

JRC FWA SYSTEM INSTRUCTION MANUAL

Rev. 3.4
24/SEP./2008



Japan Radio Co., Ltd.



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

	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.)	
		⊘ icons indicate prohibition. A detailed prohibition description is given in the vicinity of the icon. (The figure on the left prohibits disassembly.)
Do not disassemble	General prohibitions	
		● icons require you to perform the item. A detailed instruction is given in the vicinity of the icon. (The figure on the left instruct to unplug the equipment.)
Unplug	General advice	

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 turn the power off.

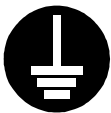
- Do not splash water on the WT adapter.
- Do not use this equipment in a place with excessive dirt or dust. Before touching a power-receiving terminal, turn the input power off to avoid electrical shocks.



Do not touch the rack of the WT during operation because it becomes 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.



Before plugging in or unplugging the coaxial cable between the AP-RFU and AP-IFU, turn the power off.



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.



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



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



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



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





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'intérieur 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'icône (la plus à gauche interdit le démontage.)
	Débranchez	● 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 débrancher le matériel avant toute opération.)
	Conseil général	

Attention

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

(French)

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 côté 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 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 masse, vous pourriez provoquer 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 modifications 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.



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.



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



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



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



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





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

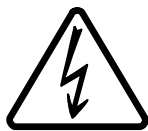
Prima dell'utilizzo

Seguire attentamente le avvertenze

Questo manuale ed il prodotto usano delle icone per aiutarLa a utilizzare propriamente il prodotto e prevengono eventuali danni a Lei o ad altre persone o beni materiale derivanti dal cattivo utilizzo di questo prodotto. Le icone seguenti classificano il pericolo ed il danno potenziale nel caso in cui le indicazioni fossero ignorate o nel caso in cui il prodotto fosse usato impropriamente. Seguire attentamente le avvertenze.

	Pericolo	Una cattiva utilizzazione di questo prodotto puo' provocare seri danni a persone mettendo i suddetti in pericolo di vita
	Avvertenza	Una cattiva utilizzazione di questo prodotto puo' provocare seri danni a persone o cose

Esempi di icone

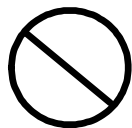


Tensioni pericolose

Un triangolo è un allarme per chiamare la Sua attenzione. Esso include un avvertimento o indicazione di pericolo. Le grafiche all'interno del triangolo differiscono dal grado di cautela. (La figura a sinistra mostra pericolo per shock elettrici.)



Non smonti



Proibizioni Generali

⊘ icone indicano proibizione. Una descrizione di proibizione particolareggiata è data accanto all'icona. (La figura sulla sinistra proibisce lo smontaggio del prodotto.)



Unplug



Consiglio Generale

! icone La invitano a compiere il gesto indicato. Una descrizione piu' dettagliata è data accanto all'icona. (La figura sulla sinistra richiede di scollegare il prodotto.)

Segnali di avvertimento

Si prega di non rimuovere, alterare o danneggiare tali etichette

Precauzioni d'uso



Pericoli



Non metta contenitori d'acqua, prodotti chimici o cosmetici, come vasi, pentole ed occhiali o piccoli pezzi di metalli vicino o in cima a questo prodotto. Liquidi versati sopra o all'interno del prodotto, piccoli elementi metallici inseriti all'interno del prodotto possono provocare shock elettrici o malfunzionamenti.



Spenga immediatamente il prodotto se qualche anomalia come fumo o vapori sono emanati dal prodotto. e contatti immediatamente il nostro ufficio di vendite. Continuare ad usare il prodotto in tali condizioni può causare inizi di incendio o shock elettrici.

(Italian)



Avvertenze



Questo manuale descrive importanti precauzioni punti per l'utilizzo e la manutenzione del prodotto. Legga le sezioni relative durante l'uso, in veglia o durante la prova dell'unità. Non tenti di eseguire prove o operazioni non descritte in questo manuale.



questa attrezzatura è una macchina di precisione. Possono verificarsi malfunzionamenti se non osserva le seguenti precauzioni:

- Non sottoponga questa attrezzatura a colpi o cadute
- Durante l'uso, non faccia scollegare il cavo connesso tra l'unità senza fili e l'adattatore di WT.

Prima di scollegare il dispositivo, rimuova il connettore dall'adattatore di WT e in seguito spenga il dispositivo.

- Non metta a contatto l'adattatore WT con acqua.
- Non usi questa attrezzatura in un luoghi polverosi o poco puliti. Prima di toccare un –terminale di potenza ricevente, spenga il dispositivo per evitare evitare shock elettrici.



Non tocchi l'intelaiatura del dispositivo WT poiché esso può produrre calore.



Quando installa il punto di accesso, connetta il filo di massa al terminale di terra. Se l'attrezzatura non è collegata a terra propriamente, Lei può ricevere shock elettrici quando l'attrezzatura diviene difettosa o in corto circuito.



Quando usa un strumento di misura, connetta il terminale di massa dello strumento di misura al terminale di massa di questa attrezzatura. Se l'attrezzatura non è collegata a terra propriamente, Lei può ricevere shock elettrici.



Per evitare pericoli di shock, non apra e non tocchi l'interno del dispositivo o i punti di rettifica eccetto durante manutenzione o ispezione. Se Lei modifica illegalmente l'attrezzatura, Lei può essere punito secondo la Legge Radio

(Italian)



Cautele



Non usi solventi organici come diluente e benzene per pulire il dispositivo perché questo può danneggiarne il rivestimento. Asciugi la superficie con una stoffa asciutta e pulita.



Prima di collegare o scollegare il cavo coassiale tra l'AP-RFU ed AP-IFU, spenga il dispositivo.



La DC -48V tensione di alimentazione elettrica per AP-IFU sarà SELV o TNV-1 a seconda della rete elettrica utilizzata (0 o 1) con riferimento a IEC62102.



L'Attrezzatura per il collegamento ad AP-IFU Ethernet-interface(RJ-45) sarà adatto per connettere ai circuiti di TNV-1.



L'Attrezzatura per il collegamento all'adattatore di WT PC-interface(RJ-45) deve essere compatibile con una connessione ai circuiti di TNV-1



Per il collegamento tra adattatore WTe WT dovrà essere utilizzato un cavo appropriato per uso esterno.



Per il collegamento dell'attrezzatura completa al AP-IFU dovrà essere utilizzato un cavo adatto ad uso esterno





Per il collegamento tra AP-IFU e AP-RFU dovrà essere utilizzato un cavo coassiale appropriato per uso esterno.

(Italian)

Bitte beachten vor der Inbetriebnahme

Warnhinweise und Kennzeichnungen

In diesem Handbuch und bei der Verwendung des Produktes werden Kennzeichen benutzt, die Ihnen helfen sollen das Produkt richtig einzusetzen und gleichzeitig verhindern sollen, dass Personenschäden entstehen. Bitte lesen Sie die folgenden Hinweise sorgfältig und beachten die Angaben beim Lesen des Handbuchs.

	Warnung	Falsche Handhabung dieses Produktes kann zu ernsthaften Personenschäden und sogar zum Tod führen.
	Caution	Falsche Handhabung dieses Produktes kann zu ernsthaften Personenschäden oder Schäden an anderen Gegenständen führen.

Beispiele für Kennzeichen und ihre Bedeutung



Ein Dreieck dient als Alarmzeichen und Warnung, um ihre Aufmerksamkeit auf Gefahren zu lenken. Das Symbol im Dreieck unterscheidet die Art der Gefahren (Die Figur auf der Linke zeigt eine Warnung vor elektrischer Hochspannung)

⊘ Kreisförmige Kennzeichen weisen auf ein Verbot hin. Eine Verbotsbeschreibung wird in der Unterschrift des Kennzeichens gegeben. (Die Figur links zum Beispiel verbietet eine Demontage)

● Gefüllte kreisförmige Kennzeichen weisen Sie auf eine beabsichtigte Handlung hin. Sie werden aufgefordert die Handlung durchzuführen. Eine ausführliche Anweisungsbeschreibung wird in der Nähe des Kennzeichens gegeben. (In der Figur links werden Sie aufgefordert den Stecker aus der Steckdose zu entfernen)

Warnkennzeichnungen

Bitte entfernen, verändern oder beschädigen Sie die Kennzeichnung nicht.

(German)

Vorkehrungen beim Gebrauch



Warnung



Bitte stellen Sie keine Wasserbehälter, Chemikalien oder Kosmetika, wie zum Beispiel Gefäße, Blumenvasen, Gläser oder kleine Metallstücke auf oder in die Nähe des Produktes. Flüssigkeiten oder kleine Metallteile, die in das Gerät gelangen, könnten Brände, Kurzschlüsse oder Fehlfunktionen hervorrufen.



Schalten Sie das Gerät unbedingt aus, wenn Sie ungewöhnliche Rauch- oder Dampfentwicklung beobachten, und kontaktieren Sie unseren zentralen Vertrieb, eine Filiale oder ein Vertriebsbüro in Ihrer Nähe. In diesem Fall darf das Gerät nicht weiterverwendet werden. Eine weitere Benutzung kann zu Bränden und elektrischen Kurzschlüssen führen.

(German)



Vorsicht



Dieses Handbuch enthält wichtige Informationen zur Bedienung und Wartung des Gerätes. Lesen Sie bitte die entsprechenden Abschnitte bevor Sie das Gerät in Betrieb bedienen, warten oder in anderer Weise testen. Bitte führen Sie keine Tests durch, die im Manual nicht beschrieben sind.



Dieses Gerät ist ein hochgenaues Instrument.

- Fehler können auftreten sollte das Gerät: Stößen oder starken Erschütterungen ausgesetzt wird.
- Während des Betriebes muss die Kabelverbindung zwischen dem Bedienelement des Funkterminal und dem WT-Adapter nicht gelöst werden.
- Um das Kabel zu entfernen, lösen Sie zuerst die DC-Versorgung Stecker des WT-Adapters und schalten das Gerät ab.
- Der WT-Adapter darf mit Wasser nicht in Berührung kommen.
- Vermeiden Sie den Betrieb des Gerätes in Umgebungen mit hoher Staub- und Schmutzbelastung.



Berühren Sie den Rahmen des WT's während des Betriebes auf keinen Fall, da dieser Teil sehr heiss wird.



Wenn Sie den Access Point installieren, verbinden Sie zuerst den Erdungsdraht mit dem Erdungsanschluss des Gerätes. Ungenügende Erdung des Gerätes, kann im Falle von Fehlfunktionen oder Kurzschlüssen zu Stromschlägen führen.



Wenn Sie ein weiteres Meßgerät einsetzen, verbinden Sie bitte den Erdungsanschluss des Messgerätes sorgfältig mit dem Erdungsanschluss des Gerätes. Ungenügende Erdung des Gerätes, kann zu Stromschlägen führen.



Bitte öffnen oder berühren Sie das Innenleben sowie die Einstellungsmittel des Gerätes nicht, ausser im Falle von Wartungsarbeiten oder Inspektionen. Wenn Sie unerlaubt Änderungen am Gerät vornehmen, zieht dies Massnahmen in Anwendung des „RADIO Gesetzes“ nach sich.

(German)



Cautions



Benutzen Sie kein organische Lösungsmittel, wie Verdüner und Benzole zur Reinigung, weil dies der Oberfläche des Gerätes beschädigen könnte. Reinigen Sie die Oberfläche nur mit einem sauberen trockenen Stofftuch.



Bitte schalten Sie das Gerät aus, bevor Sie das Koaxialkabel zwischen AP-RFU und AP-IFU anschliessen oder entfernen.



Nach IEC62102 sollte die 48V DC–Spannungsversorgung für den AP-IFU SELV oder TNV-1 in Abhängigkeit von der Netzwerkkumgebung (0 oder 1) sein.



Die Ausrüstung für Verbindung zu AP-IFU Ethernet-interface(RJ-45), wird geeignet sein, sich in Verbindung mit TNV-1-Schaltungen zu setzen.



Die die Verbindung des WT-Adapters zum WT sollte ein Kabel verwendet werden, dass für den Aussenbereich geeignet ist.



Für die Verbindung vom WT-Adapter zum WT sollte ein Kabel für Aussenanwendungen gewählt werden.



Für die Verbindung vom Terminal des Gerätes zum AP-IFU sollte ein Kabel für Aussenanwendungen gewählt werden.



Für die Verbindung AP-IFU zu AP-RFU sollte ein Koaxialkabel für den Aussenbereich installiert werden.

(German)

CONTENTS

Introduction	I
Before use	II
Precautions in Use	III
Avant usage	VI
Précautions d'utilisations	VII
Prima dell'utilizzo	X
Precauzioni d'uso	XI
Bitte beachten vor der Inbetriebnahme	XIV
Vorkehrungen beim Gebrauch	XV
CONTENTS	XVIII
1. OVERVIEW	1-1
1.1. FCC Notice	1-1
1.2. CERTIFICATION NOTE FROM INDUSTRY CANADA	1-2
1.3. System Configuration	1-2
1.4. Deployment Schemes	1-3
1.5. Components	1-4
2. Specifications	2-7
2.1. General	2-7
2.2. External Views of the Units	2-9
2.2.1. AP-RFU (Omni Antenna)	2-9
2.2.1.1. AP-RFU (Omni Antenna) Nameplate	2-10
2.2.1.2. AP-RFU (Omni Antenna) Mounting Bracket	2-11
2.2.2. AP-RFU (Sectoral-Horn Antenna)	2-12
2.2.2.1. AP-RFU (Sectoral-Horn Antenna) Nameplate	2-13
2.2.2.2. AP-RFU (Sectoral-Horn Antenna) Mounting Bracket	2-14
2.2.3. AP-IFU	2-15
2.2.3.1. AP-IFU Nameplate	2-16
2.2.4. WT	2-17
2.2.4.1. WT Nameplate	2-18
2.2.4.2. WT Mounting Bracket	2-19
2.2.5. WT (External Antenna)	2-20
2.2.5.1. WT (External Antenna) Nameplate	2-21
2.2.6. WT Adapter	2-22
2.2.6.1. WT Adapter Nameplate	2-22
2.2.7. WT AC Adapter	2-23

2.2.8.	Antenna direction adjustment tool	2-24
3.	AP	3-25
3.1.	AP-RFU	3-25
3.1.1.	Overview	3-25
3.1.2.	Antenna section	3-25
3.1.3.	RF section.....	3-25
3.1.4.	IF section	3-25
3.1.5.	Operations and Indications.....	3-26
3.1.5.1.	Indications	3-26
3.1.5.2.	Switches	3-26
3.1.6.	Terminals.....	3-27
3.1.6.1.	Omni Antenna.....	3-27
3.1.6.2.	Sectoral-Horn Antenna	3-27
3.2.	AP-IFU.....	3-28
3.2.1.	Overview	3-28
3.2.2.	IF section	3-28
3.2.3.	Operations and Indications.....	3-30
3.2.3.1.	Indications	3-30
3.2.3.2.	Switches	3-32
3.2.3.3.	Terminals	3-33
4.	WT	4-36
4.1.	WT.....	4-36
4.1.1.	Overview	4-36
4.1.2.	Antenna section	4-36
4.1.3.	RF section.....	4-36
4.1.4.	IF section	4-36
4.1.5.	Digital section	4-37
4.1.6.	Interface section	4-37
4.1.7.	Power supply	4-37
4.1.8.	Operations and Indications.....	4-39
4.1.8.1.	Indications	4-39
4.1.8.2.	Switches	4-41
4.1.8.3.	Terminals	4-42
4.1.8.3.1.	WT.....	4-42
4.1.8.3.2.	WT Adapter	4-43
5.	CONSTRUCTING A POINT-TO-MULTIPOINT SYSTEM (AP)	5-45

5.1.	Overview.....	5-45
5.2.	Installing the AP-RFU and AP-IFU	5-46
5.2.1.	Installing the AP-RFU (Omni Antenna).....	5-46
5.2.2.	Installing the AP-RFU (Sectoral-Horn Antenna)	5-48
5.2.3.	Setting AP-RFU(Sectoral-Horn Antenna)for Vertical or Horizontal Polarization	5-51
5.2.4.	installing the AP-IFU	5-52
5.2.4.1.	Installing the AP-IFU.....	5-52
5.2.4.2.	Example of Installing the AP-IFU	5-53
5.2.4.3.	Opening and Closing the AP-IFU Cover	5-54
5.3.	Adjusting the Direction of the AP-RFU.....	5-55
5.3.1.	Adjusting the Direction of the AP-RFU (Omni Antenna).....	5-55
5.3.2.	Adjusting the Direction of the AP-RFU (Sectoral-Horn Antenna).....	5-55
5.3.3.	Direction adjustment of the antenna.....	5-56
5.4.	Connecting a Cable between AP-RFU and AP-IFU.....	5-57
5.4.1.	AP-RFU (Omni Antenna)	5-57
5.4.2.	AP-RFU (Sectoral-Horn Antenna)	5-58
5.5.	Connecting Cables from the AP-IFU to external.....	5-59
5.5.1.	Connecting the Power cable connector.....	5-61
5.6.	The confirmation of AP-IFU.....	5-63
5.7.	Waterproofing Connectors	5-64
5.7.1.	Self Bonding tape	5-64
5.8.	Connecting the AP Local Management Tool.....	5-66
5.9.	Configure the AP parameters.....	5-67
5.9.1.	AP Local management tool	5-67
5.9.1.1.	Configure the AP network parameters	5-67
5.9.1.2.	Reset the AP.....	5-68
5.9.1.3.	Measure the cable loss	5-69
5.9.2.	Register the AP ID number to OpS	5-71
5.10.	Check sheet of AP Installation	5-72
6.	CONSTRUCTING A POINT-TO-MULTIPOINT SYSTEM (WT)	6-73
6.1.	Overview.....	6-73
6.2.	OpS	6-74
6.2.1.	Register the WT ID number to AP	6-74
6.3.	Connecting the WT Local Management Tool	6-76
6.4.	WT Local management tool	6-76
6.4.1.	Configure the WT.....	6-76

6.5.	Installing the WT.....	6-77
6.5.1.	Installing the WT.....	6-77
6.5.2.	Example of Installing the WT.....	6-79
6.5.3.	Setting the WT for Vertical or Horizontal Polarization	6-80
6.6.	Installing the WT (External Antenna).....	6-81
6.6.1.	Installing the WT (External Φ 30cm Antenna)	6-81
6.6.2.	Installing the WT (External Φ 60cm Antenna)	6-85
6.7.	Adjusting the Direction of the WT.....	6-89
6.7.1.	Connecting the WT Local Management Tool	6-90
6.7.2.	Roughly Adjusting the Direction	6-91
6.7.3.	Finely Adjusting the Direction	6-92
6.7.4.	The receive level and the distance.....	6-93
6.8.	Installing the WT Adapter	6-97
6.9.	Connecting Cables to the WT	6-98
6.10.	Waterproofing WT small window.....	6-100
6.11.	When you use the cable with the LAP sheath for outdoor.....	6-104
6.12.	Waterproofing Without Using a Cold-Shrinkable Tube	6-106
6.13.	Testing	6-108
6.13.1.	Perform a continuity test.....	6-108
6.13.2.	Measure the packet loss rate	6-109
6.14.	Check sheet of WT Construction	6-110
7.	CONSTRUCTING A POINT-TO-POINT SYSTEM	7-111
7.1.	Overview(WT Construction flow).....	7-111
7.2.	Connecting the WT Local Management Tool	7-112
7.3.	Configure the WT(master).....	7-113
7.4.	Configure the WT(slave)	7-115
7.5.	Installing the WT.....	7-116
7.5.1.	Installing the WT(master/slave)	7-116
7.5.2.	Example of Installing the WT.....	7-118
7.5.3.	Setting the WT for Vertical or Horizontal Polarization	7-119
7.6.	Installing the WT (External Antenna).....	7-120
7.6.1.	Installing the WT (External Φ 30cm Antenna)	7-120
7.6.2.	Installing the WT (External Φ 60cm Antenna)	7-124
7.7.	Adjusting the Direction of the WT.....	7-128
7.7.1.	Adjusting the Direction of the WT.....	7-128
7.7.1.1.	Connecting the WT Local Management Tool	7-129

7.7.1.2.	Roughly Adjusting the Direction	7-132
7.7.1.3.	Finely Adjusting the Direction	7-133
7.7.2.	The receive level and the distance	7-134
7.8.	Installing the WT Adapter(master/slave)	7-136
7.9.	Connecting Cables to the WT(master/slave)	7-137
7.10.	Waterproofing WT small window.....	7-139
7.11.	When you use the cable with the LAP sheath for outdoor.....	7-142
7.12.	Waterproofing Without Using a Cold-Shrinkable Tube	7-143
7.13.	Testing	7-146
7.13.1.	Ping test.....	7-146
7.13.2.	Measure the packet loss rate (with WT Local mnagement tool).....	7-147
7.13.3.	Measure the packet loss rate (with OpS).....	7-148
7.14.	Check sheet of Point to Point Construction	7-149
8.	Standard Tools to be Used	8-150
9.	INITIAL VALUES.....	9-151
9.1.	Point to Multipoint system	9-151
9.1.1.	Initial values for AP parameters (Point to Multipoint System)	9-151
9.1.2.	Initial values for WT(1 - 239) parameters (Point to Multipoint system)	9-153
9.1.3.	Initial values for VID(2 - 4094) table parameters (Point to Multipoint system).	9-153
9.1.4.	Initial values for AP-IFU swiches	9-154
9.1.5.	Initial values for WT(Master) parameters (Point to point System)	9-155
9.1.6.	Initial values for WT (Slave) parameters (Point to point System)	9-156
10.	System example Point to Multipoint system	10-157
11.	System example Point to Point	11-161

1. OVERVIEW

JRC FWA SYSTEM 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 to ensure 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-EL0, CKENTG335-EL2, CKENTG337-EL0, CKENTG337-EL2
CKENTG337-XL0, CKENT337-XL2**

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's authority to operate the equipment.

1.2. CERTIFICATION NOTE FROM INDUSTRY CANADA

ICID: 768B-NTG335L0, 768B-NTG337L0, 768B-NTG335L2, 768B-NTG337L2

While this equipment meets the technical requirements for its operation in its rated paired block arrangement, this block arrangement is different than the 40 + 40 MHz block arrangement prescribed in documents RSS-191 and SRSP-324.25. The operation of this equipment IS NOT permitted if the out-of-band and spurious emission limits are not met at the edge of any contiguous licensed spectrum. It should be noted that all current relevant spectrum policies, licensing procedures and technical requirements are still applicable. For additional information, please contact the local Industry Canada office.

Access Point

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Wireless Terminal

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

1.3. 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 Sectoral-Horn-type antenna (90° × 10° directivity) mainly for multi-tenant building are available.

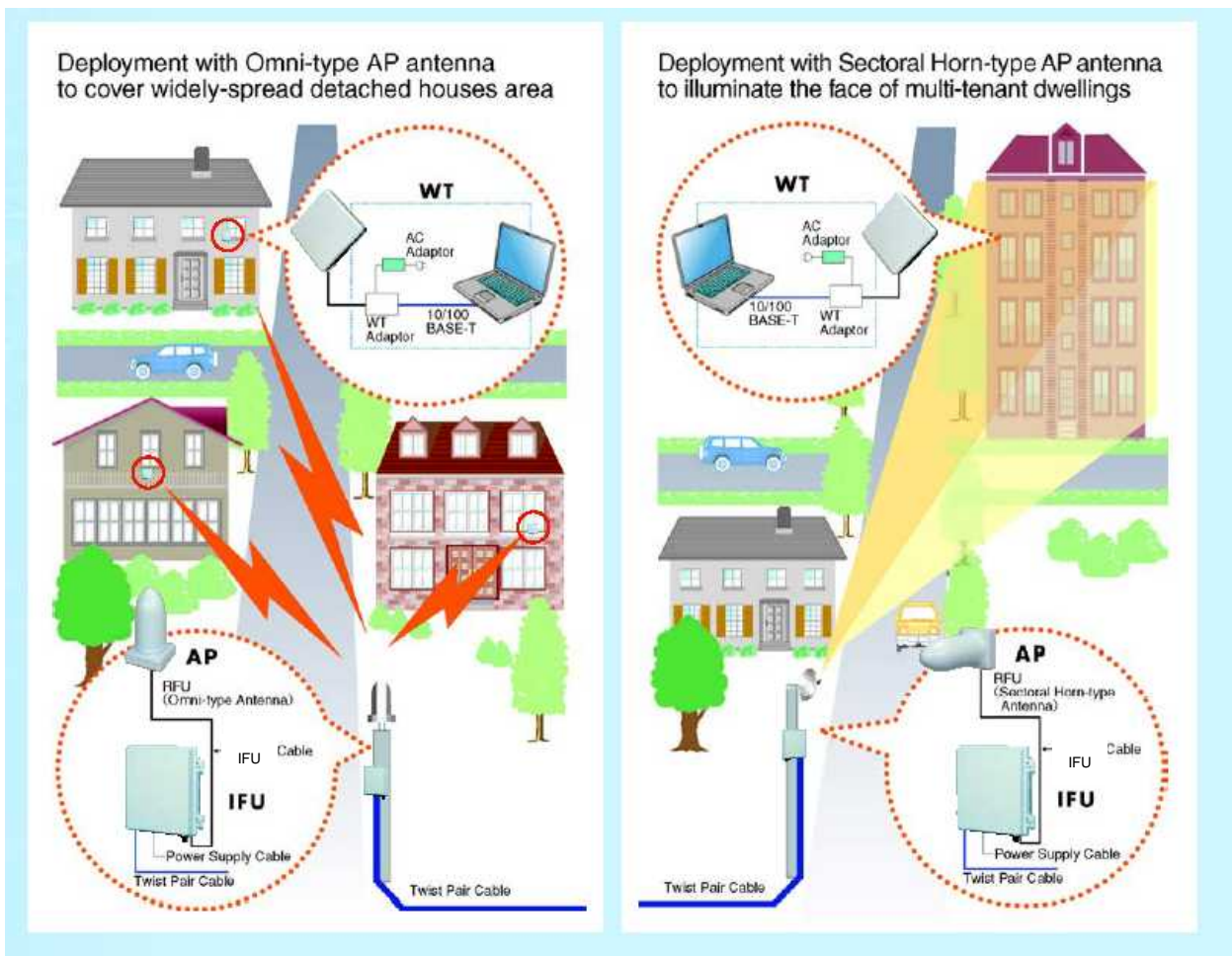
Wireless Terminal (WT), including the antenna and all the electric circuits, is designed compactly (19cm x 19cm x 7cm) and can easily be installed at any outside places of residential houses. WT is connected to a PC through one LAN cable and supplied with power through a tiny power supply adapter.

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.

1.4. Deployment Schemes

Figure 1-1 is deployment schemes of JRC FWA systems.



AP: Access Point
WT: Wireless Terminal
RFU: Radio Frequency Unit
IFU: Interface Unit

Figure 1-1 Deployment Schemes of JRC FWA Systems

1.5. Components

Table 1-1 Components

No.	Name	Model	Description
1	AP-RFU(Sectoral-Horn)	NTG-335<1><2><4>	The AP-RFU (Sectoral-Horn) 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-RFU(Omni)	NTG-339<1><2><4>	The AP-RFU (Omni) 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.
3	AP-IFU	NTJ-111<4>	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.
3.1	DC-48V connector (AP)	NRW-203-PF8-ULCSATUV	The DC -48V connector (AP) is for an external power cable. The connector is connected to the terminal for the AP-IFU power supply connector.
4	WT	NTG-337<1><3><4>	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.
4.1	WT adapter	NQD-2049<4>	The WT adapter sends both Ethernet signals

			from the PC and 24 VDC from the AC adapter to the WT through an Ethernet cable. It also sends signals from the WT to the PC.
4.2	AC adapter (100V to 240V AC)	NBG-317<3> ----- NBG-399R	The AC adapter supplies 24 VDC to the WT. NBG-399R is latest.
4.3	AC adapter cable	H-7ZCCM0132 or H-7ZCCM0135	It use for NGB-399R. H-7ZCCM0132:Atype (USA) H-7ZCCM0135:Ctype (Europe)
4.4	WT mounting bracket	MPBX39464A ----- MPBX44142	The WT mounting bracket is used to mount the WT on a pole or similar object. MPBX44142 is latest.
4.4	CS Sleeve (WT aperture)	MPPK31288	The cold-shrinkable tube is mounted on the small window of the WT to make the WT waterproof and dustproof.
5	Antenna direction adjustment tool	NKK-163	There are antenna direction adjustment tools for the AP and WT.
6	JRC Local management tool CD-ROM	H-7YZCM5074B	AP Local management tool、WT Local management tool、AP Local management tool instruction manual and WT Local management tool instruction manual are included in this CD-ROM.
6.1	AP Local management tool	H-7YZCM5053A	Connecting a computer with this software installed to the AP-IFU allows you to execute the maintenance and management functions for the AP. Use the AP local management cable to connect between the PC and AP-IFU.
6.2	WT Local management tool	H-7YZCM5052A	Connecting a computer with this software installed to the WT allows you to execute the maintenance and management functions for the WT. Use an Ethernet cable to connect between the PC and WT.
6.3	AP Local management tool instruction manual	H-7YZCM5061	instruction manual of AP Local management tool

6.4	WT Local management tool instruction manual	H-7YZCM5060	instruction manual of WT Local management tool
7	AP local management cable	H-7ZCCM5040A H-7ZCCM0121A	Use this cable to connect a PC with the AP local management tool installed to the AP-IFU. H-7ZCCM0121A is latest.
8	PMP-OpS (CD-ROM)	H-7YZCM5076C	The PMP-OpS is included in this CD-ROM.
8.1	PMP-OpS	H-7YZCM5056A	The PMP-OpS (Point-to-Multipoint Operation System) is an SNMP manager dedicated to a JRC FWA system with a point-to-multipoint configuration.
8.2	PMP-OpS INSTRUCTION MANUAL	H-7YZCM5062	The PMP-OpS INSTRUCTION MANUAL
9	PP-OpS (CD-ROM)	H-7YZCM5077B	The PP-OpS is included in this CD-ROM.
9.1	PP-OpS	H-7YZCM5055A	The PP-OpS (Point-to-Point Operation System) is an SNMP manager dedicated to a JRC FWA system with a point-to-point configuration.
9.2	PP-OpS INSTRUCTION MANUAL	H-7YZCM5063	The PP-OpS INSTRUCTION MANUAL
10	JRC FWA SYSTEM INSTRUCTION MANUAL (CD-ROM)	H-7YZCM0102C	INSTRUCTION MANUAL is included in this CD-ROM.
10.1	JRC FWA SYSTEM INSTRUCTION MANUAL	H-7YZCM0101B	INSTRUCTION MANUAL.

Subject to change without notice.

