JUL-6226   MANUAL

APRIL.13, 2005

Version 1.4

Introduction

- Read this instruction manual carefully before use. Be sure you fully understand the instructions in this manual before using the equipment.
- After reading, save this instruction manual and refer to it as necessary. If you have any questions about or there is something wrong with the equipment, refer to this manual.

Before use:

Warning Indications

This manual and the product use some icons to help you use the product properly and prevent any damage to you and other people or property. The following icons classify the potential damage if the indications are ignored or the product is used improperly. When reading the manual, keep these in mind.

 Warning — Wrong handling of this product may cause serious personal injury or death.

 Caution — Wrong handling of this product may cause personal injury or damage to properties.

Examples of icons

Dangerous voltages

A triangle is an alert to call your attention including a warning or danger indication. The graphics within the triangle differs depending on the caution. (The figure on the left shows a caution for electrical shocks.)

Do not disassemble.

General prohibitions

$\bigcirc$ icons indicate prohibition. A detailed prohibition description is given in the vicinity of the icon. (The figure on the left prohibits disassembly.)

Unplug

General advice

icons require you to perform the item. A detailed instruction description is given in the vicinity of the icon. (The figure on the left instruct to unplug the equipment.)

Warning labels

Do not remove, damage or alter the warning labels.

Precautions in Use

⚠ Warning

🚫 Don't place containers having water, chemicals or cosmetics, such as vessels, flower pots and glasses, or small pieces of metals near or on top of this product. Liquids spilled over or into or small metal pieces getting into the product may cause fire, electrical shocks or failures.

❗ Turn off the power and stop using the unit immediately if something abnormal such as fumes or smoke is detected, and contact our sales department, branch or sales office. Continuing to use the product as is may cause fire or electrical shock.

⚠ Cautions

This manual describes important points to operate and maintain the equipment. Read the related sections when operating, maintaining and testing the unit. Do not try to carry out a test or maintenance not covered in this manual.

This equipment is a precision machine. A failure may occur if you do not observe the following:
• Do not jar or subject this equipment and the units to shocks.

During operation, do not unplug the cable connected between the WT and WT adapter.Before unplugging this cable, first unplug the DC jack from the WT adapter and trun the power off.

• Do not splash water on the WT adapter.
• Do not use this equipment in a place with excessive dirt or dust.
Before touching a power-receiving terminal, turn the input power off to avoid electrical shocks.

Do not touch the rack of the WT duiring operation because it becames hot.

When installing the Access Point (AP), connect the ground wire to the ground terminal. If the equipment is not grounded properly, you may get electrical shocks when the equipment becomes faulty or shorted.

When using a measuring instrument, connect the ground terminal of the measuring instrument to the ground terminal of this equipment. If the equipment is not grounded properly, you may get electrical shocks.

To avoid shock hazards, do not open and touch the inside or adjustment points except for maintenance or inspection. If you modify the equipment illegally, you may be punished according to the Radio Law.

⚠ Cautions

(!) Don't use organic solvent for cleaning such as thinner and benzene because this may damage the coating. Just wipe the surface with a clean dry cloth.

(!) Befour plugging in or unplugging the coaxial cable between the AP-RFU and AP-IFU, turn the power off.

(!) CAUTION: The DC -48V power supply voltage for AP-IFU shall be SELV or TNV-1 depending on the network environment (0 or 1) acc. to IEC62102

(!) CAUTION: The Equipment for connection to AP-IFU Ethernet-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.

(!) CAUTION: The Equipment for connection to WT adapter PC-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.

(!) CAUTION: For the connection WT adapter to WT and a cable suitable for outdoor use shall be installed.

(!) CAUTION: For the connection Terminal Equipment to AP-IFU and a cables suitable for outdoor use shall be installed.

(!) CAUTION: For the connection AP-IFU to AP-RFU and a coaxial cable suitable for outdoor use shall be installed.

Avant usage:

Indications Préventives

Le manuel d'utilisation et le produit utilisent des icônes pour vous aider à utiliser correctement le produit et prévenir tout dommages sur vous, sur des tiers ou sur des biens.   Les icônes qui suivent, indiquent   le niveau des dommages éventuels si les précautions indiquées sont ignorées ou si le produit est mal utilisé. Quand vous lirez le manuel d'utilisation, faites attention à ces indications.

 Danger | Une mauvaise utilisation de ce produit peut causer de sérieux dommages corporels ou la mort.

 Prudence | Une mauvaise utilisation de ce produit peut causer des dommages corporels ou endommager des biens.

Exemples d'icônes

Danger électrique

Un triangle est une alerte pour attirer votre attention en cas de danger ou de conseil de prudence. Le signe à l'interieur du triangle diffère selon le risque.   (L'exemple de gauche signale un risque électrique.)

Ne pas démonter

Interdiction générale

Les deux icônes de gauche indiquent une interdiction. Une description plus détaillée est donnée près de l'icone (la plus à gauche interdit le démontage.)

Débranchez

Conseil général

Ce type d'icône exige que vous exécutiez l'action Une description plus détaillée est donnée près de l'icône (la plus à gauche exige de debrancher le matériel avant toute opération.)

Attention

N'enlevez jamais, n'endommagez jamais et ne changez jamais les signalisation de danger.

Précautions d'utilisations

⚠️ **Attention**

🚫 Ne placez pas de récipients contenant de l'eau, des produits chimiques ou des produits de beauté, tels que vaisselle, pots de fleur et verres, ou de petits morceaux de métal à coté ou sur ce produit.   Les éclaboussures de liquides sur ou à l'intérieur du produit, ainsi que les petits morceaux de métal pénétrant le produit, peuvent provoquer le feu, des chocs électriques ou des pannes.

❗ Coupez l'alimentation électrique et cessez immédiatement toute utilisation du produit si quelque chose d'anormal tel que vapeurs ou fumées sont détectées, et contactez notre service commercial. Continuer à utiliser le produit dans ces conditions, peut provoquer feu ou choc électrique.

⚠ **Attention**

Ce manuel décrit les points importants pour l'utilisation et la maintenance du Matériel. Lisez les chapitres correspondants pour l'utilisation, la maintenance et le test du Matériel. N'essayez pas d'effectuer un test ou une maintenance qui ne soit pas décrit dans ce manuel.

Cet équipement est une machine de précision. Une panne peut se produire si vous ne vous conformez pas pas à ce qui suit :
   Ne cognez pas et ne soumettez pas ce matériel et ses éléments à des chocs.
   En cours d'utilisation, ne débranchez pas le câble reliant l'interface utilisateur du terminal sans fil et l'adaptateur WT. Avant de déconnecter ce câble, débranchez d'abord la prise jack DC de l'adaptateur WT et mettez hors-tension.
   N'éclaboussez pas l'adaptateur WT.
   N'utilisez pas ce matériel dans un endroit excessivement sale ou poussiéreux.
   Avant de toucher à un terminal recevant l'alimentation, mettez hors-tension pour éviter des chocs électriques.

Ne touchez pas le rack du WT en cours d'utilisation parce qu'il devient chaud.

Lors de l'installation du Point d'accès, reliez le fil de terre à la masse du terminal. Si le matériel n'est mis correctement à la masset, vous pourriez provoquez des chocs électriques et le matériel deviendrait défectueux ou en court-circuit.

Lors de l'utilisation d'un instrument de mesure, reliez la masse de l'instrument de mesure à la prise de terre du matériel. Si les matériels ne sont pas correctement mis à la masse, vous pouvez provoquer des chocs électriques.

Pour éviter les risques de détérioration, n'ouvrez pas et ne touchez pas l'intérieur ou les points de réglage, excepté lors d'une maintenance ou d'une inspection. Si vous apportez des modification au matériel illégalement, vous pouvez être poursuivi conformément aux lois en vigueur.

⚠ **Attention**

N'utilisez pas de solvant organique pour le nettoyage, tel que dissolvant et benzène parce que cela peut endommager le revêtement. Essuyez juste la surface avec un chiffon sec et propre.

Avant de brancher ou de débrancher le câble coaxial entre AP-RFU et AP-IFU, mettez hors-tension.

ATTENTION : L'alimentation DC -48V pour AP-IFU peut être SELV ou TNV-1 en fonction du réseau (0 ou 1) conformément à la norme IEC62102.

ATTENTION : Le matériel de connexion à AP-IFU par une interface Ethernet (RJ 45) devra être relié aux circuits TNV-1.

ATTENTION : Le Matériel de connexion à l'adaptateur WT par l'nterface PC (RJ 45) devra être relié aux circuits TNV-1.

ATTENTION : Pour la connexion de l'adaptateur WT à WT, un câble adapté à l'utilisation en plein air sera utilisé.

ATTENTION : Pour la connexion du Terminal à AP-IFU, un câble adapté à l'utilisation en plein air sera utilisé.

ATTENTION : Pour la connexion de AP-IFU à AP-RFU un câble coaxial adapté à l'utilisation en plein air sera utilisé.

CONTENTS

1. OVERVIEW

JUL-6226 is a broadband wireless point-to-multipoint communication system operating at 24-26 GHz that provides high-speed IP access. The 80Mbps/40Mbps wireless transmission rate is available on one frequency channel having the RF bandwidth of 26MHz. The wireless transmission rate depends upon the selected modulation system (16QAM/QPSK), which is controlled for each subscriber terminal to be adapted with the radio propagation path environment such as the distance from the access point and rainfall conditions. The maximum throughput (average data transmission rate of an Ethernet frame) received and transmitted by an access point is 46Mbps.

The data transmissions in radio channel are encrypted by different keys for each subscriber terminal encrypt so that ensuring sufficient security. The system can deal with the subscribers fairly in assigning the bandwidth, regardless of the distances of subscriber terminals from the base station.

1.1 FCC Notice

FCCID:CKENTG335-EL2,CKENTG337-EL2

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference.

(2) This device must accept any interference received,

including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

Consult the dealer or an experienced radio/TV technician for help.

Caution. Changes or modifications to this equipment could void the user'sauthority to operate the equipment.

1.2 System Configuration

One Access Point (AP) has the capacity of linking with up to 239 subscriber terminals to configure a point-to-multipoint (P-MP) communications system.   An omni-directional antenna (with horizontal directivity of 360°) mainly for a residential area of detached houses and a horn-type antenna (90° × 10° directivity) mainly for multi-tenant building are available.

Wireless Terminal (WT), including the antenna and all the electric circuits, is designed compactly (19cm x 19cm x 7cm) and can easily be installed at any outside places of residential houses.   WT is connected to a PC through one LAN cable and supplied with power through a tiny power supply adapter.

Second layer isolation of subscriber traffic is provided by 802.1Q VLAN-tag.   Broadband Access Server (BAS) terminates access layer functions and relay user traffic to IP backbone network.

The Operation System (OpS) allowing the installation and registration of subscriber terminals and the supervision of its operational status is optionally available.

1.3 Components

Table 1-1 Components

No.	Name	Description
1	AP-RFU	The AP-RFU is a radio unit that accommodates both the antenna and transceiver in the same housing. Connecting an AP-IFU to the AP-RFU constitutes an AP and allows connecting multiple WTs over radio links.
2	AP-IFU	The AP-IFU converts Ethernet frames into radio signals and vice versa. Connecting an AP-RFU to the AP-IFU constitutes an AP. It supports the 100BASE-TX electrical network interface to allow connecting a unit such as a router. Assigning an IP address for maintenance and monitoring allows transmission and reception of maintenance signals via SNMP through a network interface.
3	WT	The WT is a radio unit that accommodates all the antenna, radio transceiver, signal processor and interface section in the same housing. It supports 10BASE-T and 100BASE-TX user interfaces to connect a personal computer and hub.

1.4 External Views of the Units

External View of the   AP-RFU (Omni)

Nameplate for
this unit

Generic
nameplate

(362)

190

190
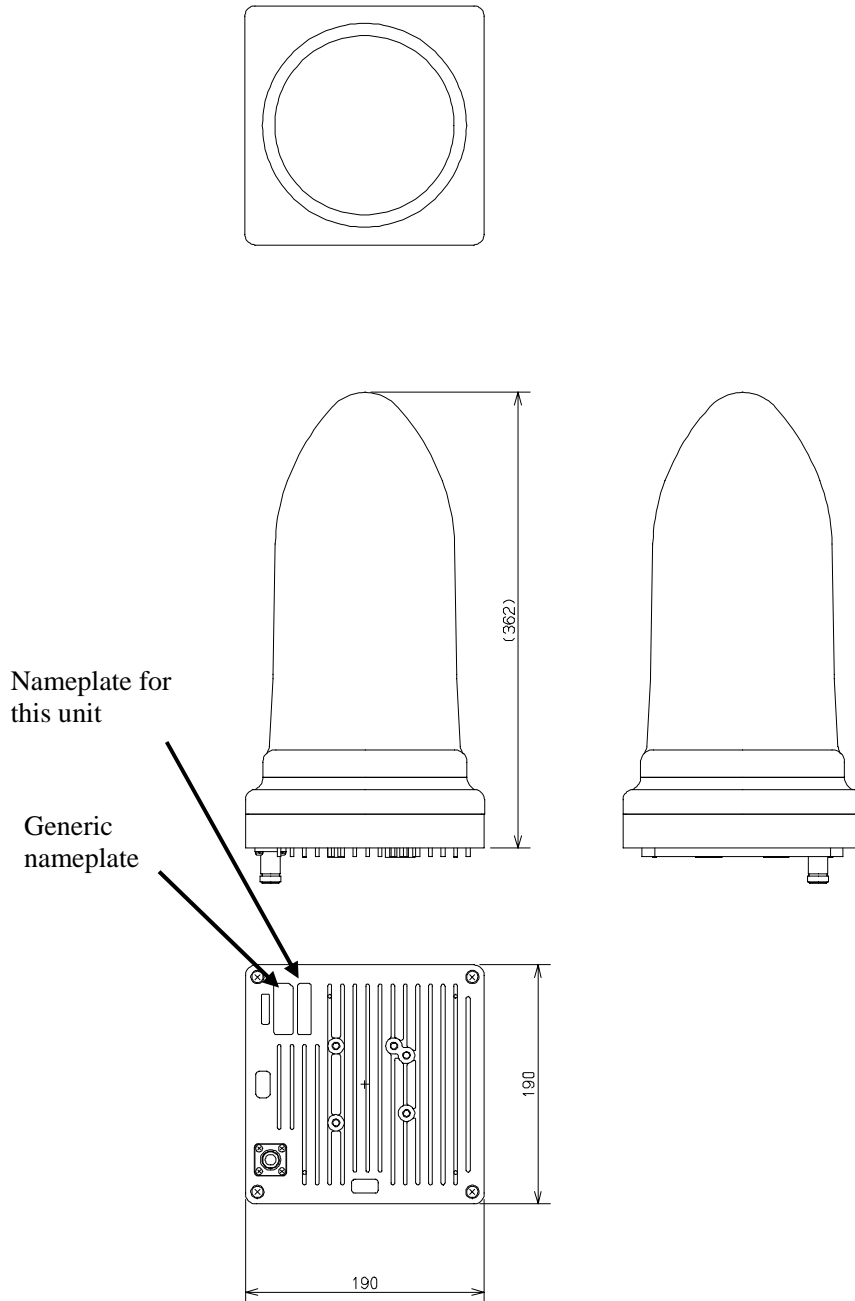
Figure 1-1 External View of the AP-RFU (Omni Antenna)

