Improper installation may result in electric shock or fire.
- **Turn off the main power supply switch or breaker before attempting any electrical work.**
  Make sure all power switches are off. Failure to do so may cause electric shock.
- **Perform installation work properly according to this Installation Manual.**
  Improper installation may result in electric shock or fire.
- **Do not modify the unit.**
  Any modification may cause a malfunction, resulting in overheating or fire.

⚠ CAUTION

- **Perform wiring correctly in accordance with the specified the current capacity.**
  Failure to do so may result in short-circuit, overheating, or fire.
- **Connect the specified cables for the terminals securely to prevent external forces from affecting them.**
  Failure to do so may result in disconnection, overheating, or fire.

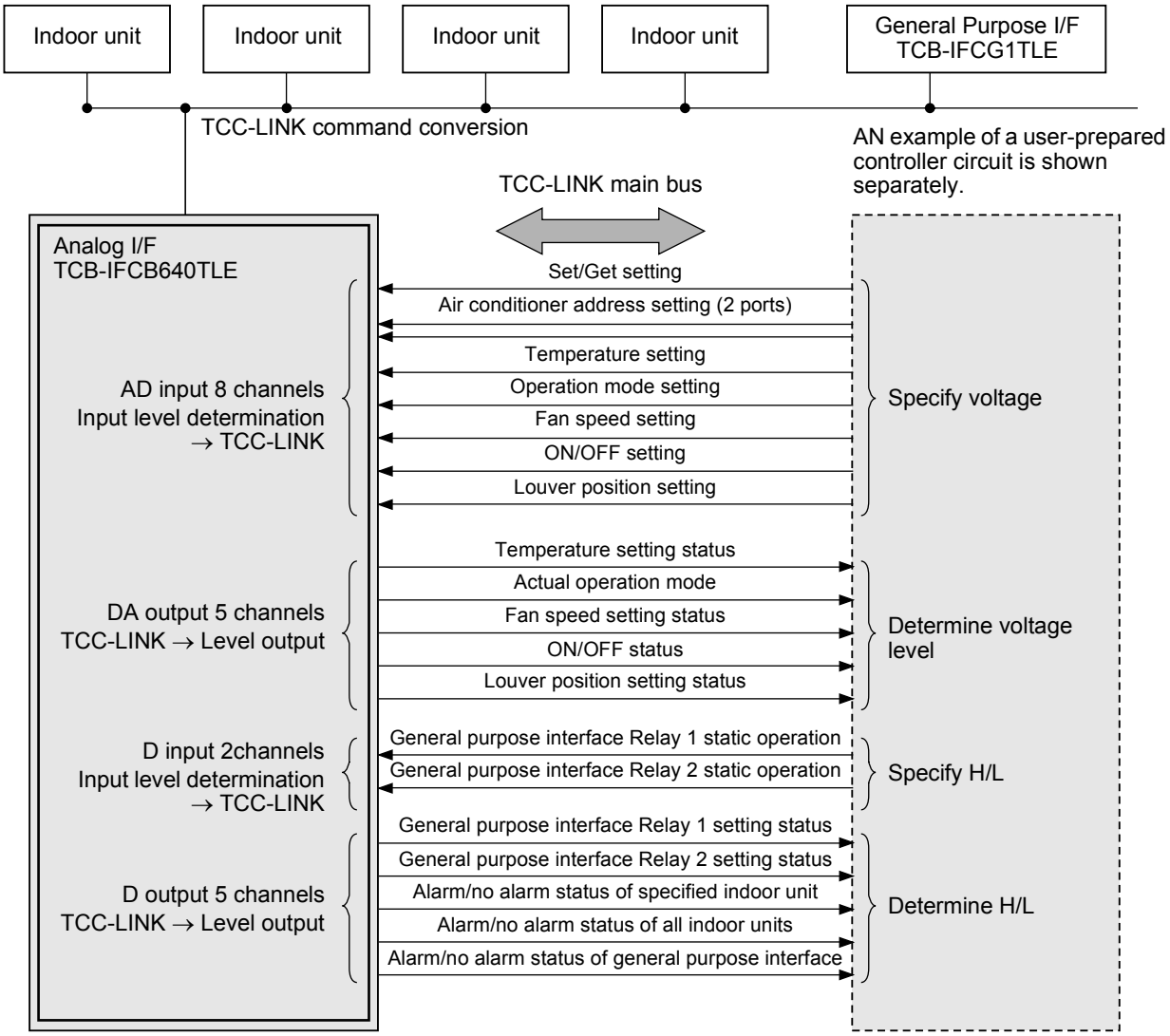
2 Introduction

■ Applications/Functions/Specifications

Applications

The TCB-IFCB640TLE can provide instructions to and acquire status information from the general purpose interface TCB-IFCG1TLE and up to 64 indoor units on the TCC-LINK by applying variable voltage 0 to 10 V to the 8-channel analog input without using special communication protocol. In other words, the TCB-IFCB640TLE can access indoor units and the general purpose interface by varying voltage at a proper timing with connection to a rotary encoder and a multi channel variable-voltage processing circuit.

- By applying voltage of each level corresponding to central control address and setting value between terminal inputs AI*+ and AI*- and specifying Set or Get, indoor units or TCB-IFCG1TLE can be controlled and their status information can be acquired.



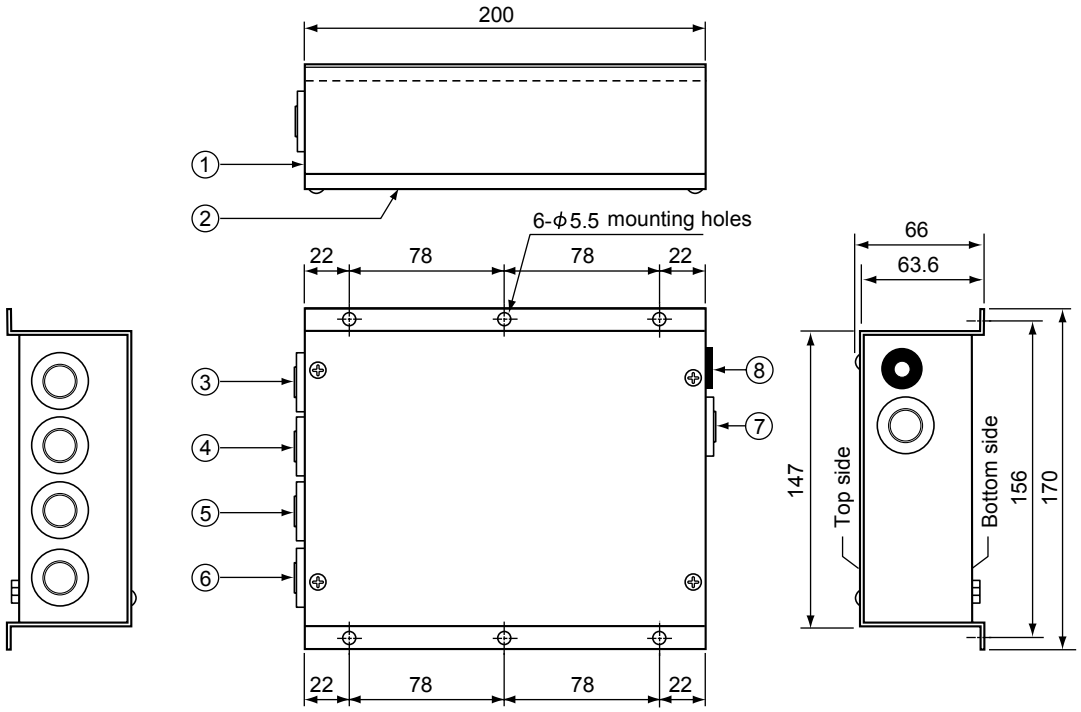
- Compatible Air Conditioners
  S-MMS, S-HRM, Mini-SMMS, DI, SDI

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Specifications

Power supply	15 VDC ±5%
Power consumption	3.2 W
Operating temperature/humidity	0 to 40 °C, 20 to 85% RH
Storage temperature	-20 to 60 °C
Chassis material	Galvanized sheet metal 0.8t (no coating)
Dimensions	66 (H) × 170 (W) × 200 (D) mm
Mass	820 g

■ External View



	Parts name	Specifications		Parts name	Specifications
1	Case	Galvanized sheet metal	5	Grommet	C30-SG20A
2	Case lid	Galvanized sheet metal	6	Grommet	C30-SG20A
3	Grommet	C30-SG20A	7	Grommet for power supply	C30-SG20A
4	Grommet	C30-SG20A	8	DC Jack	MJ-40

3 Before Installation

Check the following package contents.