<1> Frequency Type

L0 : 24.050 ~ 24.549GHz

L1 : 24.549 ~ 24.997GHz

L2 : 24.997 ~ 25.445GHz

H1 : 25.557 ~ 26.005GHz

H2 : 26.005 ~ 26.453GHz

X0 : 24.050 ~ 24.549GHz (External Antenna)

X2 : 24.997 ~ 25.445GHz (External Antenna)

<2> Antenna Type

H : Horizontal Polarization

V : Vertical Polarization

<3> AC Power Cable Plug Type

E : Europe

U : USA

<4> RoHS

Blank : non RoHS

R : RoHS

2. Specifications

2.1. General

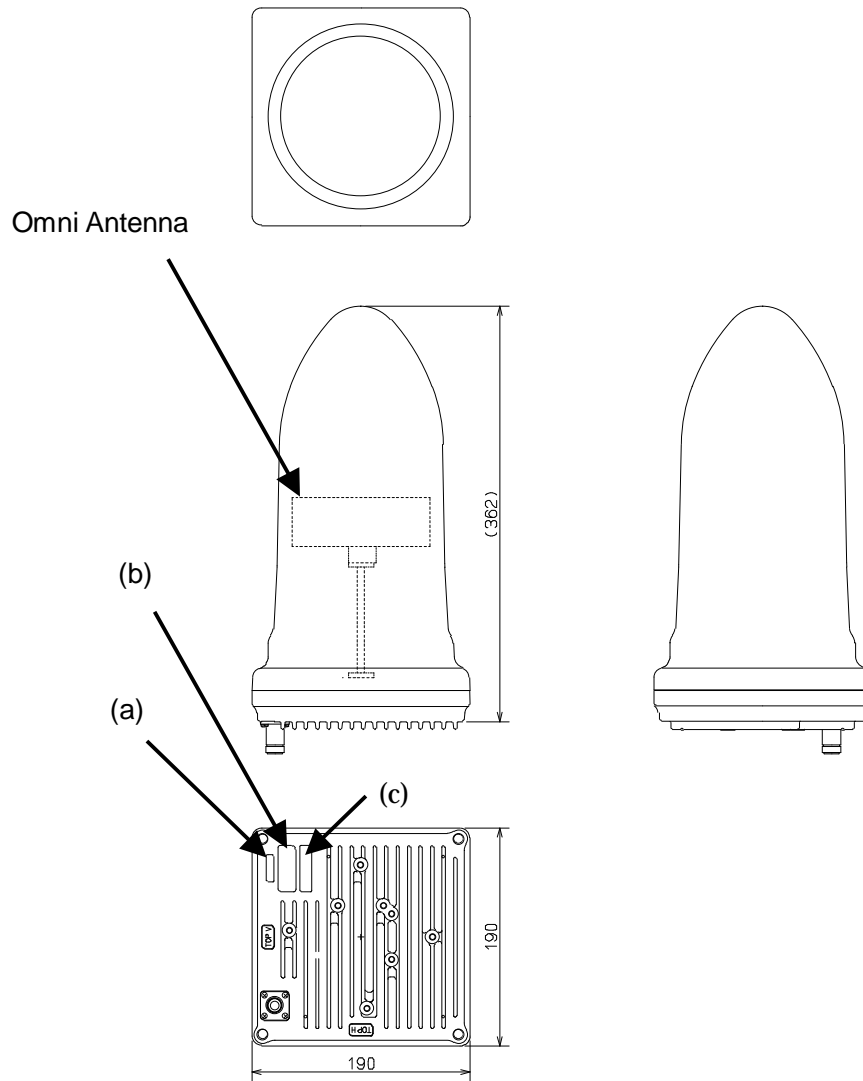
Table 2-1 JRC FWA SYSTEM Specifications

Item	Point to Multipoint System			Point to Point System	
	AP		WT		
Frequency Band [GHz]	EL0 24.050-24.549	EL1 24.549-24.997	EL2 24.997-25.445	EH1 25.557-26.005	EH2 26.005-26.453
Duplex/multiple access	TDD/TDMA			TDD	
Modulation system	QPSK/16QAM				
Symbol rate	20M symbol/s				
Radio Transmission rate (Data throughput)	QPSK:40Mbps (Max.23Mbps)		16QAM:80Mbps (Max.46Mbps)	QPSK:40Mbps (Max.16Mbps)	16QAM:80Mbps (Max.32Mbps)
Occupied bandwidth	26MHz (QPSK/16QAM)				
Channel spacing	28MHz				
Transmit output power	QPSK:+14dBm		QPSK (ATPC): -6 to +14dBm 16QAM (ATPC): -8.5 to +11.5dBm	QPSK: -6 to +14dBm 16QAM: -8.5 to +11.5dBm	
Frequency Stability	±10ppm				
Transmitter spurious emission	-30dB/MHz or less				
RF spectrum mask	QPSK:ETSI Type A 16QAM:ETSI Type B				
Minimum receiving level (BER=10 ⁻⁶) After an error correction	QPSK: -79dBm or less 16QAM: -69dBm or less				
Antenna type and gain (typ)	Omni: 6.5dBi 90°X10°Sectoral Horn:15.5dBi		High-gain flat antenna: 31dBi External Antenna: 35.7dBi(30cm) / 41.1dBi(60cm) / 44.6dBi(90cm) / 46.9dBi(120cm)		
Max number of WTs	239 WTs per AP			-	
Interface	100BASE-TX		10BASE-T/100BASE-TX		
MAC processing	VLAN (IEEE802.1Q) User data are distributed by using VLAN-TAG to each WT			-	
MAC address filtering	enable			disable	
SNMP (agent)	Remote operation is possible by OpS (option).				
	SNMP V2, Private MIB, VLAN TAG (IEEE802.1q)				
	AP setup/control WT setup/control Test Alarm log WT Operating Status List Remote downloading Bandwidth Table			Parameter setup/Control (Master) Alarm Log (Master) Traffic information (Master) Network configuration (Master)	
Local management	Local management is possible by Local management tool (option).				
	AP: Serial interface(Exclusive cable use) WT: Ether interface			Master/Slave: Ether interface	
	Setup (AP,WT) Control (AP,WT) Radio link monitor (WT) Log (AP,WT) Tool Setup (AP,WT)			Setup Control Radio link monitor Log Tool Setup (AP,WT)	

Power	-48 V DC 35W (MAX)	100 to 240 V AC 35VA (MAX)
Physical	RFU:Dimensions W190XH190XD362(mm) Weight 3kg IFU:Dimensions W275XH325XD165(mm) Weight 8kg	RF Unit (Internal Antenna):Dimensions W190XH190XD61(mm) Weight about 2kg RF Unit (External Antenna):Dimensions W220 XH220XD53(mm) Weight about 3kg WT Adapter:Dimensions W45XH95XD40(mm) Weight about 100g AC Adapter:Dimensions W60XH38XD120(mm) (NBG-317) W52XH30XD108(mm) (NBG-399R) Weight about 330g
Temperature	-33degree Celsius - +50degree Celsius cold start at minimum -10degree Celsius ambient	RF Unit: -33degree Celsius - +50degree Celsius cold start at minimum -10degree Celsius ambient WT Adapter: -20degree Celsius - +50degree Celsius AC Adapter: 0degree Celsius - +40degree Celsius
Humidity	20% - 80% non-condensing	

2.2. External Views of the Units

2.2.1.AP-RFU (Omni Antenna)

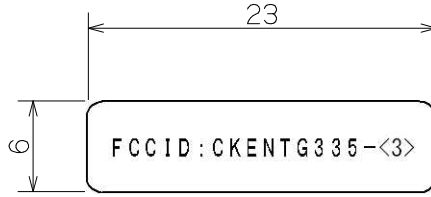


(in mm)

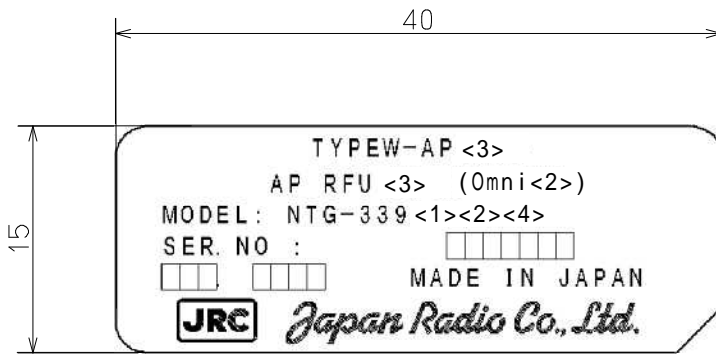
Figure 2-1 External View of the AP-RFU (Omni Antenna)

2.2.1.1. AP-RFU (Omni Antenna) Nameplate

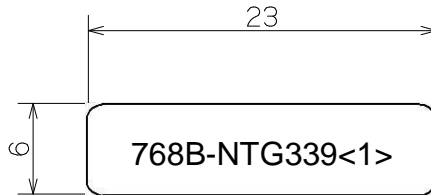
Nameplate(a)



Nameplate(b)



Nameplate(c)



<1>

L0 : 24.050 ~ 24.549GHz

L1 : 24.549 ~ 24.997GHz

L2 : 24.997 ~ 25.445GHz

H1 : 25.557 ~ 26.005GHz

H2 : 26.005 ~ 26.453GHz

<4>

Blank : non RoHS

R : RoHS

<2>

H : Horizontal Polarization

V : Vertical Polarization

<3>

EL0 : 24.050 ~ 24.549GHz

EL1 : 24.549 ~ 24.997GHz

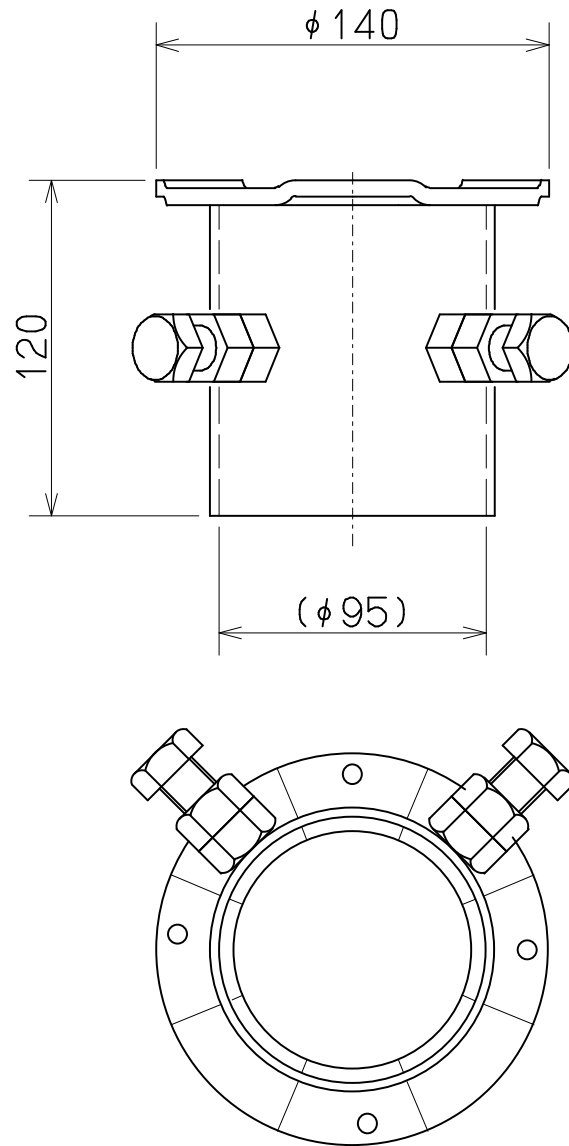
EL2 : 24.997 ~ 25.445GHz

EH1 : 25.557 ~ 26.005GHz

EH2 : 26.005 ~ 26.453GHz

Figure 2-2 Nameplate

2.2.1.2. AP-RFU (Omni Antenna) Mounting Bracket



(in mm)

Figure 2-3 Mounting Bracket

2.2.2.AP-RFU (Sectoral-Horn Antenna)

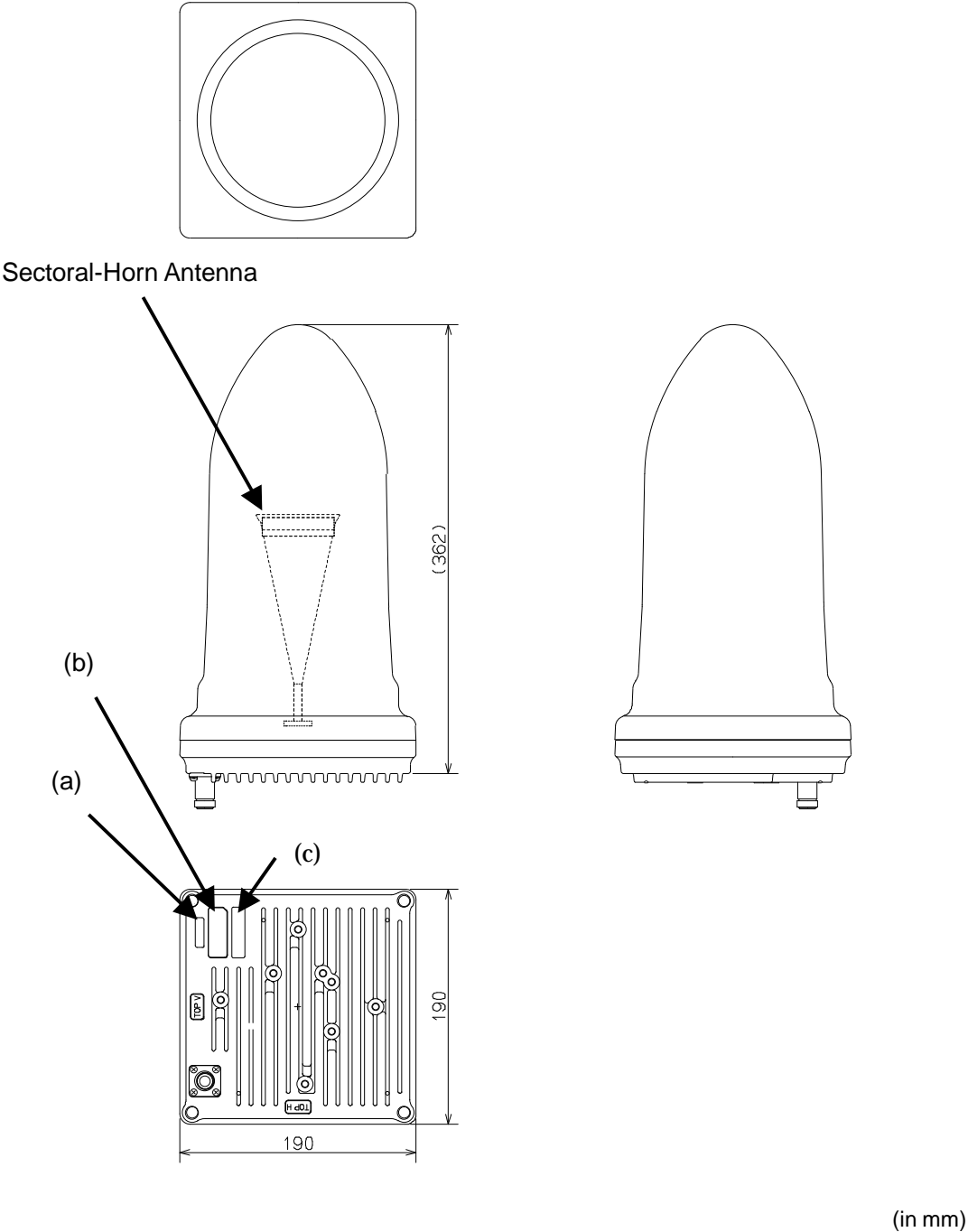
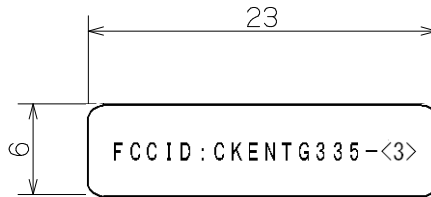


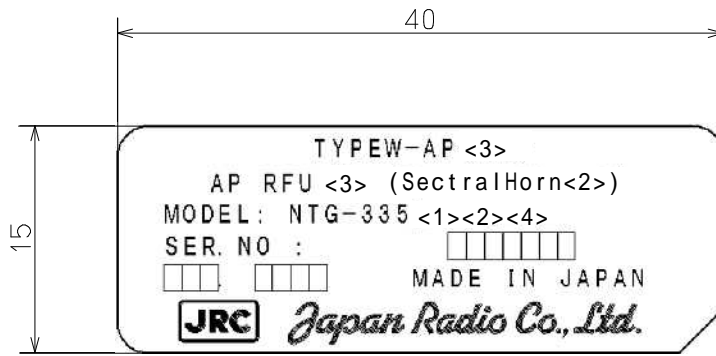
Figure 2-4 External View of the AP-RFU (Sectoral-Horn Antenna)

2.2.2.1. AP-RFU (Sectoral-Horn Antenna) Nameplate

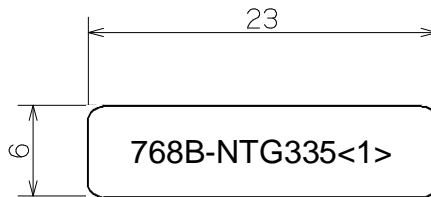
Nameplate(a)



Nameplate(b)



Nameplate(c)



<1>

L0 : 24.050 ~ 24.549GHz

L1 : 24.549 ~ 24.997GHz

L2 : 24.997 ~ 25.445GHz

H1 : 25.557 ~ 26.005GHz

H2 : 26.005 ~ 26.453GHz

<4>

Blank : non RoHS

R : RoHS

<2>

H : Horizontal Polarization

V : Vertical Polarization

<3>

EL0 : 24.050 ~ 24.549GHz

EL1 : 24.549 ~ 24.997GHz

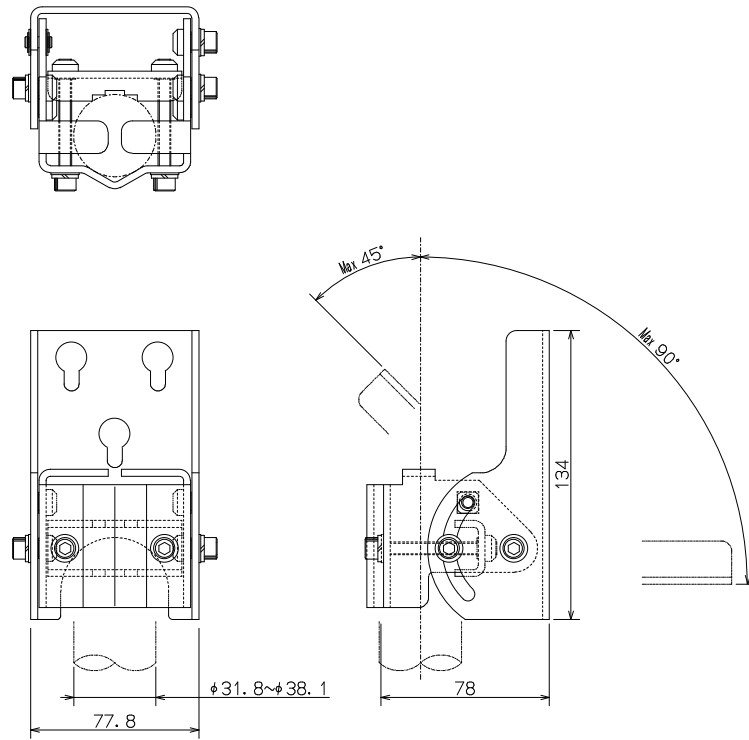
EL2 : 24.997 ~ 25.445GHz

EH1 : 25.557 ~ 26.005GHz

EH2 : 26.005 ~ 26.453GHz

Figure 2-5 Nameplate

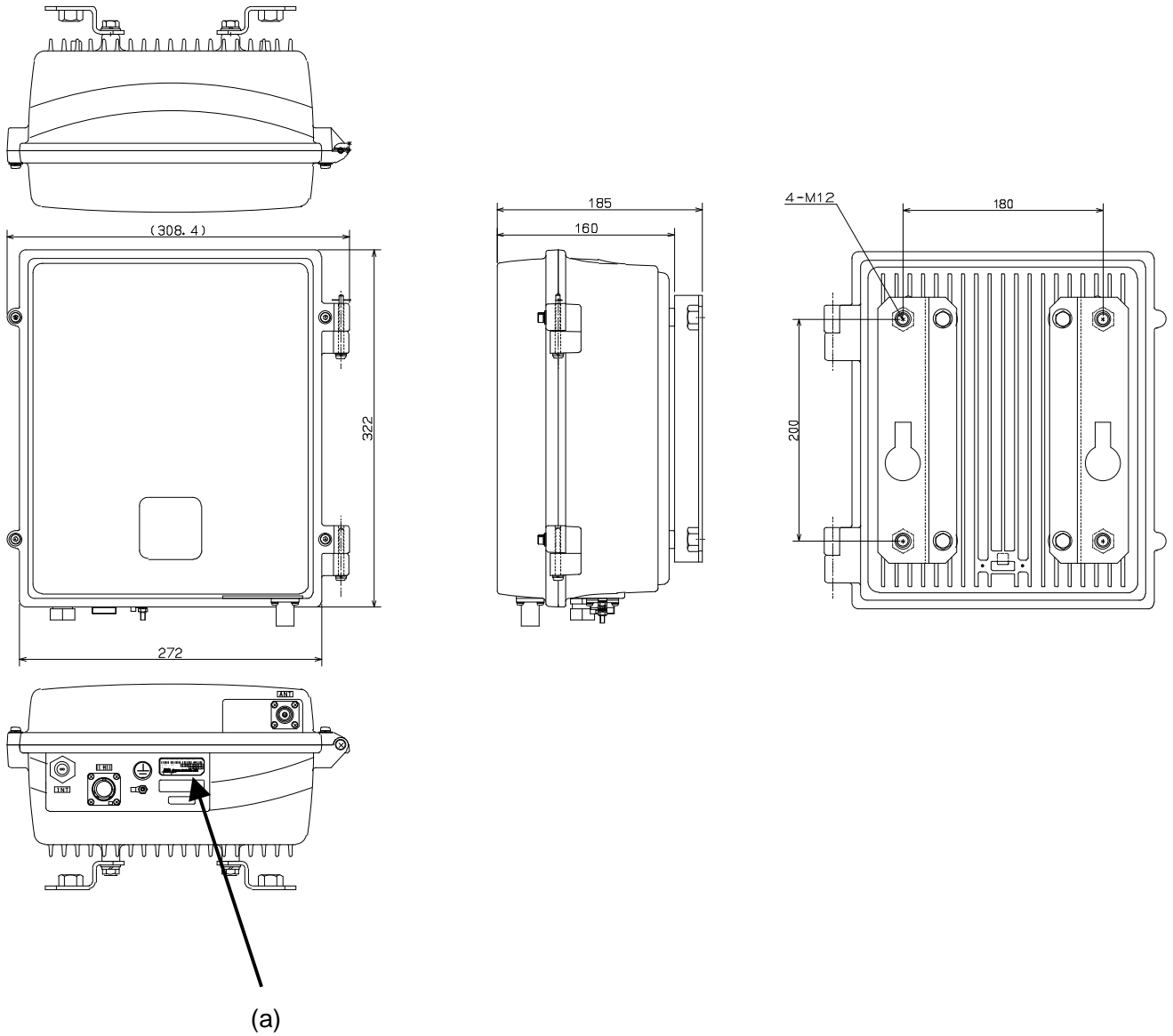
2.2.2.2. AP-RFU (Sectoral-Horn Antenna) Mounting Bracket



(in mm)

Figure 2-6 Mounting Bracket

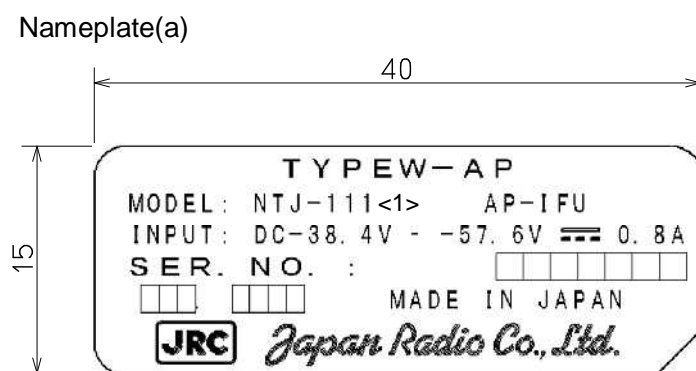
2.2.3.AP-IFU



(in mm)

Figure 2-7 External View of the AP-IFU

2.2.3.1. AP-IFU Nameplate



(in mm)

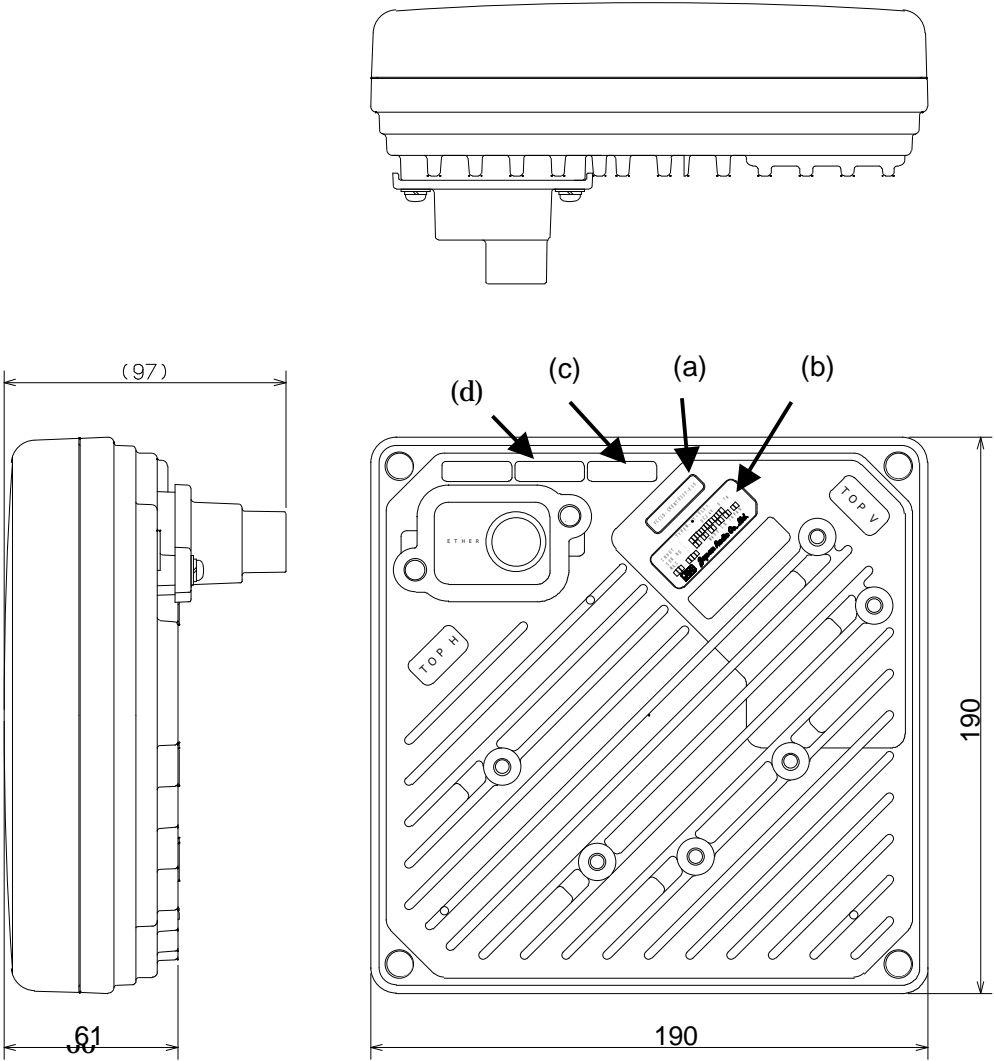
<1>

Blank : non RoHS

R : RoHS

Figure 2-8 Nameplate

2.2.4.WT

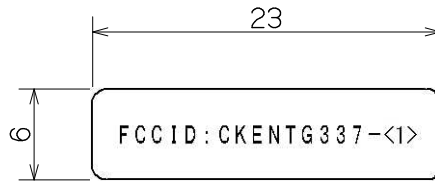


(in mm)

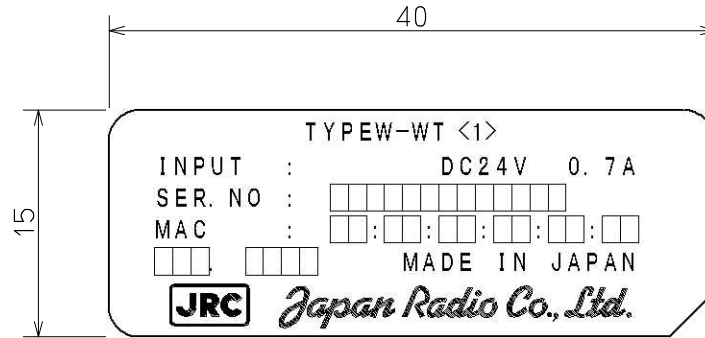
Figure 2-9 External View of the WT

2.2.4.1. WT Nameplate

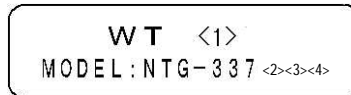
Nameplate(a)



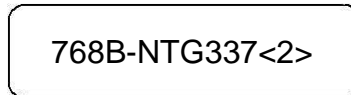
Nameplate(b)



Nameplate(c)



Nameplate(d)



<1>

EL0 : 24.050 ~ 24.549GHz
 EL1 : 24.549 ~ 24.997GHz
 EL2 : 24.997 ~ 25.445GHz
 EH1 : 25.557 ~ 26.005GHz
 EH2 : 26.005 ~ 26.453GHz

<2>

L0 : 24.050 ~ 24.549GHz
 L1 : 24.549 ~ 24.997GHz
 L2 : 24.997 ~ 25.445GHz
 H1 : 25.557 ~ 26.005GHz
 H2 : 26.005 ~ 26.453GHz

<3>

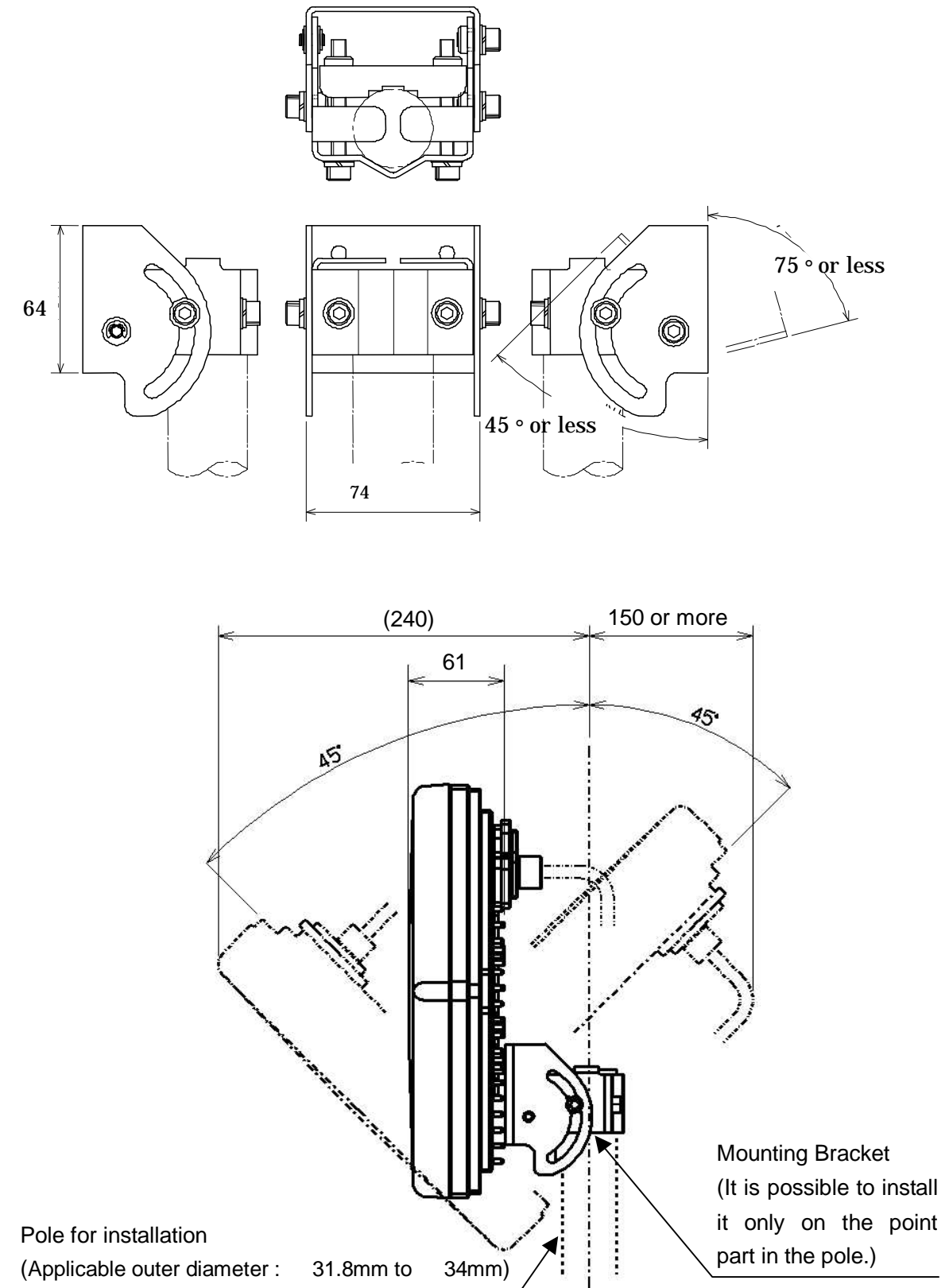
U : USA Type AC Plug
 E : European Type AC Plug

<4>

Blank : non RoHS
 R : RoHS

Figure 2-10 Nameplate

2.2.4.2. WT Mounting Bracket



(in mm)

Figure 2-11 External View of the Outdoor Mounting Brackets for the WT

2.2.5.WT (External Antenna)

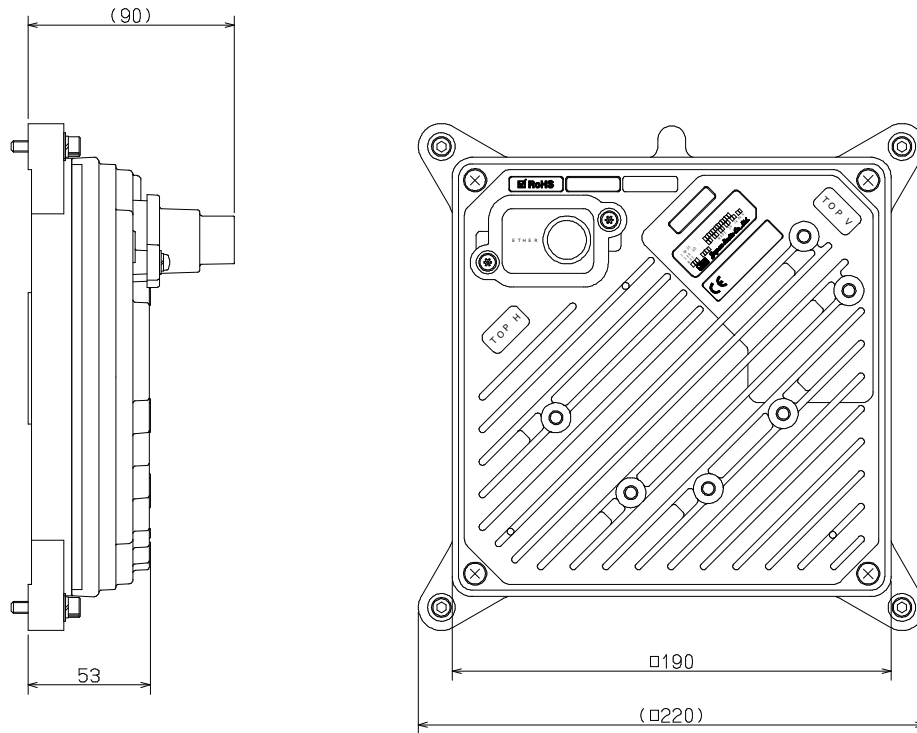
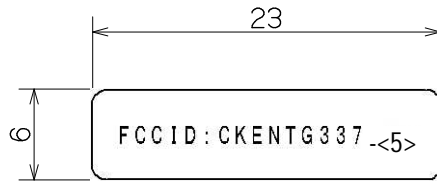


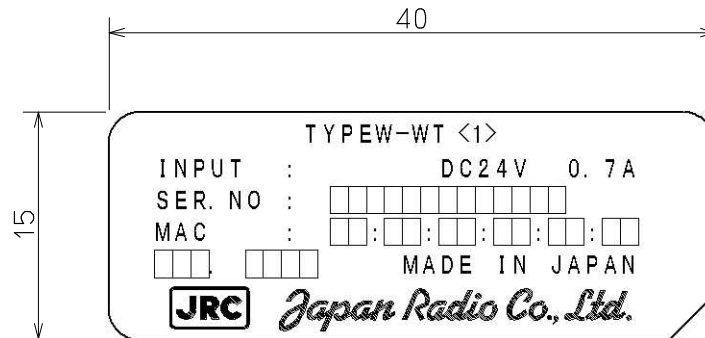
Figure 2-12 External View of the WT (External Antenna)

2.2.5.1. WT (External Antenna) Nameplate

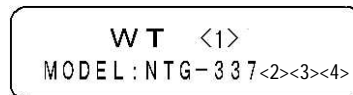
Nameplate(a)



Nameplate(b)



Nameplate(c)



<1>

EL0 : 24.050 ~ 24.549GHz

EL2 : 24.997 ~ 25.445GHz

<2>

X0 : 24.050 ~ 24.549GHz

X2 : 24.997 ~ 25.445GHz

<3>

U : USA Type AC Plug

E : European Type AC Plug

<4>

Blank : non RoHS

R : RoHS

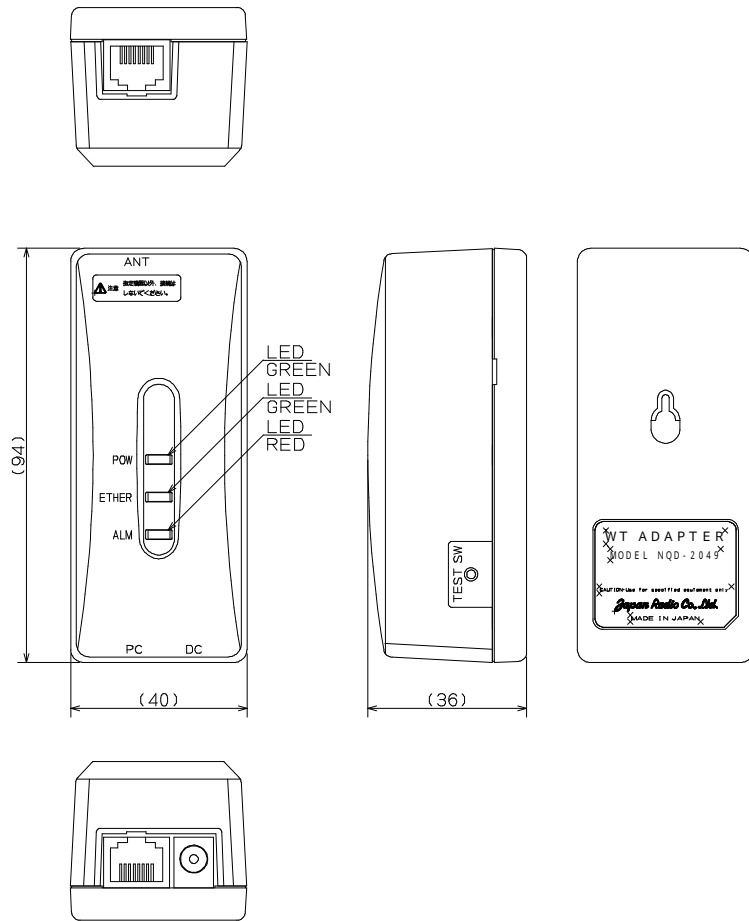
<5>

XL0 : 24.050 ~ 24.549GHz

XL2 : 24.997 ~ 25.445GHz

Figure 2-13 Nameplate

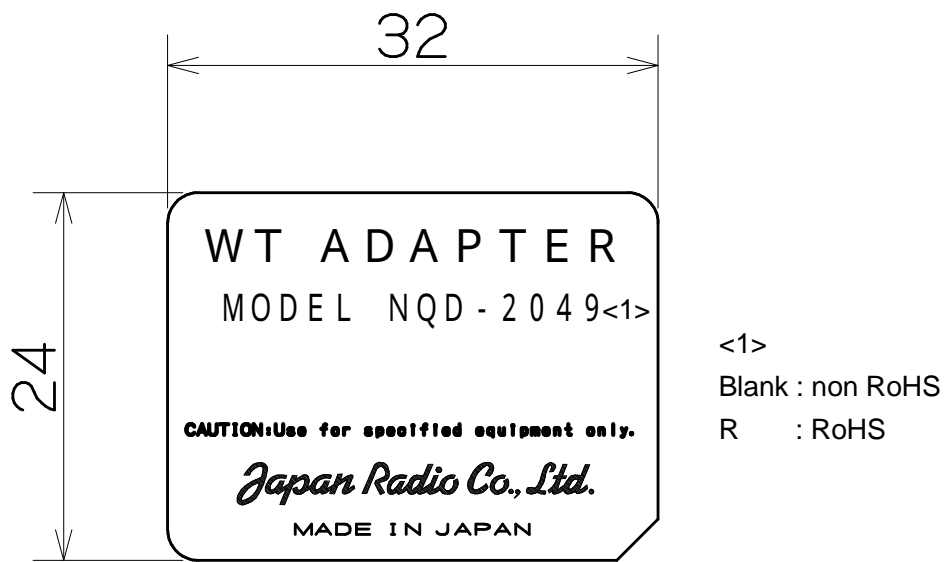
2.2.6.WT Adapter



(in mm)