External View of the   AP-RFU (Horn)

Nameplate
for this unit

Generic
nameplat

(362)

190

190
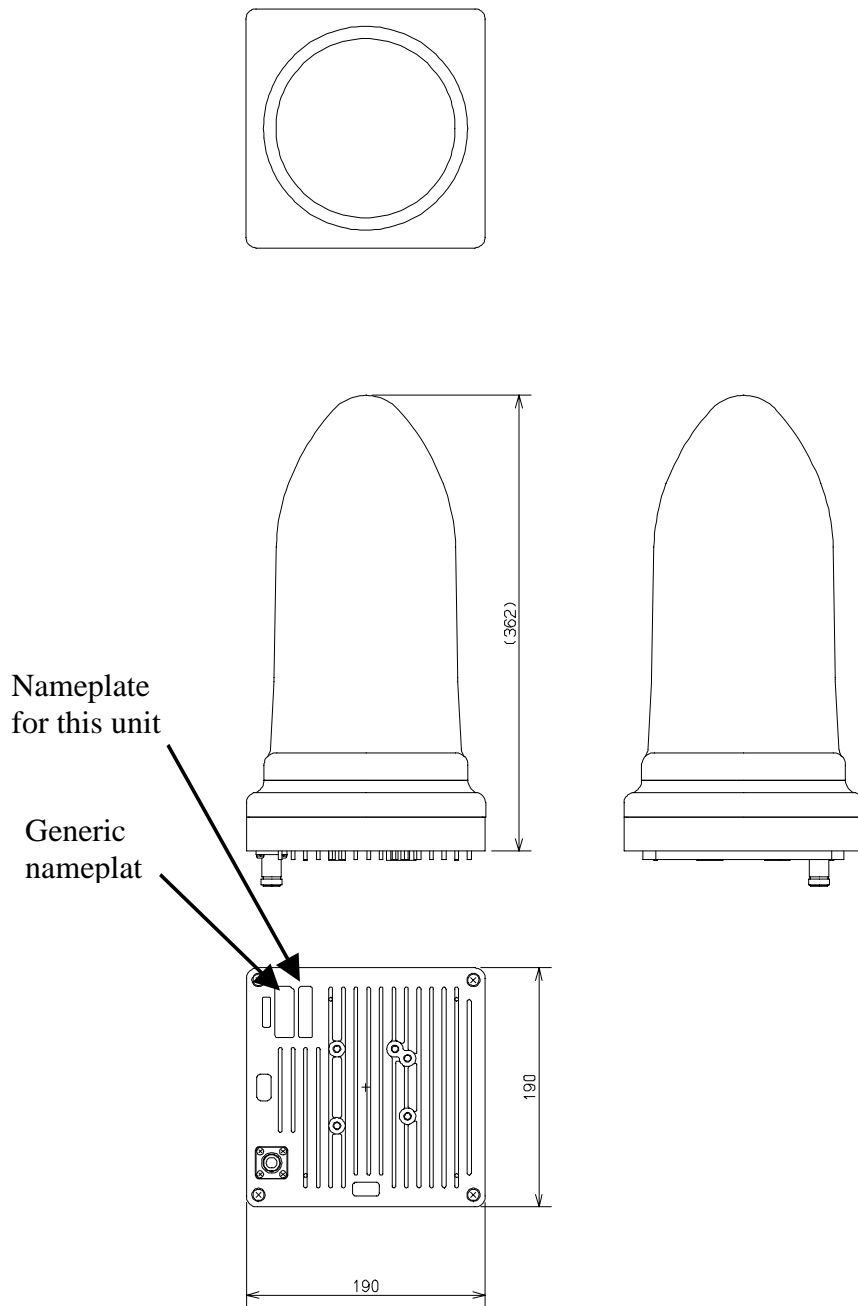
Figure 1-2 External View of the AP-RFU (Horn Antenna)

External View of the　AP-IFU

Generic
nameplate

272

322

160

ANT

DC-48V

INT

Nameplate for
this unit
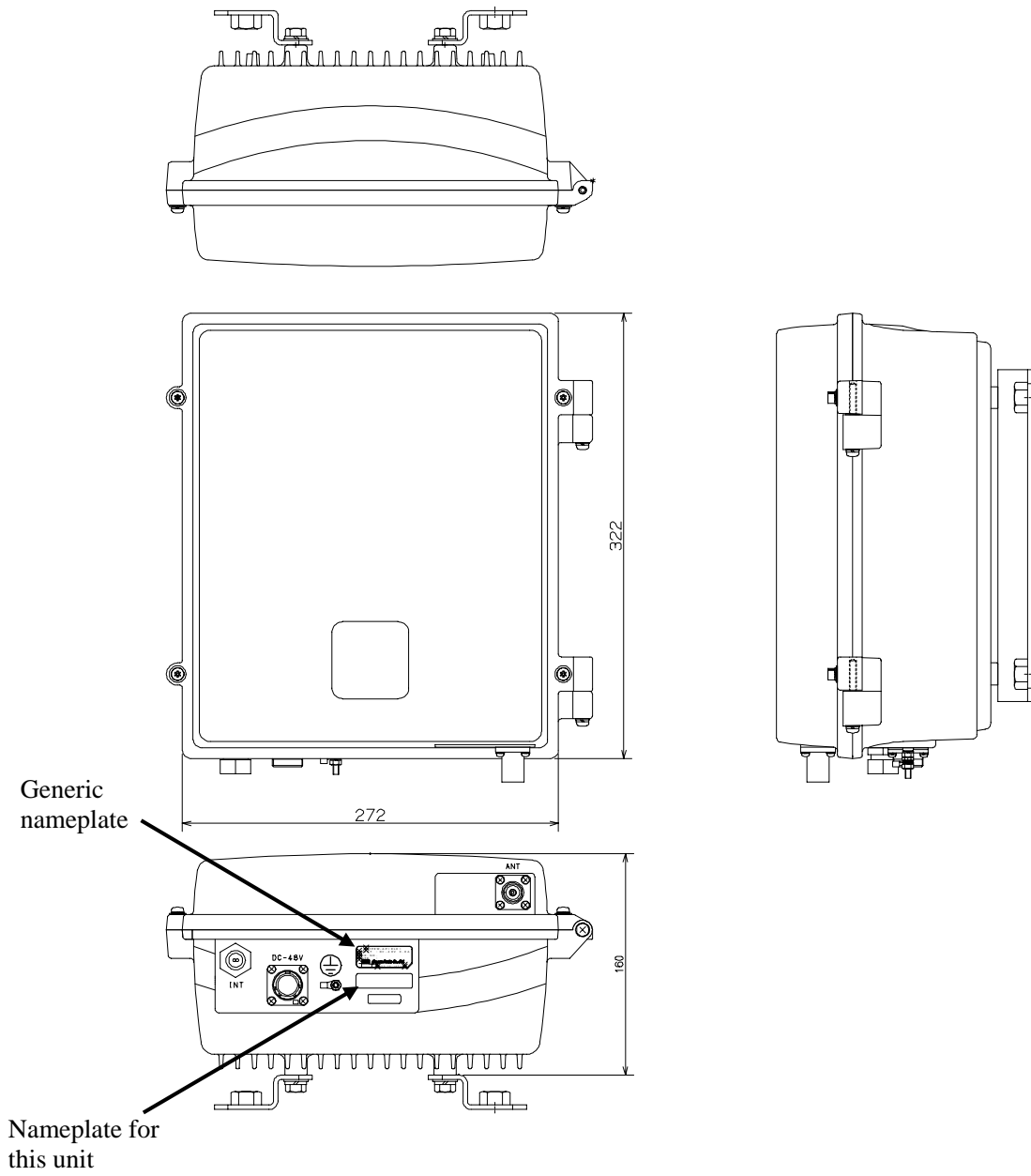
Figure 1-3 External View of the AP-IFU

External View of the　WT

190

190

60

Generic
nameplate

Nameplate for
this unit
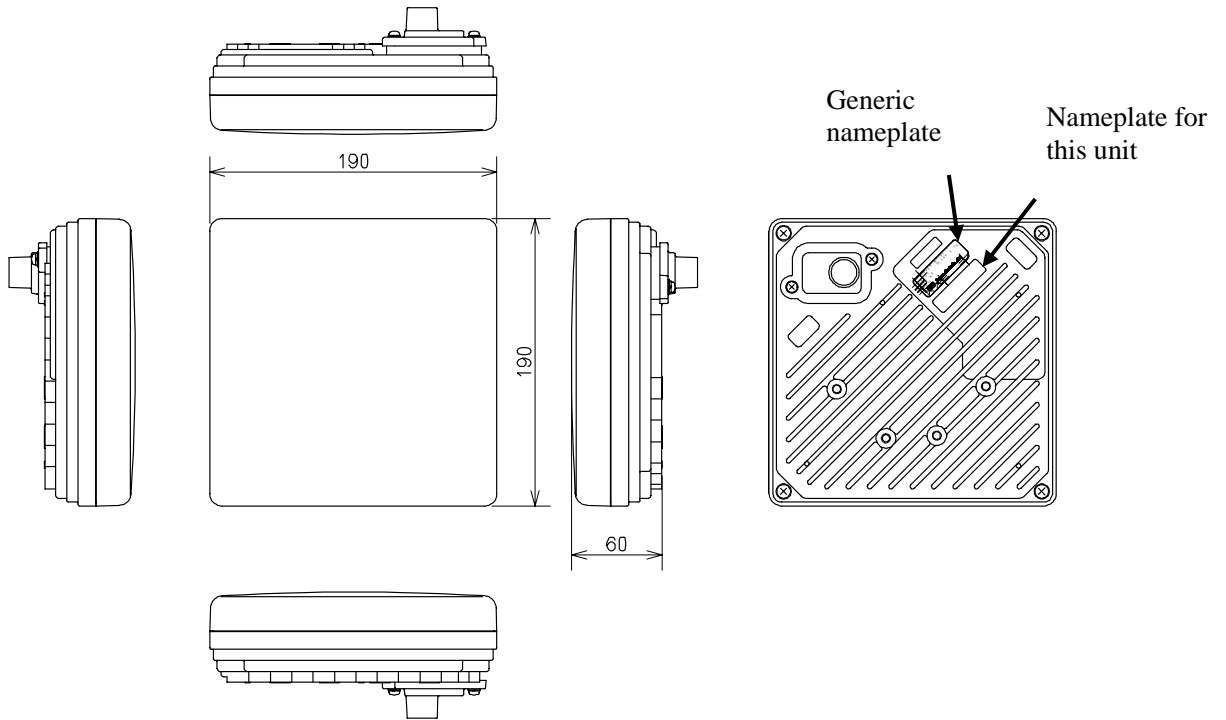
Figure 1-4 External View of the WT

70 or less

80 or less

45° or more

75° or more
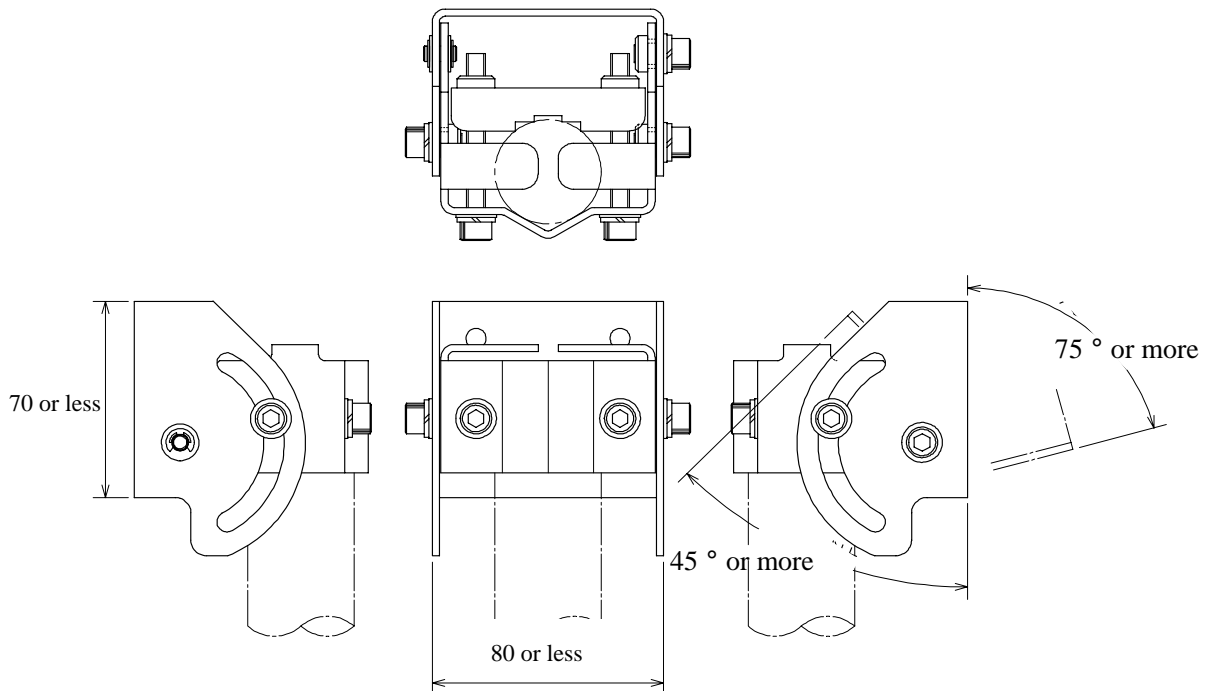
Figure 1-5 External View of the Outdoor Mounting Brackets for the WT

ANT

注意 指定機器以外、接続は
しないでください。

LED
GREEN
LED
GREEN
LED
RED

POW

ETHER

ALM

(94)

PC   DC

(40)

(36)