No.	Item	Quantity	Remarks
1	TCB-IFCB640TLE	1	
2	Installation Manual	1	
3	Screw	4	M4 x 12 mm tapping screws

Use the following wiring materials to connect the signal lines and power lines. (Procured on site)

No.	Line	Description	
1	TCC-LINK	Type	2-core shield wires
		Wire size	1.25 mm², 1000m max. 2.00 mm², 2000m max.
		Length	(Total Length of TCC-LINK Network, includes indoor/outdoor connection.)
2	Signal	Type	Multi-core wire
		Wire size	Stranded wire, single wire *1 0.08097 mm² to 3.309 mm²
		Length	(AWG28 to AWG12) Max. 20 m *2
3	Power	Specified by AC adaptor	

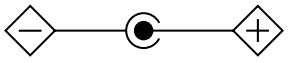
*1 Use shielded wire according to the environment.
Normally PVC cable is recommended. The conductor diameter should be approximately 0.75 mm and its resistance should be 25Ω/km. For 16-core cable, the outer diameter should be approximately 13 mm.

*2 Varies with use environment and conditions.

An AC adaptor unit for this product must meet the following requirements and be procured locally.

REQUIREMENT

- Output: 15 V ±5%
- Current: 0.5 A or more
- Shall conform to applicable safety standards (including EN60950-1 or IEC 60950-1, etc), EMI standards (EN550022 and EN61000-3), and EMS standards (including EN50024, (EN61204-3), and EN61000-4).
- Shall meet environmental conditions and required lifetime.
- DC Plug 2.1mmØ (inner diameter)
  5.5mmØ (outer diameter)
  10mm (length)



Recommended product is
Model name: UI312-1508 produced by UNIFIVE TECHNOLOGY CO., LTD
Homepage addresses of UNIFIVE TECHNOLOGY CO., LTD are
http://www.unifive-us.com/, http://www.unifive.com.tw/, http://www.unifive.co.kr/, http://www.unifive.com/ or http://www.unifive-c.com/.

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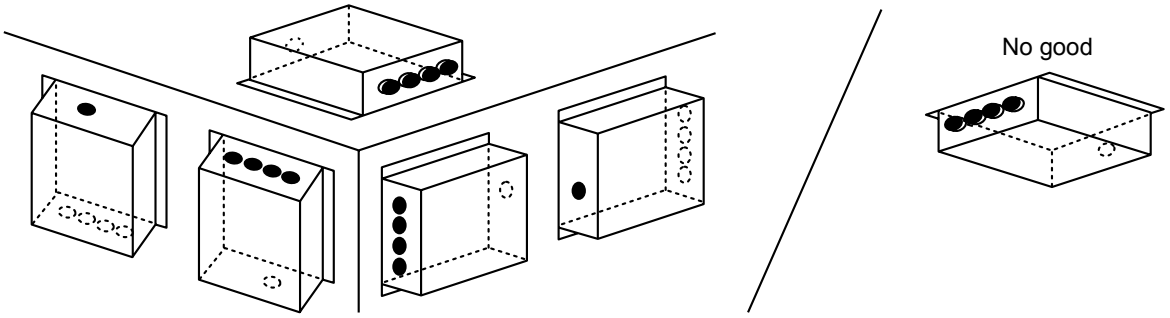
4 Installation

■ TCB-IFCG1TLE (TCB-IFCG2TLE) Installation Method and Orientation

There are five orientations of Surface/Wall Mount that the TCB-IFCG1TLE (TCB-IFCG2TLE) can be installed, these are shown below.

NOTE

Use screws supplied for installation of device.



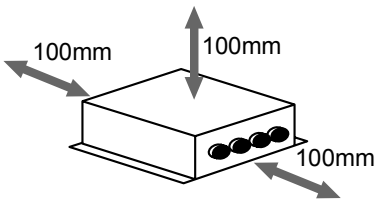
REQUIREMENT

Do not install the unit in any of the following places.

- Humid or wet place
- Dusty place
- Place exposed to direct sunlight
- Place where there is a TV set or radio within one meter
- Place exposed to rain (outdoors, under eaves, etc.)

■ Installation Space and Maintenance Space

A side space for connecting through cable inlets and an upper space for maintenance must be reserved before installation.
The other sides can be adjacent to surrounding objects.



5 Connection of Power cables/Earth wires/ Signal wires

⚠ CAUTION

- Power lines have polarity.
- The TCC-LINK signal lines have no polarity.