Figure 2-14 External View of the WT Adapter

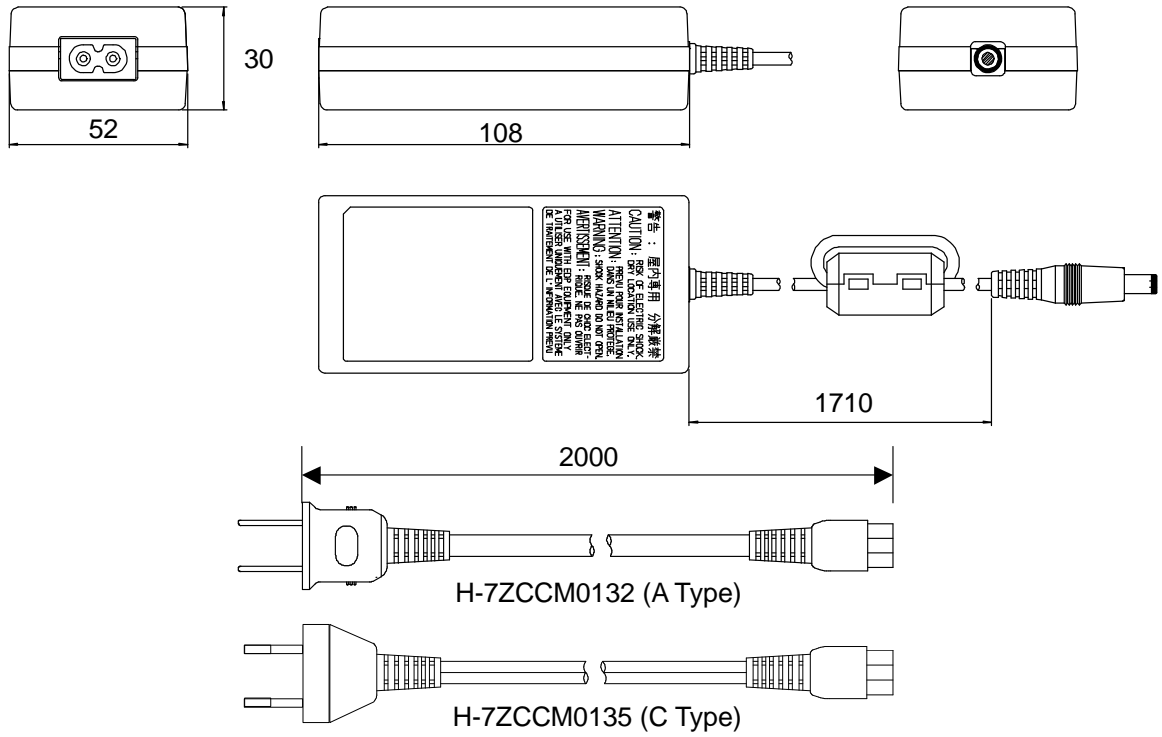
2.2.6.1. WT Adapter Nameplate



(in mm)

Figure 2-15 Nameplate

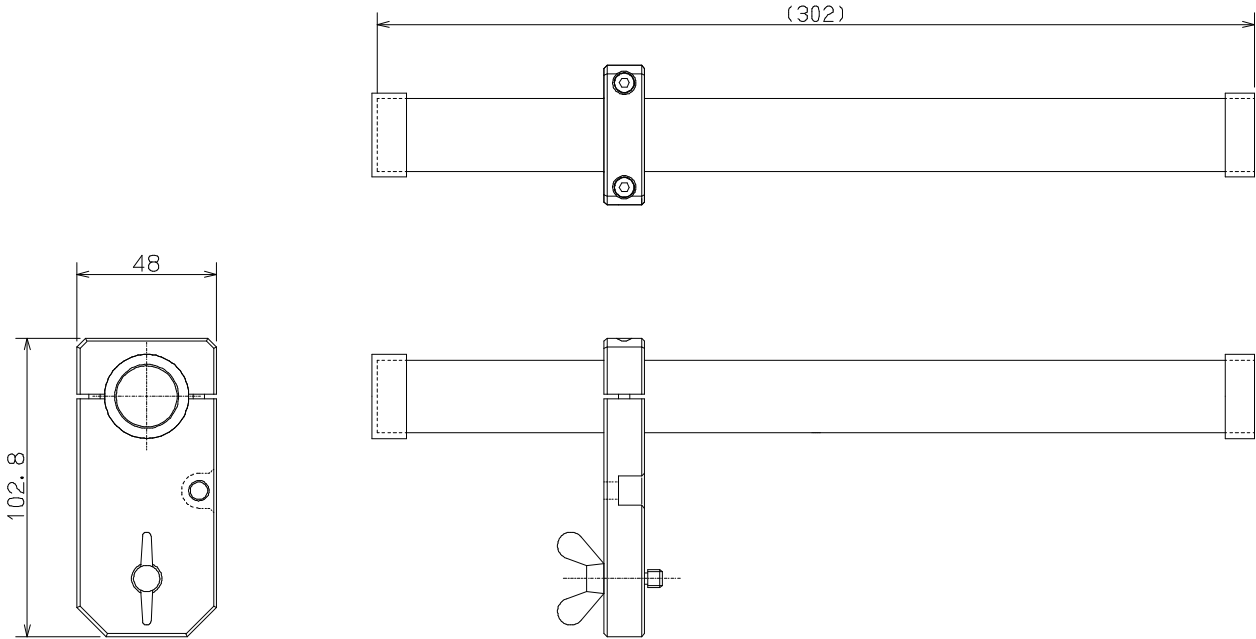
2.2.7.WT AC Adapter



(in mm)

Figure 2-16 External View of the WT AC Adapter

2.2.8. Antenna direction adjustment tool



(in mm)

Shape of the scope is subject to change without notice.

Figure 2-17 Antenna direction adjustment tool

3. AP

3.1. AP-RFU

3.1.1.Overview

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

3.1.2.Antenna section

The omni-directional antenna (with horizontal directivity of 360°) and the Sectoral-Horn-type antenna (90° × 10° directivity) look the same.

3.1.3.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 transmitting burst at the IF section turns the switch to the transmitting side.

3.1.4.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 transmitting burst signal controls the TDD-Switch in the RF section to turn it to the transmitting 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 functionality 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.

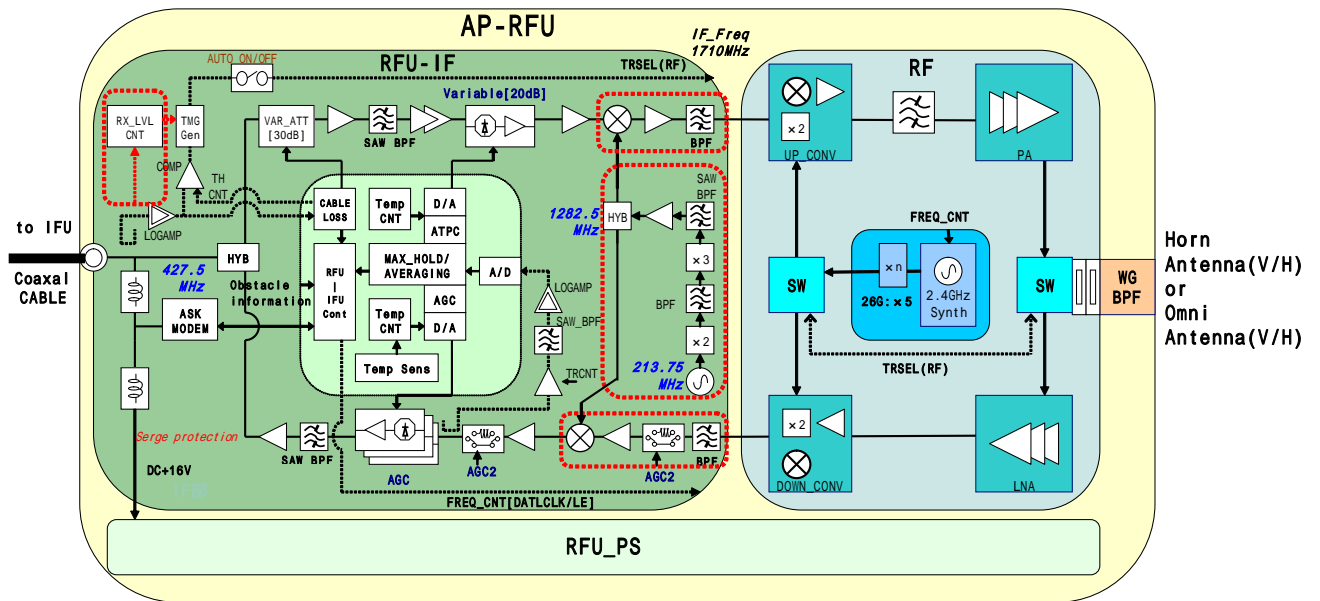


Figure 3-1 AP-RFU Block Diagram

3.1.5. Operations and Indications

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

3.1.5.1. Indications

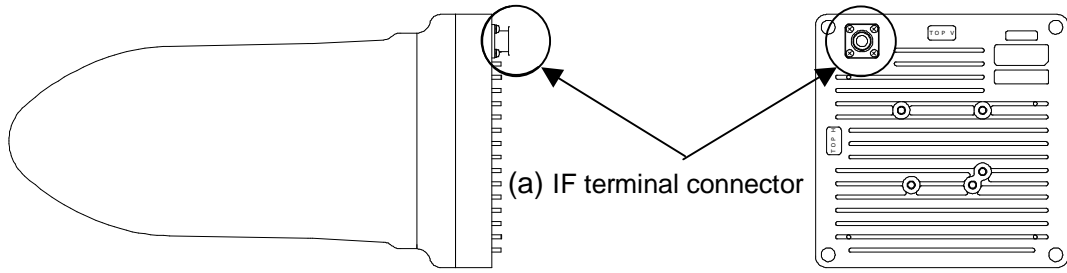
The AP-RFU does not have any LEDs or other status indicators.

3.1.5.2. Switches

The AP-RFU does not have any switches.

3.1.6. Terminals

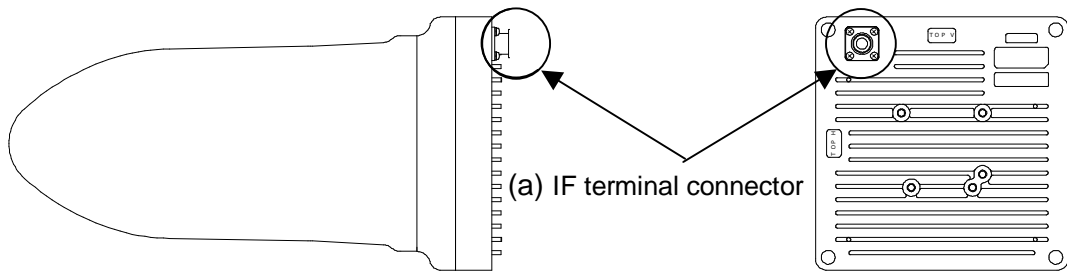
3.1.6.1. Omni Antenna



(a) IF terminal connector	
Contents	Connect the AP-IFU with the coaxial cable.
Shape	N-Type Jack for Coaxial
Applicable Connector	N-Type Plug for Coaxial

Figure 3-2 Connecting Section of the AP-RFU (Omni Antenna)

3.1.6.2. Sectoral-Horn Antenna



(a) IF terminal connector	
Contents	Connect the AP-IFU with the coaxial cable.
Shape	N-Type Jack for Coaxial
Applicable Connector	N-Type Plug for Coaxial

Figure 3-3 Connecting Section of the AP-RFU (Sectoral-Horn Antenna)

3.2. AP-IFU

3.2.1.Overview

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

3.2.2.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 functionalities 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).

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 3-4 is a block diagram of the AP-IFU.

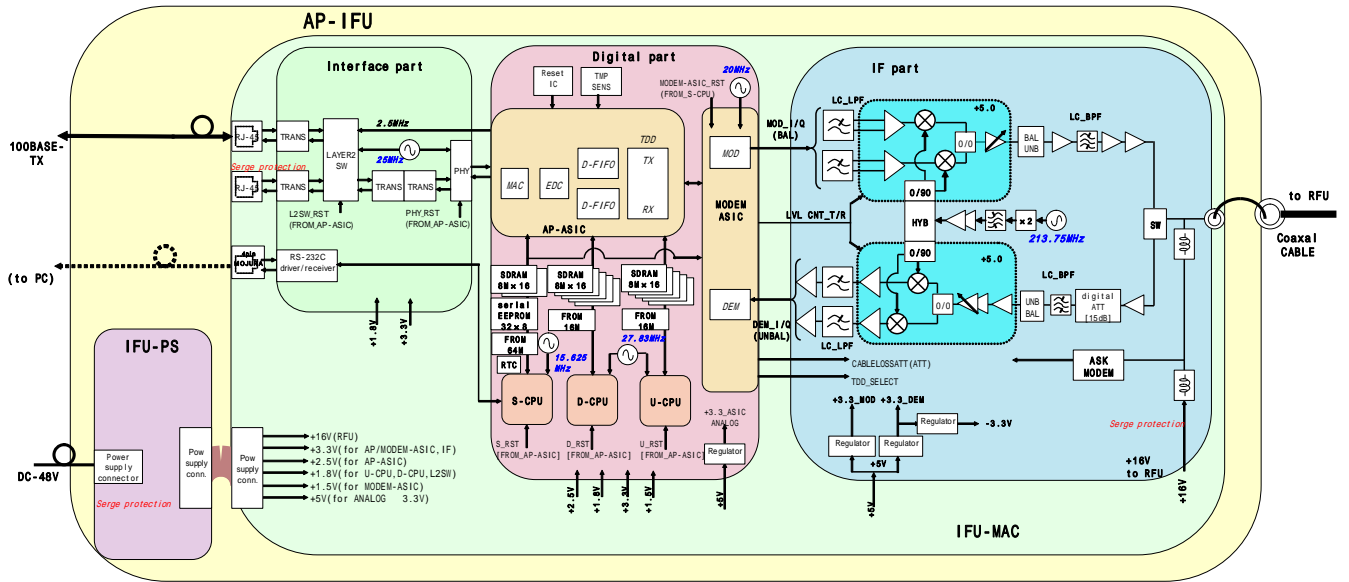


Figure 3-4 AP-IFU Block Diagram

3.2.3. Operations and Indications

3.2.3.1. Indications

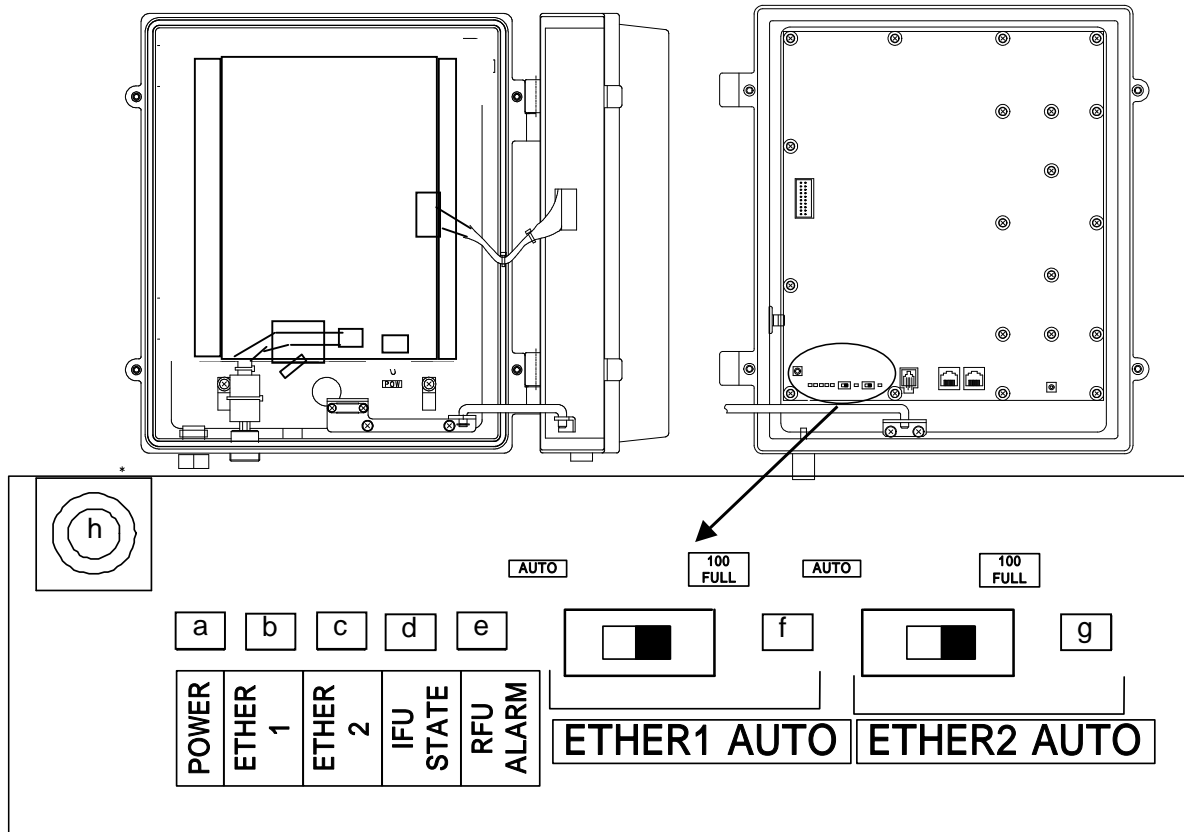


Figure 3-5 AP-IFU Operation and Indication Panel

Table 3-1 AP-IFU Indications

	LED	State indication
a	POWER	Lit green: Power on Extinguished: Power off
b	ETHER 1	Lit green: ETHER link established Flashing green: ETHER signal sent or received Extinguished: ETHER link down (See Table 3-3, 4)
c	ETHER 2	Lit green: ETHER link established Flashing green: ETHER signal sent or received Extinguished: ETHER link down (See Table 3-3, 5)
d	IFU STATE	Lit red: IFU alarm (See Table 3-3, 2) Flashing green: Normal (CPU running) Flashing orange: During initialization
e	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
f	ETHER1 AUTO	Lit green: AUTO (ETHER1 AUTO switch set to AUTO) Extinguished: 100BASE full duplex
g	ETHER2 AUTO	Lit green: AUTO Extinguished: 100BASE full duplex
h	RST	Unit reset switch

Table 3-2 AP-IFU Controls

	Switch	Description
1	ETHER1 AUTO	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	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.

3.2.3.2. Switches

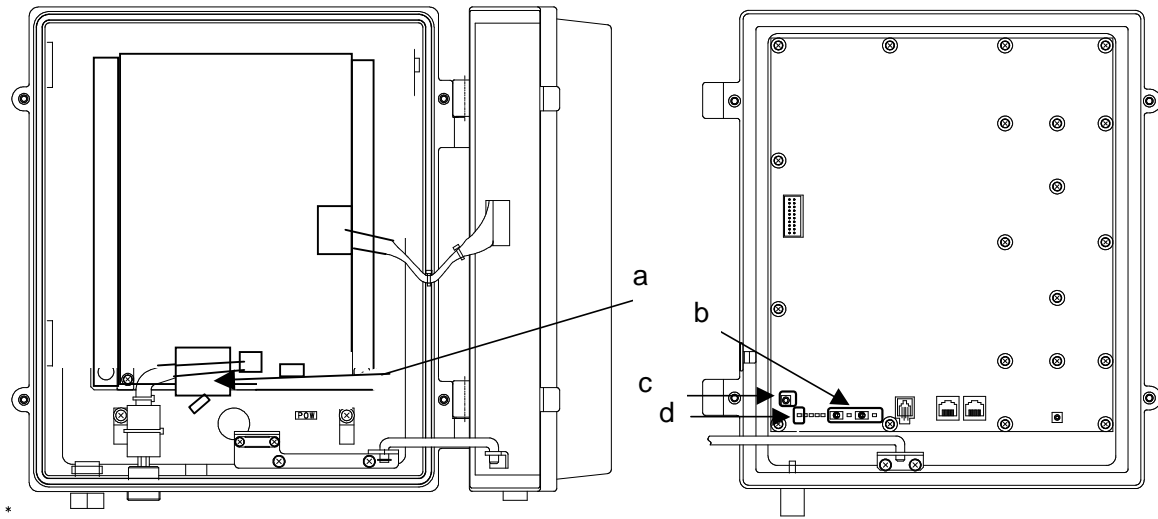
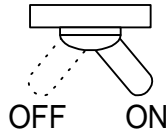


Figure 3-6 Switches on the AP-IFU

(a) Power switch

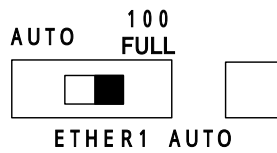
This is the switch to supply power to the AP-IFU and AP-RFU.



(b) 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

Factory setting: 100FULL

(c) RST switch

This is the switch to reset the unit.

(d) POWER LED

When on : Lit green

When off: Extinguished



- After changing the switch setting, you have to reboot the unit (power off and back on) to enable the new setting.

3.2.3.3. Terminals

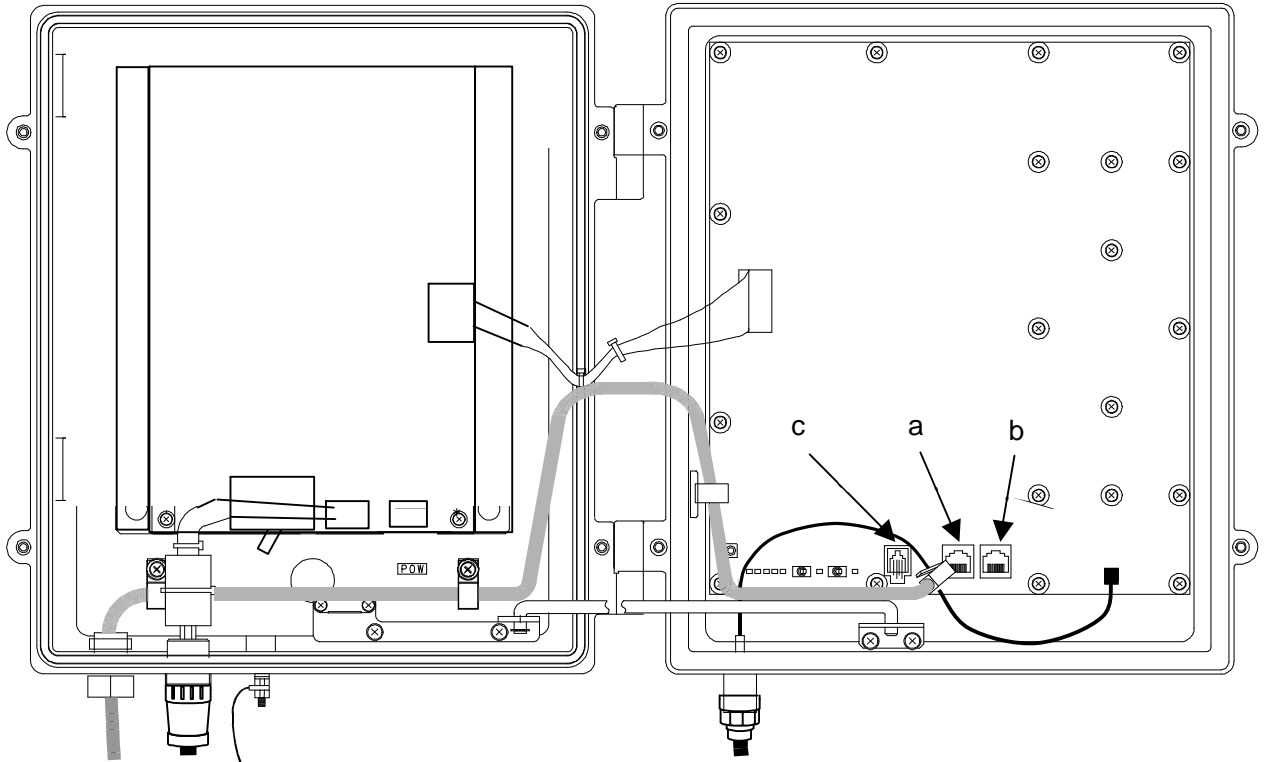


Figure 3-7 Connecting Section of the AP-IFU (Open View)

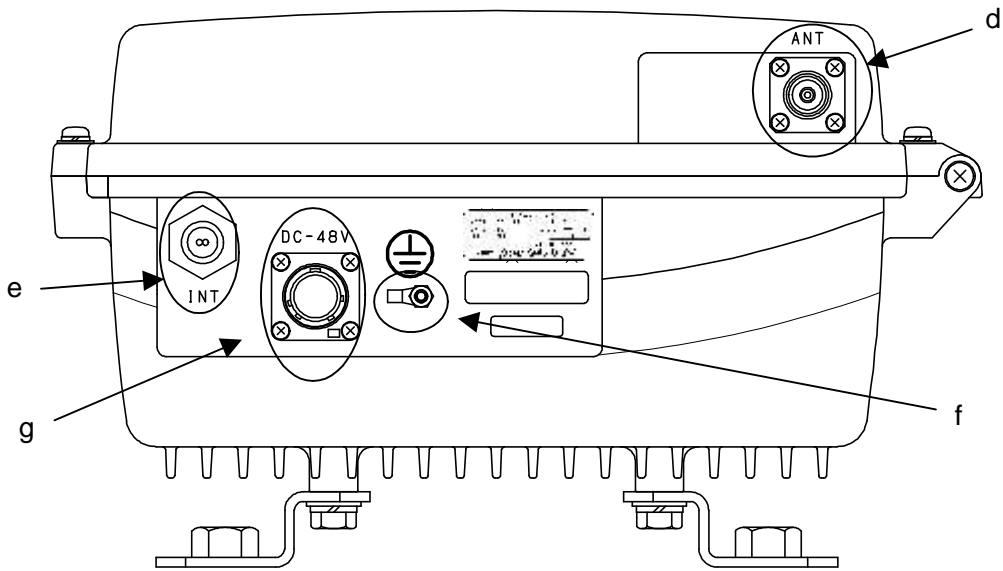
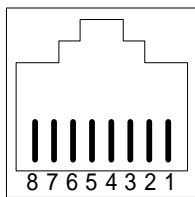
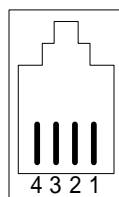


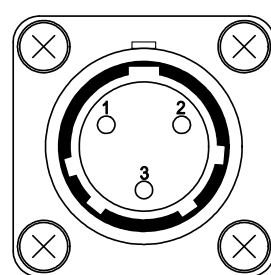
Figure 3-8 Connecting Section of the AP-IFU (Bottom View)



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



1	TXD
2	RXD
3	NU
4	GND



1	GND
2	DC-48V
3	NU

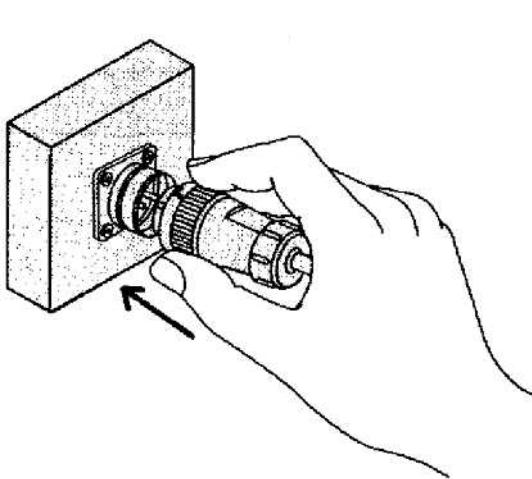
Figure 3-9 (a),(b) Ethernet connector

Figure 3-10 (c) MNT connector

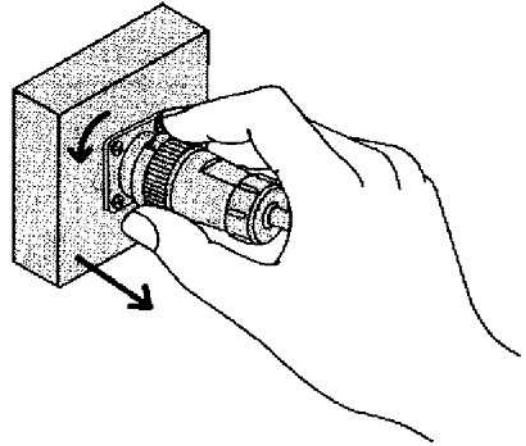
Figure 3-11 (f) Power cable connector

(a) ETHER1 connector	
Contents	Connect the outside network
	The user signal distributed by internal SW-HUB, and output to ETHER1 and ETHER2. ETHER1 is used usually.
Interface	100BASE-Tx
Connector shape	RJ-45
Pin assign	See Figure 3-9
(b) ETHER2 connector	
Contents	Connect the outside network
	The user signal distributed by internal SW-HUB, and output to ETHER1 and ETHER2. ETHER1 is used usually.
Interface	100BASE-Tx
Shape	RJ-45
Pin assign	See Figure 3-9
(c) MNT(maintenance) connector	
Contents	Connect the Local management tool
Interface	Serial
Shape	RJ-22
Pin assign	See Figure 3-10
(d) ANT terminal connector	
Contents	Connect the AP-IFU with the coaxial cable.
Shape	N-Type Jack for Coaxial
Applicable Connector	N-Type Plug for Coaxial
(e) Ethernet cable inlet	
Contents	Insert the Ethernet cable into the rubber bushing.
Applicable outer diameter	Φ5.5mm or less
(f) FG terminal	
Contents	Connect the ground wire.
Applicable Cable	Ground wire more than 1.5□mm
Applicable terminal	FG terminal M4nut.
(g) Power cable connector	
Contents	Connect the power cable.
Pin assign	See Figure 3-11
Name	NRW-203-RM-ULCSATUV (Nanaboshi Electric MFG Co.,LTD.)
Applicable Connector name	NRW-203-PF8-ULCSAUV (Nanaboshi Electric MFG Co.,LTD.) (This connector is supplied with AP-IFU.)

How to install and remove the power cable connector



To install:
Align the plug and receptacle guides,
and push in the connector straight.



To remove:
Turn the connector counterclockwise 45
degrees and pull it out straight.



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

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.

4.1.2.Antenna section

Uses a Triplate planar antennas to make the antenna compact and to provide a high gain. When you use an option, you can install a external antenna.

4.1.3.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.

4.1.4.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 section 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.

4.1.5.Digital section

The digital section consists of a digital modem, TDD/TDMA framer, wireless MAC processor, and system controller. These functionalities 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 also performs scrambling, encryption, and error correction functionalities.

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 communicates with the AP processor via the DMF channel.

4.1.6.Interface section

The interface section provides the physical interfaces 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.

4.1.7.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.