TEST SW

CAUTION:Use for specified equipment only.
Japan Radio Co.,Ltd.
MADE IN JAPAN
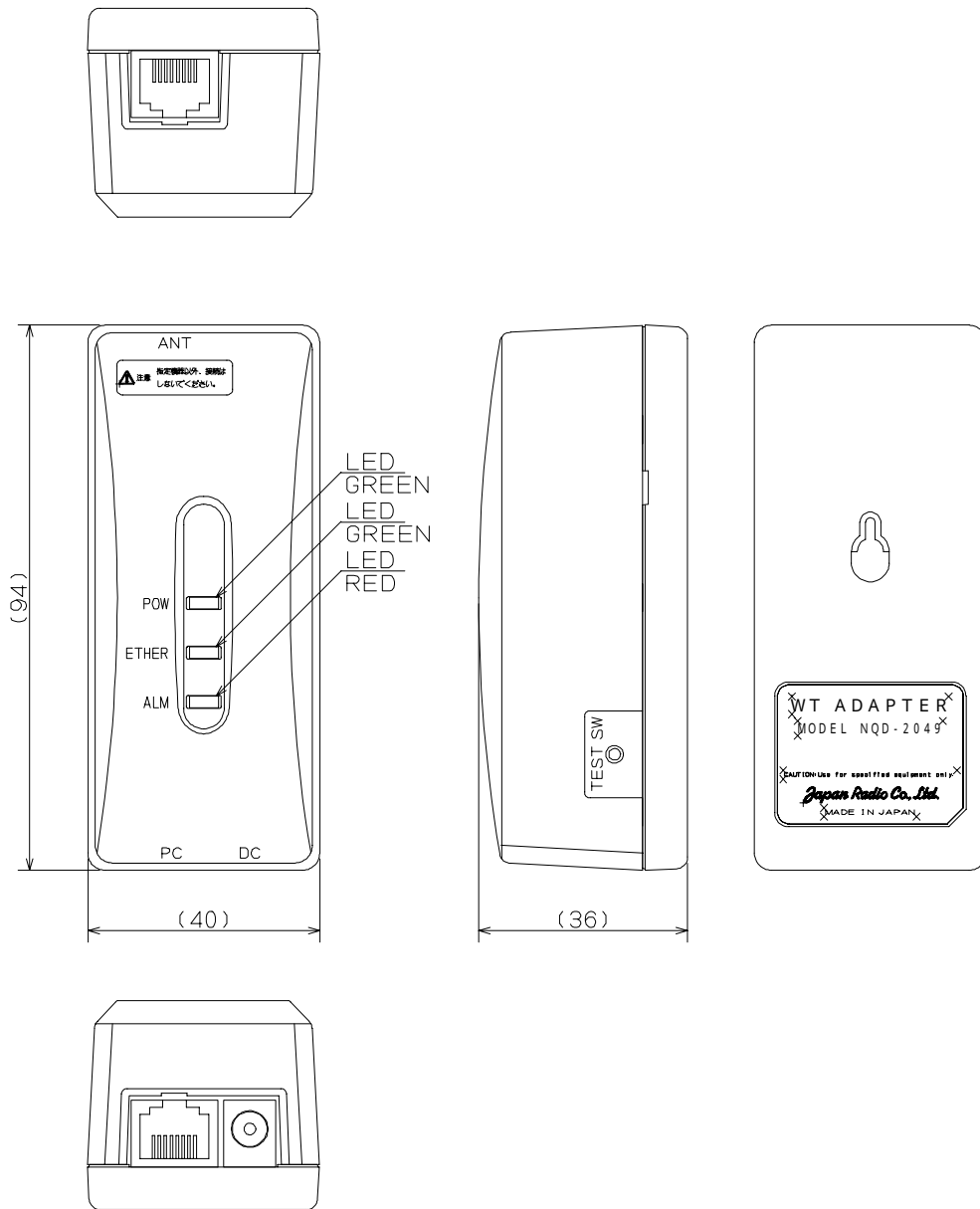
Figure 1-6 External View of the WT Adapter

30 or less

120 or less

70 or less
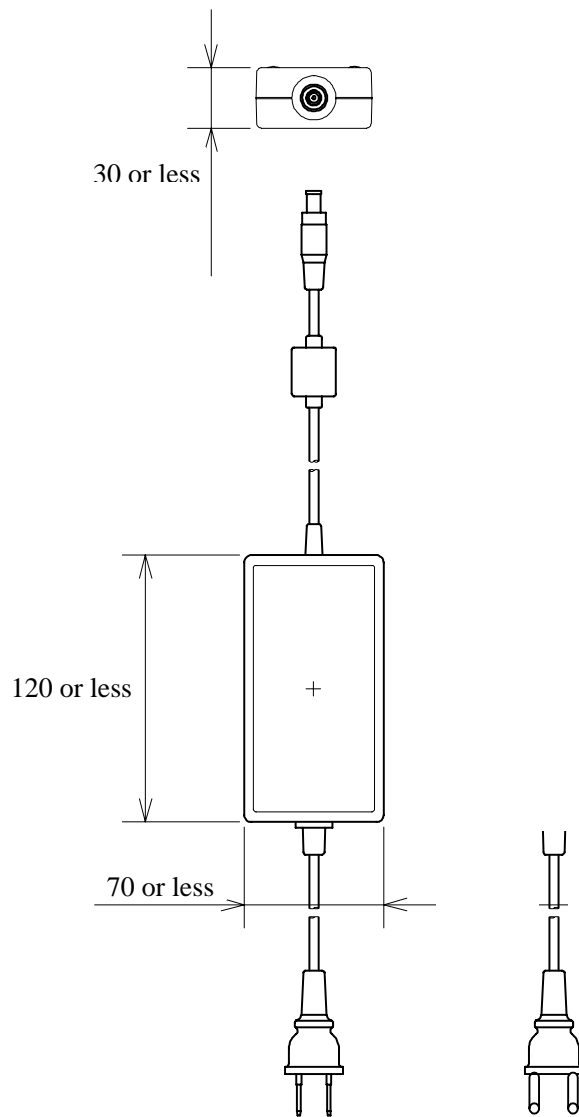
Figure 1-7 External View of the WT AC Adapter

2. Specifications

2.1 General

Table 2-1   General

General		
Transmit/Receve Band	EL0	24.101-24.549 GHz
	EL1	24.549-24.997 GHz
	EL2	24.997-25.445 GHz
	EH1	25.557-26.005 GHz
	EH2	26.005-26.453 GHz
Channel spacing		28MHz
Number of Remote Terminals		239 per Carrier
Duplex / Access Method		TDD-TDM/TDMA
Modulation		QPSK & 16-QAM, dynamic adaptive
Throughput/ RF Carrier		QPSK: 23 Mbps Aggregate 16-QAM: 46 Mbps Aggregate
Protocols Supported		802.3, 802.1Q
Transmit output power	QPSK	AP:+14dBm,WT:-6dBm to +14dBm (ATPC)
	16QAM	AP+11.5dBm,WT:-8.5dBm to +11.5dBm (ATPC)
Frequency tolerance		±15ppm
Minimum receiving level (BER=10^{-6})	QPSK	-79dBm or less
	16QAM	-69dBm or less
RF spectrum mask	QPSK	ETSI TypeA
	16QAM	ETSI TypeB
Occupied bandwidth	QPSK	26MHz or less
	16QAM	26MHz or less
Transmitter spurious emissions		-30dBm/MHz or less

2.2 AP

Table 2-2 AP

Access Point(AP)		
Antenna Beamwidth and Gain	Omni(V/H)	360° : 6.5dBi
	Sectoral(V/H)	90°x10°: 15.5dBi
Network Interface		100BASE-TX and 100BASE-FX(option)
Input Power		-48VDC -/+20% <0. 8Amps
Physical	RFU	Dimensions:W190 x H190 x D362mm
		Weight:3kg
	IFU	Dimensions:W275 x H325 x D165mm
		Weight:14kg
Temperature		-20 - +50 ,cold start at minimum -10 ambient
Humidity		20% - 80% , non-condensing

2.3 WT

Table 2-3　WT

Wireless Terminai(WT)		
Antenna Beamwidth and Gain	Flat	4° : 31.5dBi or more
Network Interface		100BASE-TX
Input Power		100 -240vac , <0.5Amps
Physical	RF Unit	Dimensions:W190 x H190 x D70mm
		Weight:2.5kg
	Adapter Box	Dimensions:W45 x H95 x D40mm
		Weight:100g
	AC Adapter	Dimensions:W60 x H38 x D120mm
		Weight:330g
Temperature		-20 - +50 ,cold start at minimum -10 ambient
Humidity		20% - 80% , non-condensing

3. AP

3.1 AP-RFU

3.1.1 Overview

The AP-RFU consists of three blocks: Antenna section, RF section and IF section.

• Antenna section

The omni-directional antenna (with horizontal directivity of 360°) and the horn-type antenna (90° × 10° directivity) give same shapes of AP-RFU.

• RF section

In the RF section, the transmission IF signals are up-converted into 24-26 GHz-band RF signals using the local signal, which is generated by multiplying the 2.4 GHz synthesized oscillator. The next-stage BPF eliminates unwanted sideband components. The up-converted 24-26 GHz-band RF signals are amplified up to the desired level then fed to the antenna via the TDD-Switch and the Waveguide Filter.

The received 24-26 GHz-band RF signals by the antenna are fed in to the LNA via the Waveguide Filter and the TDD-Switch. The output signals of the LNA are down-converted into IF signals using the local signal, which is generated by multiplying the 2.4 GHz synthesized oscillator. The BPF is employed to eliminate the image components (interference).

The TDD Switch selects the transmitting or receiving function. Detection of the transmiting burst at the IF section turns the switch to the transmiting side.

• IF section

In the receiving IF section, the output level to the AP-IFU is adjusted by the automatic gain control (AGC) function, so that the input level of the AP-IFU does not saturate for the reception of the WT signal which gives highest receiving level. The SAW filter eliminates the adjacent channel interference.

In the transmitting IF section, the detection of the transmiting burst signal control the TDD-Switch in the RF section to turn it to the transmiting side. The SAW filter provides the signal delay for the period of the burst detection and the TDD-Switch turning time, as well as the elimination of the non-desired signal component.

The IF section also has the compensation functionarity for cable losses between the AP-RFU and AP-IFU.

The CPU in the IF section performs the AGC, the cable loss compensation , and the monitoring and control functionalities.

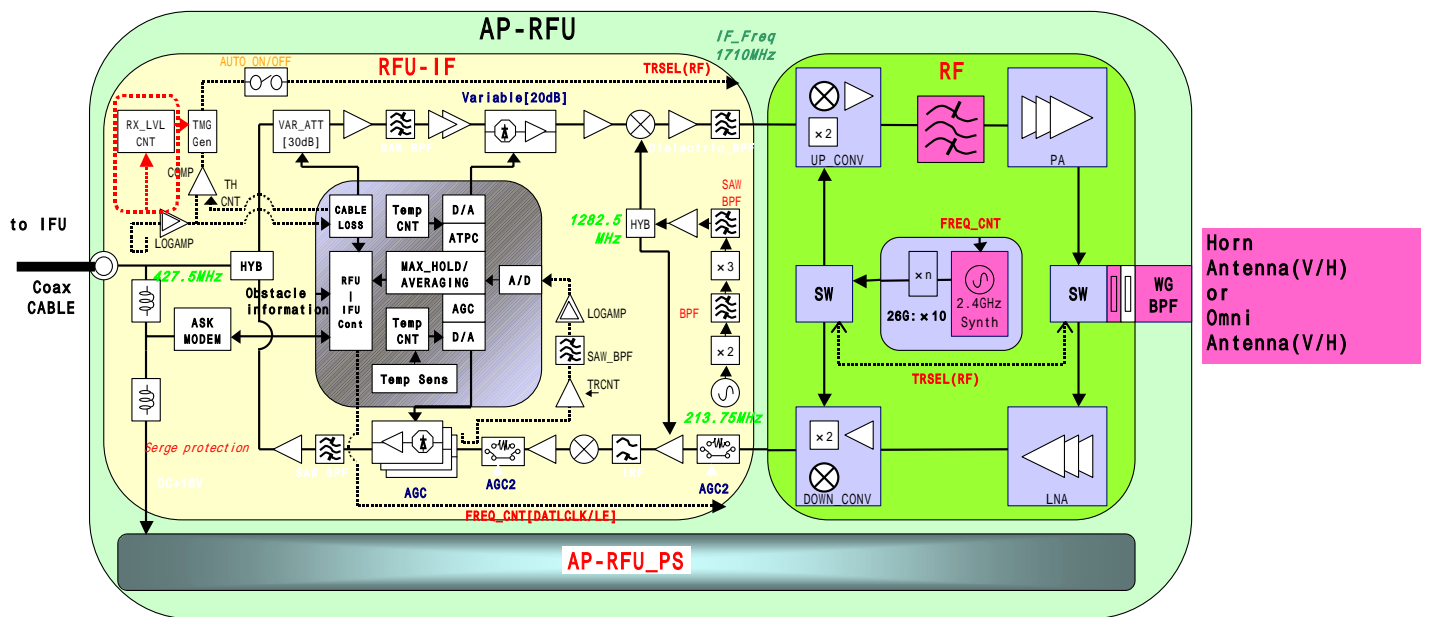Figure 3-1 is a block diagram of the AP-RFU.

Figure 3-1 AP-RFU Block Diagram

3.1.2 Operations and Indications

The AP-RFU does not have any operation or indication panels.

3.2 AP-IFU
3.2.1 Overview

AP-IFU consists of three blocks: IF section, digital section and interface section.

• IF section

The transmission IF section performs quadrature modulation of 427.5MHz IF frequency according to the transmission output from the digital modem installed in the WT-ASIC.

In the receiving IF section, the received burst signal level is adjusted by the automatic gain control (AGC) function of the digital modem. The quadrature demodulator downconverts the received IF signal into the baseband signal.

The digital section consists of a digital modem, TDD/TDMA framer, wireless MAC processor, and system controller. These functionarities are equipped in the WT-ASIC.

The digital modem performs modulation and demodulation of transmitting and receiving burst signals.

The interface section has an interface between the AP and the upper unit (100BASE-TX). It provides a 100BASE-FX interface by installing the AP optical INTF unit.

The digital section consists of the wireless MAC processor, TDD/TDMA controller, modem and system controller. The wireless MAC processor converts between the Ethernet frames that the interface section handles and wireless MAC frames. It also schedules the dynamic slot assignment. The TDD/TDMA controller performs scrambling, encryption, error correction and other processing. The system controller performs operating parameter setting, state monitoring, control and testing for the modem, TDD/TDMA processor, wireless MAC processor and network interface. It also sends and receives maintenance signals via SNMP. It performs delay control, authentication and other procedures, operating parameter setting, state monitoring, control and testing for the subordinate WTs over a DMF channel.