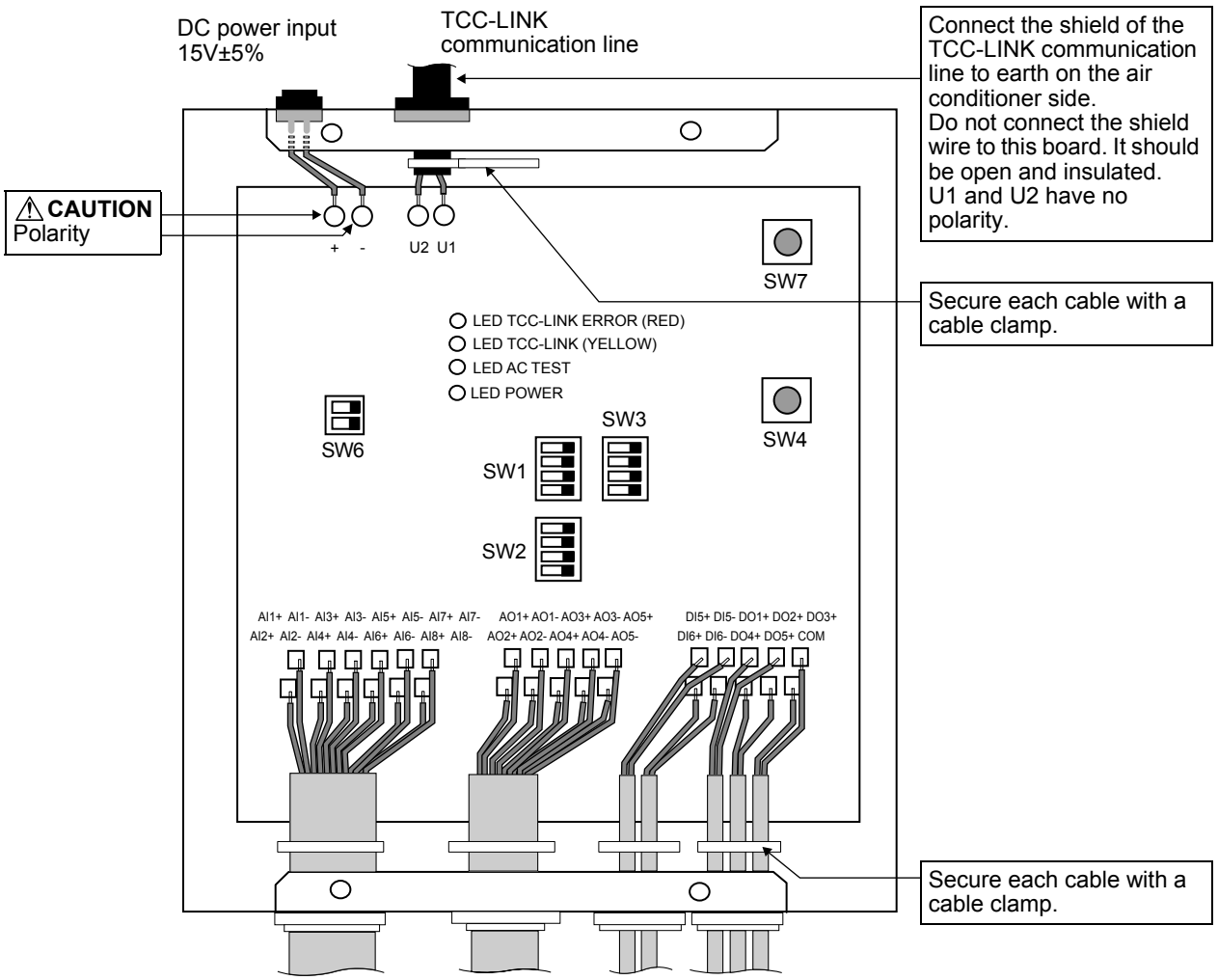
REQUIREMENT

Disconnect the AC adaptor for this appliance from the main power supply.

- The AC adaptor for this appliance must be connected to the main supply by a circuit breaker or switch with a contact separation of at least 3 mm.

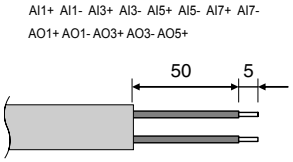
■ Power cables/Earth wires/Signal wires

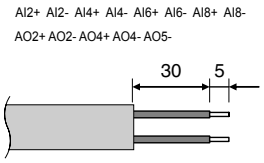
Connect power cables, earth wires, and signal wires to the specified terminals on the terminal block as shown below.

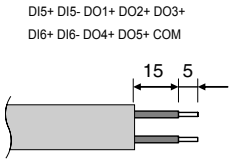


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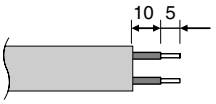
▼Length of stripped signal wires





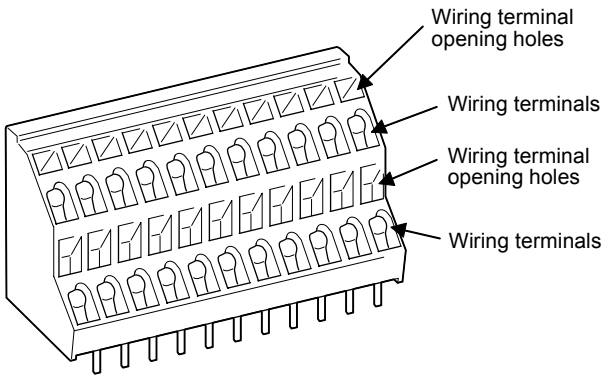


▼U1 U2

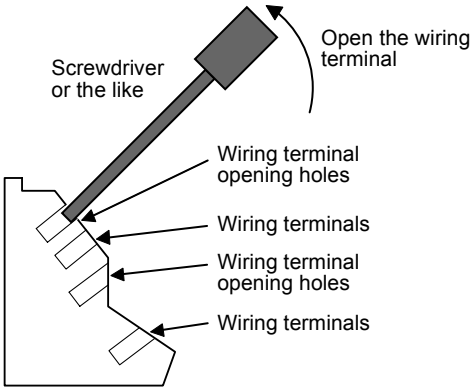


⚠ CAUTION

To connect a wire to a wiring terminal on the signal terminal block, insert a screwdriver or the like into a wiring terminal opening hole at an angle of 45 degrees and raise the screwdriver end to open the wiring terminal as shown below. Insert a wire into the open wiring terminal in this state, and then lower the screwdriver end and remove from the terminal opening hole.



Appearance of signal terminal block



Side view of signal terminal block

■ Wiring Connection

The following displays an example of the TCB-IFCG1TLE connection to the TCC-LINK Network.
The TCC-LINK communication lines are connected to the U1 and U2 terminal blocks on the TCB-IFCG1TLE board as shown below.

NOTE

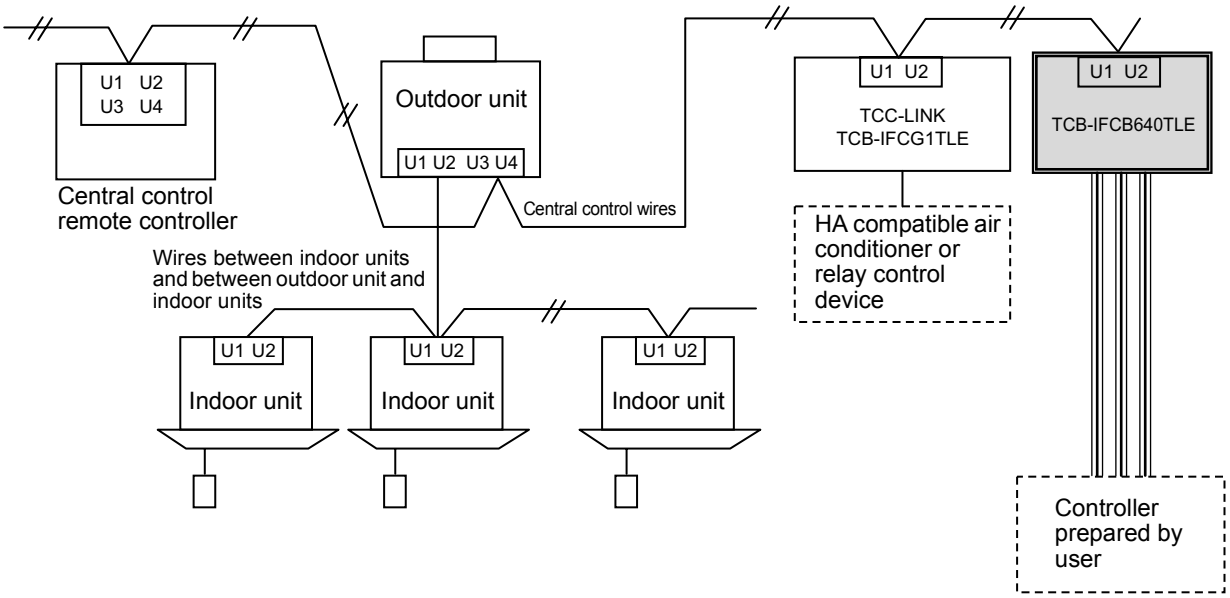
The TCB-IFCG1TLE device can be connected to the TCC-LINK network on the Indoor side using the U1 & U2 connections, OR on the Outdoor Side via the U3 & U4 connections.

Shield earthing

The shield of the TCC-LINK Network wire should be connected on the air conditioner side and left open and insulated at the TCB-IFCG1TLE side.