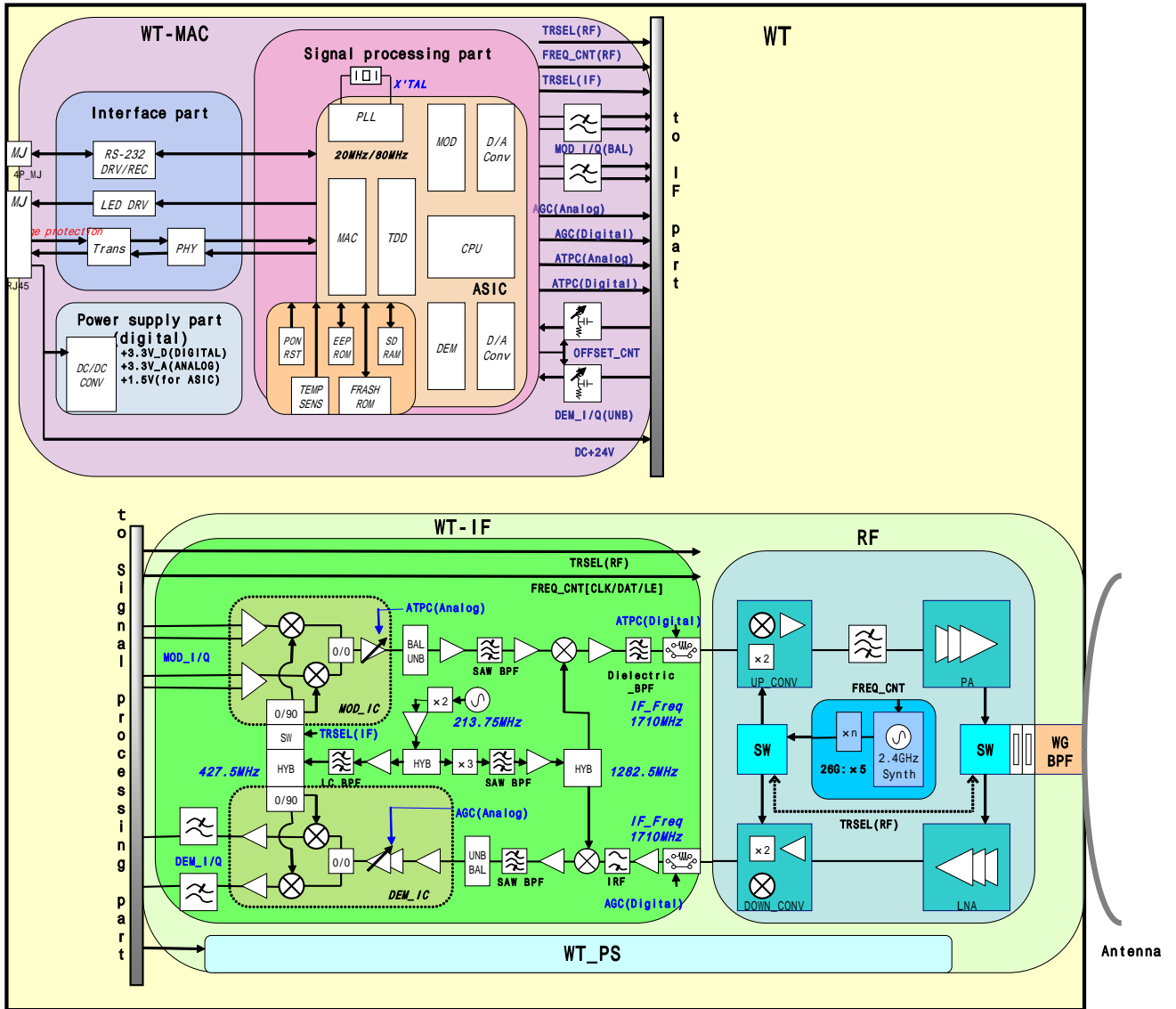


Figure 4-1 WT Block Diagram

4.1.8. Operations and Indications

4.1.8.1. Indications

(1) Indications

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

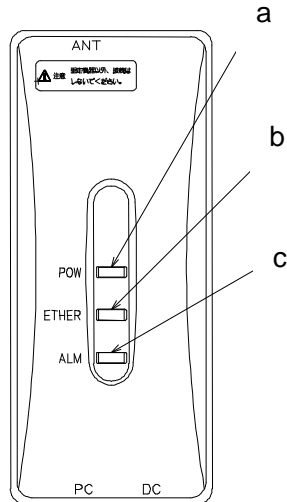


Figure 4-2 Indications on the WT Adapter

Table 4-1 Indications on the WT Adapter

	LED	Indication (Point to Multipoint System)	Indication (Point to Point System)
a	POW	-Lit green: Power on. -Extinguished: Power off.	-Lit green: Power on. -Extinguished: Power off.
b	ETHER	-Lit green: ETHER link established. -Flashing green: Transmission or reception on the ETHER port. -Extinguished: ETHER link down.	-Lit green: ETHER link established. -Flashing green: Transmission or reception on the ETHER port. -Extinguished: ETHER link down.
c	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)	-Lit red: Wireless synchronization lost. -Flashing red: Flashing red for 500msec: Wireless synchronization established (during authentication). -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 (Point to Multipoint system)

		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
a	POW	Lit	Lit	Lit	Lit	Lit	
b	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.
c	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 (Point to Multipoint system)

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)

4.1.8.2. Switches

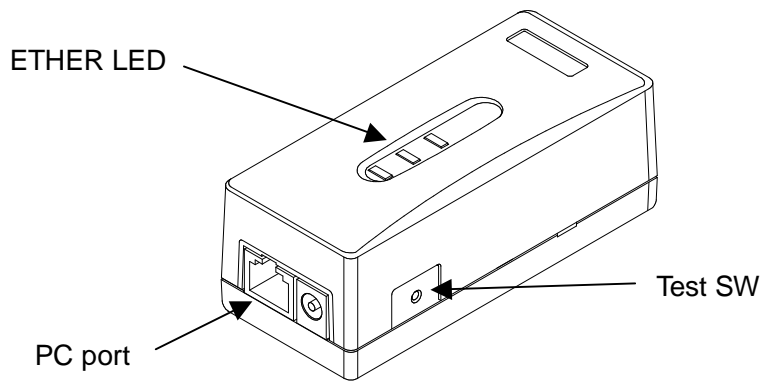


Figure 4-3 Switches on the WT Adapter

(a) [TEST SW] switch

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

The connection of the ETHER signal line (4) in the Ethernet cable (8) can be confirmed. 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:

- connected to cable between WT and WT adapter, and turns on the power supply with the AC adapter.
- 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.



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

4.1.8.3. Terminals

4.1.8.3.1. WT

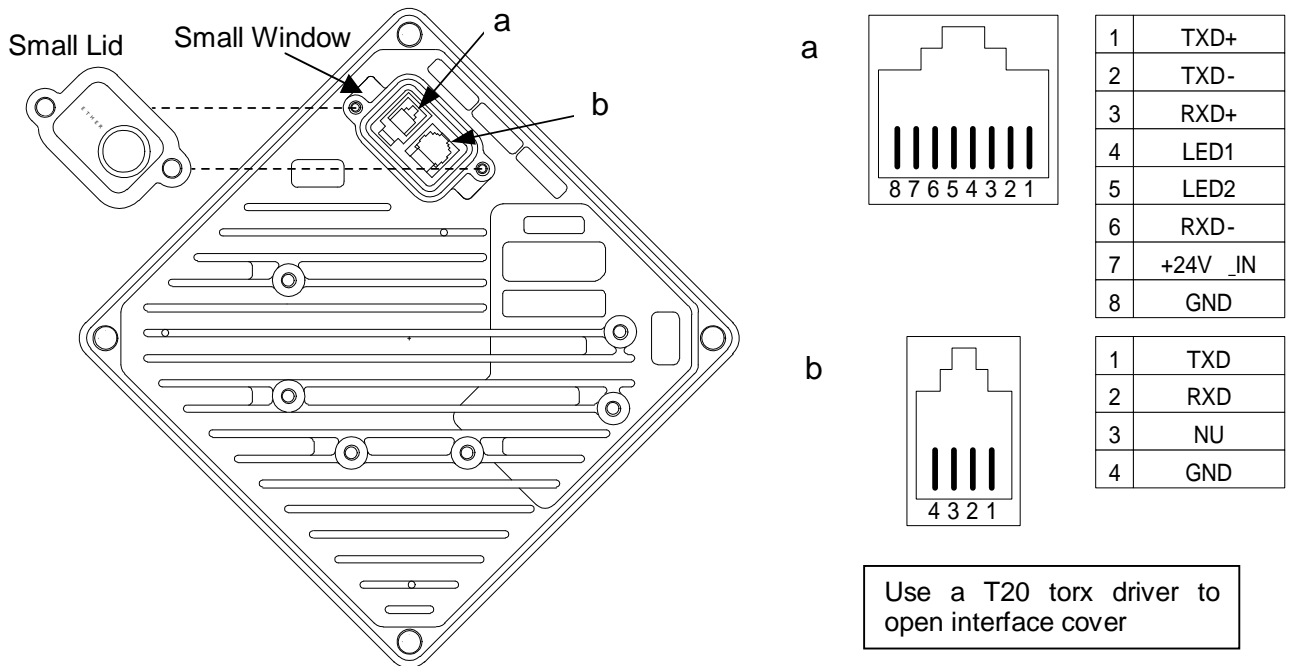


Figure 4-4 Connecting Section of the WT

(a) ETHER port

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

Connected cable between WT and WT adapte	
Cable type	Ethernet cable for outdoor, straight
Range of applicable outer diameter	φ5.0 mm ~ 5.7mm
Cable length	50m(max)
Connector	
Shape	RJ-45
Pin assign	<ul style="list-style-type: none"> • Ethernet signal (MDI specification) • An Ethernet cable has eight signal lines. Four lines are used to carry Ethernet signals. The remaining four lines are used as power lines and LED control lines.

(b) Industrial port

This is the industrial port.

Shape: RJ-22

- 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.
- The cable connecting the WT and WT adapter is a straight cable. Wrong connection may damage the unit.
- When closing the small window, make sure that the rubber packing of the small window is free from any foreign matter.

4.1.8.3.2. WT Adapter

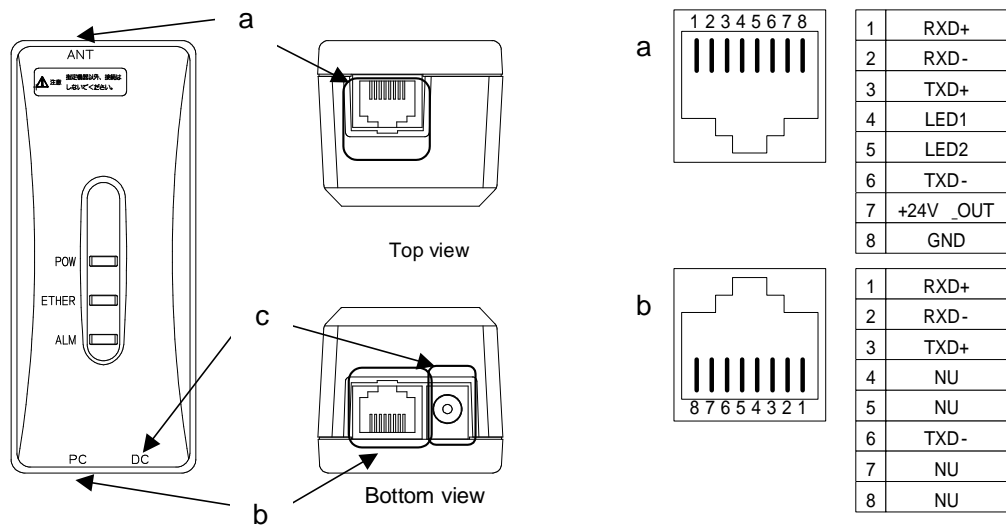


Figure 4-5 Connecting Section of the WT Adapter

(a) 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.

Connected cable between WT and WT adapte	
Cable type	Ethernet cable for outdoor, straight
Range of applicable outer diameter	φ5.0 mm ~ 5.7mm
Cable length	50m(max)
Connector	
Shape	RJ-45
Pin assign	<ul style="list-style-type: none"> • Ethernet signal (MDI X specification) • An Ethernet cable has eight signal lines. Four lines are used to carry Ethernet signals. The remaining four lines are used as power lines and LED control lines.



(b) PC port: (Connector type: RJ-45)

This is the port to connect the communication terminal.

Interface	
Interface	10BASE-T / 100BASE-TX
Connector	
Shape	RJ-45
Pin assign	Ethernet signal (MDI-X)

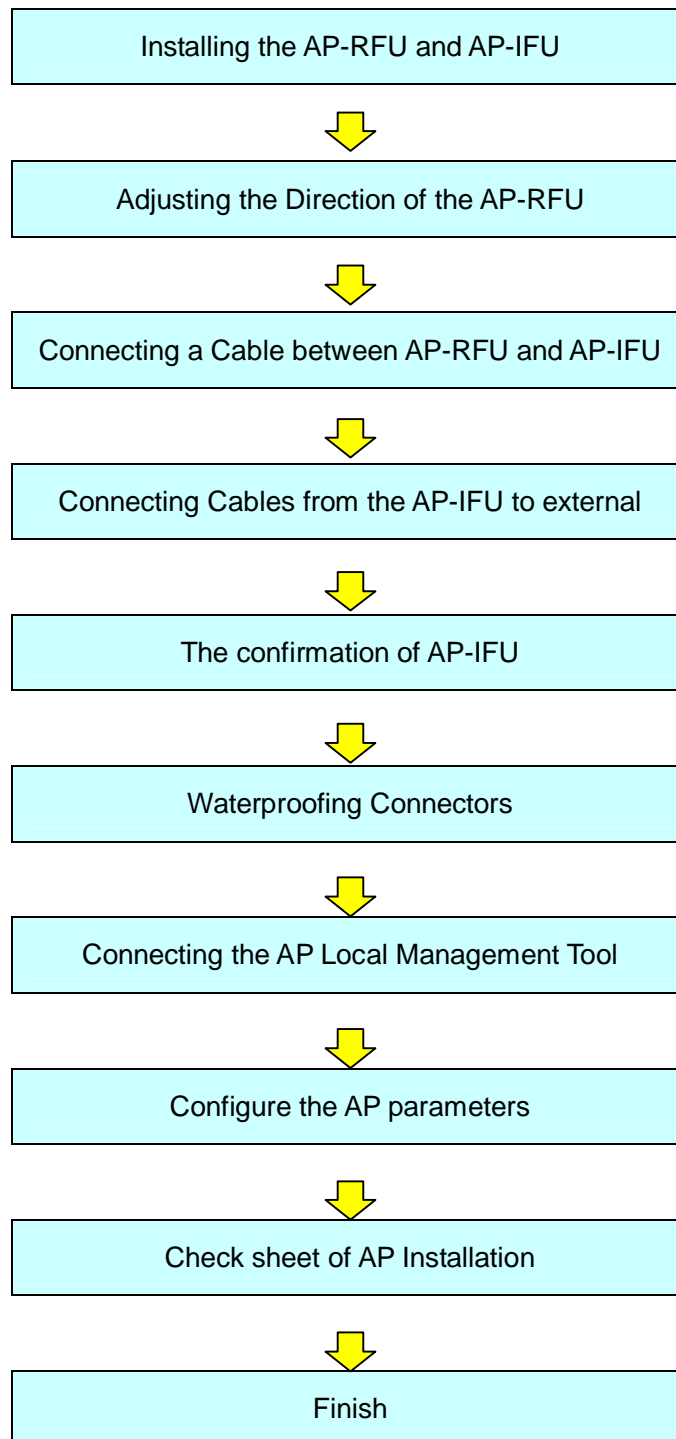
(c) DC jack: (+24VDC power supply)

Connect the AC adapter that comes with the WT.

-  • Never connect a communication terminal to the ANT port of the WT adapter. Doing so may damage your personal computer.
-  • 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.
- The cable connecting the WT and WT adapter is a straight cable. Wrong connection may damage the unit.
- PC port: (Connector type: RJ-45 (b))The Equipment for connection to WT adapter PC-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.

5. CONSTRUCTING A POINT-TO-MULTIPOINT SYSTEM (AP)

5.1. Overview



5.2. Installing the AP-RFU and AP-IFU

5.2.1. Installing the AP-RFU (Omni Antenna)

Secure the AP-RFU (omni antenna) to a pole using the bolts (a), as shown in Figure 5-1.

- (1) As shown in Figure 5-1, install the AP mounting bracket on the AP-RFU and tighten the bolts (a).

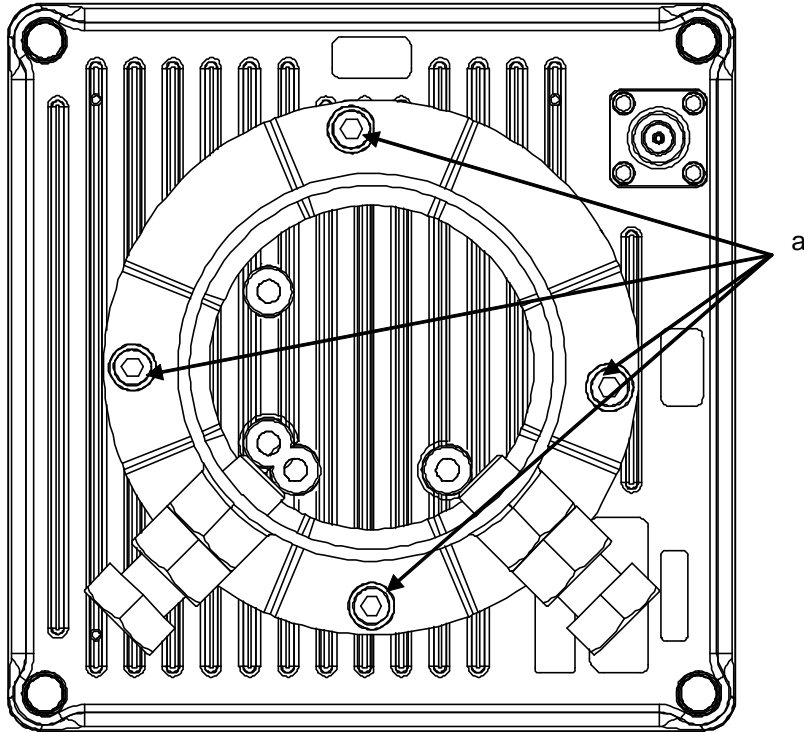


Figure 5-1 Installing the Mounting Bracket on the AP-RFU (Omni Antenna)

- (2) As shown in Figure 5-2, loosen the bolts and nuts (b) and (c) for the AP mounting bracket and install the bracket on the pole. Next, tighten the bolts (b) and tighten the nuts (c) while making sure that the bolts (b) stay in place.

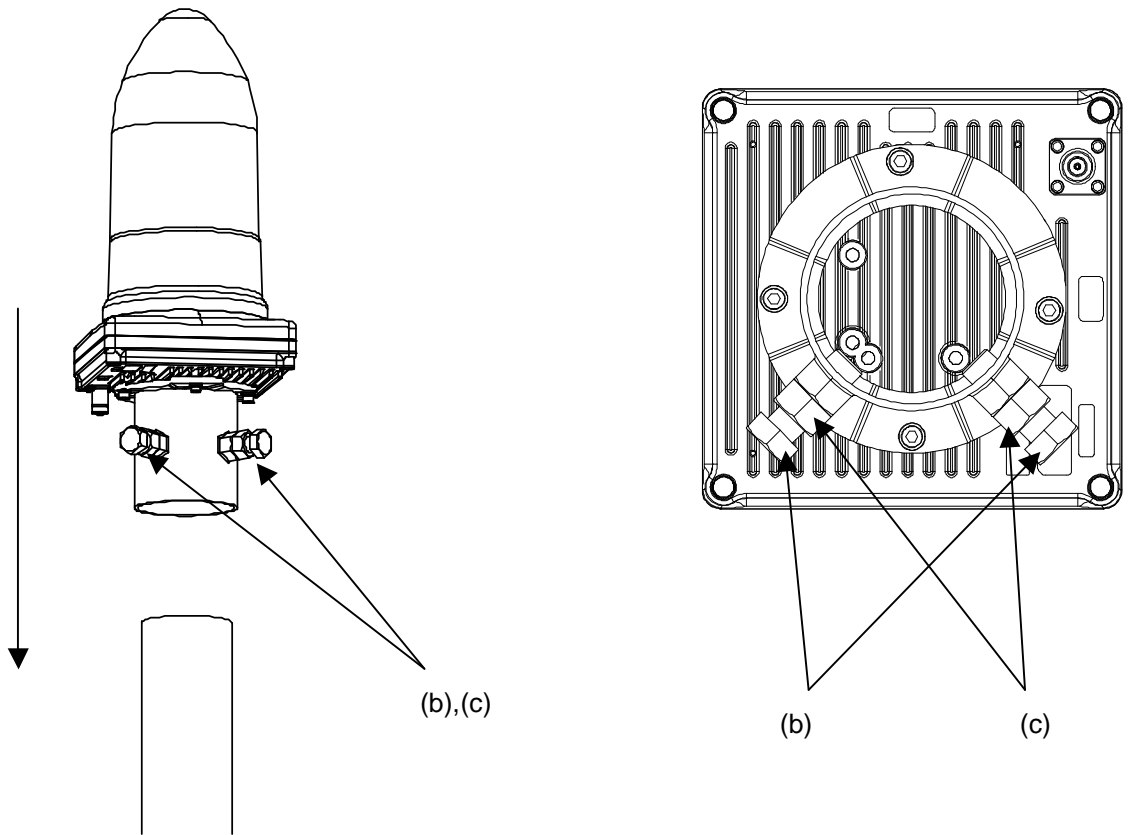


Figure 5-2 Installing the AP-RFU (Omni Antenna)

5.2.2. Installing the AP-RFU (Sectoral-Horn Antenna)

The mounting bracket are attached AP-RFU.

- (1) As shown in Figure 5-3, loosen the bolts (a), (b), and (c) and install the AP-RFU mounting bracket on the pole. Next, tighten the bolts (a), (b), and (c). (Recommended tightening torque: 8.5 N-m)

! Applicable pole diameter: From 31.8mm to 38.1mm

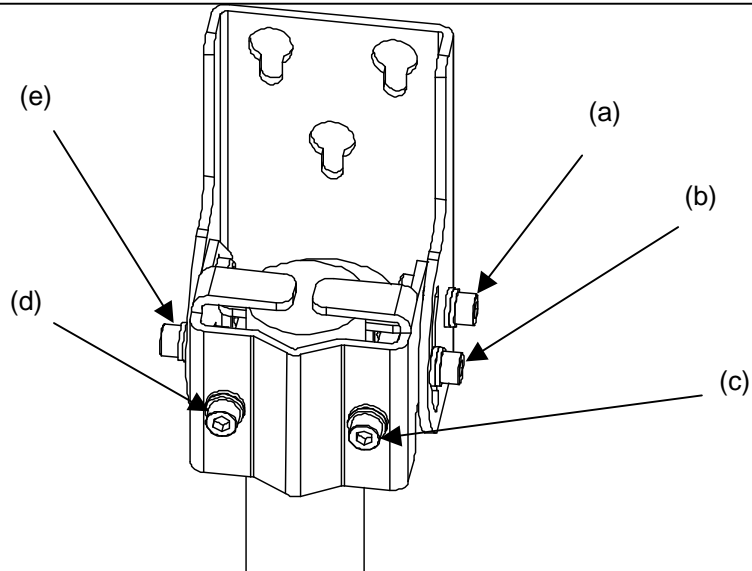


Figure 5-3 Installing the AP-RFU Mounting Bracket on the Pole

- (2) As shown in Figure 5-4, finger-tighten the bolts (f) in the threaded holes on the rear of the AP-RFU.

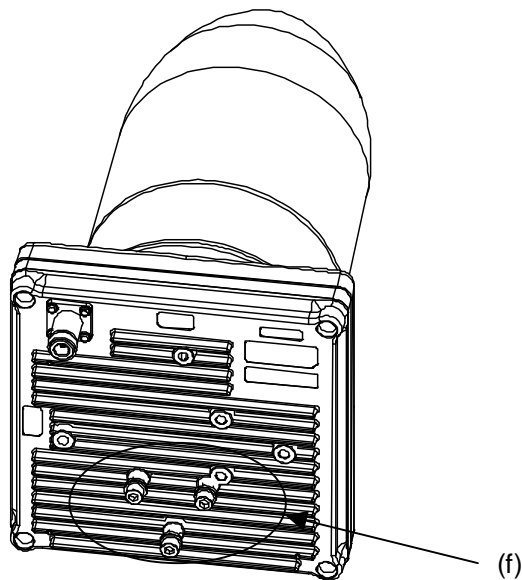


Figure 5-4 Finger-tightening the Mounting Bolts to the AP-RFU

- (3) As shown in Figure 5-5, align the AP-RFU with the openings in the AP-RFU mounting bracket and tighten the bolts (f). (Recommended tightening torque: 8.5N-m)

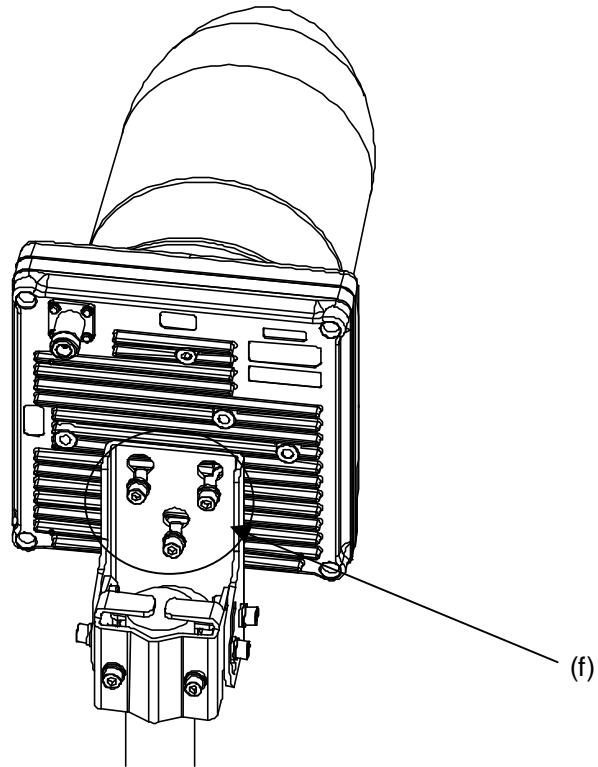


Figure 5-5 Installing the AP-RFU on the Mounting Bracket

A builder prepares a steel pipe by the installation place (a wall, a pole or etc.), and it install.
The required space of installation is shown below.

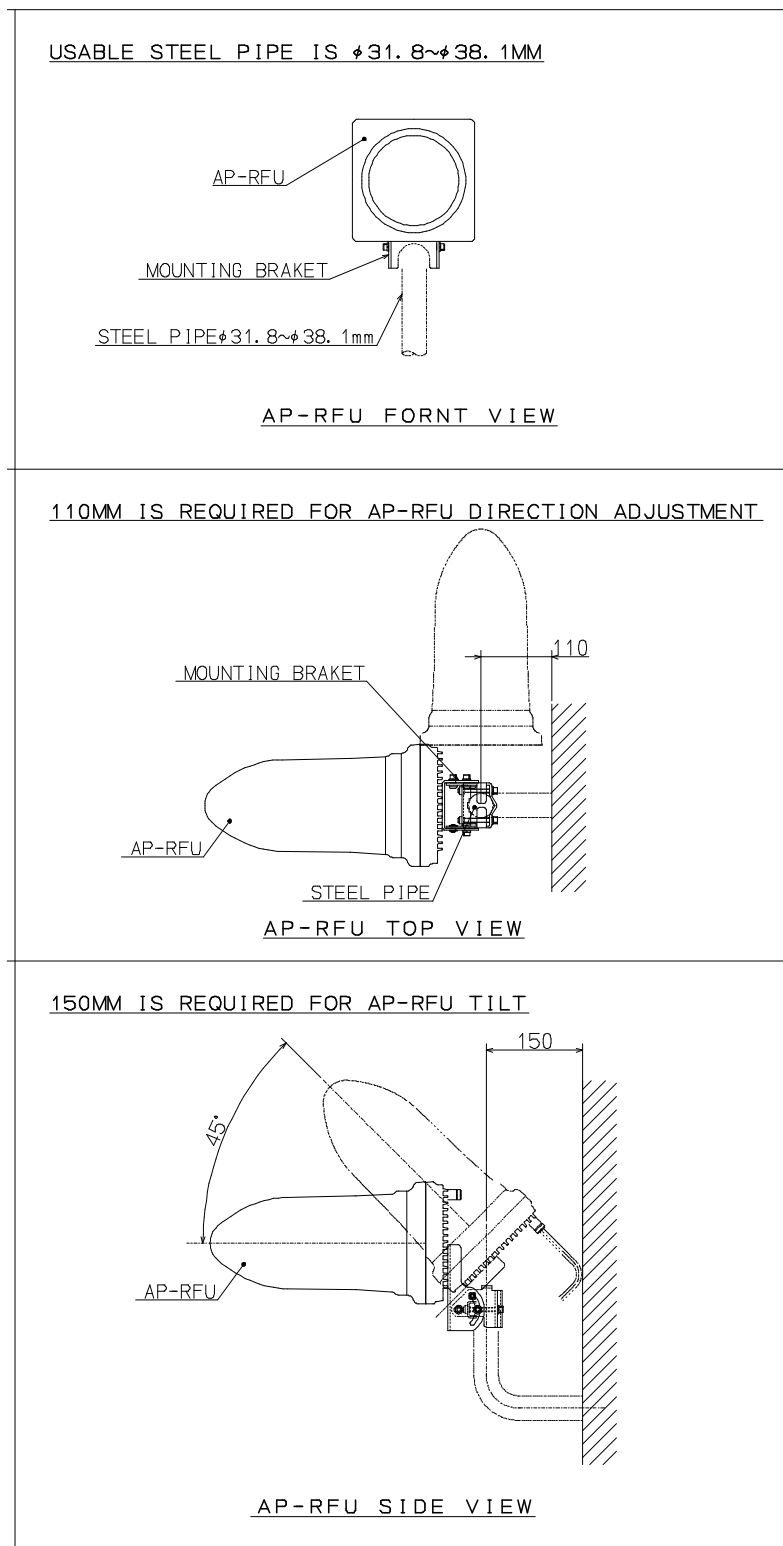


Figure 5-6 the required space of installation

5.2.3. Setting AP-RFU(Sectoral-Horn Antenna)for Vertical or Horizontal Polarization

(1) NTG-335<1><2>V

The NTG-335<1><2>V device is used only for the vertical polarization plane. Install it with the **TOP V** marking at the top.

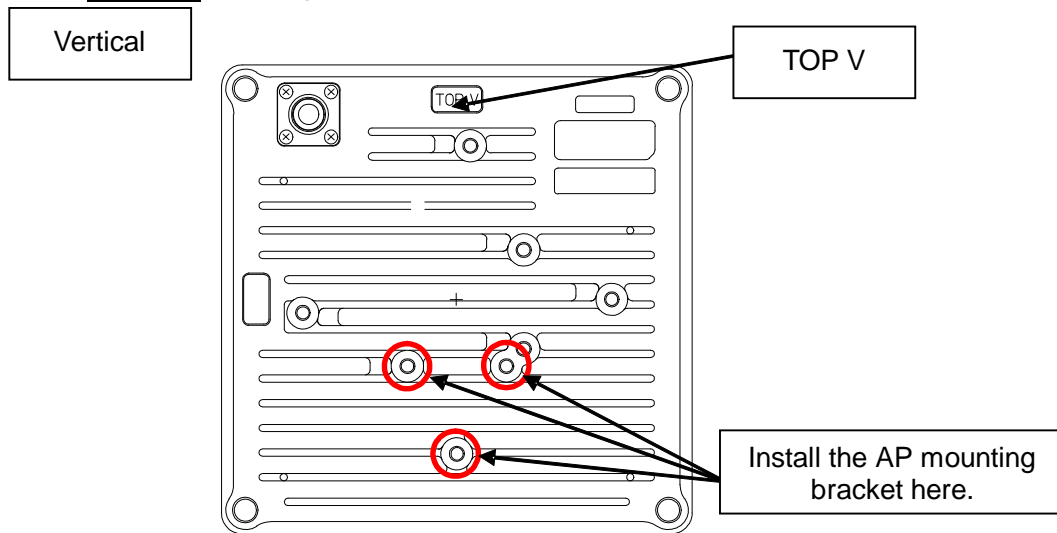


Figure 5-7 Vertical Polarization

(2) NTG-335<1><2>H

The NTG-335<1><2>H device is used only for the horizontal polarization plane. Install it with the **TOP H** marking at the top.

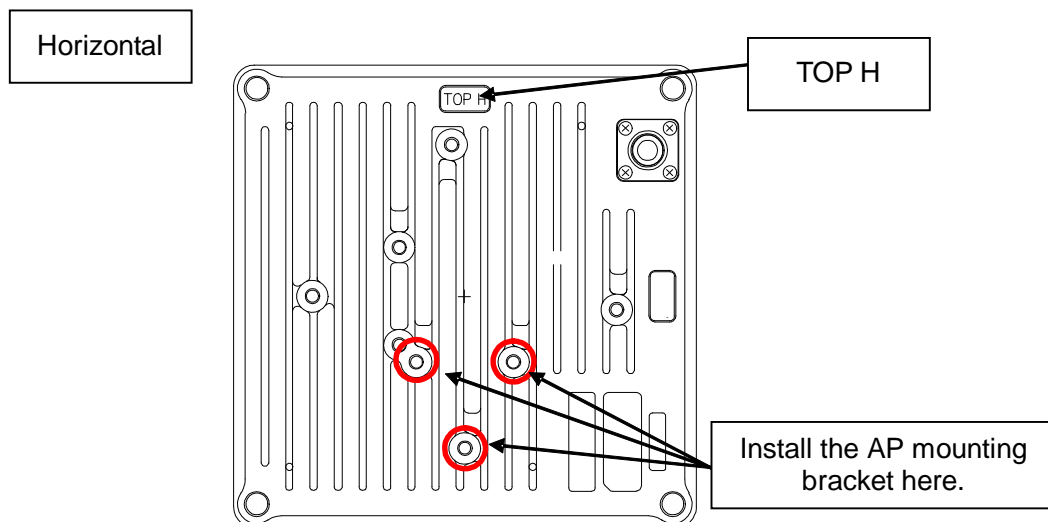


Figure 5-8 Horizontal Polarization

5.2.4. installing the AP-IFU

5.2.4.1. Installing the AP-IFU

The mounting braket are attached AP-IFU.

A builder prepares a fixing braket by the installation place (a wall, a pole or etc.), and it install.

The required space of installation is shown below.