The transmission IF section in the IF section performs quadrature modulation for the transmission baseband signals at 427.5MHz LOC frequency for upconversion to IF signals. It also controls the output level to the desired level based on the control from the ASIC. The receive IF section equalizes the level of the reception waves arriving in a wide level range using the automatic gain control (AGC) from the ASIC, and then downconverts them into baseband signals.
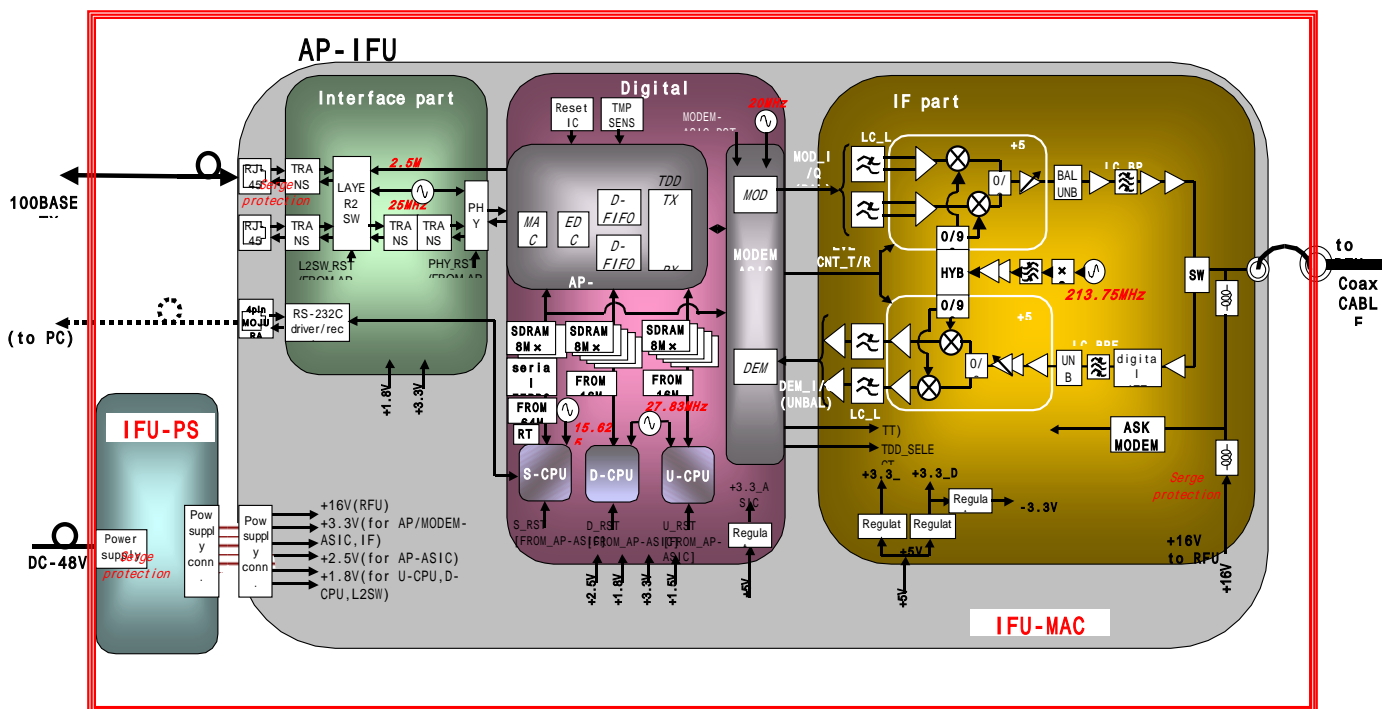
Figure 3-2 is a block diagram of the AP-IFU.

Figure 3-2 AP-IFU Block Diagram
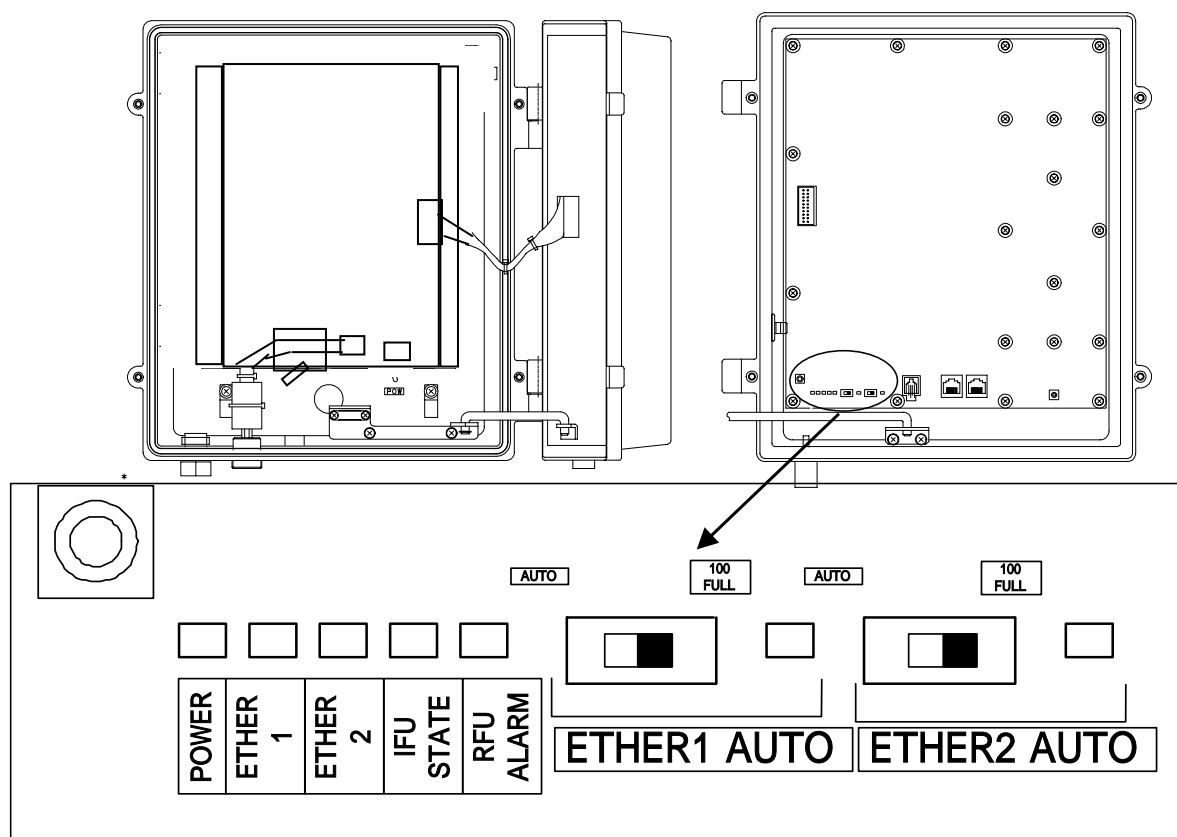
3.2.2 Operations and Indications

Figure 3-3 AP-IFU Operation and Indication Panel

Table 3-1 AP-IFU Indications

	LED	State indication
①	POWER	Lit green: Power on Extinguished: Power off
②	ETHER 1	Lit green: ETHER link established Flashing green: ETHER signal sent or received Extinguished: ETHER link down (See Table 3-3, 4)
③	ETHER 2	Lit green: ETHER link established Flashing green: ETHER signal sent or received Extinguished: ETHER link down (See Table 3-3, 5)
④	IFU STATE	Lit red: IFU alarm (See Table 3-3, 2) Flashing green: Normal (CPU running) Flashing orange: During initialization
⑤	RFU ALARM	Lit red: RFU alarm (Cause: RFU failure (See Table 3-3, 1) or communication error between the IFU and RFU (See Table 3-3, 3)) Extinguished: RFU alarm cleared
⑥	ETHER1 AUTO	Lit green: AUTO (ETHER1 AUTO switch set to AUTO) Extinguished: 100BASE full duplex
⑦	ETHER2 AUTO	Lit green: AUTO Extinguished: 100BASE full duplex
⑧	RST	Unit reset switch

Table 3-2 AP-IFU Controls

	Switch	Description
1	ETHER1 AUTO (The shape of the switch may be changed)	Sets the ETHER1 interface (100BASE full duplex/AUTO). After changing the switch setting, you have to reboot the unit (power off and back on) to enable the new setting. AUTO: AUTO 100FULL: 100BASE full duplex (factory setting)
2	ETHER2 AUTO (The shape of the switch may be changed)	Sets the ETHER2 interface (100BASE full duplex/AUTO). After changing the switch setting, you have to reboot the unit (power off and back on) to enable the new setting. AUTO: AUTO 100FULL: 100BASE full duplex (factory setting)

Table 3-3 Alarm Issuance and Clear Conditions

	Item	Initial state	Issued when:	Cleared when:
1	RFU failure	Cleared	The RFU-CPU detects LOCALM or TRSELALM three times each for more than 10msec.	The RFU-CPU detects no LOCALM or TRSELALM three times each for more than 10msec.
			LOCALM (local oscillator alarm) occurs if the local oscillator lost synchronization.	Synchronization is recovered.
			TRSELALM (transmission/reception switchover SW failure) occurs if the transmission state continues for more than 1sec.	Only by a reset.
			IFU-CPU detects a RFU-IFU communication error (monitoring response).	IFU-CPU is cleared by a single RFU-IFU communication (monitoring response).
2	IFU failure	Cleared	Communication error among the S-CPU, D-CPU and U-CPU. No response to polling for 3sec	Cleared by a single response.
			L2SW setting failure If setting failed four times (once for transmission and 3 times for retransmission)	No recovery
3	Communication error between RFU and IFU	Cleared	The S-CPU detects a S-RFU-CPU communication error. No response to polling four times (once for transmission and 3 times for retransmission)	Cleared by a single response.
4	ETHER 1 link down	Issued	PHY link down 3 times each for 100msec.	Recovered from PHY link down 3 times each for 100msec.
5	ETHER 2 link down	Issued	PHY link down 3 times each for 100msec.	Recovered from PHY link down 3 times each for 100msec.

4. WT

4.1 WT

4.1.1 Overview

The WT consists of the antenna section, RF section, IF section, digital section, interface section and power supply.

• Antenna section

Uses a Triplate planar antennas to make the antenna compact and to provide a high gain.

• RF section

In the RF section, the transmission IF signals are up-converted into 24-26 GHz-band RF signals using the local signal, which is generated by multiplying the 2.4 GHz synthesized oscillator. The next-stage BPF eliminates unwanted sideband components. The up-converted 24-26 GHz-band RF signals are amplified up to the desired level then fed to the antenna via the TDD-Switch and the Waveguide Filter.

The received 24-26 GHz-band RF signals by the antenna are fed in to the LNA via the Waveguide Filter and the TDD-Switch. The output signals of the LNA are down-converted into IF signals using the local signal, which is generated by multiplying the 2.4 GHz synthesized oscillator. The BPF is employed to eliminate the image components (interference).

The TDD Switch selects the transmitting or receiving function under the control of TDD/TDMA framer installed in the WT-ASIC.

• IF section

The transmission IF section performs quadrature modulation of 427.5MHz IF frequency according to the transmission output from the digital modem installed in the WT-ASIC. The SAW filter in the next stage eliminates undesired out-of-band signals. The output level of the transmission IF secton is adjusted by the automatic transmission gain control (ATPC) function of the digital modem.
.
In the receiving IF section, the SAW filter eliminates the adjacent channel interference. The received burst signal level is adjusted by the automatic gain control (AGC) function of the digital modem. The quadrature demodulator downconverts the received IF signal into the baseband signal.

• Digital section

The digital section consists of a digital modem, TDD/TDMA framer, wireless MAC processor, and system controller. These functionarities are equipped in the WT-ASIC.

The digital modem performs modulation and demodulation of transmitting and receiving burst signals.

The TDD/TDMA framer constructs and deconstructs radio burst frames.   It alse performs scrambling, encryption, and error correction functionarities.

The wireless MAC processor converts between the Ethernet frames and the wireless MAC frames in the radio channel.

The system controller performs operating parameter setting, state monitoring, control and testing for the entire unit.   It also communicate with the AP processer via the DMF channel.

• Interface section
The interface section provides the physical interrfaces of Ethernet for user interface and serial interface for the receiving level measurement terminal.   It has a lightning surge protector to protect the unit against external surges.

• Power supply
The power supply section generates various voltages used within the unit from +24V input power.
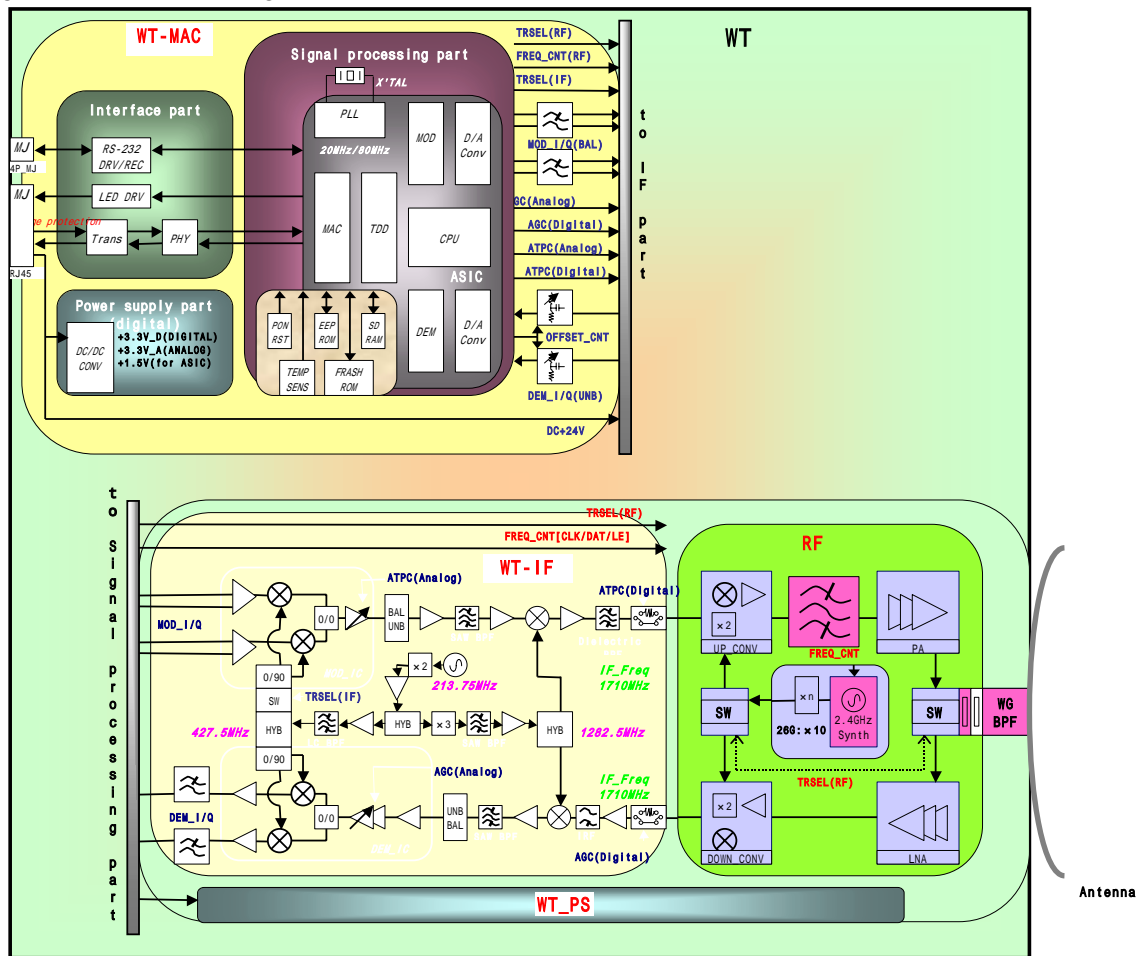
Figure 4-1 is a block diagram of the WT.

Figure 4-1 WT Block Diagram

4.1.2 Indications

(1) Indications

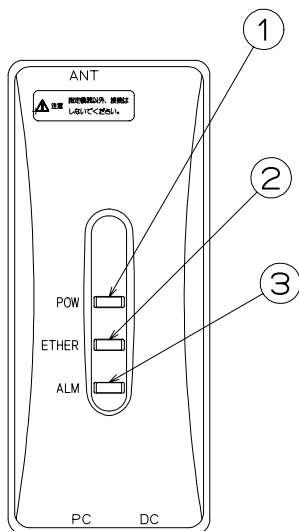The indications on the WT adapter allows you to check the state of the WT.