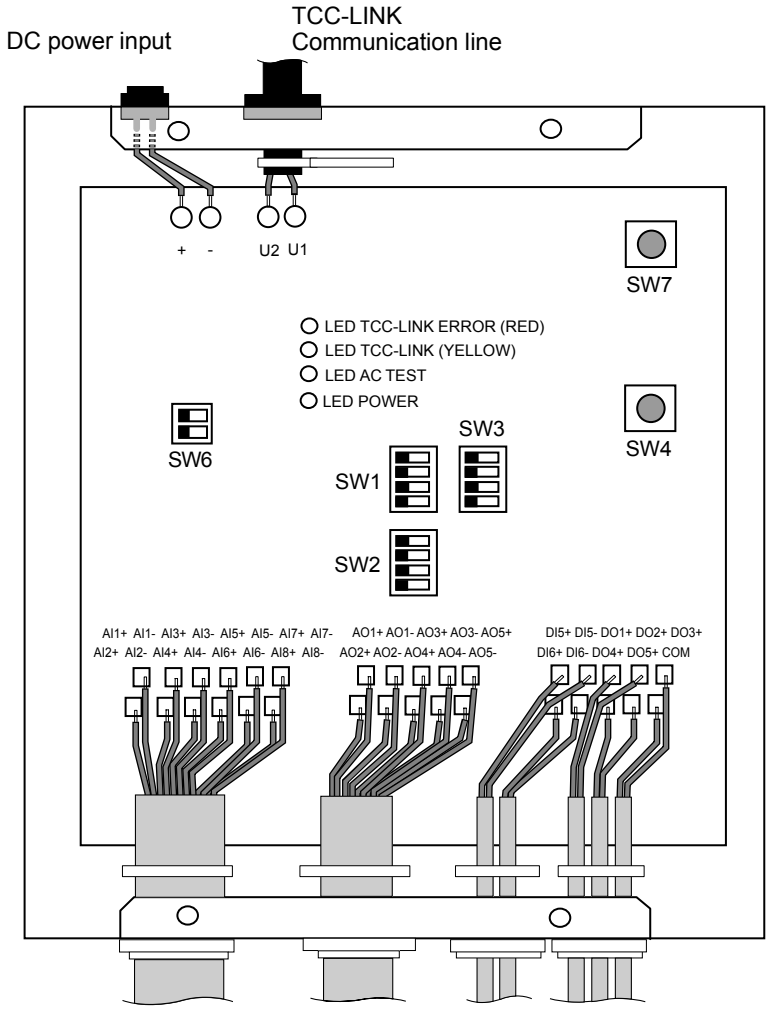
- U1 and U2 have no polarity.

When connecting to multiple outdoor units or central control wires



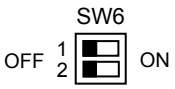
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6 Setting



1. Setting Terminator Resistor for the TCC-LINK Communication Line

Set SW6-1 to OFF and do not insert 100-ohm terminator resistor into the TCC-LINK bus. SW6-2 is not used.



2. Setting SW1, SW2, and SW3

SW1, SW2, and SW3 are used for the trial operation check. For details, refer to “7 Trial Operation Check”. SW1, SW2, and SW3 are usually set to all OFF.



NOTE

Switch settings are ONLY registered at power ON and when the reset switch has been pressed. When changing DIP Switch settings please be sure to either power down, or press reset switch SW7 to enable changes to be registered.

7 Trial Operation Check

■ Before starting trial operation

Set all Indoor unit and TCB-IFCG1TLE central control addresses (DN03).

NOTE

These central control address MUST be different for ALL indoor units in a central control network.

- Once the Indoor Unit Central Control addresses have been set, be sure to press the reset Switch (SW7) on the TCB-IFCB640TLE to enable the device to update itself.

■ Trial operation

(1) Check the communication status between TCB-IFCB640TLE and indoor unit or TCB-IFCG1TLE using LED D13. To check the communication between the TCB-IFCB640TLE and each Indoor Unit or TCB-IFCG1TLE connected, select the Central Control Address (DN03) using SW1 to SW3 and monitor the response of LED D13 referring to the table below.

Confirming procedure:

- Set bit1 of SW3 to “ON” during normal operation.
- Set the central control address of the target indoor unit with SW1 and SW2 according to the “Indoor unit or TCB-IFCG1TLE central control address and SW1/SW2 setting” table shown below.
- Communication status is displayed by LED D13.

Communication status with indoor unit	D13	Remarks
Normal	Lighting	
Error	Blinking	Communication with the indoor unit was established previously, but is disabled currently.
Invalid indoor unit	Light off	Communication with the indoor unit has never been established.

(Example) Check the communication status of indoor unit with a central control address of 41.
Set bit1 of SW3 to “ON”, SW2 to “2” and SW1 to “8”.

Indoor unit or TCB-IFCG1TLE central control address and SW1/SW2 setting

Indoor unit central control address	SW2	SW1	Indoor unit central control address	SW2	SW1	Indoor unit central control address	SW2	SW1	Indoor unit central control address	SW2	SW1
1	0	0	17	1	0	33	2	0	49	3	0
2	0	1	18	1	1	34	2	1	50	3	1
3	0	2	19	1	2	35	2	2	51	3	2
4	0	3	20	1	3	36	2	3	52	3	3
5	0	4	21	1	4	37	2	4	53	3	4
6	0	5	22	1	5	38	2	5	54	3	5
7	0	6	23	1	6	39	2	6	55	3	6
8	0	7	24	1	7	40	2	7	56	3	7
9	0	8	25	1	8	41	2	8	57	3	8
10	0	9	26	1	9	42	2	9	58	3	9
11	0	A	27	1	A	43	2	A	59	3	A
12	0	B	28	1	B	44	2	B	60	3	B
13	0	C	29	1	C	45	2	C	61	3	C
14	0	D	30	1	D	46	2	D	62	3	D
15	0	E	31	1	E	47	2	E	63	3	E
16	0	F	32	1	F	48	2	F	64	3	F

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The relationship between the notation for SW1 and SW2 in the table above and the bits of SW1 and SW2 are shown in the following table.
The ●s indicate that the bit is turned on.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
SW Bit1		●		●		●		●		●		●		●		●
SW Bit2			●	●			●	●			●	●			●	●
SW Bit3					●	●	●	●					●	●	●	●
SW Bit4									●	●	●	●	●	●	●	●

After the communication status check is completed, set all bits of SW2 and bit1 of SW3 to “OFF”.