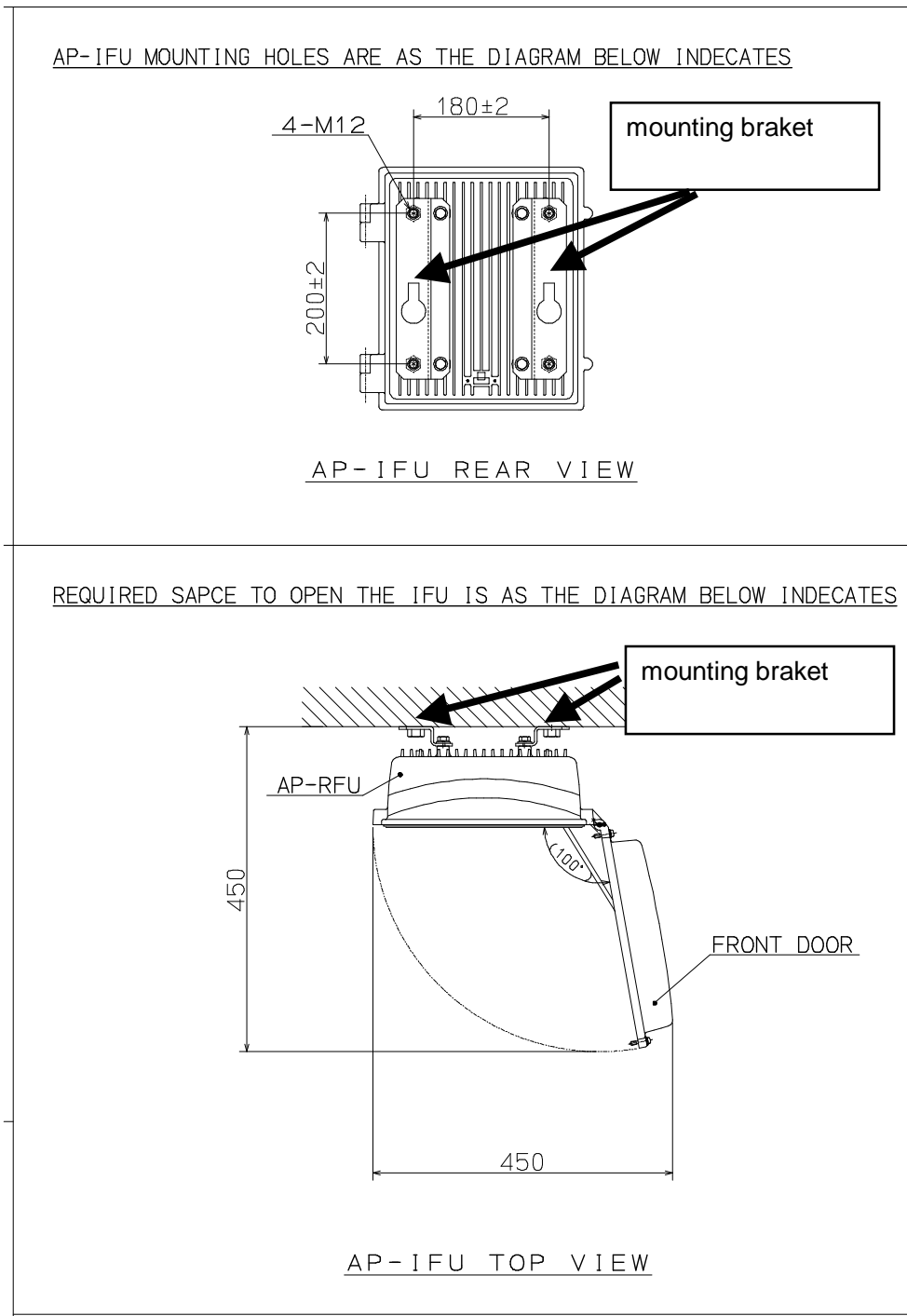


Figure 5-9 The required space of installation

5.2.4.2. Example of Installing the AP-IFU

(1) On a Utility Pole

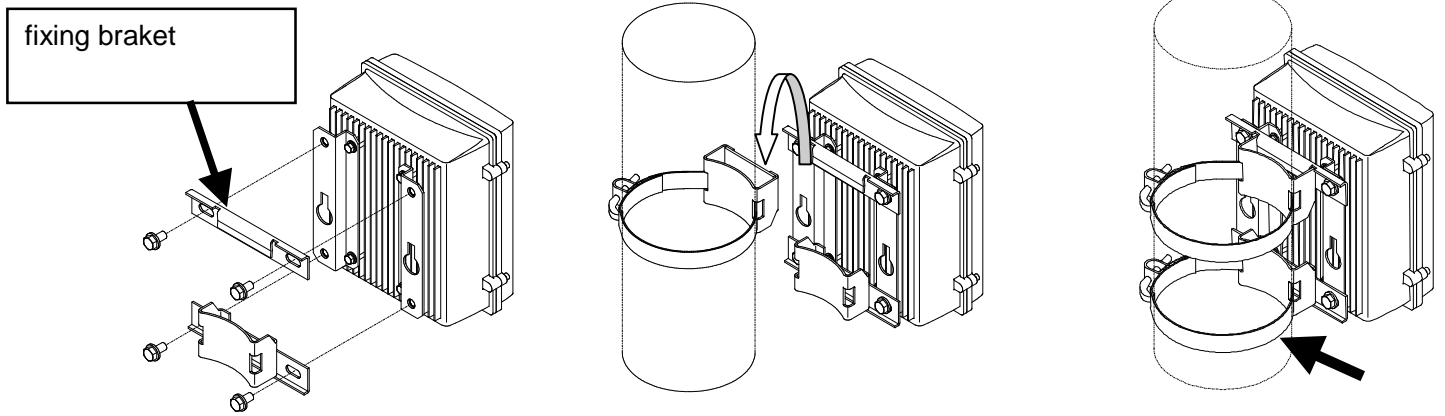


Figure 5-10 Installing the AP-IFU on a Utility Pole

(2) Indoor Installation

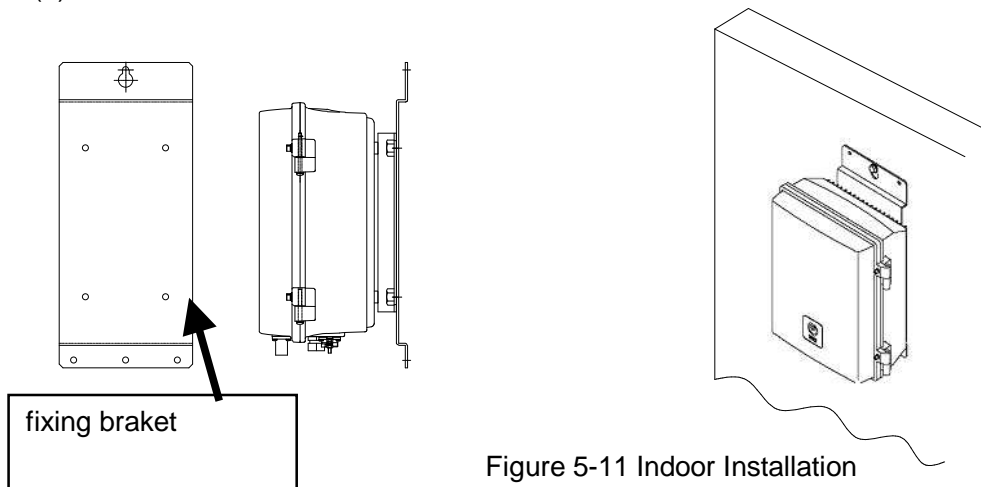


Figure 5-11 Indoor Installation

(3) 19-inch Rack

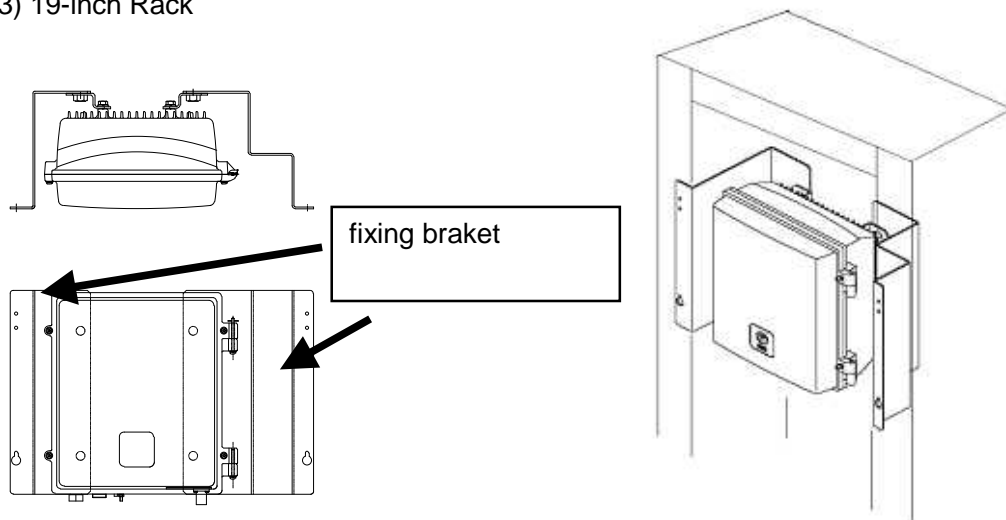


Figure 5-12 Installing the AP-IFU on a 19-inch Rack

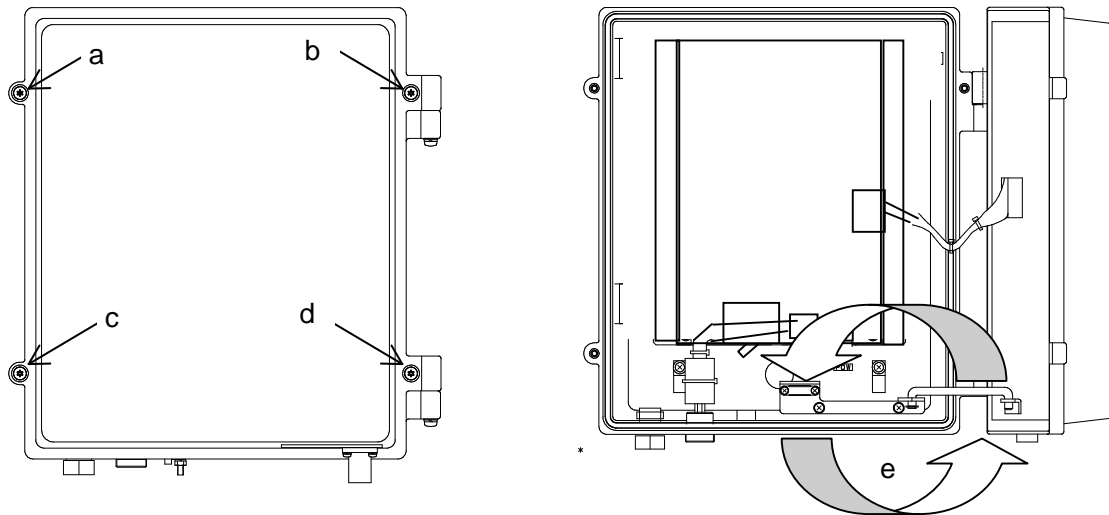
5.2.4.3. Opening and Closing the AP-IFU Cover

To open the cover:

- (1) Loosen the special screws (a) to (d) to open the cover as shown in Figure 5-13.
- (2) Keep the cover stay open using the stopper (e) as shown in Figure 5-13.

To close the cover:

- (1) Replace the stopper (e) on the main unit as shown in Figure 5-13
- (2) Close the cover and tighten the special screws (a) to (d) as shown in Figure 5-13.



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

Figure 5-13 Opening and Closing the AP-IFU Cover



- When opening the AP-IFU cover, make sure that the four special screws are loosened completely. Forcing open the cover may damage it.
- 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.
- 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.
- When closing the cover, be careful not to nick cables.

5.3. Adjusting the Direction of the AP-RFU

5.3.1. Adjusting the Direction of the AP-RFU (Omni Antenna)

The AP-RFU (omni antenna) eliminates the need for adjusting the antenna direction.

5.3.2. Adjusting the Direction of the AP-RFU (Sectoral-Horn Antenna)

This section explains how to adjust the antenna direction for the AP-RFU (sectoral-horn antenna). To adjust the antenna direction for the AP-RFU (sectoral-horn antenna), use the Antenna direction adjustment tool and the following procedure.

Step1 Before adjusting

- Install the Antenna direction adjustment tool.

Step2 Direction adjustment of the antenna

- Adjust the horizontal direction
- Adjust the vertical direction
- Tighten the antenna with the appropriate torque.

Step3 After adjusting

- Remove the Antenna direction adjustment tool.

5.3.3.Direction adjustment of the antenna

Step1 Adjust the horizontal direction

- As shown in Figure 5-14, use the wing bolt (a) to attach the Antenna direction adjustment tool.
- As shown in Figure 5-15, loosen the hexagonal socket head bolts (b) and (c) securing the mounting bracket, swing the antenna left or right, and adjust the horizontal direction.
- Finally, tighten the bolts (b) and (c). (Recommended tightening torque: 8.5 N-m)

In figure is an example when the antenna type is the horizontal polarization.

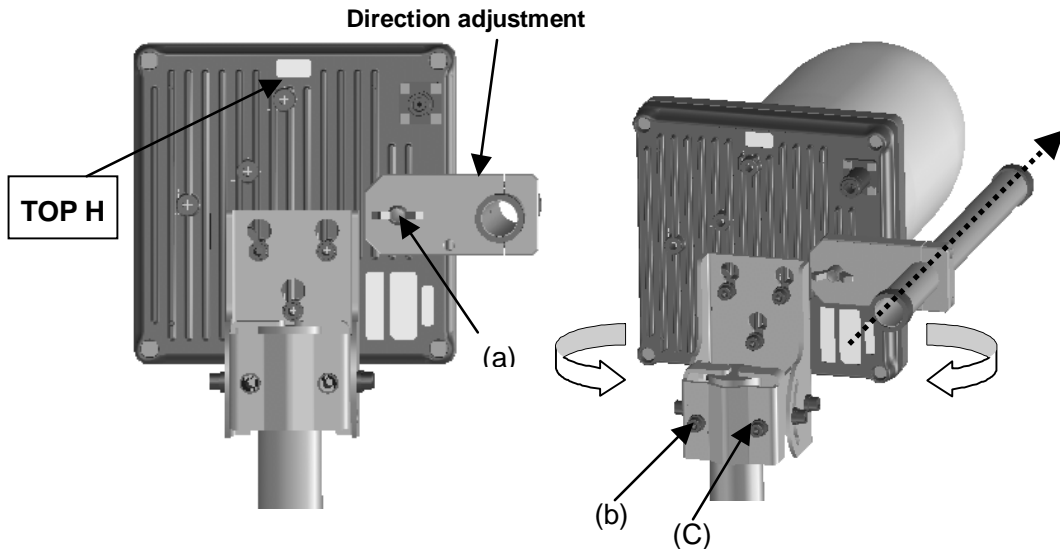


Figure 5-14 Attaching the Direction Adjustment tool Figure 5-15 Adjusting the Horizontal Direction

Step2 Adjust the vertical direction

- As shown in Figure 5-16, loosen the hexagonal socket head bolts (d), (e), and (f) securing the mounting bracket, and tilt the antenna up or down to adjust the vertical direction.
- Tighten the bolts (d), (e) and (f). (Recommended tightening torque: 8.5 N-m)
- Finally, loosen the wing bolt (a) and remove the Antenna direction adjustment tool.

In figure is an example when the antenna type is the horizontal polarization.

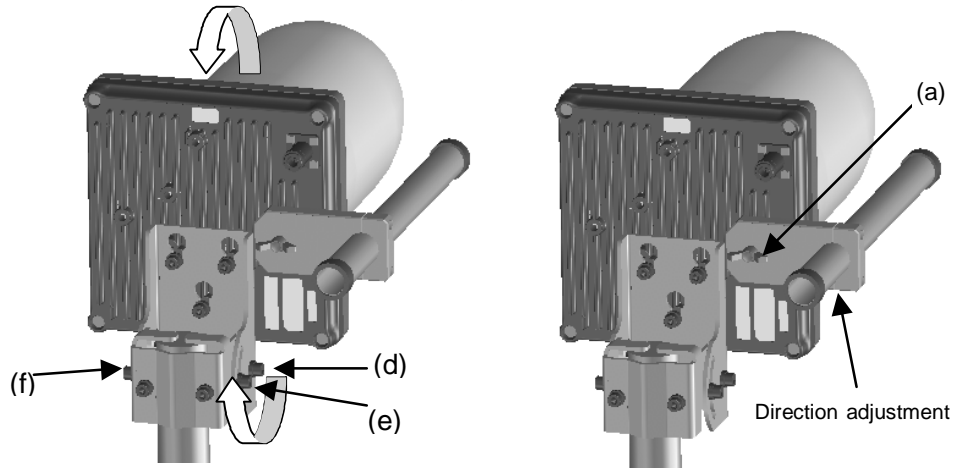


Figure 5-16 Adjusting the Vertical Direction

5.4. Connecting a Cable between AP-RFU and AP-IFU

5.4.1. AP-RFU (Omni Antenna)

Step1 Use the coaxial cable to connect the AP-RFU and the AP-IFU. (Figure 5-17)

Step2 Waterproof the connection with self-bonding tape or cold-shrinkable tube.

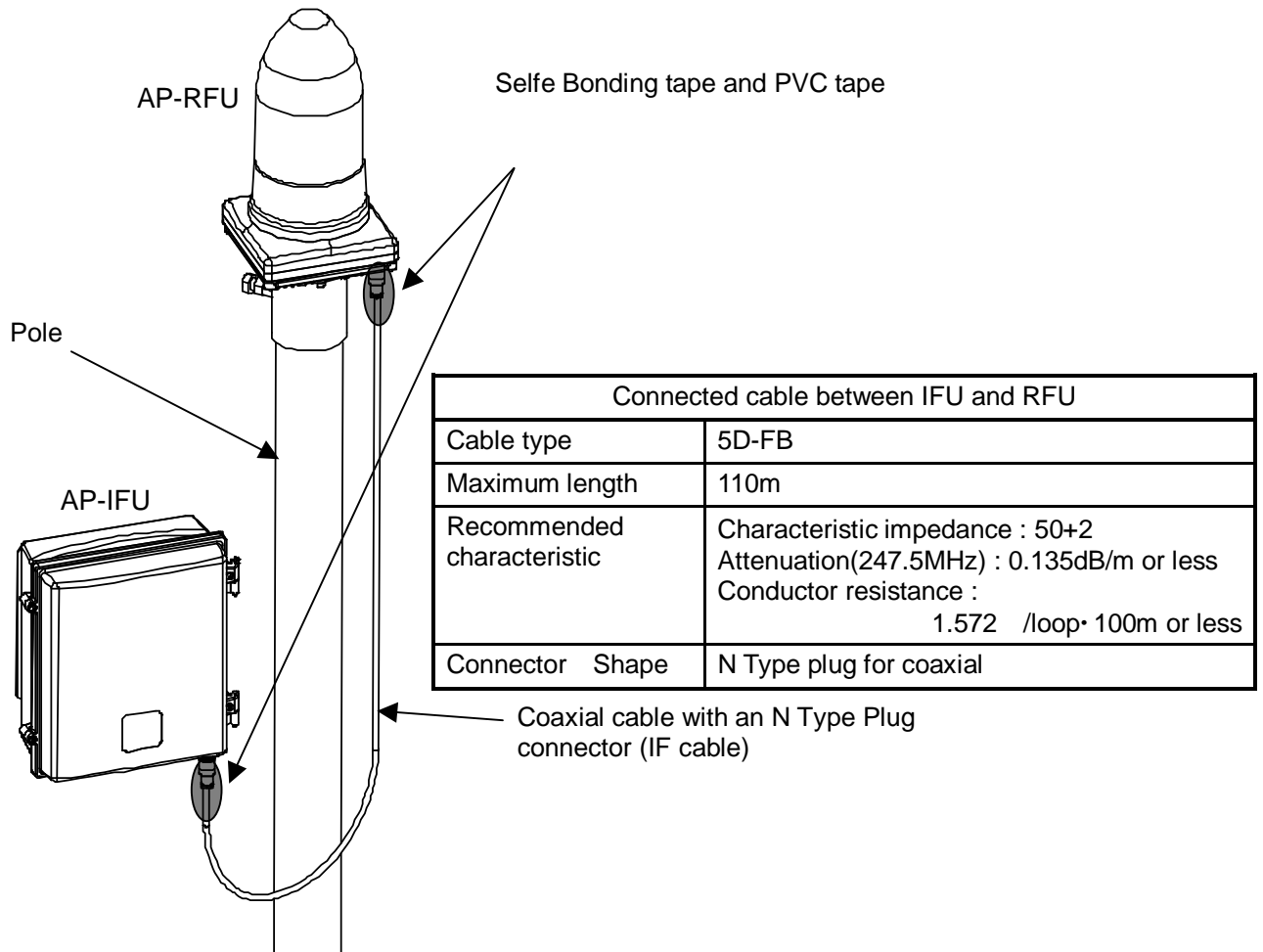


Figure 5-17 Connecting the Cable to the AP-RFU (Omni Antenna)

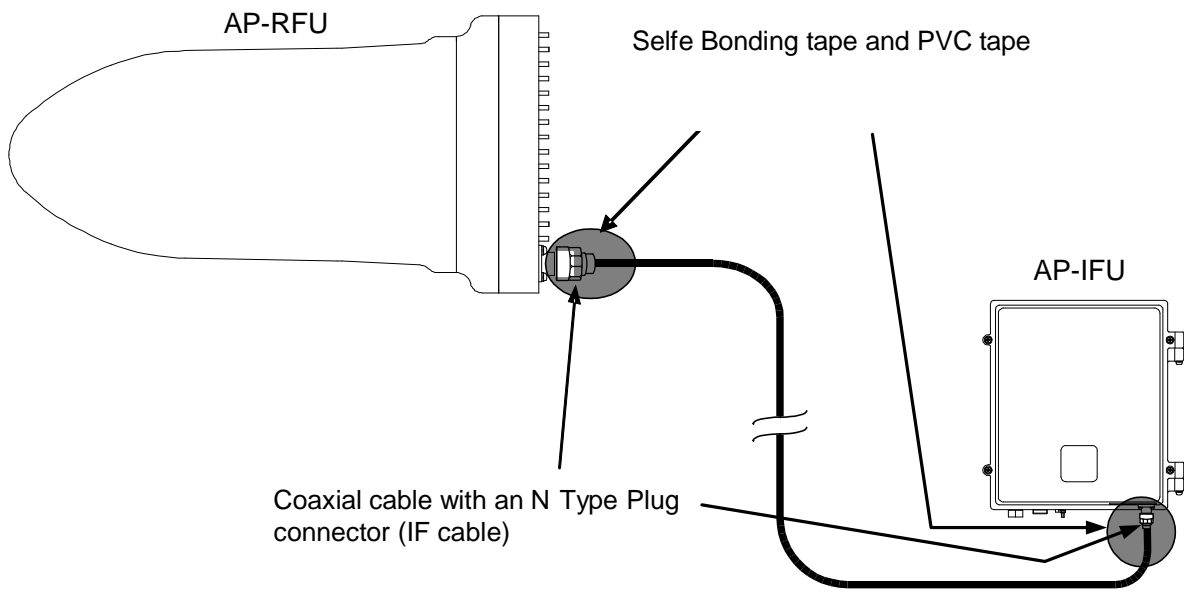


- +16VDC to be supplied to the AP-RFU is superimposed on the signals in the IF cable. Turn off the power to the AP-IFU when installing or removing the IF cable. Otherwise, the unit may be damaged.
- Cover the cable connection with a cold-shrinkable sleeve to make it waterproof. Otherwise, water may get in the connection.
- The curvature radius of the connection cable between the RFU and IFU should be 6 times or more the outer diameter of the cable.
- When securing the connection cable between the RFU and IFU, be careful so the cable is not deformed.

5.4.2.AP-RFU (Sectoral-Horn Antenna)

Step1 Use the coaxial cable to connect the AP-RFU and the AP-IFU. (Figure 5-18)

Step2 Waterproof the connection with self-bonding tape and PVC tape.



Connected cable between IFU and RFU	
Cable type	5D-FB
Maximum length	110m
Recommended characteristic	Characteristic impedance : 50+2 Attenuation(247.5MHz) : 0.135dB/m or less Conductor resistance :1.572 /loop· 100m or less
Connector Shape	N Type plug for coaxial

Figure 5-18 Connecting a Cable to the AP-RFU (Sectoral-Horn Antenna)



- +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.
- Cover the cable connection with a cold-shrinkable sleeve to make it waterproof. Otherwise, water may get in the connection.
- The curvature radius of the connection cable between the RFU and IFU should be 6 times or more the outer diameter of the cable.
- When securing the connection cable between the RFU and IFU, be careful so the cable is not deformed.

5.5. Connecting Cables from the AP-IFU to external

Step1 Connect four cables to the AP-IFU: a coaxial cable (with an N-type plug), Ethernet cable, outdoor power supply cable, and ground wire.

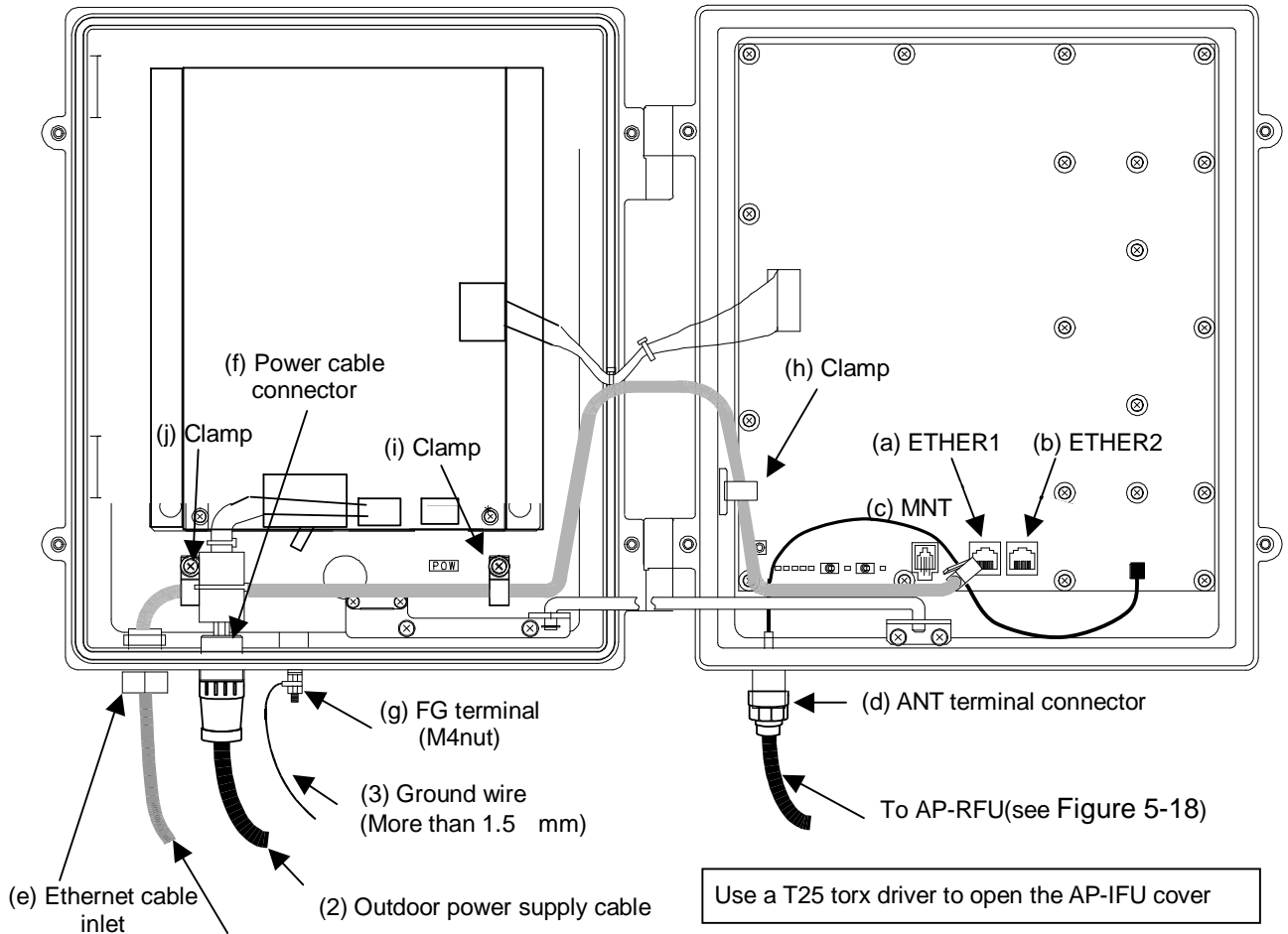


Figure 5-19 Connecting Cables to the AP-IFU

(1) Ethernet Cable	
Cable contents	Connect the (a)ETHER1 connector. Fix the cable by using (h), (i), (j) clamp in the AP-IFU. Connect the external network through the (e)Ethernet cable inlet.
Interface	100BASE-Tx
Connector shape	RJ-45
Pin assign	ETHER signal (MDI)
Cable type	Ethernet cable for outdoor
Range of applicable outer diameter	Φ5.5mm or less

(2) Power cable	
Contents	Connect the power cable connector.
Equipment specification of power	DC-48V,35W(Max)
Range of applicable outer diameter	7.0mm – 8.5mm
Connector name	NRW-203-RM-ULCSATUV (Nanaboshi Electric MFG Co.,LTD.)
Applicable Connector	NRW-203-PF8-ULCSAUV (Nanaboshi Electric MFG Co.,LTD.) (This connector is supplied with AP-IFU.)
(3) Ground wire	
Contents	Connect the ground wire.
Applicable Cable	Ground wire more than 1.5□
Applicable terminal	FG terminal M4nut.
Method of processing connector	See Subsection 5.5.1

(1) Ethernet cable

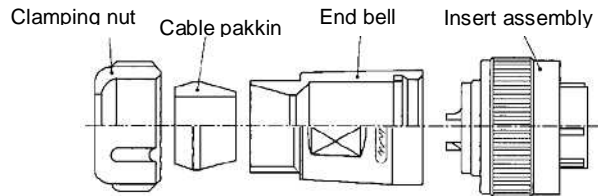


- Ground wire more than 1.5□mm
- FG terminal M4nut.
- The DC -48V power supply voltage for AP-IFU shall be SELV or TNV-1 depending on the network environment (0 or 1) acc. to IEC62102.
- The Equipment for connection to AP-IFU Ethernet-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.
- For the connection Terminal Equipment to AP-IFU and a cables suitable for outdoor use shall be installed.
- When opening the AP-IFU cover, make sure that the four special screws are loosened completely. Forcing open the cover may damage it.
- +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.
- Cover the cable connection with a cold-shrinkable sleeve to make it waterproof. Otherwise, water may get in the connection.
- 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.
- For the connection AP-IFU to AP-RFU and a coaxial cable suitable for outdoor use shall be installed.

5.5.1. Connecting the Power cable connector

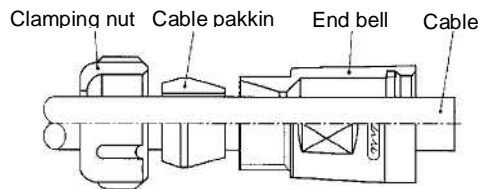
The connector manufacturer (Nanaboshi Electric MFG Co., Ltd.) recommends the following method of cable connection.

- (1) Disassemble the connector, as shown here.
 - (a) Remove the insert assembly from the end bell by turning the assembly counterclockwise.
 - (b) Loosen the clamping nut to remove the cable packing.

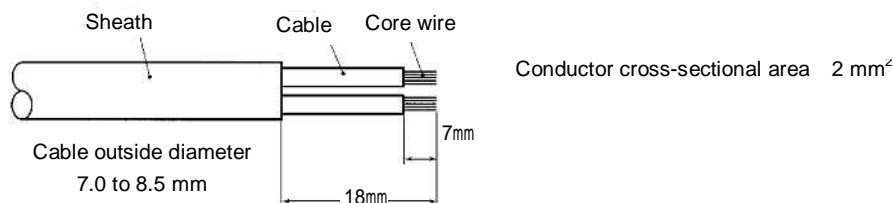


- (2) Pass the cable through the disassembled parts in the sequence shown here.

Note: Be sure that all the parts are placed in the specified sequence and in the correct direction.



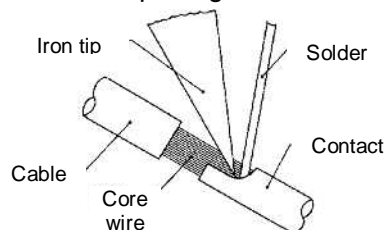
- (3) Peel the cable sheath and wires according to the dimensions specified here.



- (4) Process the ends of the cable's core wires and pretin them.

Note: Do not pretin the cable sheath.

Note: When the cable core is pretinned, it should be uniform everywhere and smaller than the diameter of the opening in the contact.



(5) Soldering

- (a) Insert the pretinned core wires into the contact's solder pot.
- (b) Using a soldering iron, heat the contact and the core wires.
- (c) Let solder flow into the gap between the contact and the core wires until the gap is filled.

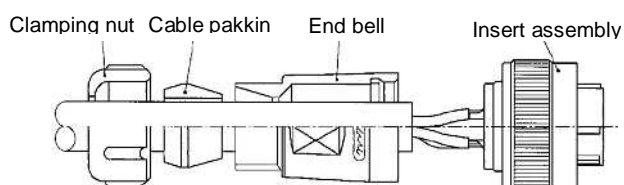
Soldering iron wattage [W]	Conductor cross-sectional area [mm ²]	Iron tip temperature []
30	2	350 to 370

(6) Assemble the connector.

- (a) Clamp the insert assembly and tighten the end bell with the specified torque.
- (b) Push the cable packing into the end bell, clamp the end bell, and tighten the clamping nut with the specified torque.
- (c) Move the cable back and forth until it moves easily (as shown). Once again, tighten the parts with the specified torque.

Where to tighten	Shell size: 20
End bell	1.0 to 1.5
Clamping nut	1.5 to 2.0

[Unit: N-m]



5.6. The confirmation of AP-IFU

Turn on the AP-IFU and check the state of the LEDs on the AP-IFU.

Table 5-1 LED State Indications

AP-IFU LED	State
POWER LED	Lit green
IFU STATE LED	Flashing green
IFU ALM LED	Off
ETHER1 LED	Lit green or flashing
ETHER2 LED	Off *1
ETHER1 AUTO LED	Off *2
ETHER2 AUTO LED	Off *3

*1 The LED lights if an Ethernet cable is connected to ETHER2.

*2 The LED lights if the ETHER1 switch is set at AUTO.

*3 The LED lights if the ETHER2 switch is set at AUTO.

5.7. Waterproofing Connectors

5.7.1. Self Bonding tape

Figure 5-20 shows how to waterproof the connection using self-bonding tape.

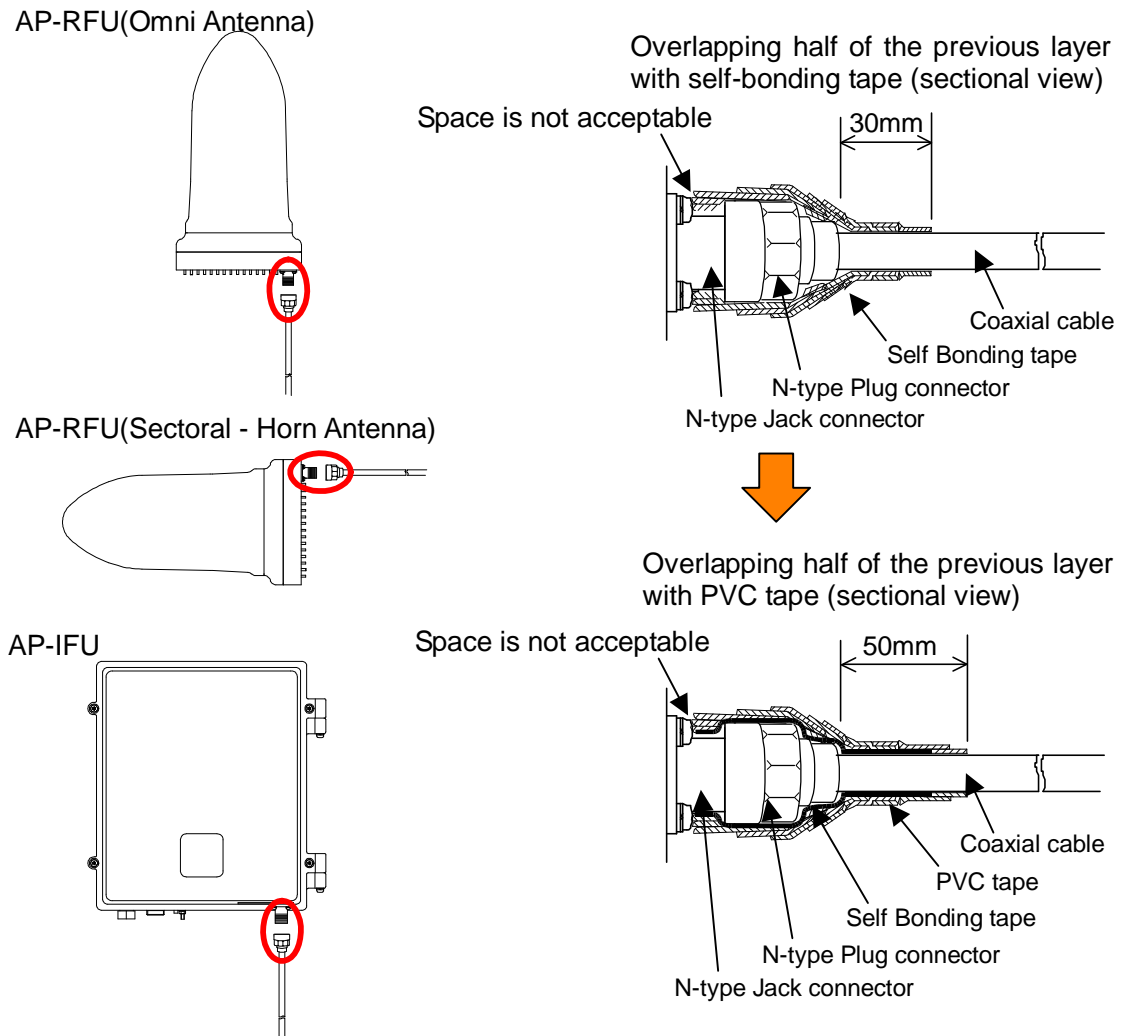


Figure 5-20 Waterproofing a Connector Using Self-Bonding Tape

Waterproofing procedure

- Step1 Wrap the self-bonding tape around the base of the N-type jack connector on the unit side one complete turn. After one turn, wrap around the coaxial cable by about 30 millimeters, overlapping one-half of the previous turn. Reverse the wrapping direction back to the base of the N-type jack connector on the unit side.
- Step2 Wrap the PVC tape for class 2 protection around the coaxial cable starting from the base of the N-type jack connector on the unit side by about 50 millimeters,

overlapping one-half of the previous turn so that the self-bonding tape is completely hidden. Reverse the wrapping direction back to the base of the N-type jack connector on the unit side.