Figure 4-2 Indications on the WT Adapter

Table 4-1 Indications on the WT Adapter

	LED	Indication
①	POW	Lit green: Power on Extinguished: Power off
②	ETHER	Lit green: ETHER link established Flashing green: Transmission or reception on the ETHER port Extinguished: ETHER link down

③	ALM	Lit red: Wireless synchronization lost
		Flashing red:
		  Flashing red for 500msec: Wireless synchronization established (during authentication)
		  Flashing red for 1 sec: VID use halted
		Extinguished: Wireless synchronization established (after authentication)

(2) State transition

The table below shows how each LED changes its state after the power is turned on until the unit becomes operable.

Table 4-2 LED State Transition when the Power is Turned On

		Immediately after the power is turned on	Several seconds after the power is turned on	Radio synchronization lost	Authenticating after radio synchronization is reestablished	Operating after authentication is finished	Remarks
①	POW	Lit	Lit	Lit	Lit	Lit	
②	ETHER	Extinguished (Extinguished)	Lit (Lit)	Extinguished (Lit/Flashing)	Extinguished (Lit/Flashing)	Extinguished (Lit/Flashing)	The state within parentheses is that when a PC is connected.
③	ALM	Extinguished	Lit	Lit	Flashing*	Extinguished	

*Flashing for 500msec. (On for 500msec. and off for 500msec.)

(3) Lighting conditions

The table below shows when the ALM LED lights.

Table 4-3 Lighting Conditions of the ALM LED in the Out-of-Service State

Operation state	Out-of-service state	
	Out of service	Cleared
During authentication	ALM LED=Extinguished	ALM LED=Extinguished
During operation	ALM LED=Flashing*	ALM LED=Extinguished
Carrier off	ALM LED=Extinguished	ALM LED=Extinguished

*Flashing for one second (On for one second and off for one second)

5. INSTALLATION

5.1 Installing the AP-RFU and AP-IFU

5.1.1　Installing the AP-RFU (Omni Antenna)

Fix the AP-RFU (omni antenna) to a pole using the bolts ① and ②. At this time, extract the pigtail cable that comes with the AP-RFU from the hole in the pole as shown in Figure 5-1.
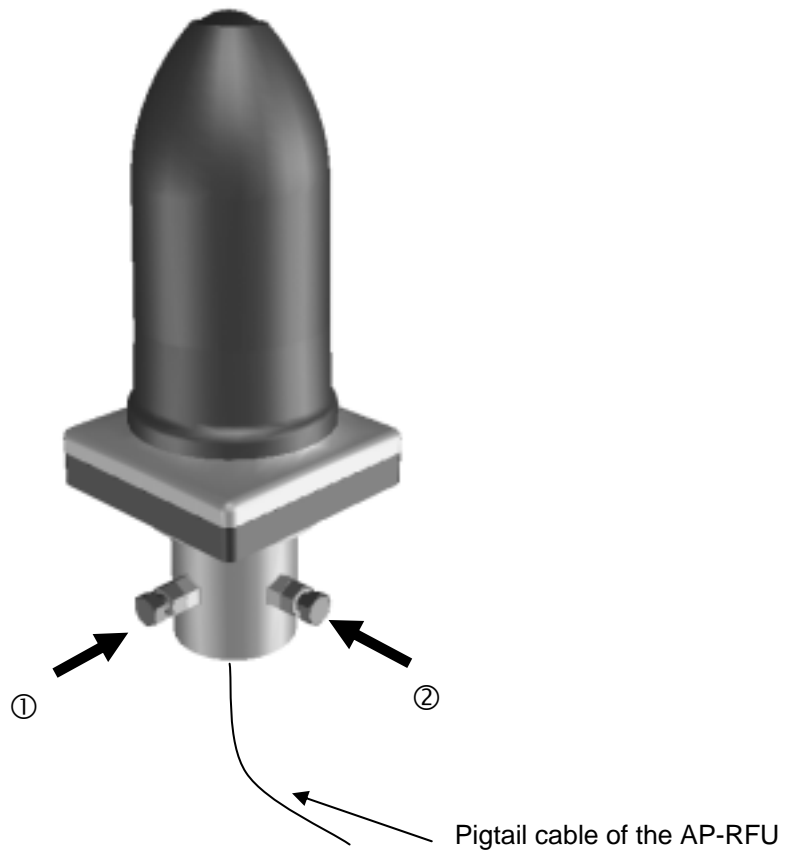
Figure 5-1 Installing the AP-RFU (Omni Antenna)

5.1.2　Installing the AP-RFU (Horn Antenna)

Attach the AP-RFU mounting bracket to the AP-RFU using the three bolts ③ as shown in Figure 5-3.

You can align the antenna either for vertical or horizontal polarization.

Fix the AP-RFU mounting bracket to the pole using the bolts ① and ② as shown in Figure 5-2.

AP-RFU
mounting bracket
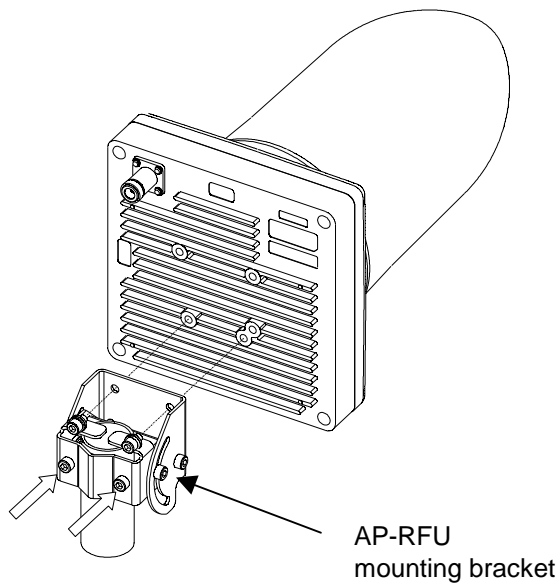
Figure 5-2 Installing the Mounting Bracket　　Figure 5-3 Installing the AP-RFU (Horn Antenna)
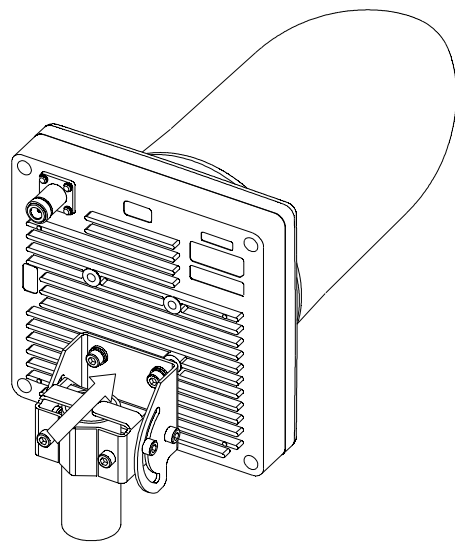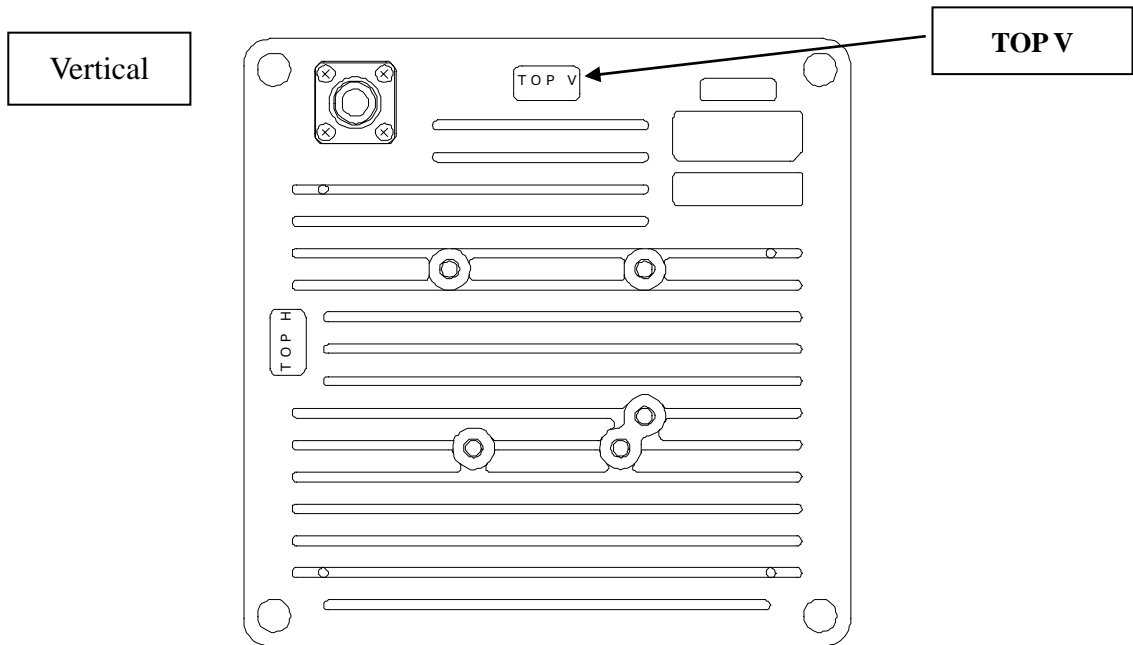
5.1.3 Setting AP-RFU (Horn Antenna) for Vertical or Horizontal Polarization

Vertical

TOP V

Figure 5-4 Vertical Polarization

Horizontal

TOP H
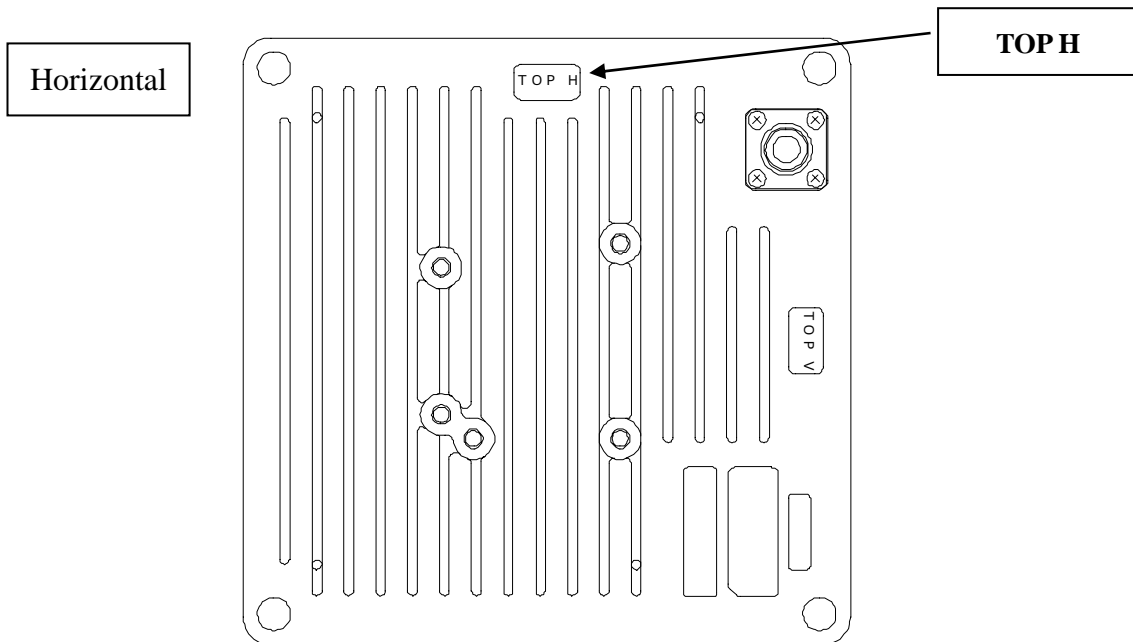
Figure 5-5 Horizontal Polarization

5.1.4   Installing the AP-IFU

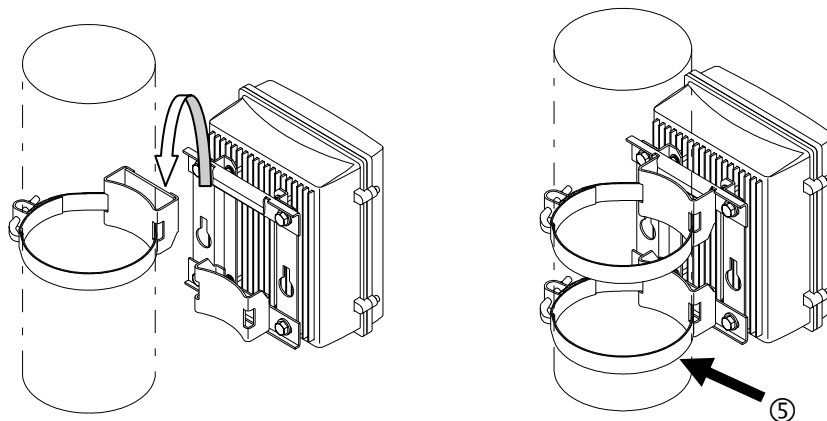### 5.1.4.1   Installing the AP-IFU on a Utility Pole

Figure 5-6 Installing the AP-IFU on a Utility Pole
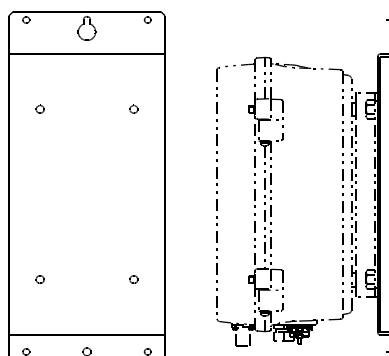
5.1.4.2   Indoor Installation

Figure 5-7 Indoor Installation

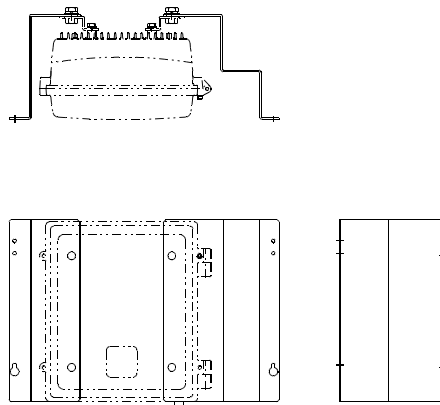### 5.1.4.3   Installing the AP-IFU on a 19-inch Rack

Figure 5-8 Installing the AP-IFU on a 19-inch Rack

5.1.4.4 Opening and Closing the AP-IFU Cover

To open the cover:

(1) Loosen the special screws ① to ④ to open the cover as shown in Figure 5-9.

(2) Fix the cover using the stopper ⑤ as shown in Figure 5-9.

To close the cover:

(1) Fix the stopper ⑤ on the main unit as shown in Figure 5-9.

(2) Close the cover and tighten the special screws ① to ④ as shown in Figure 5-9.