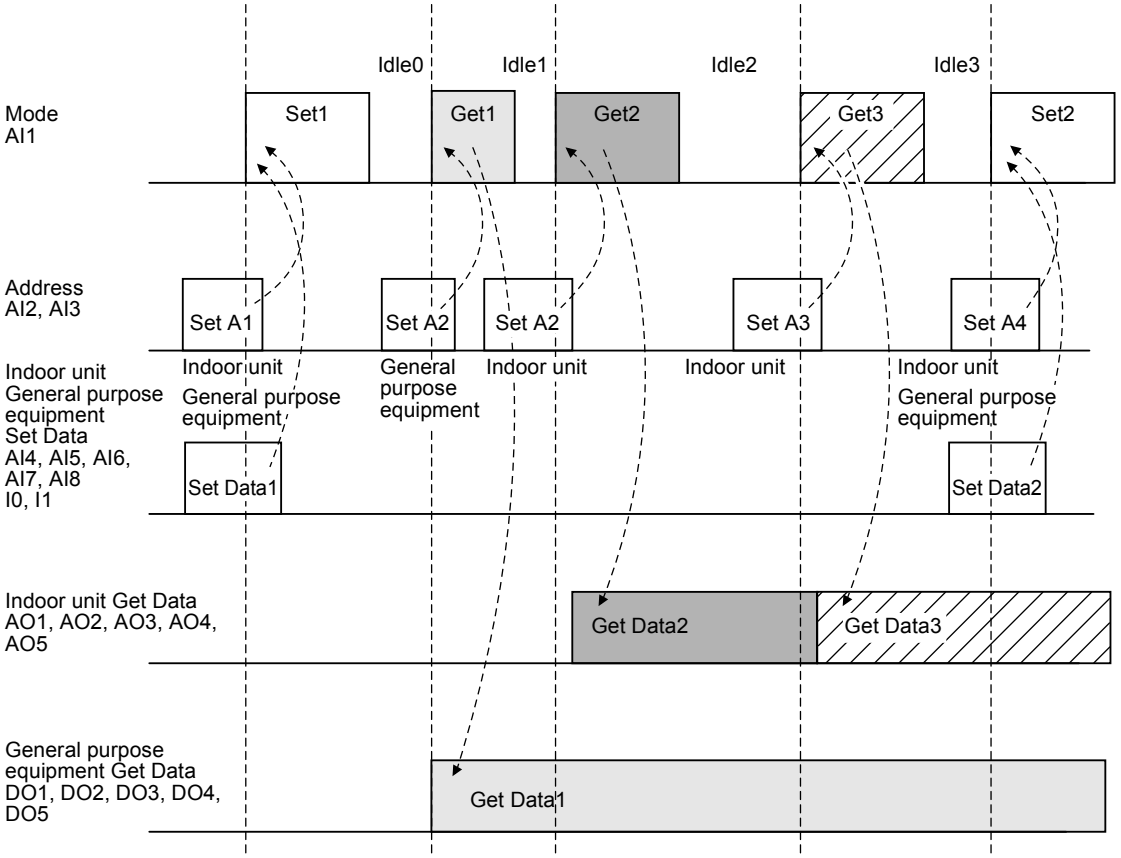
■ LED indication during normal operation

LED		Description
D10	Power indicator	Lights while the power is on.
D11	TCC-LINK communication status indicator	Blinks during TCC-LINK communication.
D12	TCC-LINK communication error indicator	Lights temporarily when TCC-LINK is busy.
D13	TEST indicator	Used in the test mode.

8 Input/Output Specifications

■ Setting input timing chart

The AI1 Input Mode will always have an “Idle mode” inserted between and Set (Setting) of Get (Status acquisition) operation when they are transmitted.
During a “Set” operation, the Indoor unit Central Control address specified by AI2 and AI3 immediately after the transition to the “Set” mode is read, and the value to be set is applied to the indoor unit. The setting value is read and set ONLY during the transition to the Set mode.
During a Get operation, the indoor unit central control address specified by AI2 and AI3 immediately after transition to the Get mode is read, and the address status is output to AO1, AO2, AO3, AO4, and AO5. This output value is retained until the next Get operation is performed. General purpose equipment addresses are retained as DO1, DO2, DO3, DO4, and DO5 outputs separately from indoor unit addresses until the next general purpose equipment Get operation is performed. The process moves to Set or Get mode from the specified idle voltage.
Retain AI4, AI5, AI6, AI7, AI8, I0, and I1 address setting data for 200 ms after transition to the Set mode as input condition. For AI1 Set or Get, retain the value for 200 ms after transition from the idle mode.



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■ Input/output level

■ Analog input/output specifications

Analog input/output voltage levels are shown in the following table.

Signal classification		Port name	Data item	Specification
Analog input	0 to 10V range	AI1 AI2 AI3 AI4 AI5 AI6 AI7 AI8	Input type	Resistor-divided A/D converter input
			Number of input points	2
			Resolution	10 bits, 0 to 1023 levels
			Allowable input voltage range	0.0 V to 10.0 V
			Input resistance	3 KΩ
			Connection circuit output resistance	50 Ω or less
			Conversion time	160 ms
Analog output	0 to 10V range	AO1 AO2 AO3 AO4 AO5	Output type	Class-C push-pull
			Output point	5
			Resolution	8 bits, 0 to 255 levels
			Output voltage range	0.0 V to 10.0 V
			Maximum output source current	10 mA
			Connection circuit load resistance	10 KΩ or more
			Conversion time	10 μS

A/D converter input specifications

Apply voltages specified in the table below to each set of terminals AI + and AI- on the terminal block.
If a value outside of those outlined in the table below is sent to the device, then no setting will be applied to the air conditioner.

No.	Name	Description	In/Out	Connector
S0	Set/Get/Idle	Sets mode.	Analog In	AI1
S1	Address set	Sets the lower 3 bits of central control address.	Analog In	AI2
S2	Address set	Set the upper 3 bits of central control address.	Analog In	AI3
S3	Set Point Temperature set	Room temperature setting value 16 to 29°C (in units of 1°C)	Analog In	AI4
S4	Operation Mode set	Sets operation mode.	Analog In	AI5
S5	Fan Speed set	Sets fan speed.	Analog In	AI6
S6	Indoor on/off set	Sets on/off.	Analog In	AI7
S7	Louver set	Sets louver position.	Analog In	AI8
SO1	Set Point Temperature set value	Temperature set value status 18 (16) to 29 (27)°C (in units of 1°C)	Analog Out	AO1
SO2	Operation Mode status	Actual operation mode	Analog Out	AO2
SO3	Fan Speed set status	Fan speed set status	Analog Out	AO3
SO4	Indoor on/off status	On/off status, communication failure status, and internal error status	Analog Out	AO4
SO5	Louver set status	Louver position set status	Analog Out	AO5

S1, S2	S7	S5	10V circuit input value (volt)
0	Invalid	Invalid	1.52 ± 0.20
1	Swing	Fan Stop	2.66 ± 0.20
2	F1	Auto	3.80 ± 0.20
3	F2	Quick	4.94 ± 0.20
4	F3	High	6.09 ± 0.20
5	F4	Low	7.22 ± 0.20
6	F5	Ultra Low	8.39 ± 0.20
7	Stop	–	9.57 ± 0.20
Default			0.645 >

The following table shows the relationship between S1/S2 settings and central control addresses. Apply voltages corresponding to values of S1 and S2.

Central control address	Setting		Central control address	Setting		Central control address	Setting		Central control address	Setting		Central control address	Setting		Central control address	Setting		Central control address	Setting		Central control address	Setting	
	S1	S2		S1	S2		S1	S2		S1	S2		S1	S2		S1	S2		S1	S2		S1	S2
1	0	0	9	0	1	17	0	2	25	0	3	33	0	4	41	0	5	49	0	6	57	0	7
2	1	0	10	1	1	18	1	2	26	1	3	34	1	4	42	1	5	50	1	6	58	1	7
3	2	0	11	2	1	19	2	2	27	2	3	35	2	4	43	2	5	51	2	6	59	2	7
4	3	0	12	3	1	20	3	2	28	3	3	36	3	4	44	3	5	52	3	6	60	3	7
5	4	0	13	4	1	21	4	2	29	4	3	37	4	4	45	4	5	53	4	6	61	4	7
6	5	0	14	5	1	22	5	2	30	5	3	38	5	4	46	5	5	54	5	6	62	5	7
7	6	0	15	6	1	23	6	2	31	6	3	39	6	4	47	6	5	55	6	6	63	6	7
8	7	0	16	7	1	24	7	2	32	7	3	40	7	4	48	7	5	56	7	6	64	7	7

S3	10V circuit input value (volt)
18 (16)	1.04 ± 0.15
19 (17)	1.82 ± 0.15
20 (18)	2.60 ± 0.15
21 (19)	3.38 ± 0.15
22 (20)	4.16 ± 0.15
23 (21)	4.94 ± 0.15
24 (22)	5.72 ± 0.15
25 (23)	6.51 ± 0.15
26 (24)	7.28 ± 0.15
27 (25)	8.06 ± 0.15
28 (26)	8.85 ± 0.15
29 (27)	9.70 ± 0.15
Default	0.469 >

NOTE

The relationship between temperature and 10V input shifts depending on the indoor unit temperature setting range specification.