- For the stretching margin of self-bonding tape, see the instruction manual for the product.
- Press evenly along the entire length of tape to remove air pockets.
- Make sure that there are no air pockets between layers of the self-bonding tape. Air pockets will degrade the waterproofing effect.

5.8. Connecting the AP Local Management Tool

Open the cover of the AP-IFU.

Connect the AP local management tool terminal to the MNT port of the AP-IFU using the AP local management cable as shown in Figure 5-21

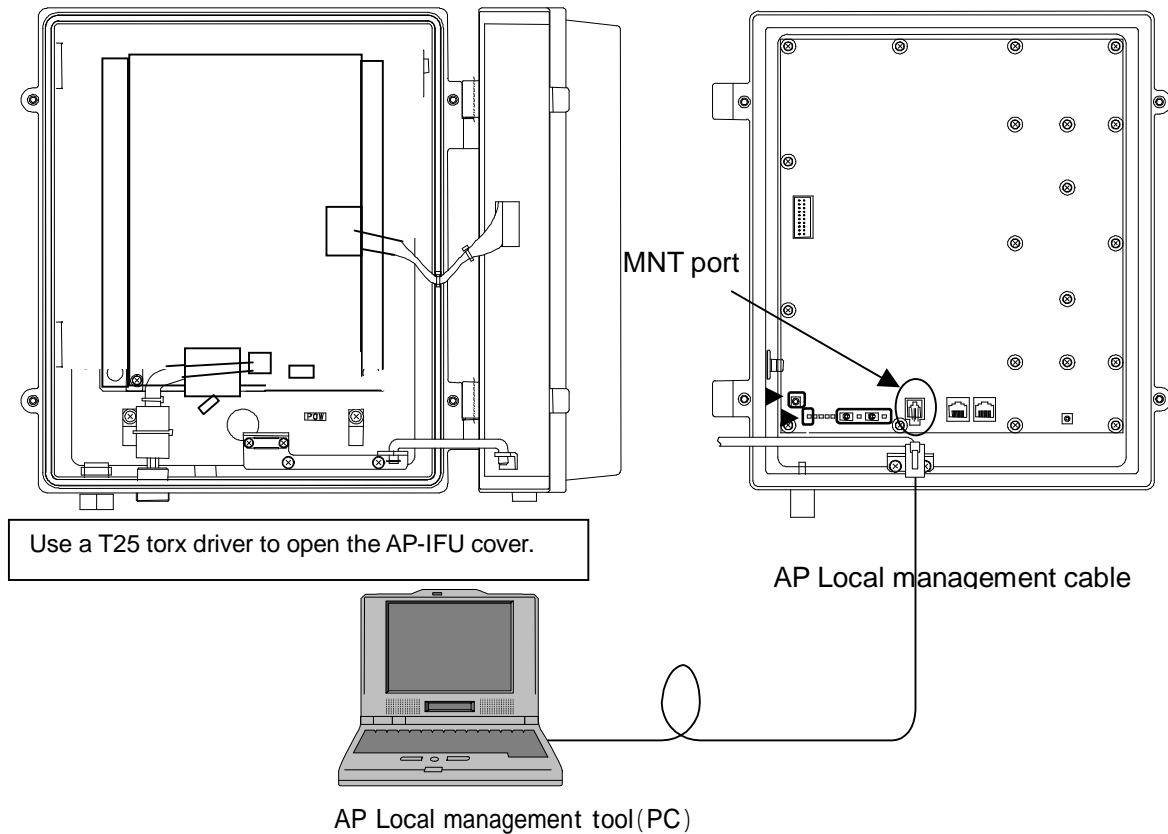


Figure 5-21 Connection

- When opening the AP-IFU cover, make sure that the four special screws are loosened completely. Forcing to open the cover may damage it.
- 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.
- 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.
- When closing the cover, be careful not to nick cables.

5.9. Configure the AP parameters

5.9.1. AP Local management tool

5.9.1.1. Configure the AP network parameters

Use the AP Local Management Tool to set the network parameters.

These settings enable the OpS to connect to the AP.

Perform the following setup procedure from the AP setup screen on the AP Local Management Tool.

- Step 1: OpS Frame Priority: Set the OpS frame priority.
- Step 2: User Frame Priority: Set the user frame priority.
- Step 3: OpS Frame VLAN-ID: Set the OpS frame Vlan-ID.
- Step 4: Radio frequency: Set the radio frequency.
- Step 5: AP IP Address: Set the AP IP address.
- Step 6: Subnet mask: Set the subnet mask.
- Step 7: Default gateway: Set the default gateway.
- Step 8: Trap Des, IP Add. 1: Set the "Reg./Not" and trap destination IP address 1. Set "Reg." or "Not" and set an IP address for trap destination IP address 1. If necessary, you can also set Trap Des, IP Add. 2 and Trap Des, IP Add. 3.
- Step 9: Ether-IF 1: Set whether to use Ether-IF 1. If necessary, you can also set Ether-IF 2.
- Step 10: Click the **Setup** button.

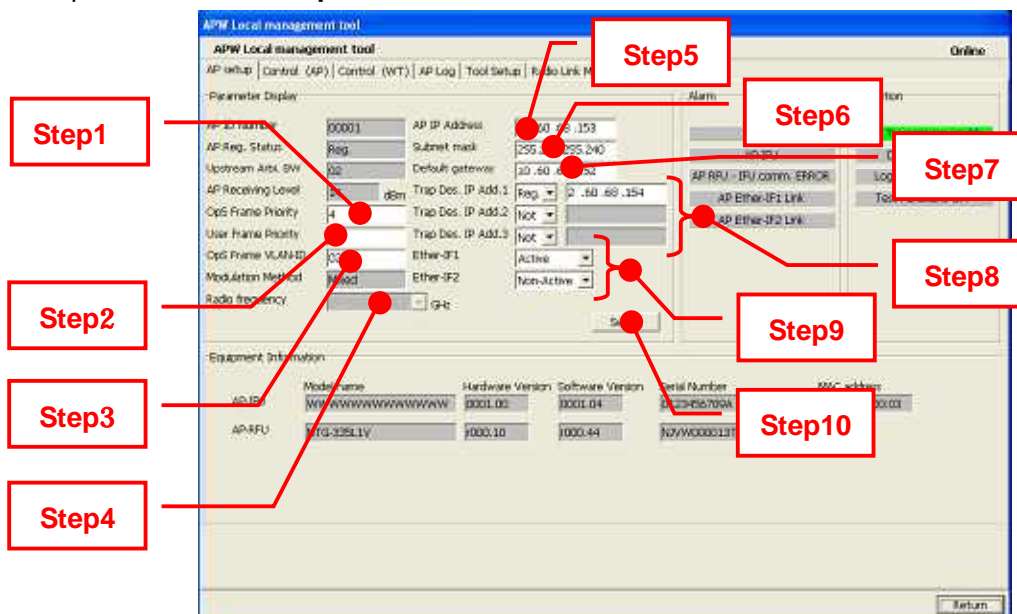


Figure 5-22 Configure the AP network

Step 11: when you click the button, a range check is performed. If the range check does not detect any error, the Confirmation dialog box appears. Click the Yes (Y) button.

If a range error is detected, a message saying that a setting value is outside the range appears.



Figure 5-23 Confirmation Dialog Box

5.9.1.2. Reset the AP

Resetting the AP-IFU enables the AP network parameter settings.

To reset the AP-RFU, on the Control (AP) screen in the AL Local Management Tool, click the **Execute** button. A confirmation dialog box appears. Clicking the **Yes (Y)** button executes a reset.

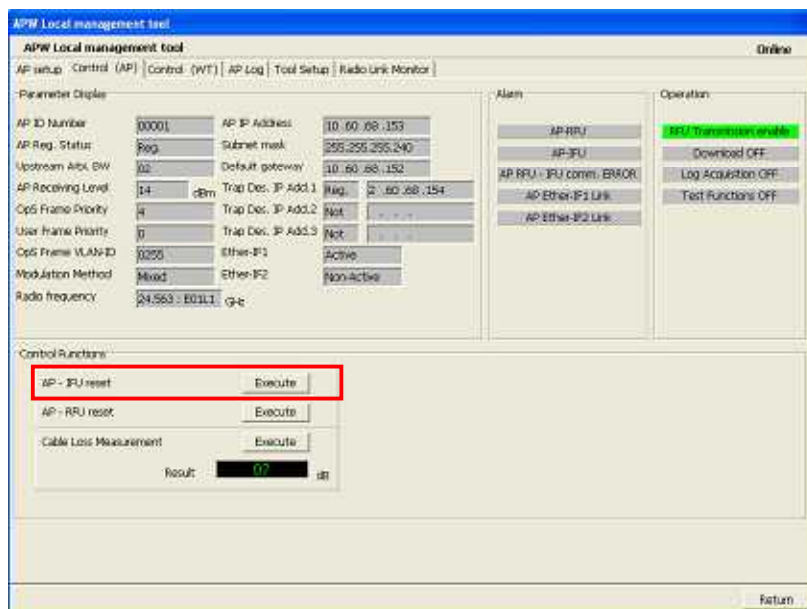


Figure 5-24 Reset the AP

5.9.1.3. Measure the cable loss

Check that the cable between the AP-IFU and the AP-RFU is connected correctly, and start cable loss measurement.

When the measurement of cable loss between the AP-IFU and the AP-RFU is completed, the value is automatically compensated for.

The cable loss compensation value is stored in the memory in the AP-RFU.

Step 1: Select the Control (AP) screen in the AP Local Management Tool.

Step 2: In the Cable Loss Measurement field, click the Execute button.

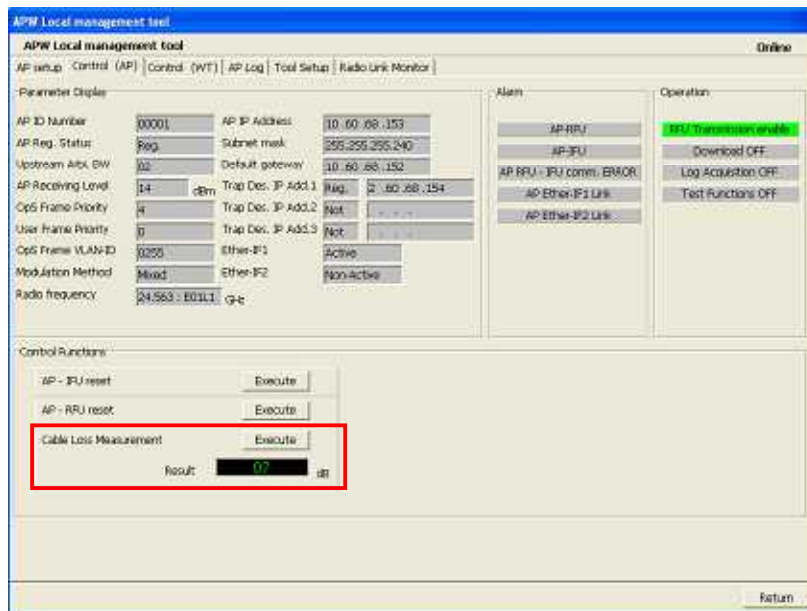


Figure 5-25 Measure the cable loss

Step 3: The Confirmation dialog box appears. Clicking the Yes (Y) button executes the measurement.

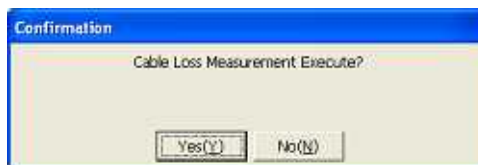


Figure 5-26 Confirmation Dialog Box

Step 4: If measurement ends normally, the Result dialog box appears. Click the OK button to end the measurement process.

You can compensate for a cable loss of 0 to 15 dB

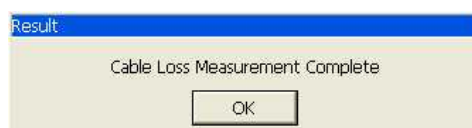


Figure 5-27 Cable Loss Measurement Complete

Step 5: If the procedure ends abnormally, the Under Control dialog box appears.

Check if the cable between the IFU and RFU is too long and there is a contact failure at the connector section.

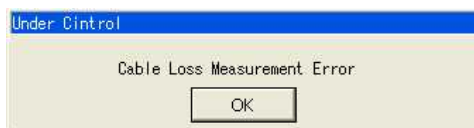


Figure 5-28 Cable Loss Measurement Error

Step 6: If the procedure ends normally, the Under Control dialog box appears.

Check if the cable between the IFU and RFU is connected correctly.

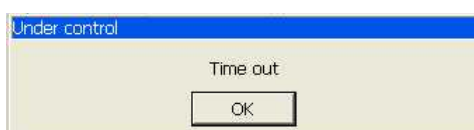


Figure 5-29 Time out

5.9.2. Register the AP ID number to OpS

Connect the OpS to the target AP and specify the setup parameters.

Procedure

Step 1: In the OpS, select the AP Parameter Setup/Control screen.

Step 2: AP ID Number: Set the AP ID number and click the Set button.

Step 3: Upstream Arbi. BW: Set the upstream arbitration bandwidth.

Step 4: AP trans. Level: Set the AP transmission level (You can set only +14dBm) and click the Set button.

Step 5: AP Reg. Status: Set the AP registration status to Registered and click the Set button.

Step 6: RFU transmission: Set the RFU transmission to Enable and click the Set button.

Step 7: Modulation Method: Set the modulation method to QPSK, 16QAM or Mixed, and click the Set button.

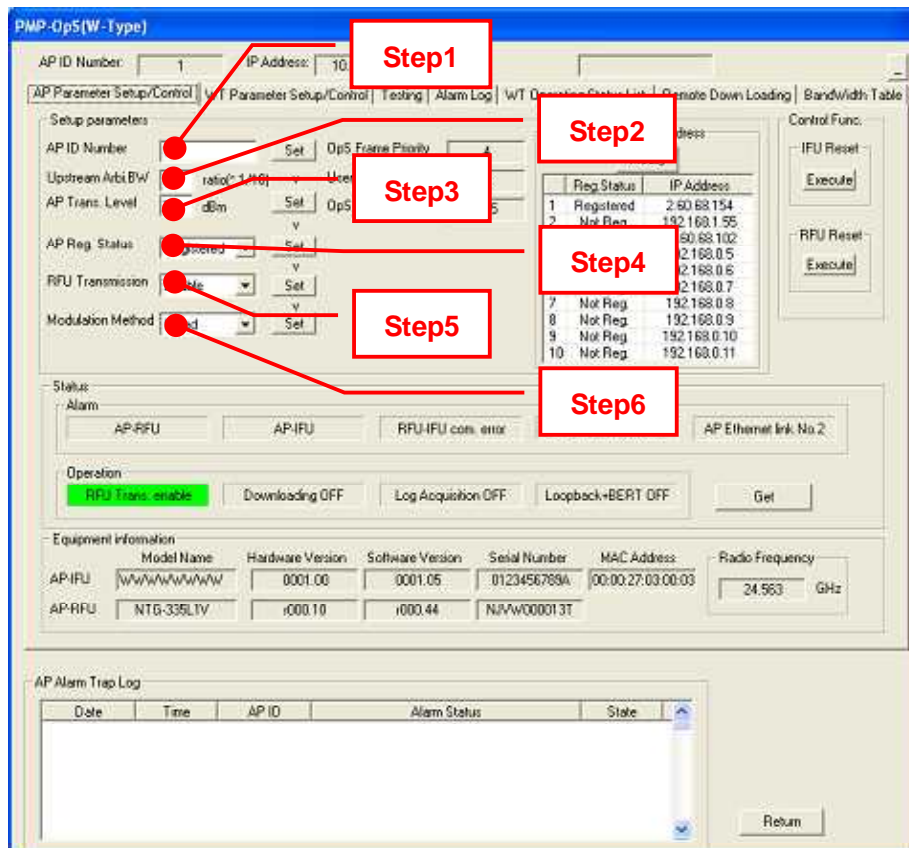


Figure 5-30 Register the AP to OpS

5.10. Check sheet of AP Installation

You can use the check sheet below to check the operation of the AP.

Procedure

(A) LED operation test

- Turn off the AP-IFU and confirm that the "POWER" LED goes out.
- Turn on the AP-IFU and check the states of all the LED.

(B) Alarm operation test

- Turn on the AP-IFU and cause the "AP power recovery" trap to occur. Confirm that the message "AP power recovery: Clear" appears in the list of OpS alarms.

(C) Control operation test

- Run the RFU Reset command from the OpS and cause the "AP RFU-IFU communication error" trap to occur. Confirm that the message "AP RFU-IFU communication error: Clear" appears in the list of OpS alarms.

Table 5-2 Check sheet

AP	Serial number	Test date	
Test type	Test condition	Check item	Pass/fail
LED operation test	When power is off	Confirm that the POWER LED is off.	
	When power is on	Confirm that the POWER LED lights green.	
		Confirm that the IFU STATE LED flashes green.	
		Confirm that the IFU ALM LED is off.	
		Confirm that the ETHER1 LED lights green or flashes.	
		Confirm that the ETHER2 LED is off. *1	
		Confirm that the ETHER1 AUTO LED is off. *2	
Confirm that the ETHER2 AUTO LED is off. *3			
Alarm operation test	OpS	Confirm that the message "AP power recovery: Clear" appears in the list of OpS alarms.	
Control operation test	Running RFU Reset from OpS	Confirm that the message "AP RFU-IFU communication error: Clear" appears in the list of OpS alarms.	

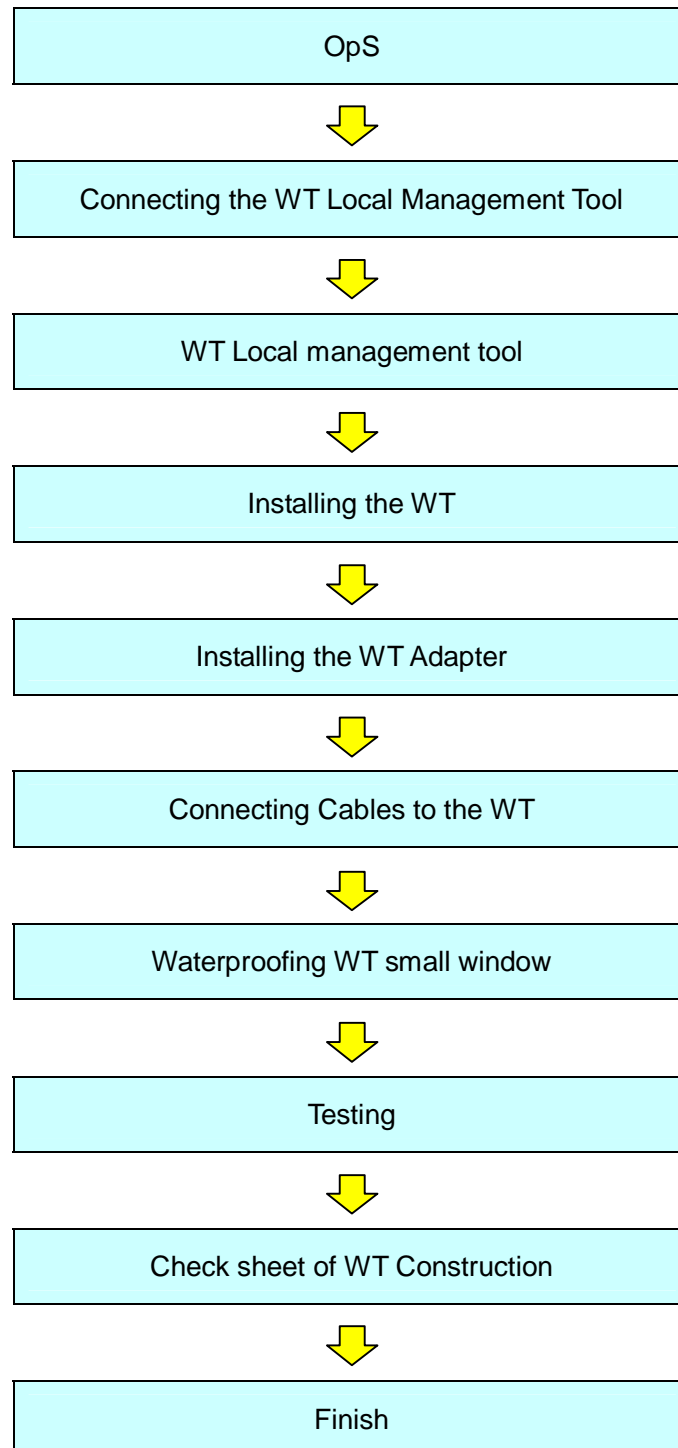
*1 The LED lights if an Ethernet cable is connected to ETHER2.

*2 The LED lights if the ETHER1 switch is set at AUTO.

*3 The LED lights if the ETHER2 switch is set at AUTO.

6. CONSTRUCTING A POINT-TO-MULTIPOINT SYSTEM (WT)

6.1. Overview



6.2. OpS

6.2.1. Register the WT ID number to AP

Connect the OpS to the target AP and register a WT.

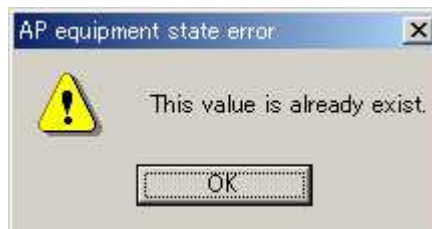
Step 1: In the OpS, select the WT Parameter Setup/Control tab.

Step 2: Select the WT from "Select WT ID number."

Step 3: Specify the setup parameters.

- VLAN-TAG Cont: Set the VLAN-TAG Cont to Transparent.
- Authen Param: Set the authentication parameter.
- Serial number: Set the serial number and click the **Set** button.
- WT Reg. Status: Set the WT registration status to Registered and click the **Set** button.
- Modulation: Set the modulation to QPSK, 16QAM, or Adaptive and click the **Set** button.
- Interface Class: Set the interface class to AUTO or 10BASE and click the **Set** button.
- RFU Transmission: Set the RFU Transmission to Enable and click the **Execute** button.

The following dialog box appears since a value is already set for "RFU Transmission." Click the **OK** button.



- UP Stream Bandwidth table [Maximum Limit / Minimum Guarantee]
- Down Stream Bandwidth table [Maximum Limit / Minimum Guarantee]

Clicking the **Set** button displays a dialog box. Place checkmarks in the checkboxes and click the **Set** button.

Step 4: Set the VLAN-ID.

- VLAN-ID: Set the VLAN-ID and click the **Register** button.
- Since the VLAN-ID that has been set appears on the screen, select it.
- VLAN-ID Registration status: Set the VLAN-ID registration status to Registered.
- Service status [out of service / In service] : Set the Service status to In service

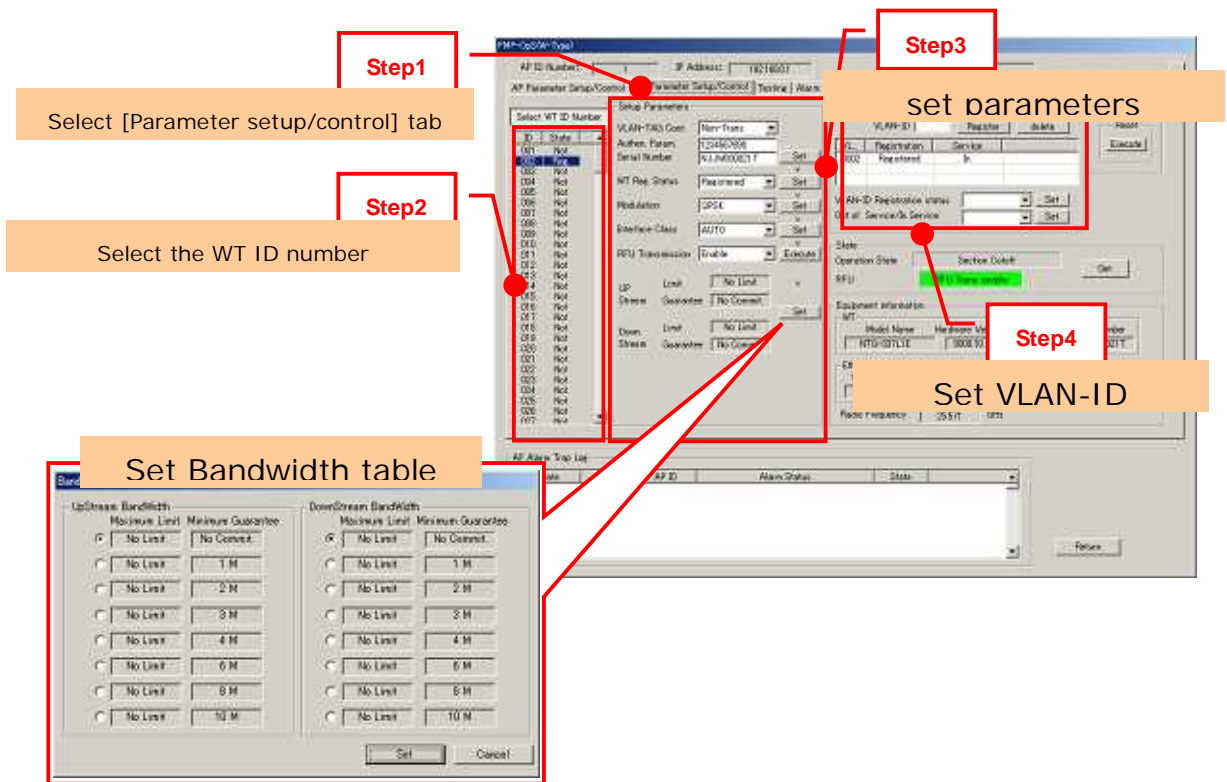


Figure 6-1 Register the WT ID number to AP

6.3. Connecting the WT Local Management Tool

Connect the WT local management tool terminal to the PC port of the WT adapter (Figure 6-2) using a straight Ethernet cable.

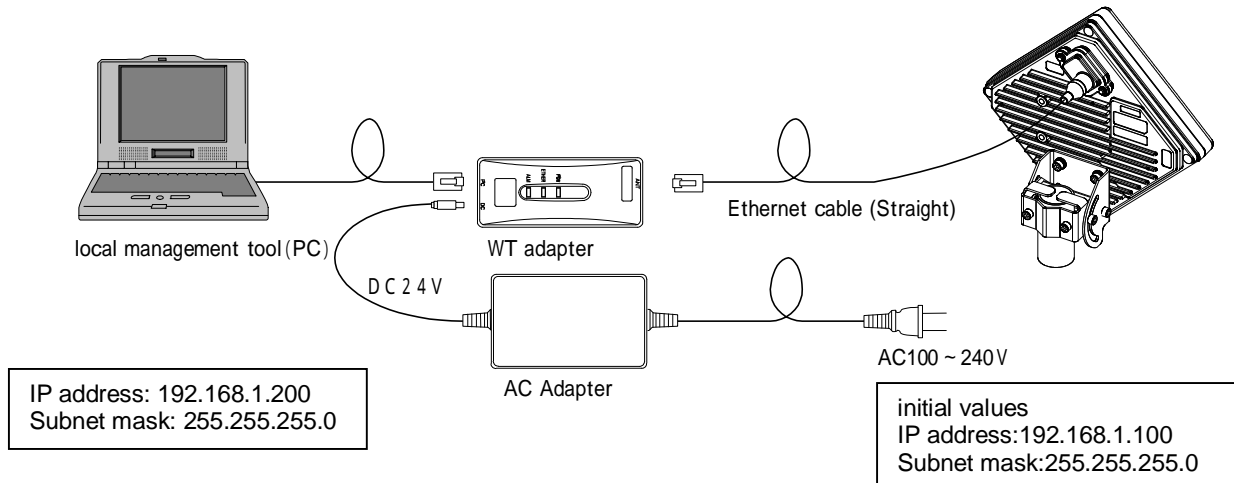


Figure 6-2 Connection

6.4. WT Local management tool

6.4.1. Configure the WT

Use the WT Local Management Tool to specify the Setup Parameters.

- Step 1: Select the Setup tab.
- Step 2: Set the WT ID number.
- Step 3: Set the AP ID number.
- Step 4: Set the authentication parameter.
- Step 5: Set the radio frequency.
- Step 6: Click the **Setup** button.

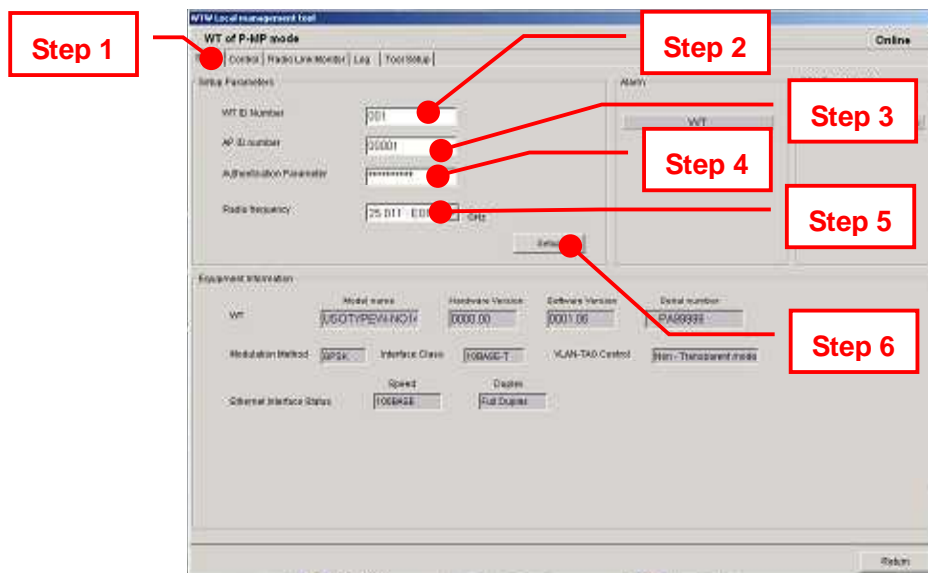


Figure 6-3 Configure the WT

6.5. Installing the WT

6.5.1. Installing the WT

Step1 Attach the WT mounting bracket to the WT using the bolts(a)and (b).

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

Step2 Secure the WT mounting bracket to the pole using the bolts.

Applicable pole diameter: From $\Phi 31.8\text{mm}$ to $\Phi 34\text{mm}$

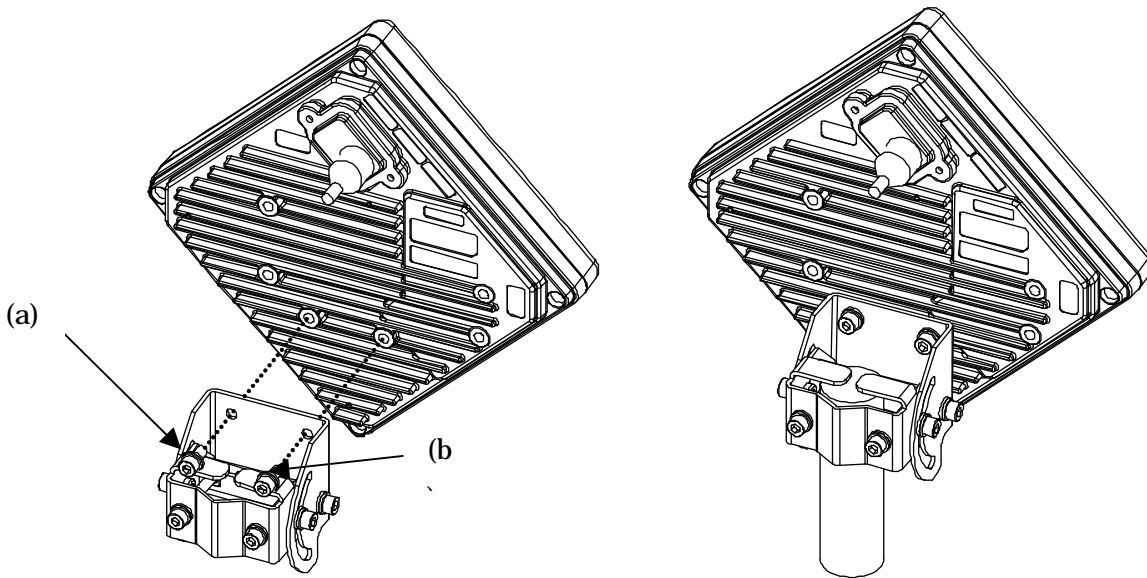


Figure 6-4 Installing the WT

A builder prepares a steel pipe by the installation place (a wall, a pole or etc.), and it install.
 The required space of installation is shown below.