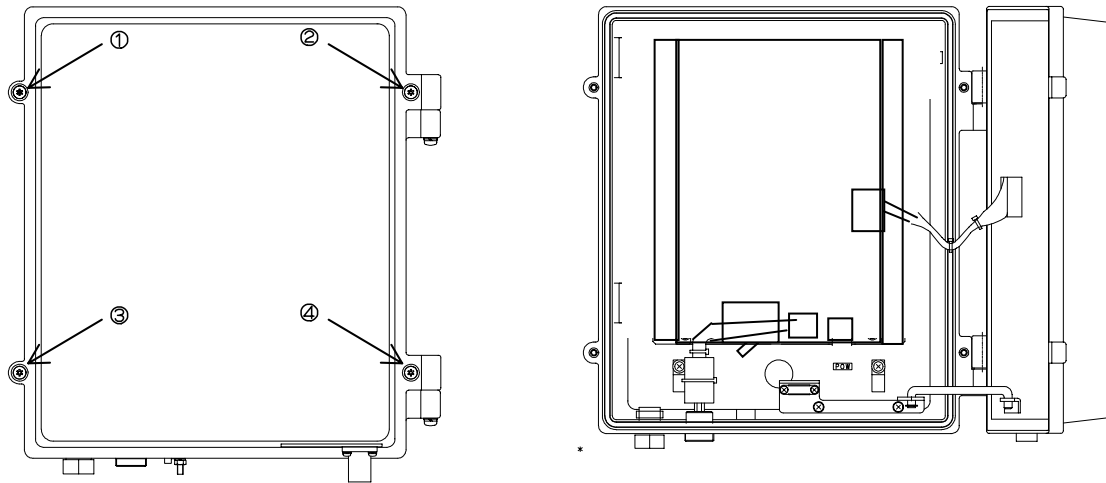

Figure 5-9 Opening and Closing the AP-IFU Cover

⚠ CAUTION: When opening the AP-IFU cover, make sure that the four special screws are loosened completely. Forcing open the cover may damage it.

> Use a T25 torx driver to open the AP-IFU cover.

⚠ CAUTION: After you opened the AP-IFU cover, make sure to secure it using the stopper. Otherwise, you may get hurt. To close the cover, be sure to return the stopper to the original position.

⚠ CAUTION: If it is difficult to tighten the four special screws of the AP-IFU cover, adjust the locations of the screw holes (support the cover and align the top of the cover to that of the chassis) and tighten the screws. Forced tightening of the screws may damage the cover and screws.

⚠ CAUTION: When closing the cover, be careful not to nick cables.

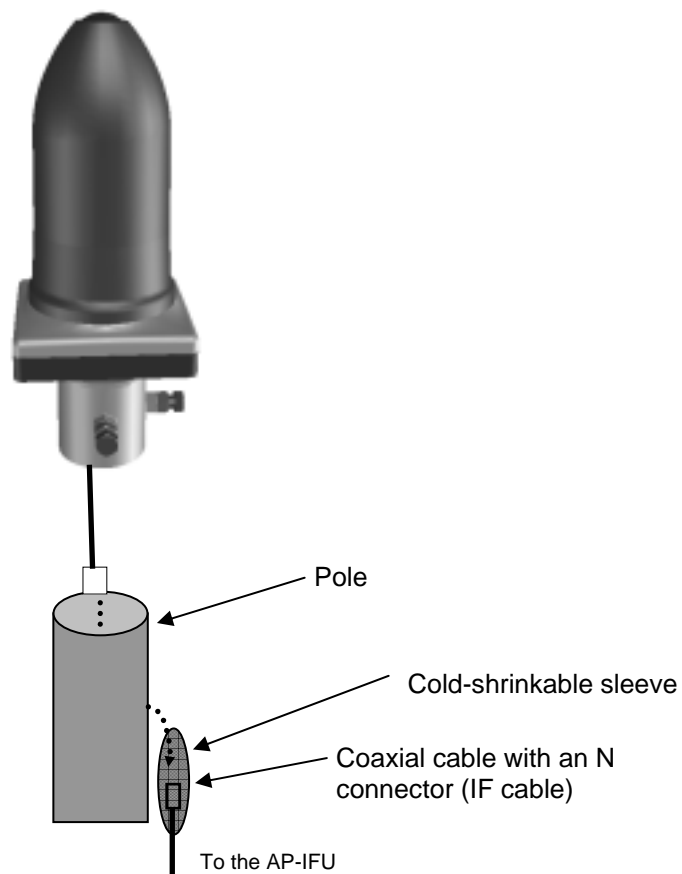## 5.1.5 Connecting a Cable to the AP-RFU (Omni Antenna)

Pole

Cold-shrinkable sleeve

Coaxial cable with an N connector (IF cable)

To the AP-IFU

Figure 5-10 Connecting the Cable to the AP-RFU (Omni Antenna)

! CAUTION: +16VDC to be supplied to the AP-RFU is superimposed on the signals in the IF cable. Turn off the power to the AP-IFU when installing or removing the IF cable. Otherwise, the unit may be damaged.

! CAUTION: Cover the cable connection with a cold-shrinkable sleeve to make it waterproof. Otherwise, water may get in the connection.

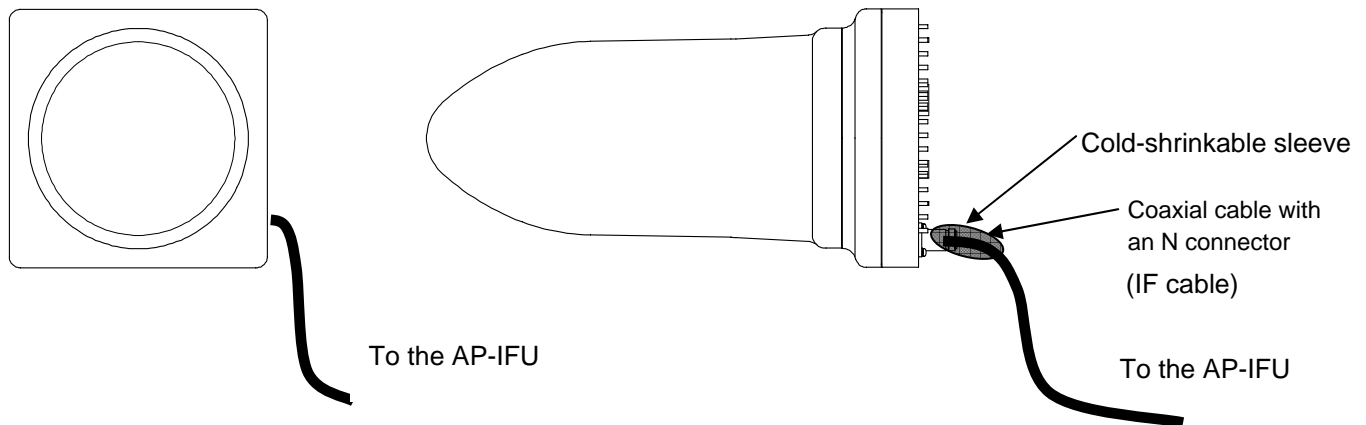## 5.1.6　Connecting a Cable to the AP-RFU (Horn Antenna)

Figure 5-11 Connecting a Cable to the AP-RFU (Horn Antenna)

❗ CAUTION: +16VDC to be supplied to the AP-RFU is superimposed on the signals in the IF cable.
Turn off the power to the AP-IFU when installing or removing the IF cable. Otherwise, the unit may
be damaged.

❗ CAUTION: Cover the cable connection with a cold-shrinkable sleeve to make it waterproof.
Otherwise, water may get in the connection.

5.1.7 Connecting Cables to the AP-IFU

Connect four cables to the AP-IFU: a coaxial cable (with an N connector), optical cable, outdoor power supply cable, and ground wire.
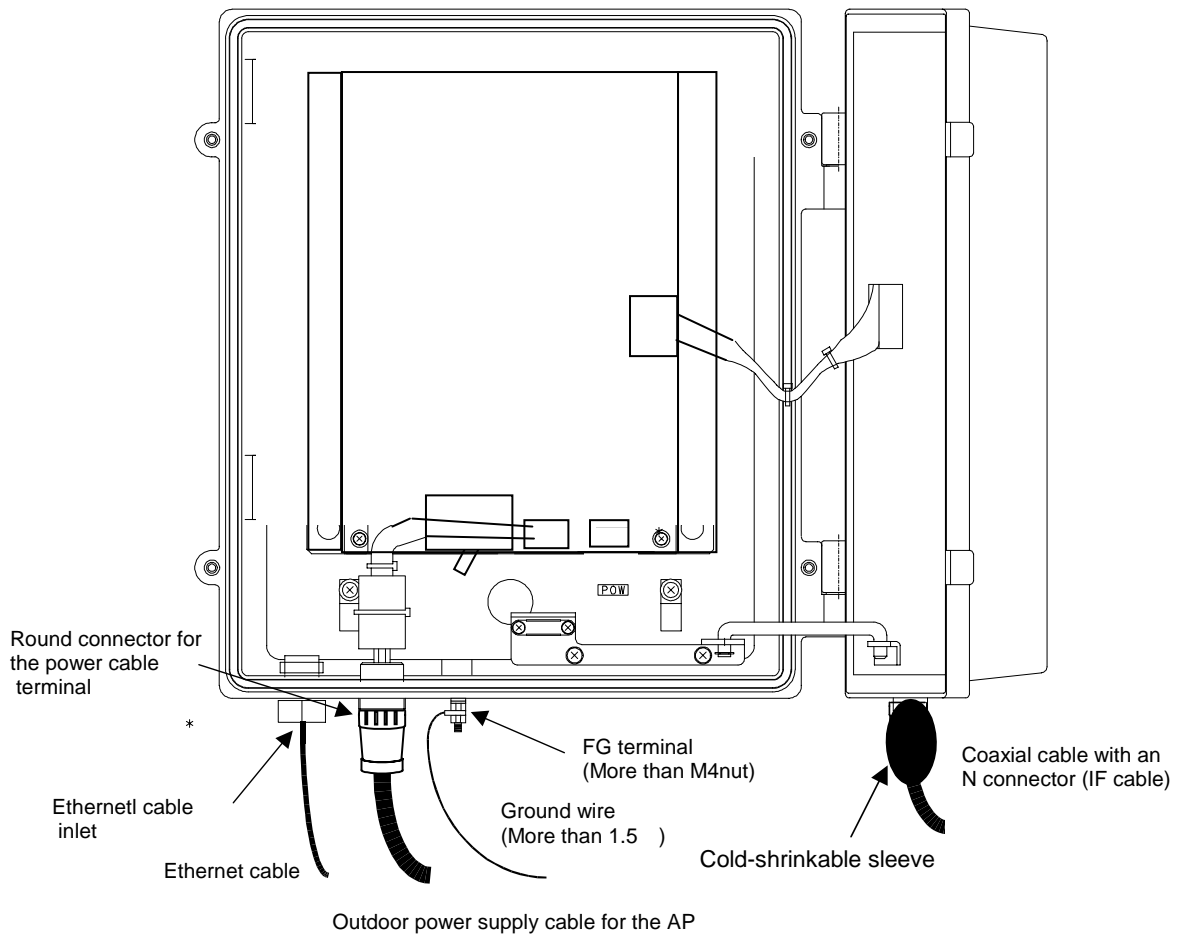
Round connector for
the power cable
terminal

*

Ethernetl cable
inlet

Ethernet cable

FG terminal
(More than M4nut)

Ground wire
(More than 1.5   )

Coaxial cable with an
N connector (IF cable)

Cold-shrinkable sleeve

Outdoor power supply cable for the AP

Figure 5-12-1 Connecting Cables to the AP-IFU (on the AP-PWR Side)

CAUTION: Ground wire more than 1.5

CAUTION: FG terminal wire more than M4nut.

CAUTION: The DC -48V power supply voltage for AP-IFU shall be SELV or TNV-1 depending on the network environment (0 or 1) acc. to IEC62102.

CAUTION: The Equipment for connection to AP-IFU Ethernet-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.

CAUTION: For the connection Terminal Equipment to AP-IFU and a cables suitable for outdoor use shall be installed.

IF terminal

Coaxial cable with an N
connector (IF cable)

Cold-shrinkable
sleeve

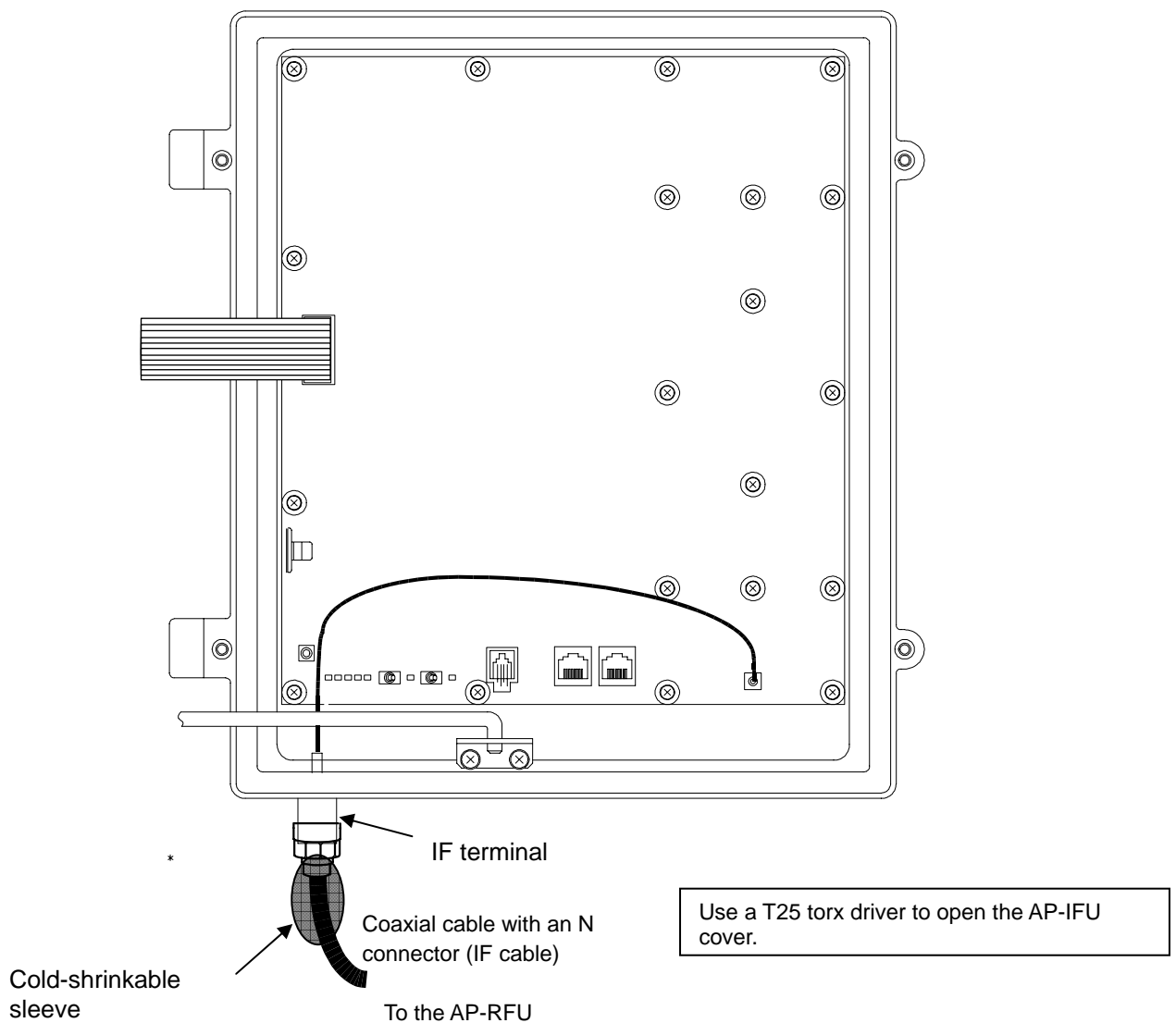To the AP-RFU

Use a T25 torx driver to open the AP-IFU
cover.