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S4	10V circuit input value (volt)
Heat	2.70 ± 0.30
Cool	4.21 ± 0.20
Fan	5.76 ± 0.20
Dry	7.31 ± 0.20
Auto	8.94 ± 0.20
Default	1.15 >

S6	S0	10V circuit input value (volt)
OFF	SET	3.50 >
ON	GET	5.06 ± 1
Idle	Idle	6.67 <

D/A converter output

Each AO output during a Get operation of a unit that was judged to be non-existent due to power-off or disconnection immediately after start-up will be treated as default.

SO5	SO3	SO2	Circuit output value (volt)
Invalid	Invalid	Invalid	1.77 ± 0.2
Swing	Fan Stop	Heat	2.75 ± 0.2
F1	Auto	Cool	3.77 ± 0.2
F2	Quick	Fan	4.75 ± 0.2
F3	High	Dry	5.77 ± 0.2
F4	Low	Auto Heat	6.79 ± 0.2
F5	Ultra Low	Auto Cool	7.77 ± 0.25
Stop	–		8.24 ± 0.25
Default			0

SO1	Circuit output value (volt)
18 (16)	1.26 ± 0.2
19 (17)	2.00 ± 0.2
20 (18)	2.71 ± 0.2
21 (19)	3.41 ± 0.2
22 (20)	4.16 ± 0.2
23 (21)	4.86 ± 0.2
24 (22)	5.61 ± 0.2
25 (23)	6.31 ± 0.2
26 (24)	7.02 ± 0.25
27 (25)	7.77 ± 0.25
28 (26)	8.47 ± 0.25
29 (27)	9.18 ± 0.25
Default	0

NOTE

The relationship between temperature and 10V input shifts depending on the indoor unit temperature setting range specification.

SO4	Circuit output value (volt)
OFF	2.67 ± 0.2
ON	4.20 ± 0.2
No response	5.73 ± 0.2
For future reserved	7.22 ± 0.25
For future reserved	8.86 ± 0.25
default	0
Internal error	10.00 ± 0.25

“ON” and “OFF” indicates the status of a unit of the specified address. However, this indicates the Relay1 status for the TCB-IFCG1TLE.
“No response” is output when a unit that was judged as existent during the initialization process disappeared after that and was judged to send no response.
“Internal error” is output when an analog interface error occurs independently of other units. If Get operation is performed in the case that there is no unit from the beginning, the default value is output.

■ Digital input/output specifications

The following table lists digital input/output specifications.

Signal classification	Port name	Data item	Specification
Digital output	DO1 DO2 DO3 DO4 DO5	Output type	Insulated by photocoupler
		Output point	5
		Maximum output current	10 mA
		Maximum voltage (between DO and Com)	DC 55 V
		Maximum voltage (between Com and DO)	DC 7 V
Digital input	DI5 DI6	Input type	Insulated by photocoupler
		Input point	2
		Input resistance	100 Ω
		Minimum input ON current	2 mA
		Maximum allowable input ON current	30 mA
		Maximum input OFF current	0.05 mA

The DO4 alarm outputs “1” when any one of the indoor units outputs an alarm in the free existent address setting mode. For specifications of the general purpose interface TCB-IFCG1TLE, refer to the TCB-IFCG1TLE manual.

Name	Description	In/Out	Connector
Relay 1 set for General Purpose I/F	Relay setting for general purpose interface TCB-IFCG1TLE (1: on, 0: off)	In	DI5
Relay 2 set for General Purpose I/F	Relay setting for general purpose interface TCB-IFCG1TLE (1: on, 0: off)	In	DI6
Alarm status output for General Purpose I/F	General purpose interface TCB-IFCG1TLE alarm input status (1: alarm, 0: no alarm)	Out	DO3
Alarm status	Specified indoor unit (1: alarm, 0: no alarm)	Out	DO5
Alarm status	All indoor units (1: alarm, 0: no alarm)	Out	DO4
Relay 1 set status for General Purpose I/F	Relay set value for general purpose interface TCB-IFCG1TLE (1: on, 0: off)	Out	DO1
Relay 2 set status for General Purpose I/F	Relay set value for general purpose interface TCB-IFCG1TLE (1: on, 0: off)	Out	DO2

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■ Connection to External Devices

Observe the following precautions when connecting this product to external devices.

General safety precautions to be observed in the circuit design process

- Be sure to install a safety circuit in the external control circuit so that the system will operate safely in the event of a malfunction or abnormality occurring in this product or a abnormality as a result of external factors.
- Take fail-safe measures at the user side in case of a signal line disconnection or an abnormal signal due to power interruption.

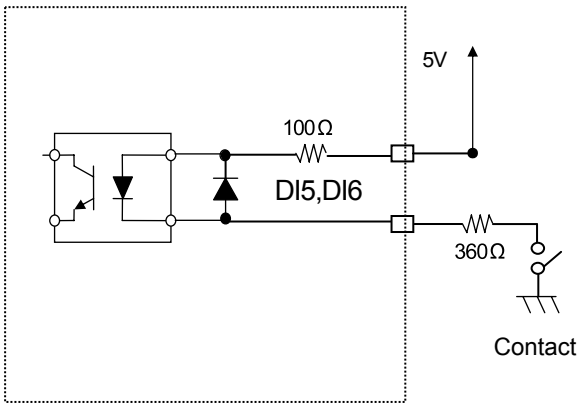
General precautions on system start-up

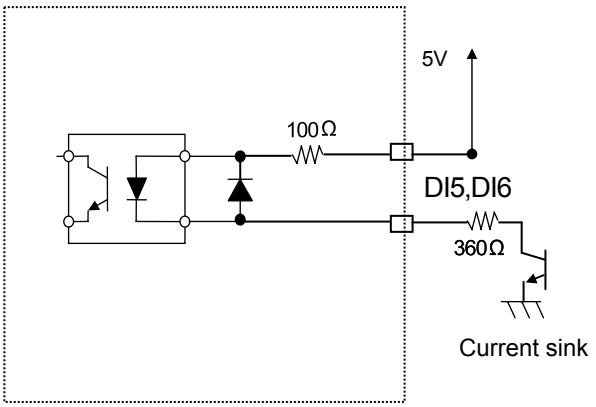
- For systems that have a load that could be dangerous to humans and/or has equipment connected to the output circuit, be sure to disconnect the output wiring temporarily and then perform the operation test.
- Before turning on the power supply, make sure that electrical specifications and wiring are all correct.