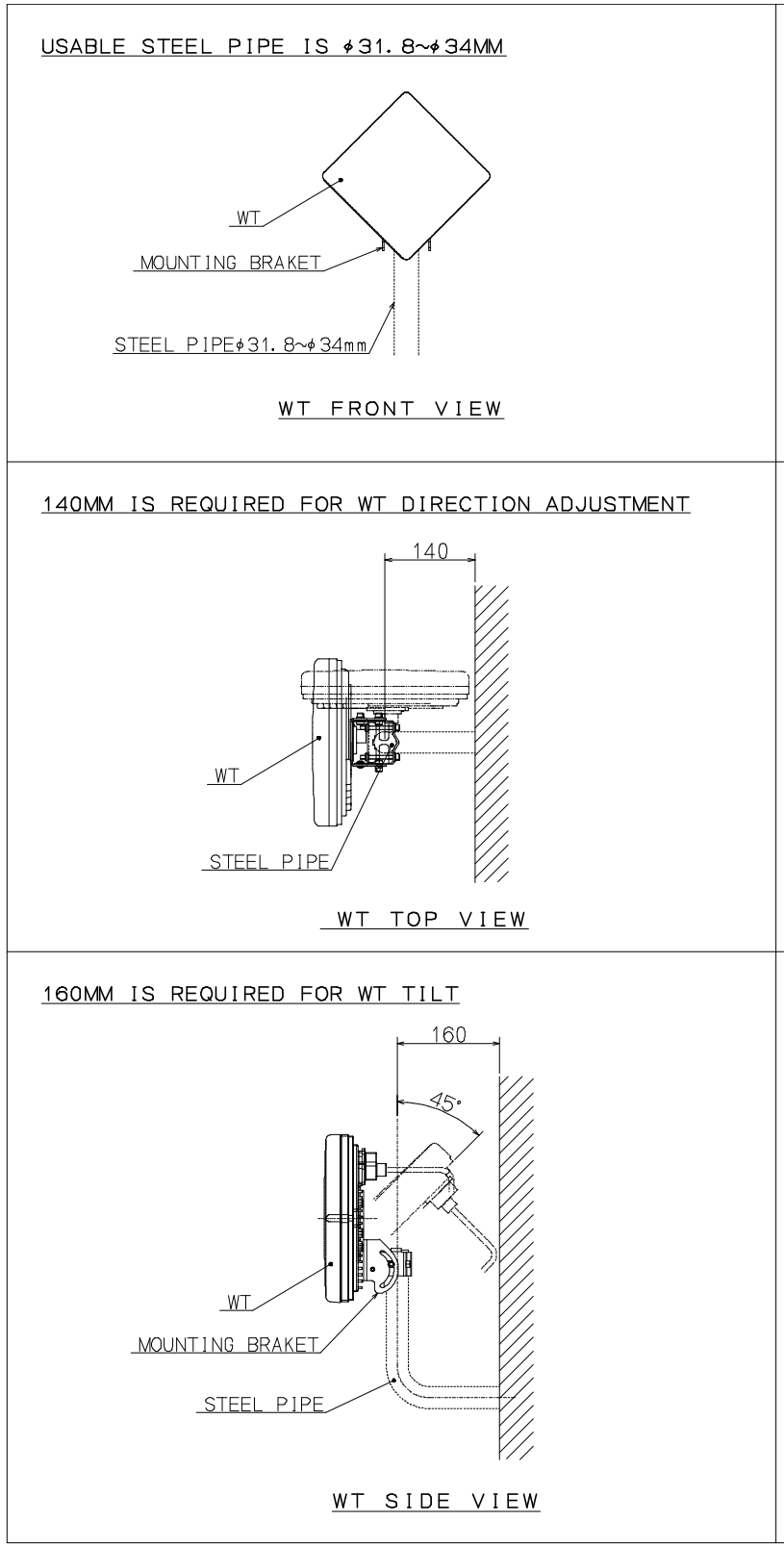


Figure 6-5 The required space of installation

6.5.2.Example of Installing the WT

(1) On a metal fence

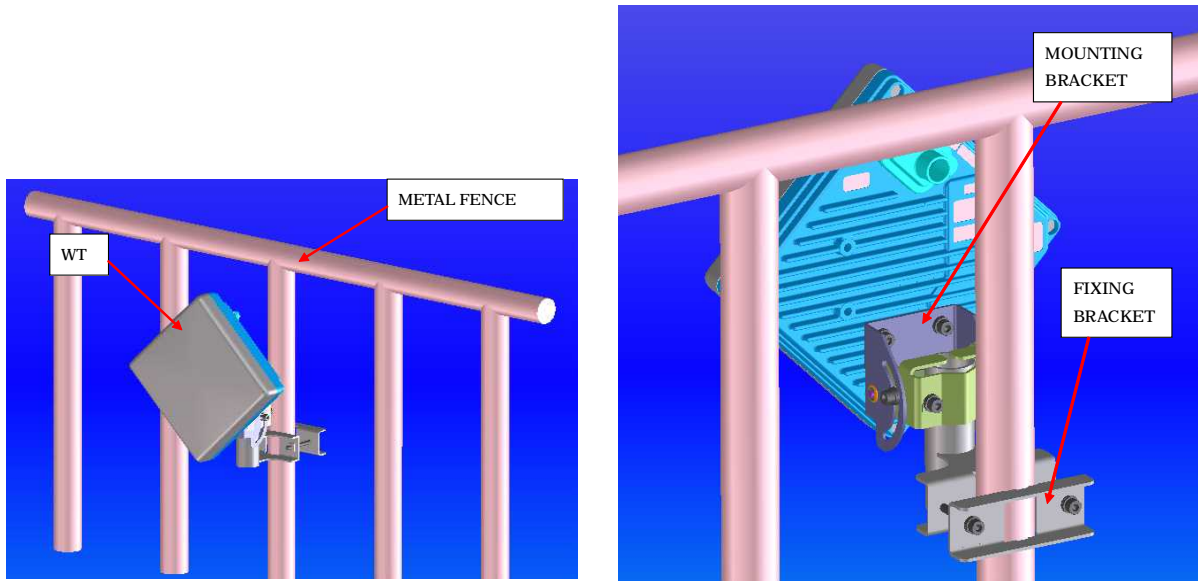


Figure 6-6 Installing on a metal fence

(2) On a house wall

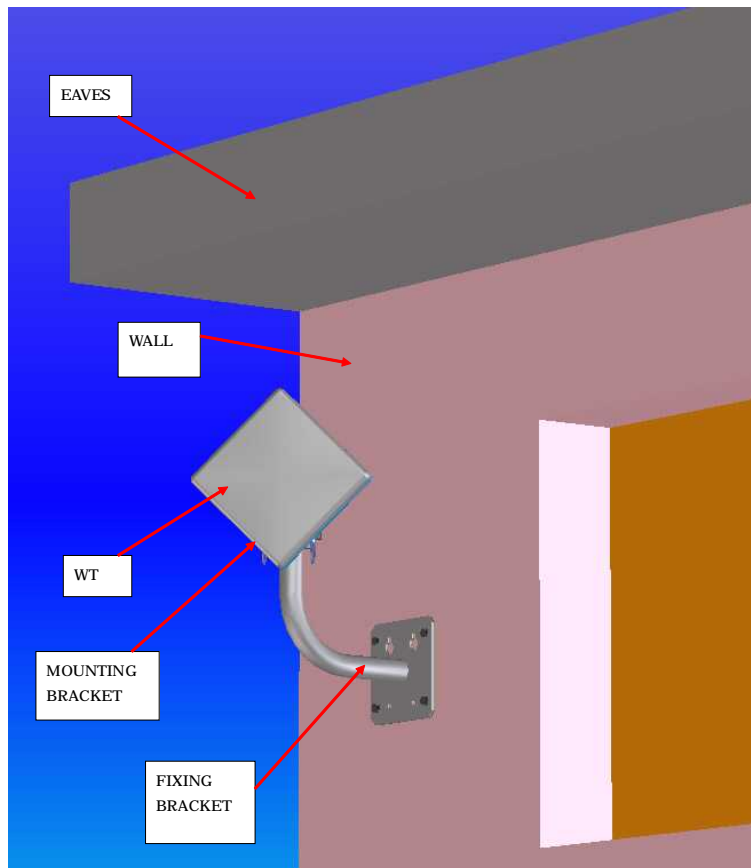


Figure 6-7 Installing on a house wall

6.5.3. Setting the WT for Vertical or Horizontal Polarization

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

For vertical polarization, position **TOP V** at the top.

For horizontal polarization, position **TOP H** at the top.

Vertical polarization

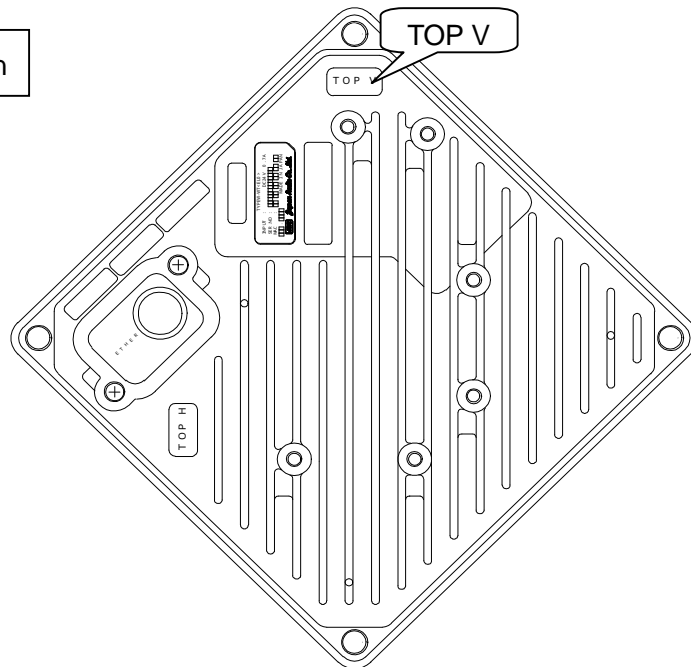


Figure 6-8 Vertical Polarization

Horizontal polarization

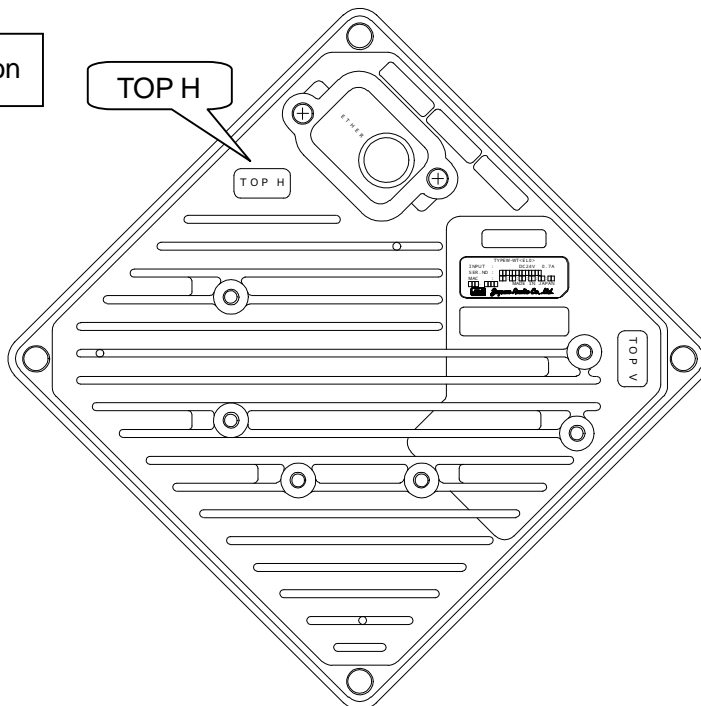


Figure 6-9 Horizontal Polarization

6.6. Installing the WT (External Antenna)

6.6.1. Installing the WT (External 30cm Antenna)

1. Φ30cm antenna installation procedure

1) According to the antenna manual of RADIO WAVES, INC., set it up on the pole. (Figure 6-10)

2) Spread specified grease on the O-ring.
The spreading method depends on the manual. (Figure 6-11)

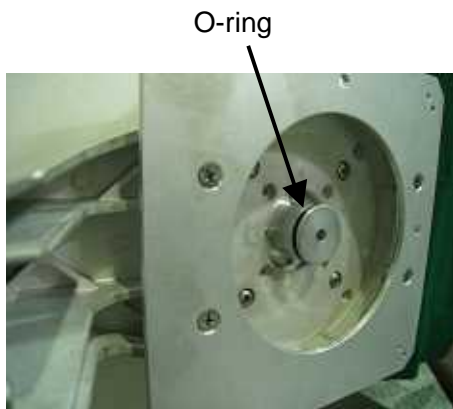


Figure 6-11



Figure 6-10 Φ30cm antenna

2. WT installation procedure

Attach the antenna adaptor to the WT with the O-ring using four M3 screws. (Figure 6-12 & Figure 6-13)

Tightening torque : 57 N·cm

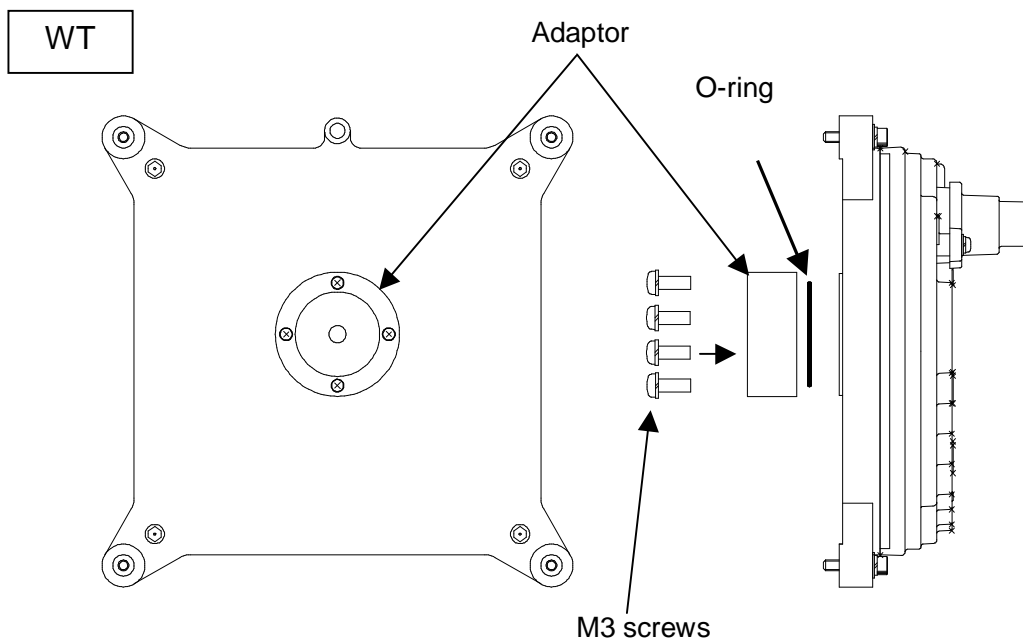
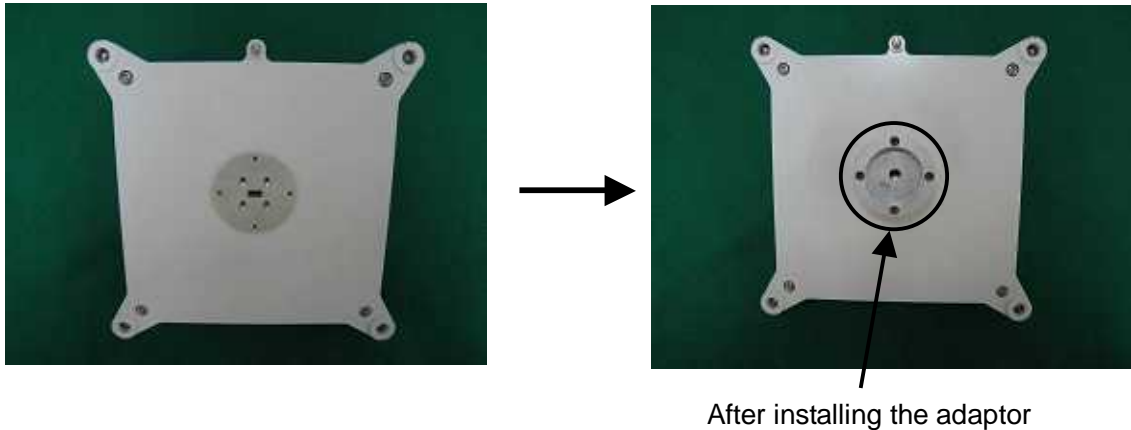


Figure 6-12



After installing the adaptor

Figure 6-13

3. Attachment of the WT to the antenna

1) V(ertical) polarization

When using the V polarization, the guide pin of the WT should be turned to right above and inserted into the V guide hole of the plate. (Figure 6-14 & Figure 6-15)



Guide pin



V polarization

Figure 6-15

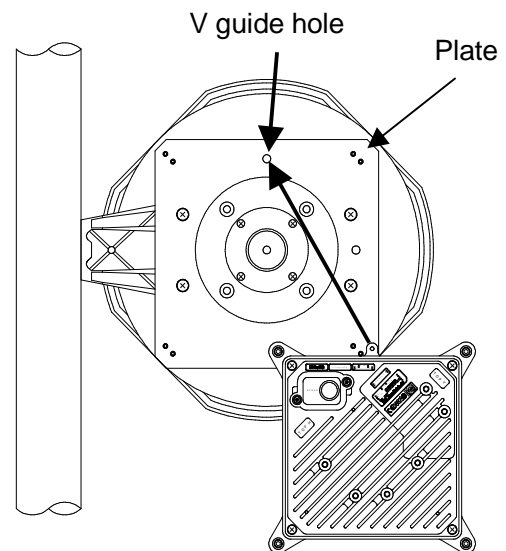


Figure 6-14

After inserting the guide pin of the WT into the guide hole, presses the WT to the plate.
While you are pressing the WT, you must be tightening the four M5 screws. (Figure 6-16)

Tightening torque : 265 N·cm

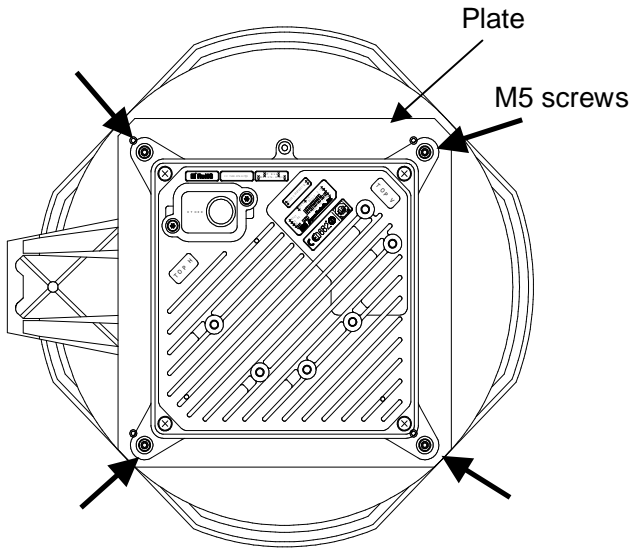


Figure 6-16

2) H(orizontal) polarization

When using H polarization, the guide pin of the WT should be rotated to the right and inserted into the H guide hole of the plate. (Figure 6-17& Figure 6-18)



Figure 6-17

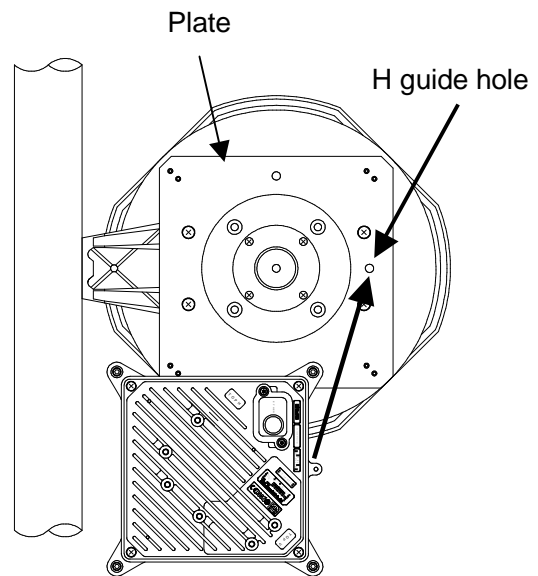


Figure 6-18

After inserting the guide pin of the WT into the guide hole, presses the WT to the plate.
While you are pressing the WT, you must be tightening the four M5 screws. (Figure 6-19)
Tightening torque : 265 N·cm

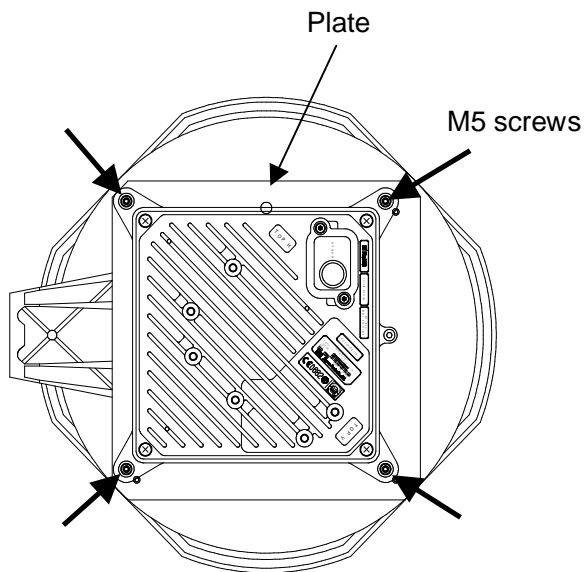


Figure 6-19

6.6.2. Installing the WT (External 60cm Antenna)

1. $\Phi 60$ cm antenna installation procedure

- 1) According to the antenna manual of RADIO WAVES, INC., set it up on the pole. (Figure 6-20)
- 2) Spread specified grease on the O-ring.
The spreading method depends on the manual. (Figure 6-21)

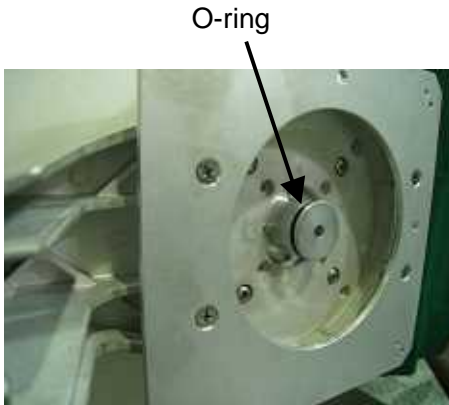


Figure 6-21



Figure 6-20 $\Phi 30$ cm antenna

2. WT installation procedure

- Attach the antenna adaptor to the WT with the O-ring using four M3 screws. (Figure 6-22 & Figure 6-23)
Tightening torque : 57 N·cm

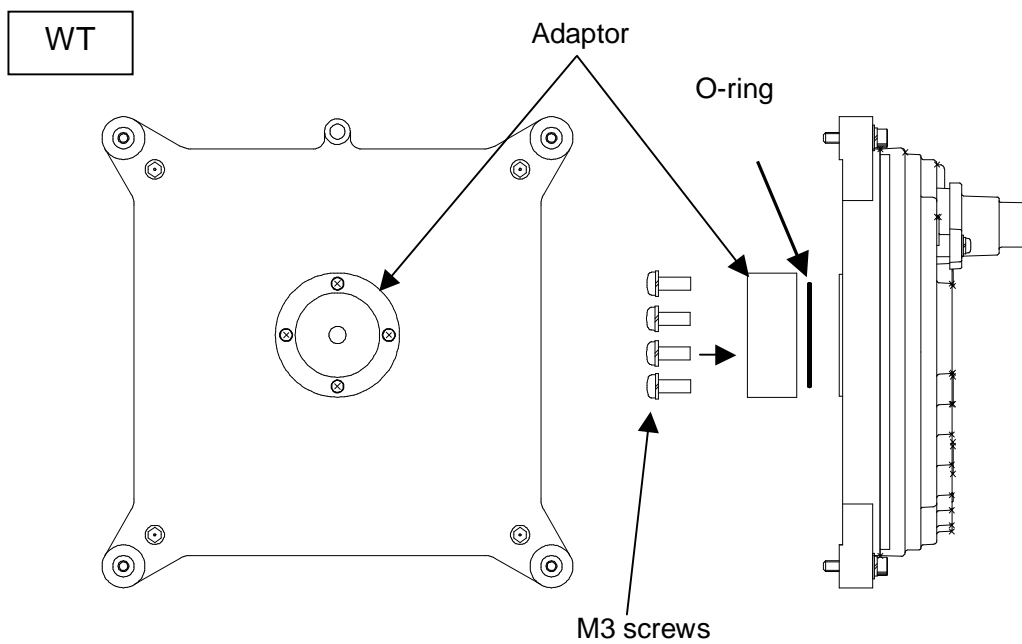
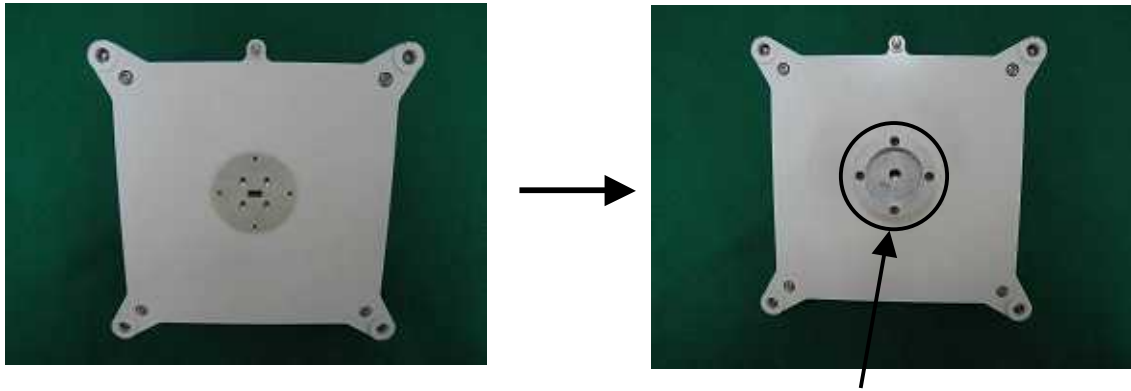


Figure 6-22



After installing the adaptor

Figure 6-23

3. Attachment of the WT to the antenna

1) V(ertical) polarization

When using the V polarization, the guide pin of the WT should be turned to right above and inserted into the V guide hole of the plate. (Figure 6-24 & Figure 6-25)



Guide pin



V polarization

Figure 6-25

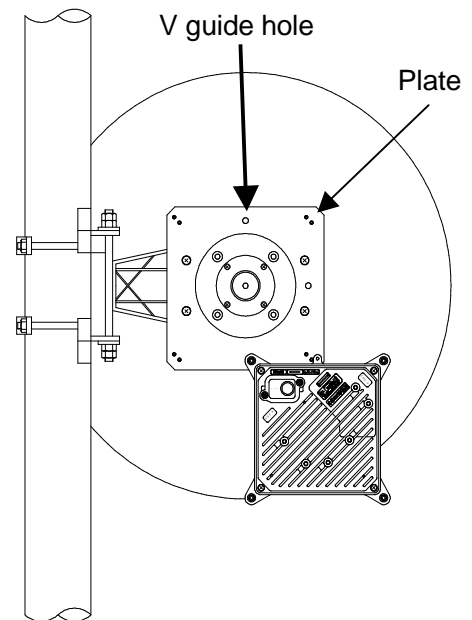


Figure 6-24

After inserting the guide pin of the WT into the guide hole, presses the WT to the plate.
While you are pressing the WT, you must be tightening the four M5 screws. (Figure 6-26)

Tightening torque : 265 N·cm

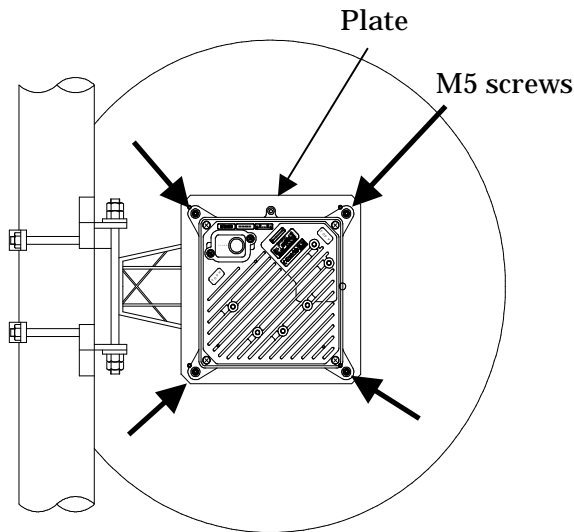


Figure 6-26

2) H(orizontal) polarization

When using H polarization, the guide pin of the WT should be rotated to the right and inserted into the H guide hole of the plate. (Figure 6-27 & Figure 6-28)



Figure 6-27

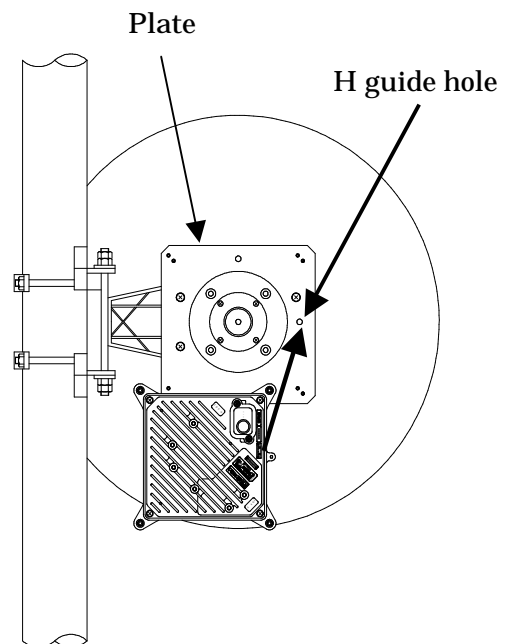


Figure 6-28

After inserting the guide pin of the WT into the guide hole, presses the WT to the plate.
While you are pressing the WT, you must be tightening the four M5 screws. (Figure 6-29)
Tightening torque : 265 N·cm

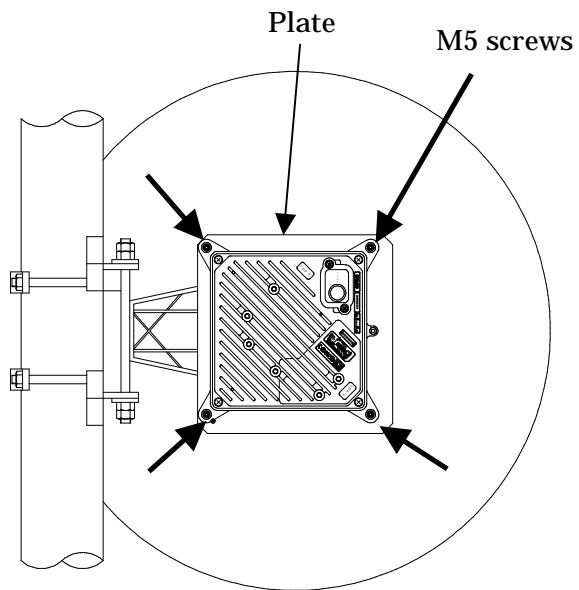


Figure 6-29

6.7. Adjusting the Direction of the WT

To adjust the direction of the WT antenna, use the Antenna direction adjustment tool together with the WT Local Management Tool.

Step1 Connecting the WT Local Management Tool and display the Receiving Level.

- See Subsection 6.7.1

Step2 Rough adjustment

- Install the Antenna direction adjustment tool.
- See Subsection 6.7.2

Step3 Fine adjustment

- See Subsection 6.7.3

Step4 Verification

- After adjust the direction, use the WT Local Management Tool to final check the receive level.

If the receive level value is within the standard range, the procedure for adjusting the antenna direction has been completed.

If the receive level value is lower than a standard value, you need to perform Step 3 again.

- Exit the WT Local Management Tool, and remove the Ethernet cable from the WT adapter.
- Remove the Antenna direction adjustment tool.

6.7.1. Connecting the WT Local Management Tool

(1) As shown in Figure 6-30, connect the WT Local Management Tool (PC) to the WT adapter.

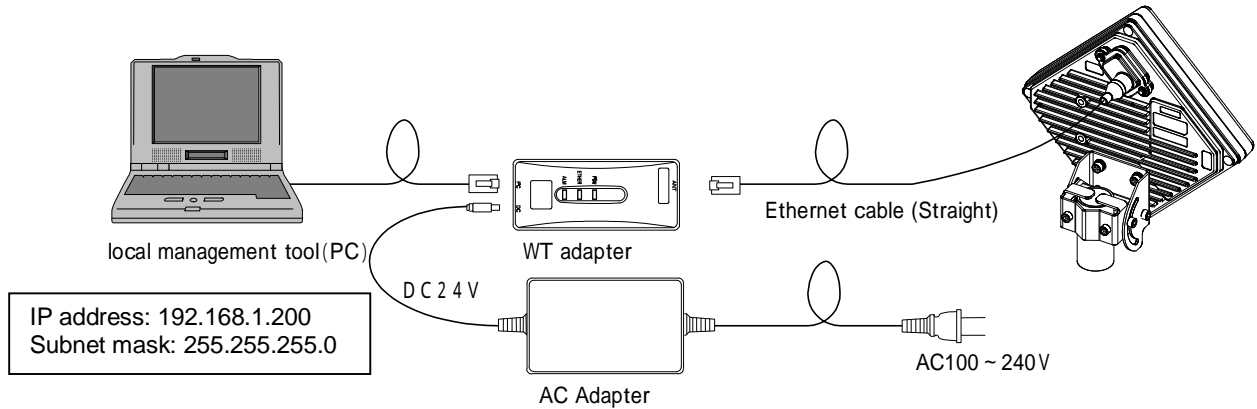


Figure 6-30 How to Install the Cabling

(2) Method of measuring the receive level of the WT (P-MP mode)

STEP1 Start the WT Local Management Tool in P-MP mode.

STEP2 Go to the Radio Link Monitor screen of the WT in P-MP mode and display the Receiving Level.

The procedure is shown in Figure 6-31.

! • The Receiving Level provides a display interval of 1 second, and you need to adjust the antenna direction slowly.

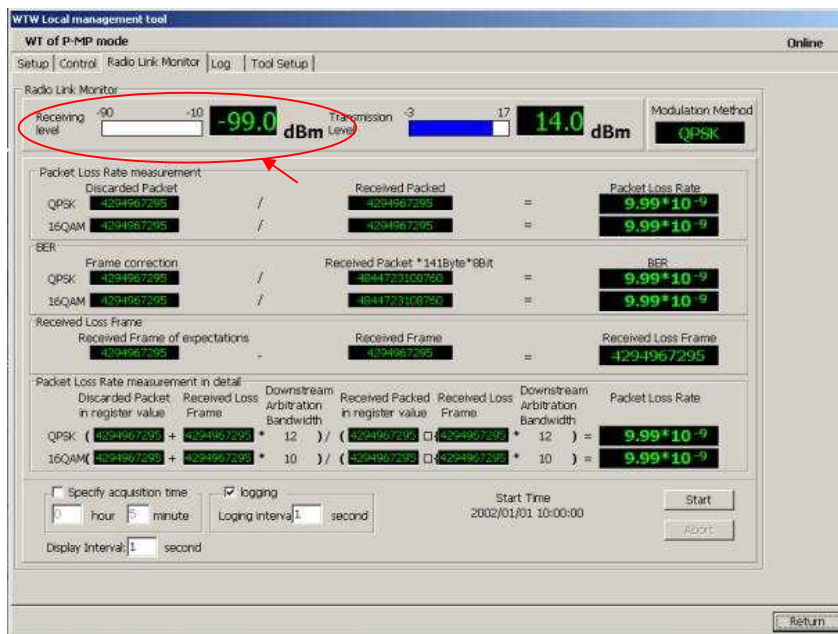


Figure 6-31 Method of Measuring the Receive Level

6.7.2. Roughly Adjusting the Direction

- Step1 As shown in Figure 6-32 and Figure 6-33, use the wing bolt (a) to attach the Antenna direction adjustment tool.
- Step2 As shown in Figure 6-34, loosen the hexagonal socket head bolts (b) and (c) securing the mounting bracket and swing the antenna left or right. Adjust the antenna approximately for the WT direction and finger-tighten the bolts (b) and (c).
- Step3 As shown in Figure 6-35, loosen the bolts (d), (e), and (f) and tilt the antenna up or down. Perform vertical-direction adjustment so that the WT of the opposite station can be seen through the scope of the Antenna direction adjustment tool.