Figure 5-12-2 Connecting Cables to the AP-IFU (on the AP-CNT Side)

❗ CAUTION: When opening the AP-IFU cover, make sure that the four special screws are loosened
completely. Forcing open the cover may damage it.

❗ CAUTION: +16VDC to be supplied to the AP-RFU is superimposed on the signals in the IF cable.
Turn off the power to the AP-IFU when installing or removing the IF cable. Otherwise, the unit may
be damaged.

❗ CAUTION: Cover the cable connection with a cold-shrinkable sleeve to make it waterproof.
Otherwise, water may get in the connection.

❗ CAUTION: After you opened the AP-IFU cover, make sure to secure it using the stopper. Otherwise,
you may get hurt. To close the cover, be sure to return the stopper to the original position.

❗ CAUTION: For the connection AP-IFU to AP-RFU and a coaxial cable suitable for outdoor use shall
be installed.

5.2 Installing the WT

5.2.1   Installing the WT

Attach the WT mounting bracket to the WT using the bolts ① and ②.

You can orient the WT either for vertical or horizontal polarization.

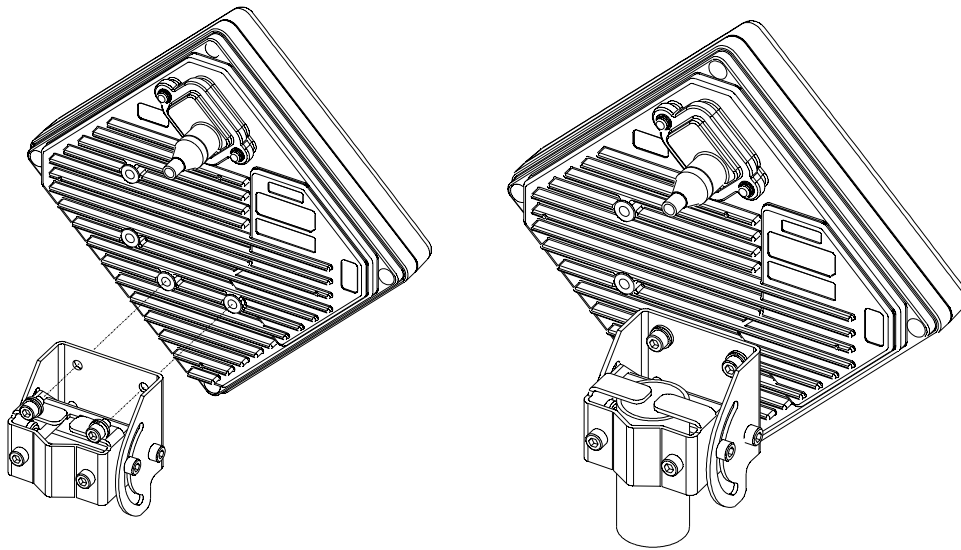Secure the WT mounting bracket to the pole using the bolts.

Figure 5-13 Installing the WT

5.2.2 Setting the WT for Vertical or Horizontal Polarization

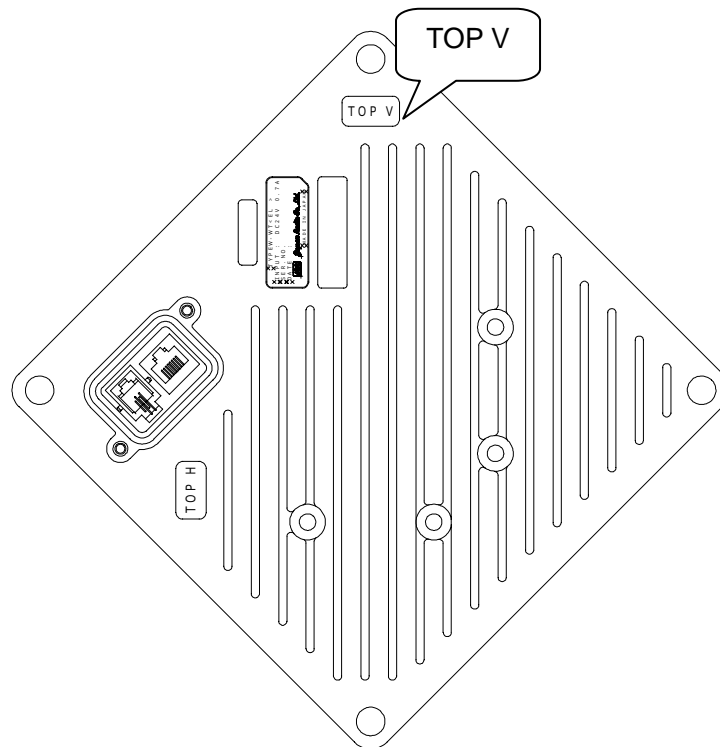Rotate the antenna ninety degrees to choose between vertical or horizontal polarization
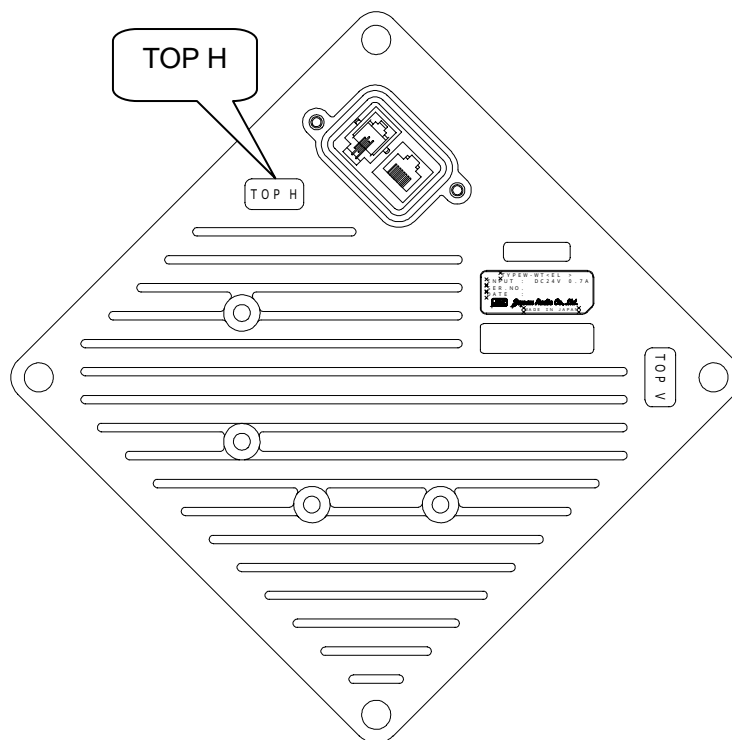

Figure 5-14 Vertical Polarization

Figure 5-15 Horizontal Polarization

5.2.3   Installing the WT Adapter

Screw into the mounting position the wood screw that comes with the WT adapter, leaving 2 mm.
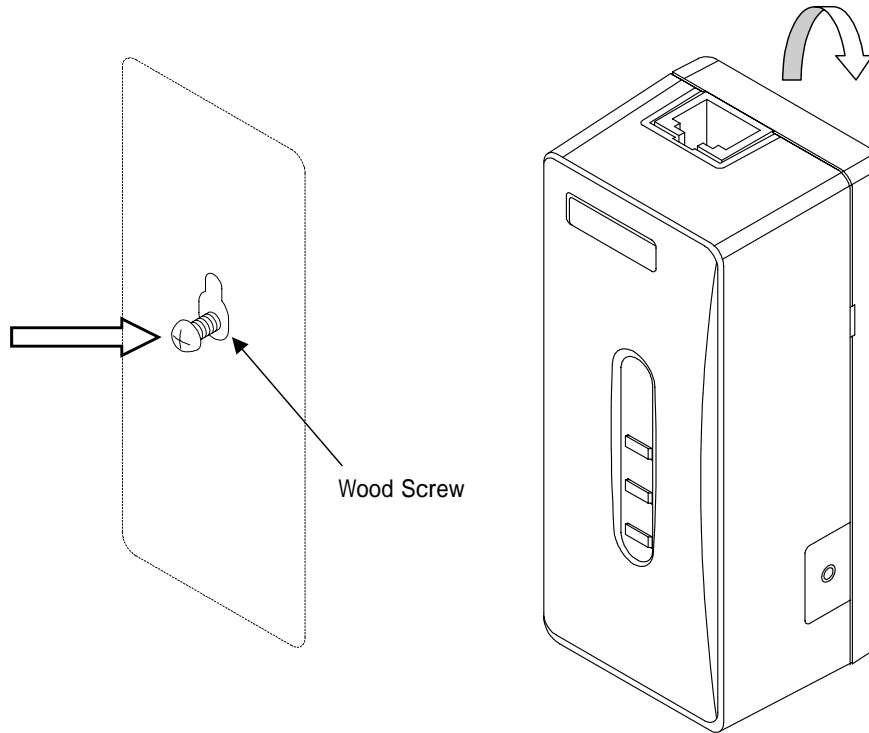Hook the WT adapter on the wood screw.

Wood Screw

Figure 5-16 Installing the WT Adapter on the Wall

5.2.4 Connecting Cables to the WT Adapter

Connect three cables to the WT adapter: Ethernet cable to connect the WT, Ethernet cable to connect the PC, and AC adapter cable.

    (1)   Specification for the Ethernet cable to connect the WT and WT adapter:
            Straight

    (2)   Specification for the Ethernet cable to connect the PC (PC port):
            To PC: Straight
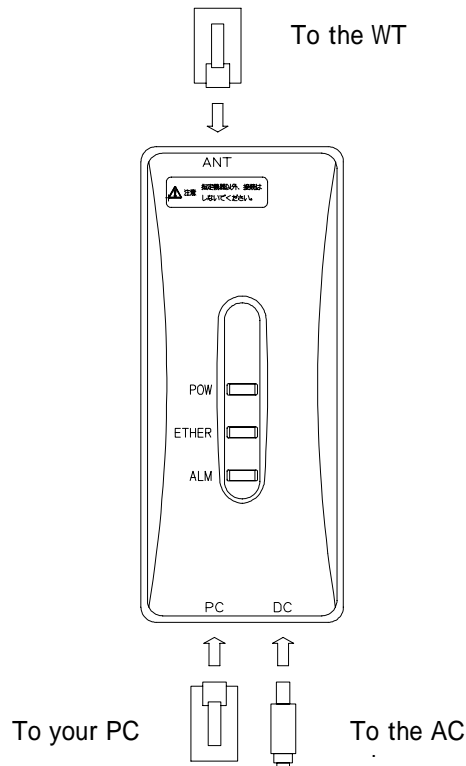   To the hub: Cross
            To the router: Straight

Figure 5-17 Connecting Cables to the WT Adapter

PROHIBITION: Never connect your personal computer to the ANT port of the WT adapter. Doing so may damage your personal computer.

CAUTION: The cable connecting between the WT and WT adapter carries 24 VDC for the WT in addition to Ethernet signals. Before unplugging the cable connecting between the WT and WT adapter, make sure to unplug the DC jack of the WT adapter to turn the power off. Otherwise, the unit may be damaged.

CAUTION: The cable connecting the WT and WT adapter is a straight cable. Wrong connection may damage the unit.

CAUTION: The Equipment for connection to WT adapter PC-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.

CAUTION: For the connection WT adapter to WT and a cable suitable for outdoor use shall be installed.

5.3 Standard Tools to be Used

The table below lists the tools used during installation or maintenance of the units.

Table 5-1 Tools Used

No.	Unit name	Used for:		Tightening torque [N•cm]	Tool
1		Door	M5	265	Torx driver (VESSEL T25H-120)
2		Power board	M4	127	Phillips screwdriver
3		Cable clamp	M4	127	Phillips screwdriver
4		Power board	M4	127	Phillips screwdriver
5		Cable clamp	M4	127	Phillips screwdriver
6	AP-IFU	Ground	M4 nut	127	Socket driver (Width across flats: 7)
7		SC lock	M16 nut	80 to 120	Spanner wrench (Width across flats: 22)
8		MC mounting plate	M3	57	Tightened manually
9		Mounting plate	M8	1080	Socket wrench (Width across flats: 13)
10		MC mounting feet	M3	57	Socket driver (Width across flats: 5.5)
11		MC mounting feet (for cascade connection)	M4	130	Phillips screwdriver
12		Small window	M4	127	Torx driver (VESSEL T20H-120)
13	WT	Mounting bracket	M5	265	Allen wrench (Width across flats: 5)
14		Ethernet cable			Crimping tool for RJ-45 (Release-after-crimp type)
15	AP-RFU (Omni)	Mounting bracket (axis tightening)	M16	9410	Socket wrench (Width across flats: 24)
16	AP-RFU (Horn)	Mounting bracket	M5	265	Allen wrench (Width across flats: 5)

The appropriate tightening torque is ±10% of the value indicated in the table.

5.4 Switches
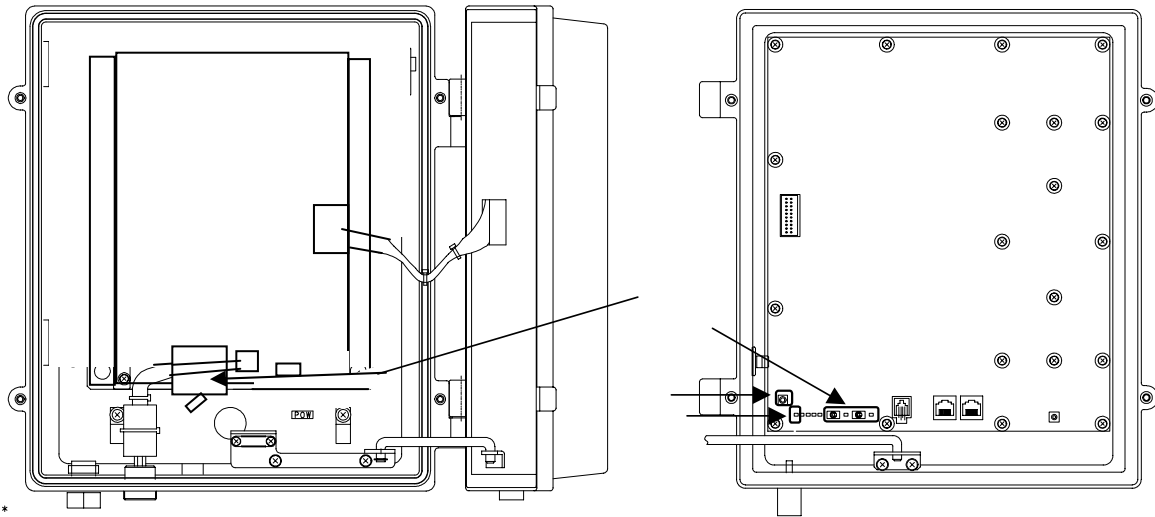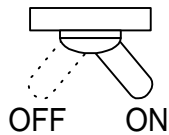### 5.4.1　Switches on the AP-IFU

Figure 5-18 Switches on the AP-IFU

① Power switch

This is the switch to supply power to the AP-IFU and AP-RFU.
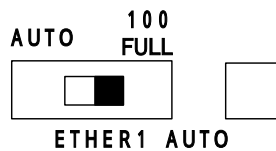

OFF　　ON

④ POWER LED
When on : Lit green
When off: Extinguished

② ETHER1/ETHER2 switch

This is the switch to set AUTO or 100FULL.