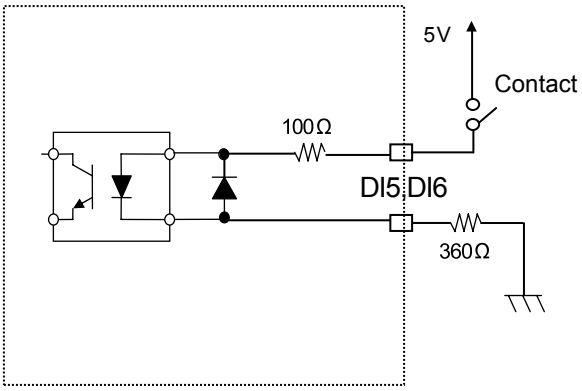
REQUIREMENT

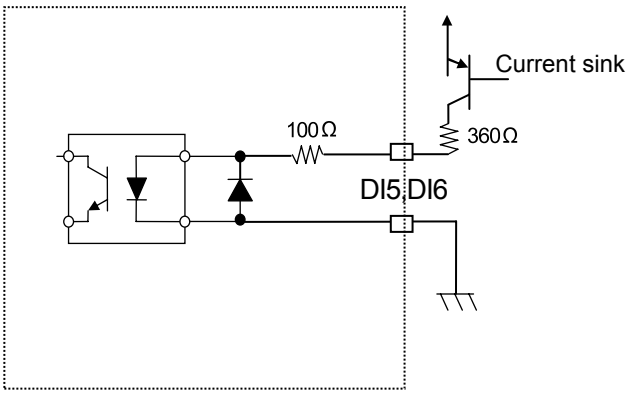
- The electrical circuit to be connected to this product must be provided on the power supply secondary side and operate at a voltage of 50 V or less.
- To protect the signals from noise interference use the correct shielded cable for wiring.

▼Example of digital input connection





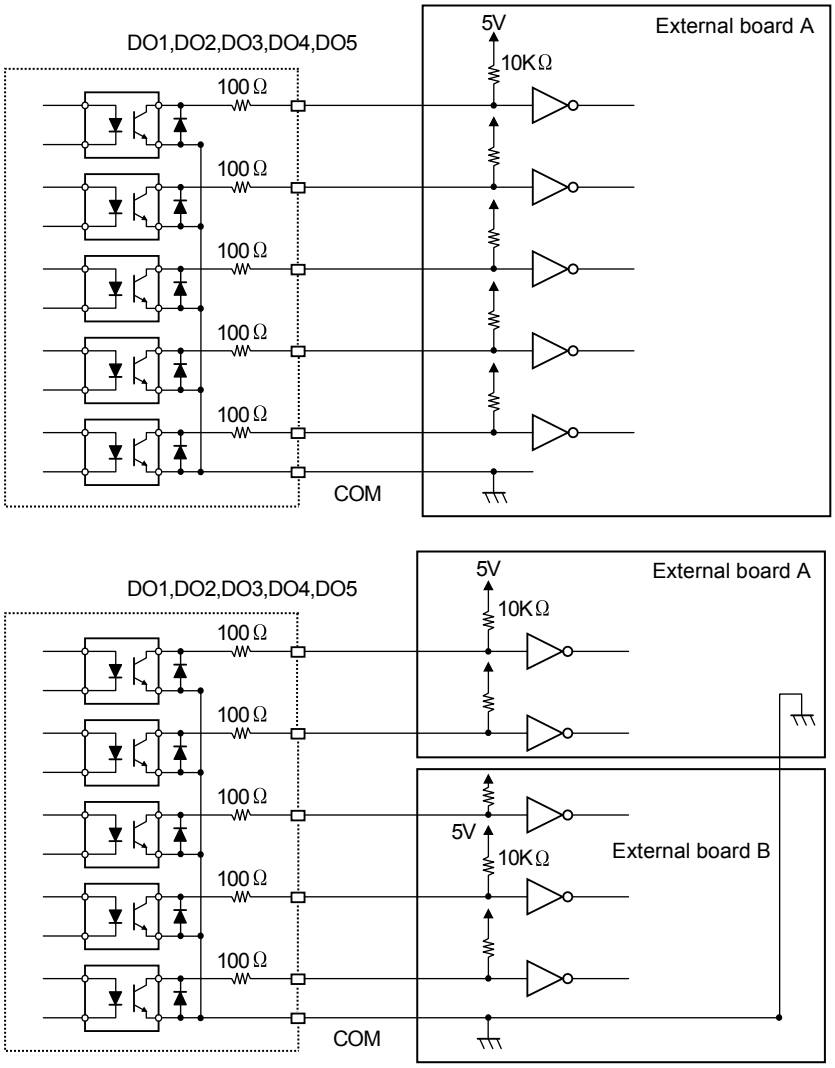




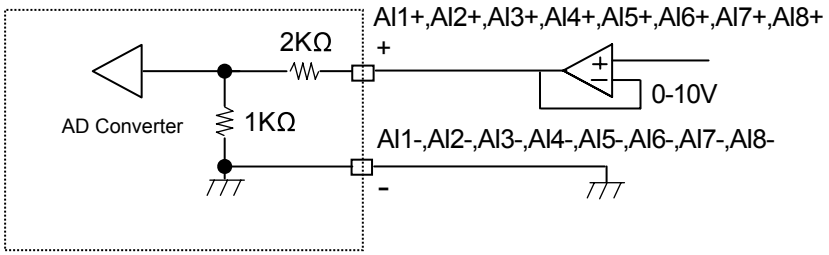
REQUIREMENT

Connect an external connecting point group DI5- and DI6- to the same earth point in each power supply system.

▼ Example of digital output connection



▼ Example of analog input connection



Note)

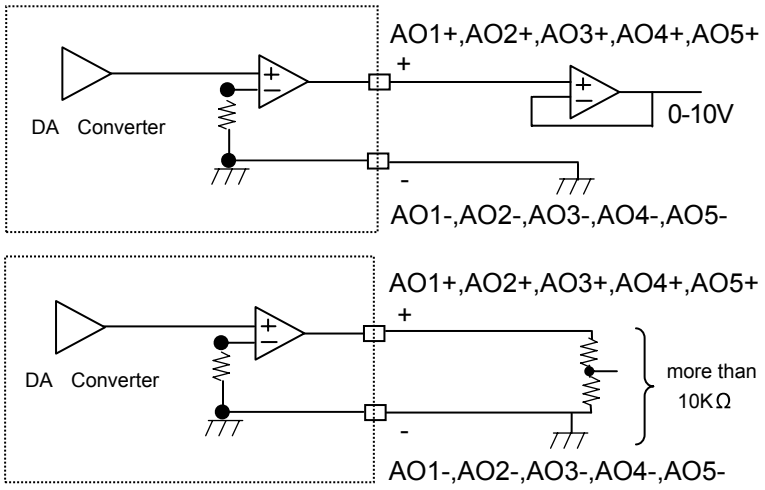
Board side

REQUIREMENT

Connect external connecting point groups AI1-/AI2-/AI3-/AI4/AI5-/AI6-/AI7-/AI8- and AO1-/AO2-/AO3-/AO4-/AO5- to the same earth point in each power supply system.