(The shape of the switch may be changed.)

ETHER AUTO LED
AUTO: Lit green
100FULL: Extinguished

FULL

Factory setting: 100FULL

③ RST switch

This is the switch to reset the unit.

❗ CAUTION: After changing the switch setting, you have to reboot the unit (power off and back on) to enable the new setting.
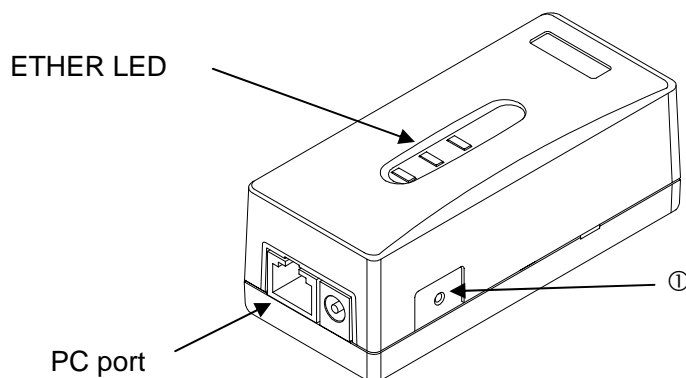
5.4.2　Switches on the WT Adapter

Figure 5-19 Switches on the WT Adapter

ETHER LED

PC port

①

① TEST SW switch

This is the switch to check for any disconnection on the Ethernet cable connecting the WT and WT adapter.

CAUTION: If you turn on this switch, the Ethernet signal is looped back to the WT and not output to the PC port.

How to check for a disconnection:

- Unplug the cable from the PC port of the WT adapter.
- Make sure that the ETHER LED lights.
- Hold down the TEST SW switch.
- (The Ethernet signal from the WT is looped backed to the WT via the WT adapter.)
- The connection is normal if the ETHER LED lights green.
- The four Ethernet signal lines have a disconnection or wrong wiring if the ETHER LED remains extinguished.

CAUTION: The TEST SW cannot identify a wrong connection for the straight/cross cable. When connecting a connector, make the correct connection for the straight or cross cable.

CAUTION: If you turn on this switch by mistake, the Ethernet signal is looped back to the WT and not output to the PC port.

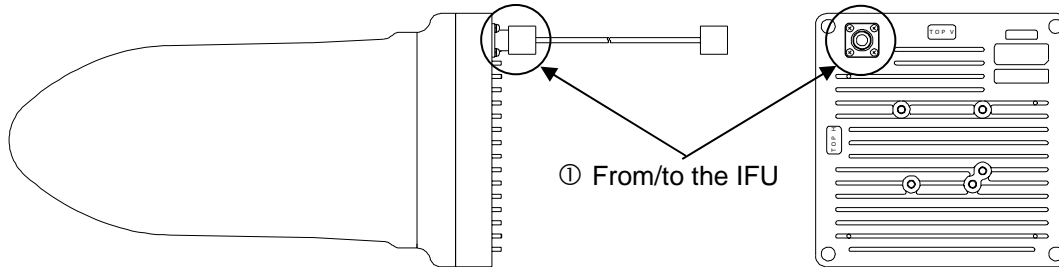## 5.5 Connectors

5.5.1　Connecting the AP-RFU and AP-IFU

Figure 5-20 Connecting Section of the AP-RFU (Omni Antenna)

① IF terminal: Pigtail connector (connector type: N-J)

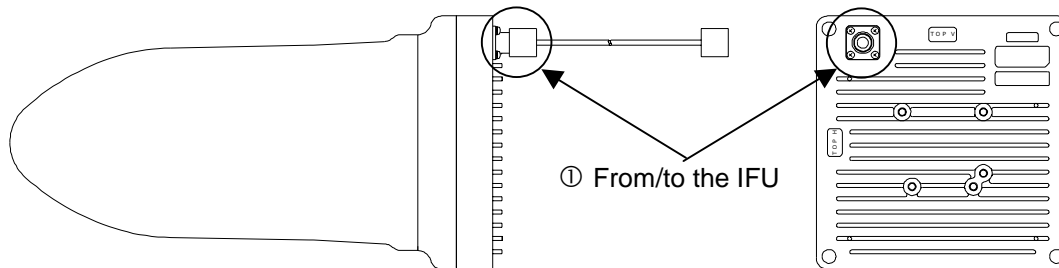Connect the coaxial cable with an N-type connector from the AP-IFU.

Figure 5-21 Connecting Section of the AP-RFU (Horn Antenna)

① IF terminal: (Connector type: N-J)

Connect the coaxial cable with an N-type connector from the AP-IFU.
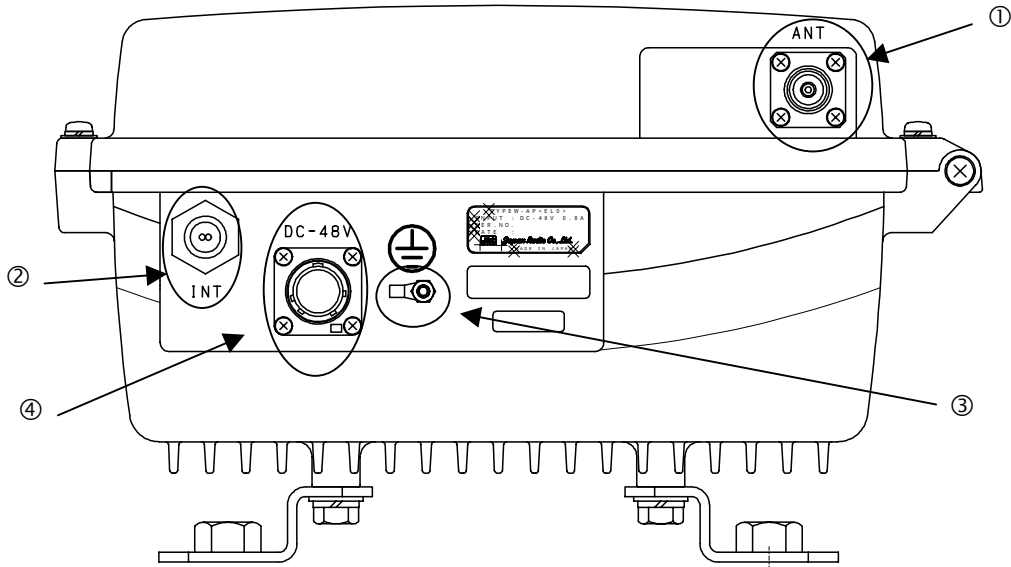
5.5.2 Connectors on the AP-IFU

Figure 5-22 Connecting Section of the AP-IFU (Bottom View)

① ANT terminal: (Connector type: N-J)

  Connect the coaxial cable with an N-type connector from the AP-RFU.

② Ethernet cable inlet:

  Insert the Ethernet cable into the rubber bushing.

③ FG terminal:

  Connect the ground wire.

④ Power cable terminal: (Connector type: Round)

  Connect the power cable.

1	GND
2	DC-48V
3	NU
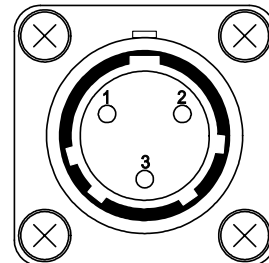
CAUTION: Power cable terminal(　): The DC -48V power supply voltage for AP-IFU shall be SELV or TNV-1 depending on the network environment (0 or 1) acc. to IEC62102.

CAUTION: Ethernet cable inlet(　)　The Equipment for connection to AP-IFU Ethernet-interface (RJ-45) shall be appropriate to connect to TNV-1 circuits.

5.5.3 Connectors on the WT

1	TXD+
2	TXD-
3	RXD+
4	LED1
5	LED2
6	RXD-
7	+24V _IN
8	GND

87654321

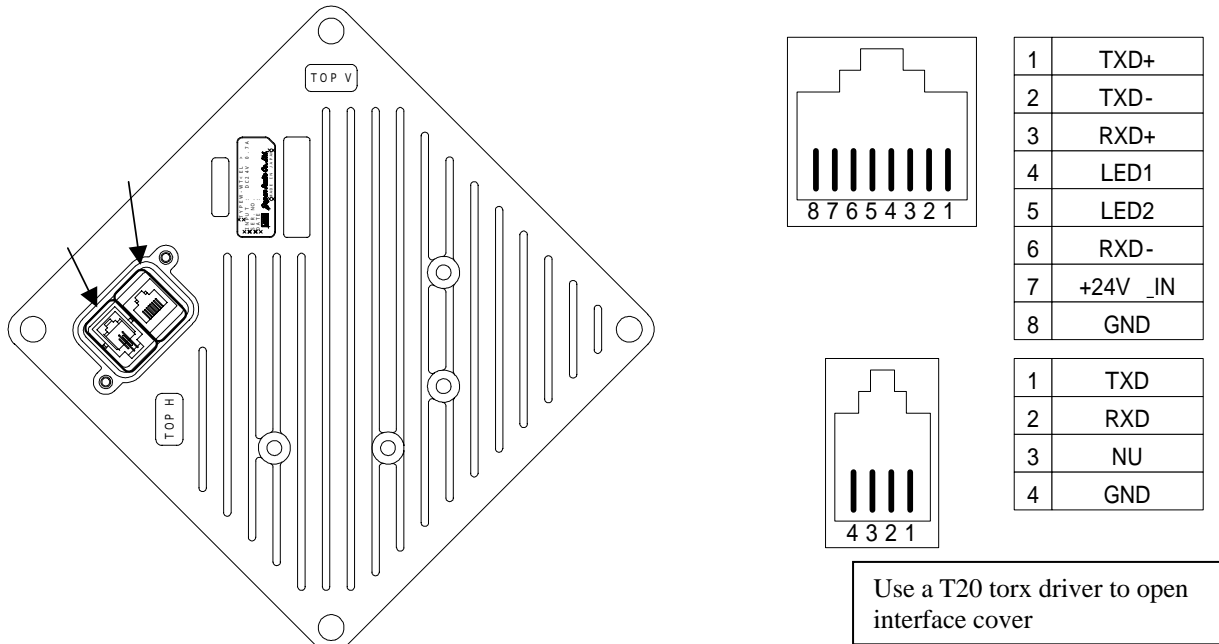|	
1	TXD
2	RXD
3	NU
4	GND

4 3 2 1

Use a T20 torx driver to open interface cover

Figure 5-23 Connecting Section of the WT

① ETHER port

This is the port to connect the WT to the WT adapter. Use a straight cable between the WT and WT adapter.

Shape: RJ45 connector

Specification: Ethernet signal (MDI specification)

The four remaining idle conductors are used for power and LED control.

When connecting the receiving level measurement terminal, connect battery to this port.

② Receive level measurement terminal port

This is the port to connect the receiving level measurement terminal.

Shape: RJ-22

Connect the receiving level measurement terminal to this port using the WT connection cable (that comes with the receive level measurement terminal).

⚠ CAUTION: The cable connecting between the WT and WT adapter carries 24 VDC for the WT in addition to Ethernet signals. Before unplugging the cable connecting between the WT and WT adapter, make sure to unplug the DC jack of the WT adapter to turn the power off. Otherwise, the unit may be damaged.

⚠ CAUTION: The cable connecting the WT and WT adapter is a straight cable. Wrong connection may damage the unit.

⚠ CAUTION: When closing the small window, make sure that the rubber packing of the small window is free from any foreign matter.
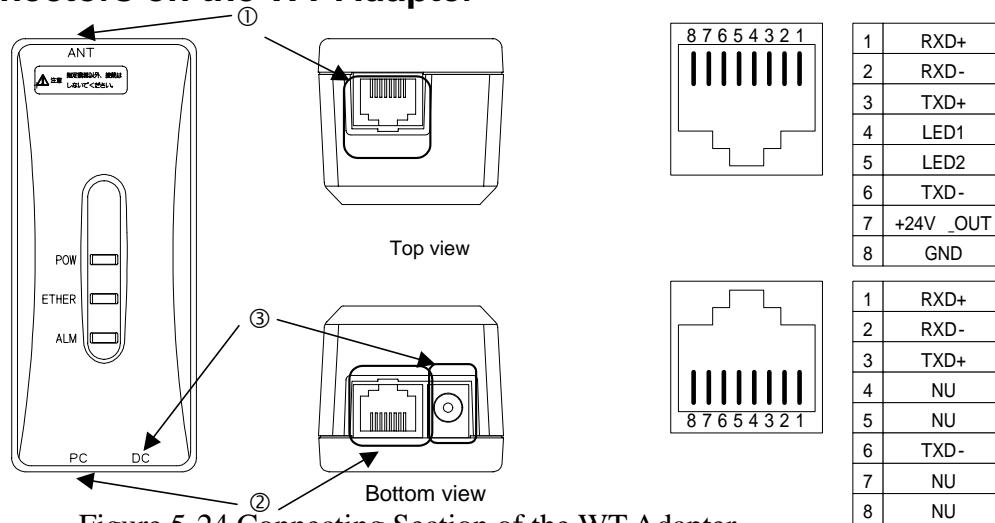
5.5.4 Connectors on the WT Adapter

Figure 5-24 Connecting Section of the WT Adapter

1	RXD+
2	RXD-
3	TXD+
4	LED1
5	LED2
6	TXD-
7	+24V _OUT
8	GND

1	RXD+
2	RXD-
3	TXD+
4	NU
5	NU
6	TXD-
7	NU
8	NU

① ANT port: (Connector type: RJ-45)

This is the port to connect the WT to the WT adapter. Use a straight cable between the WT and WT adapter.

Shape: RJ45 connector

Specification: Ethernet signal (MDI-X specification)

The four remaining idle conductors are used for power and LED control.

② PC port: (Connector type: RJ-45)

This is the port to connect the communication terminal.

Shape: RJ45 connector

Specification: Ether signal (MDI-X specification)

Connect the local management tool terminal using a straight cable.

Use a cross cable to connect the hub.

Use a straight cable to connect a PC or router.

③ DC jack: (+24VDC power supply)

Connect the AC adapter that comes with the WT.

⃠ PROHIBITION: Never connect a communication terminal to the ANT port of the WT adapter. Doing so may damage your personal computer.

❗ CAUTION: The cable connecting between the WT and WT adapter carries 24 VDC for the WT in addition to Ethernet signals. Before unplugging the cable connecting between the WT and WT adapter, make sure to unplug the DC jack of the WT adapter to turn the power off. Otherwise, the unit may be damaged.

❗ CAUTION: The cable connecting the WT and WT adapter is a straight cable. Wrong connection may damage the unit.

❗ CAUTION: PC port: (Connector type: RJ-45　)The Equipment for connection to WT adapter PC-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.