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▼ **Example of analog output connection**



Note)

Board side

■ Indication of LEDs

The following LEDs light as follows:

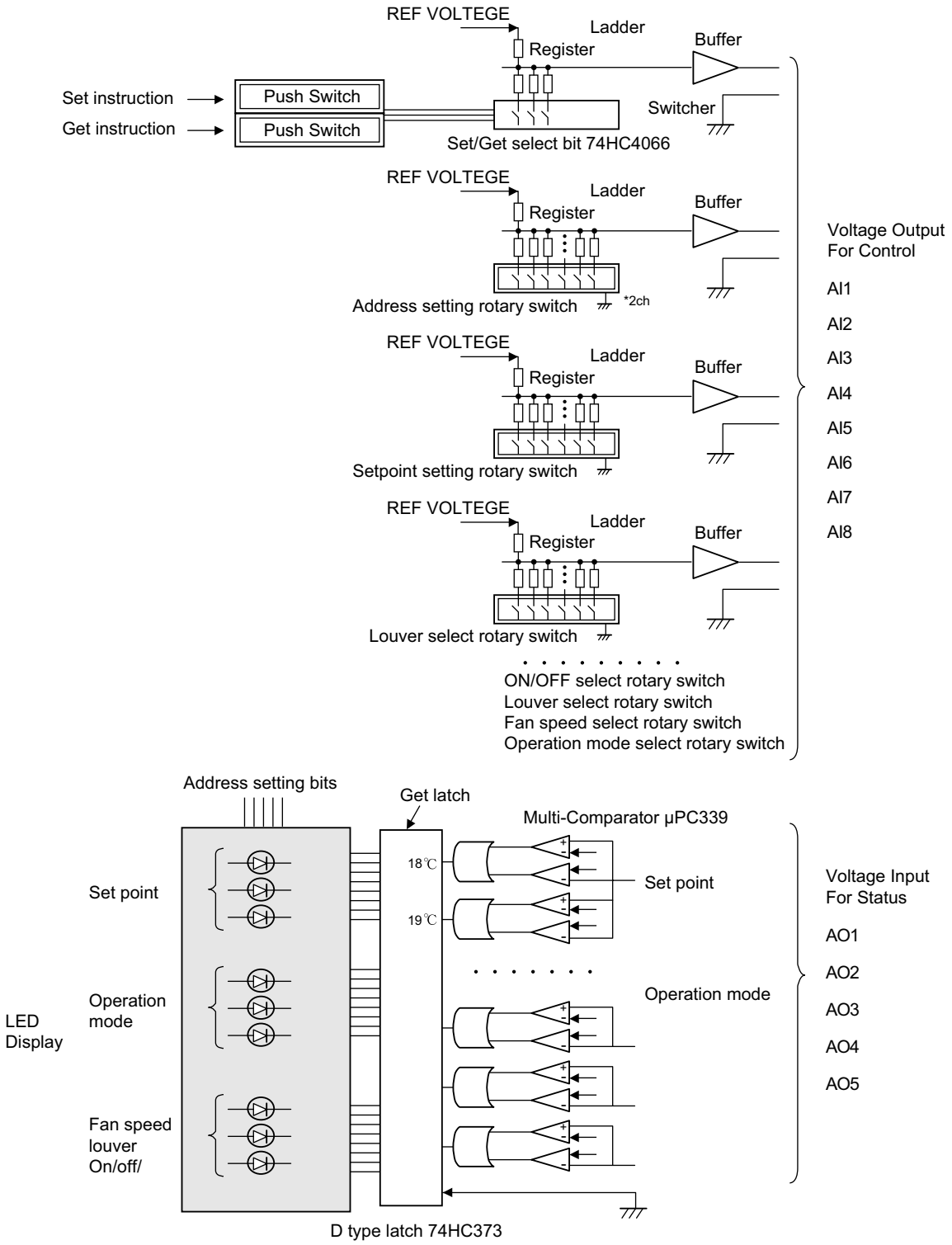
LED No.	LED color	Lighting condition
D10	Red	Lights while power is supplied to this board.
D11	Yellow	Lights for 0.5 seconds during TCC-LINK transmission.
D12	Red	Lights while TCC-LINK transmission is halted.
D13	Green	Indoor communication test

9 Annex

■ Example of controller interface

▼ Example of AD/DA connection circuit

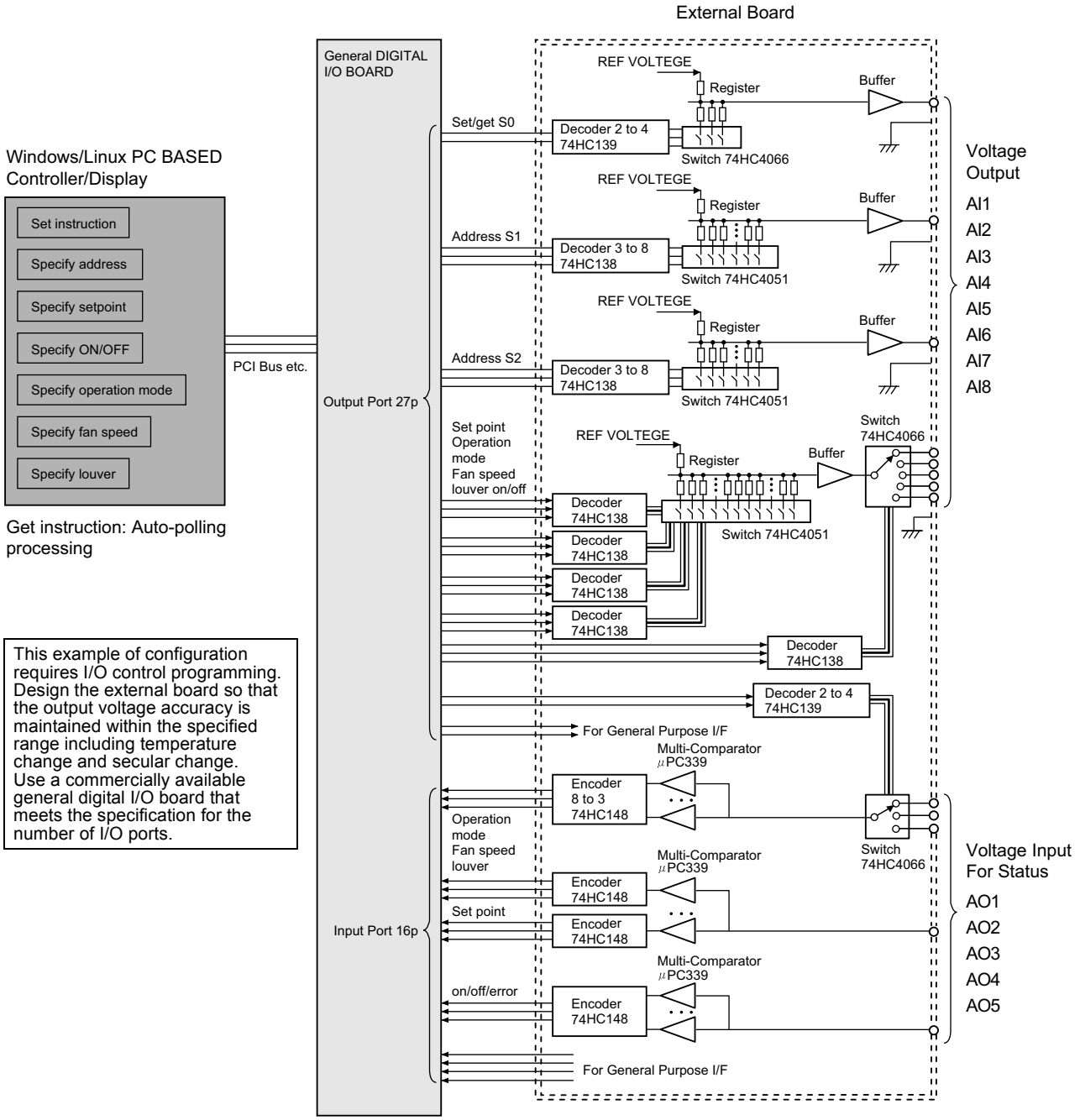
Example of controller internal configuration 1



This circuit can be realized by hardware.
Design this circuit to maintain the accuracy of voltage output and input detection.

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Example of controller internal configuration 2



MEMO

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