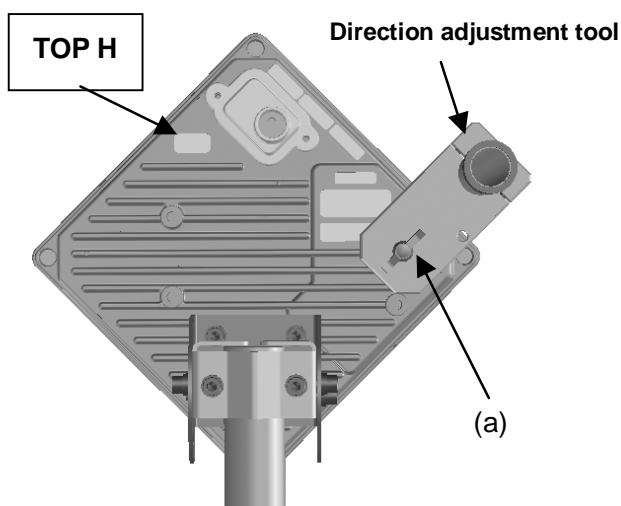


Figure 6-32 How to Install Direction Adjustment tool when the antenna type is the horizontal polarization

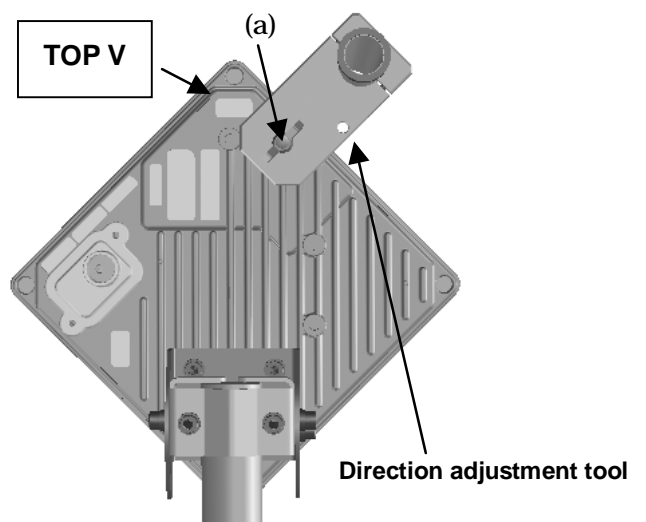


Figure 6-33 How to Install Direction Adjustment tool when the antenna type is the vertical polarization

In Figure 6-34 and Figure 6-35 is an example when the antenna type is the horizontal polarization.

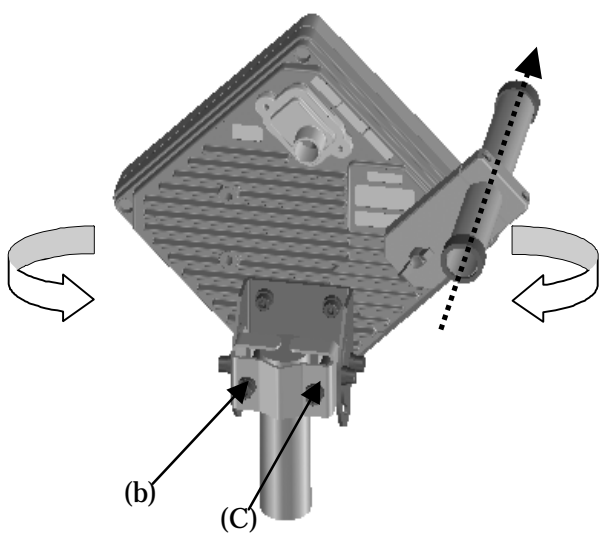


Figure 6-34 Rough-adjusting Horizontal Direction

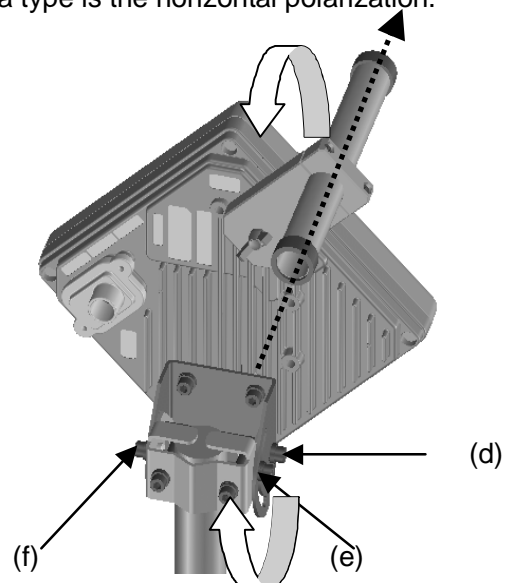


Figure 6-35 Rough-Adjusting the Vertical Direction

! • Never look at the sun directly. Doing so may seriously damage the eyes.

6.7.3. Finely Adjusting the Direction

Step 1: Horizontal direction

As shown in Figure 6-36, loosen the hexagonal socket head bolts (a) and (b) securing the mounting bracket and swing the antenna left or right. Adjust the antenna direction so that the receive level indicates the maximum value, and finger-tighten the bolts (a) and (b).

Step 2: Vertical direction

As shown in Figure 6-37, loosen the hexagonal socket head bolts (c), (d), and (e) securing the mounting bracket and tilt the antenna up or down. Adjust the antenna direction so that the receive level indicates the maximum value. Tighten the bolts at a point showing the maximum receive level (tightening torque: 8.5N•m). Tighten the bolts (c), (d), and (e) and make sure that the point showing the maximum receive level is maintained. This concludes the procedure for vertical-direction adjustment.

Step 3: Horizontal direction

Finely adjust the horizontal direction by slightly loosening the bolts (a) and (b) again. Once again, locate the point where the receive level reaches the maximum value and hold that point. Finally, tighten the bolts (a) and (b) (tightening torque: 8.5N•m) while making sure that the point showing the maximum receive level is maintained. This concludes the procedure for horizontal-direction adjustment.

The figures show examples of horizontal polarization setup.

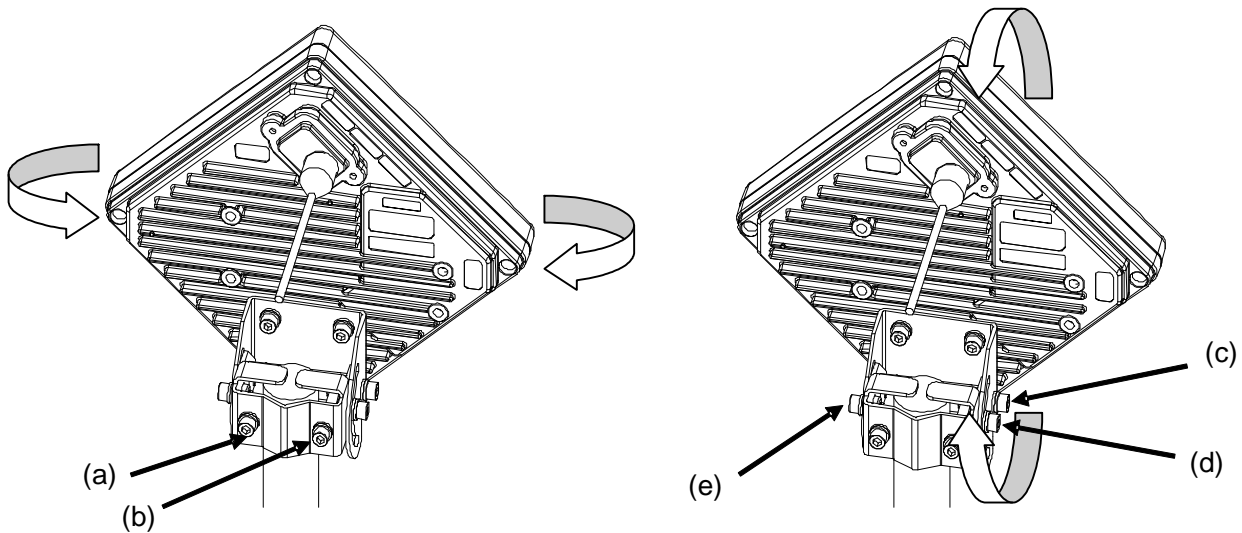


Figure 6-36 Finely Adjusting the Horizontal Direction Figure 6-37 Finely Adjusting the Vertical Direction

Note : When adjusting the antenna direction
When adjusting the direction, you might mistakenly take the antenna's side lobe as the maximum receive level. For fine adjustment, therefore, you should move the antenna some more after the receive level has reached the maximum value to make sure that you have not caught a side lobe.

6.7.4. The receive level and the distance

For the receiving AP-RFU (Sectoral-Horn Antenna) in a point-to-multipoint system, the receiving level at clear sky and the distance are related as shown in Figure 6-38.

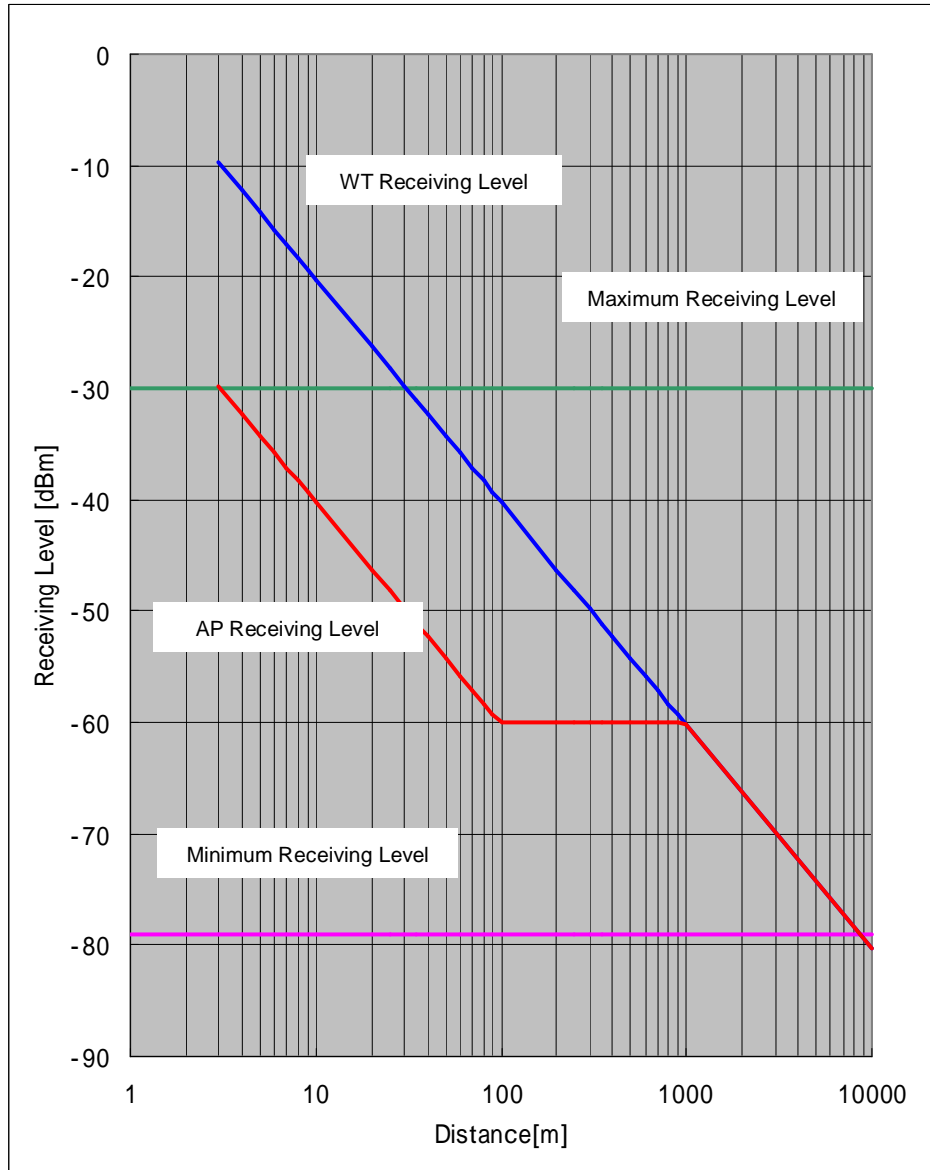


Figure 6-38 Receiving Level and Distance (Sectoral QPSK)

Transmission level (QPSK)	14	[dBm]
Frequency	26	[GHz]
Antenna gain[TX+RX]	46.5	[dBi]
TX Sectoral Antenna Gain:15.5dBi _{TYP}		
RX WT Antenna Gain:31dBi _{TYP}		

Free space loss L_p [dB]

$$[m] = \frac{c [m]}{f [Hz]}$$

$$L_p = 20 \log \left[\frac{4}{d} \right]$$

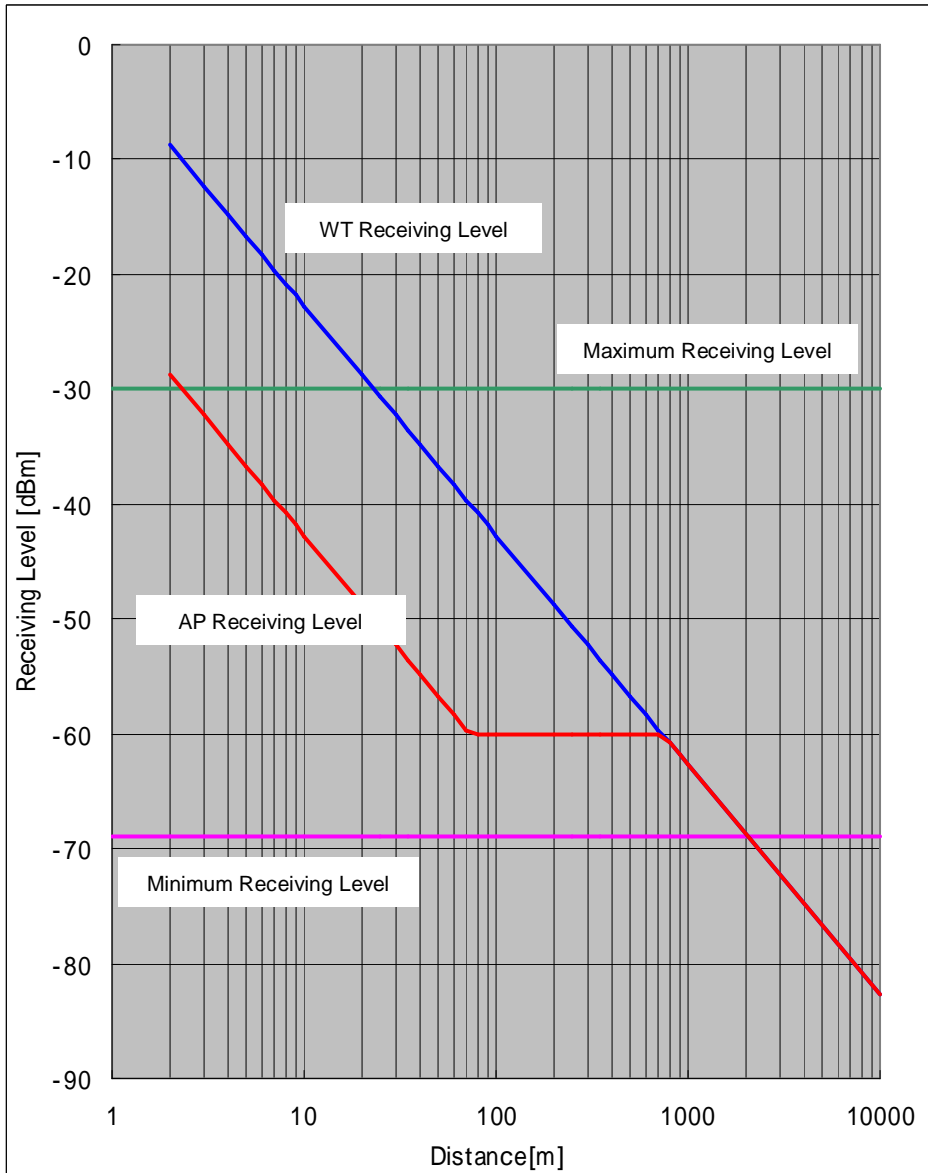


Figure 6-39 Receiving Level and Distance (Sectoral 16QAM)

Transmission level (16QAM)	11.5	[dBm]
Frequency	26	[GHz]
Antenna gain[TX+RX]	46.5	[dBi]
TX Sectoral Antenna Gain:15.5dBi _{TYP}		
RX WT Antenna Gain:31dBi _{TYP}		

Free space loss L_p [dB]

$$[m] = \frac{c[m]}{f[Hz]}$$

$$L_p = 20 \log \left[\frac{4}{d} \right]$$

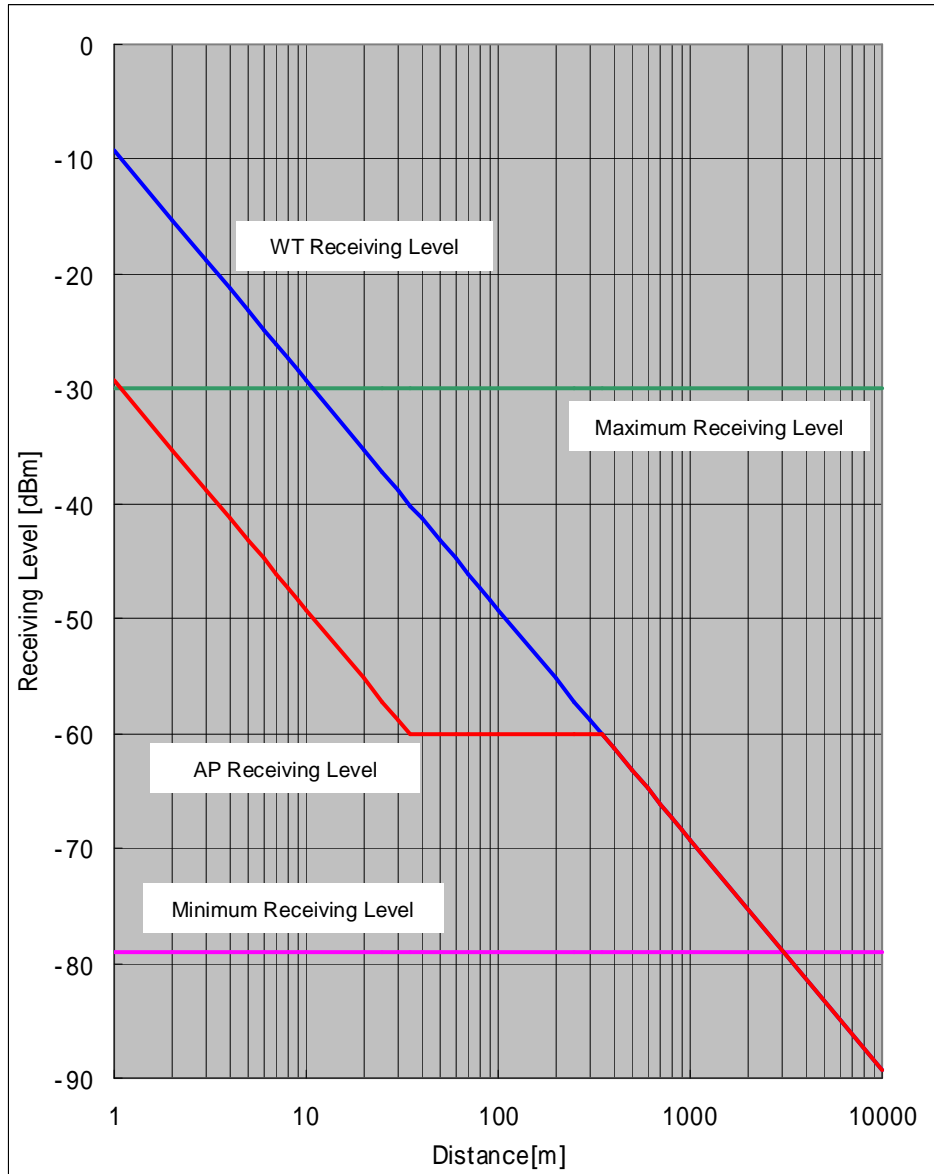


Figure 6-40 Receiving Level and Distance (Omni QPSK)

Transmission level (QPSK)	14	[dBm]
Frequency	26	[GHz]
Antenna gain[TX+RX]	37.5	[dBi]
TX Sectoral Antenna Gain:6.5dBi _{TYP}		
RX WT Antenna Gain:31dBi _{TYP}		

Free space loss L_p [dB]

$$[m] = \frac{c[m]}{f[Hz]}$$

$$L_p = 20 \log \left[\frac{4}{d} \right]$$

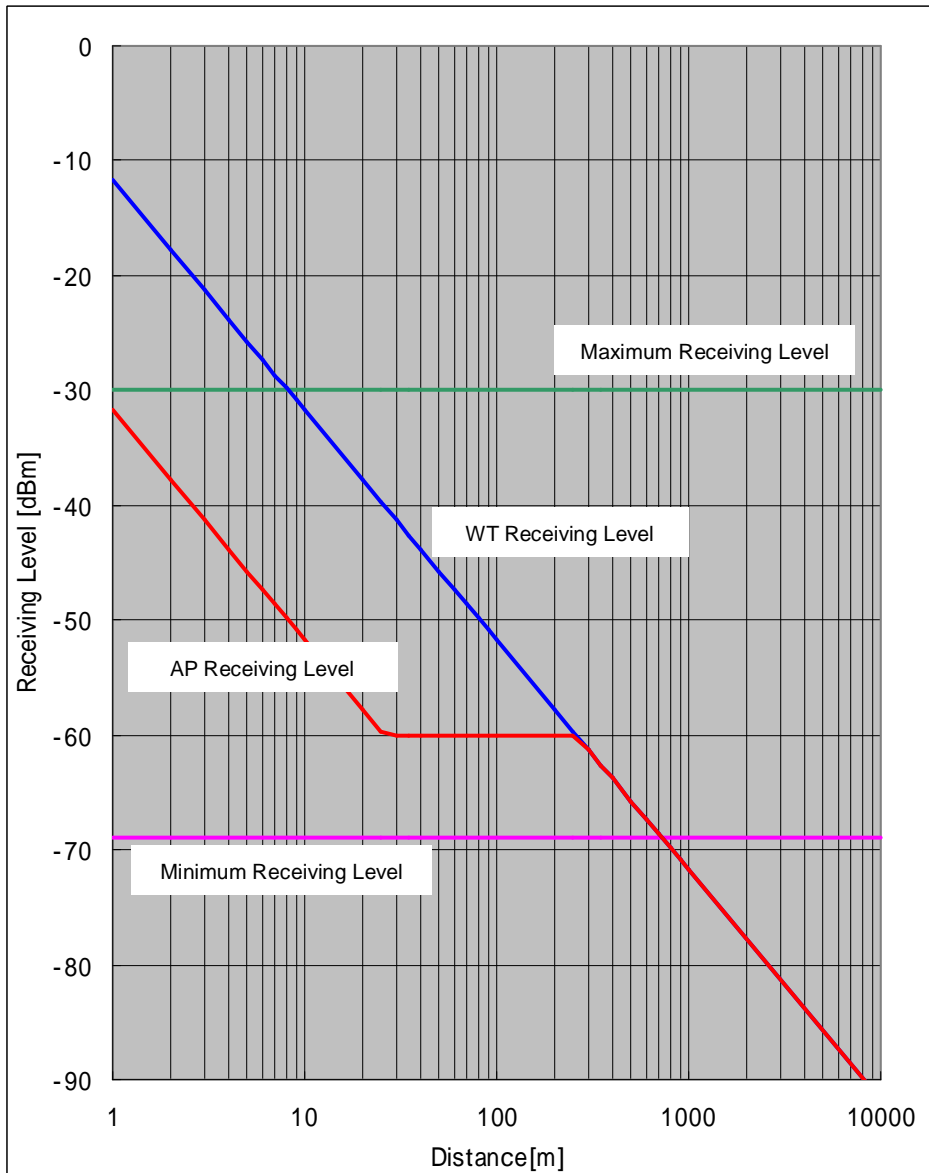


Figure 6-41 Receiving Level and Distance (Omni 16QAM)

Transmission level(16QAM)	11.5 [dBm]	
Frequency	26 [GHz]	
Antenna gain[TX+RX]	37.5 [dBi]	
TX Sectoral Antenna Gain:6.5dBi _{TYP}		
RX WT Antenna Gain:31dBi _{TYP}		

Free space loss L_p [dB]

$$[m] = \frac{c [m]}{f [Hz]}$$

$$L_p = 20 \log \left[\frac{4 d}{\lambda} \right]$$

6.8. Installing the WT Adapter

WT Adapter is installed in indoor

It is an example of installing the appended wood screw.

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.

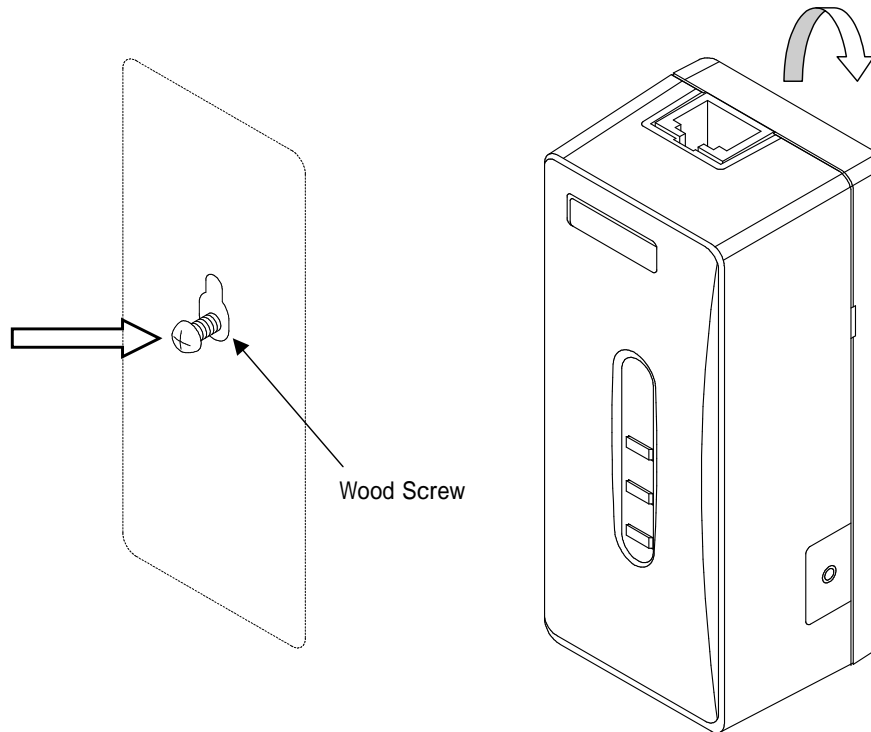


Figure 6-42 Installing the WT Adapter on the Wall

6.9. Connecting Cables to the WT

Use an Ethernet cable (straight) to connect the WT and the WT adapter as shown in Figure 6-43.

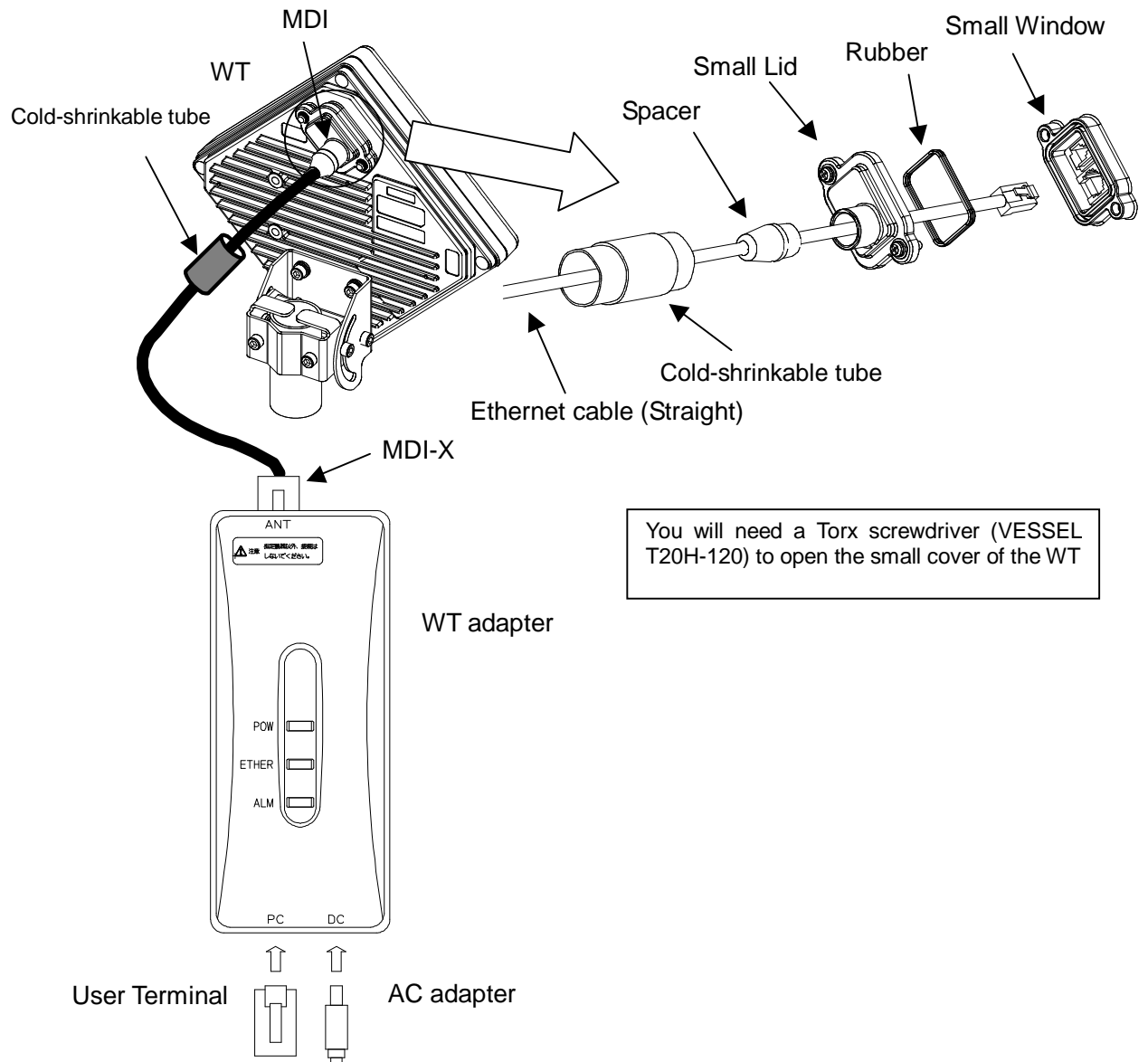


Figure 6-43 Connecting Cables to the WT

(1) Connected cable between WT and ANT port of WT adapter

Cable	
Cable type	Ethernet cable for outdoor, straight
Range of applicable outer diameter	φ5.0 mm ~ 5.7mm
Cable length	50m (maximum)
Connector of both side	
Shape	RJ-45
Cable connection	Straight connection - WT : MDI - ANT port of WT adapter : MDI-X An Ethernet cable has eight signal lines. Four lines are used to carry Ethernet signals. The remaining four lines are used as power lines and LED control lines.

(2) Connect the user terminal to PC port of WT adapter

Interface	
Interface	10BASE-T / 100BASE-TX
Connector	
Shape	RJ-45
Pin assign	Ethernet signal (MDI-X)
Cable	
Communication terminal	Cable connection
PC	straight
HUB	crossover
ROUTER	straight

(3) Connect the AC adapter to DC port to the WT adapter



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



- 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.
- When closing the small window, make sure that the rubber packing of the small window is free from any foreign matter.
- The cable connecting the WT and WT adapter is a straight cable. Wrong connection may damage the unit.
- The Equipment for connection to WT adapter PC-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.
- For the connection WT adapter to WT and a cable suitable for outdoor use shall be installed.

6.10. Waterproofing WT small window

- (1) Pass the Ethernet cable through the cold-shrinkable tube (a) from the bonded portion of the spiral tube. Pay attention to the insertion direction (Figure 6-45).

Applicable LAN cable diameter: 5.0 mm to 5.7 mm

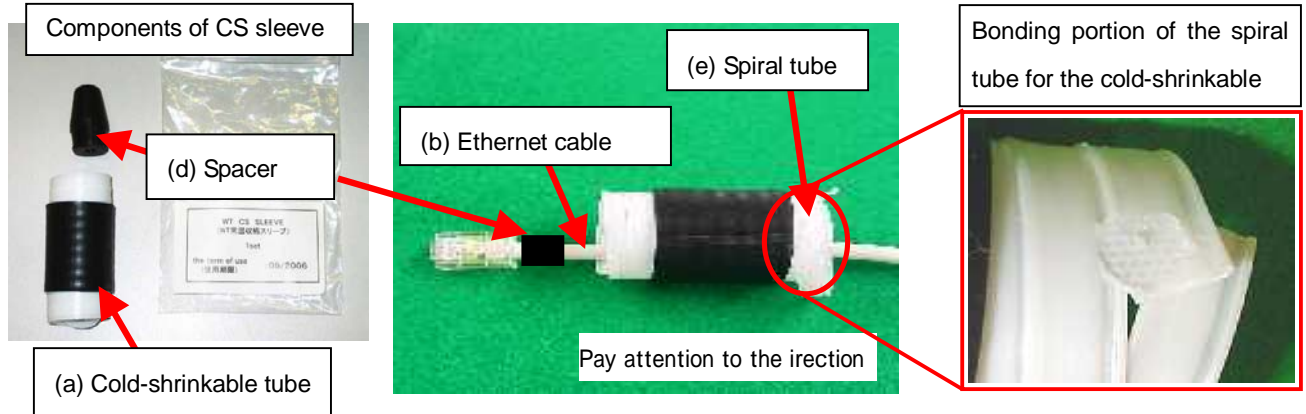


Figure 6-44

Figure 6-45

- (2) Connect the Ethernet cable to the WT (Figure 6-46).
- (3) Using cable ties (c) or the like, secure the Ethernet cable to the supporting bracket. Attach the cable ties 70 to 100 mm from the end of the supporting bracket. The cable is approximately 300 mm long measured from the cable joint (with a diameter of approximately 200 mm) to the first cable tie (Figure 6-47).



Figure 6-46

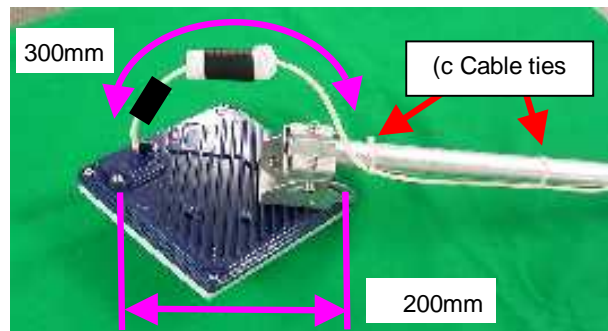


Figure 6-47



- Never allow the inside of the small window to become wet. Dampness may cause a malfunction. Connect the Ethernet cable perpendicular to the WT. Failure to do so will spoil the waterproofing effect, resulting in a device malfunction.

Cable perpendicular
to the WT



Bent cable



(4) Mounting spacer (d)

- Mount the spacer on the Ethernet cable .
- Make sure that the spacer is fully inserted in the small Lid of the WT(Figure 6-49).

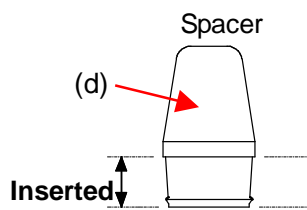


Figure 6-48



Figure 6-49



- Insert the spacer into the small window fully. Partial insertion of the spacer will spoil the waterproofing effect.

(5) Mounting cold-shrinkable tube (a)

- Place the cold-shrinkable tube on the spacer and small Lid (Figure 6-50).
- Butt the end of the cold-shrinkable tube against the base of the small Lid. Pulling white spiral tube (e) to the very edge of the cold-shrinkable tube eases the subsequent procedure (Figure 6-50).
- Pull the spiral tube to mount the edge of the cold-shrinkable tube on the small Lid (Figure 6-51). Make sure that there is no gap between the cold-shrinkable tube and the base of the small Lid and between the spacer and the small Lid.
- Pull the spiral tube to mount the cold-shrinkable tube, paying attention so the spacer is not lifted (Figure 6-52 and Figure 6-53). Make sure that the spacer is not protruded from the cold-shrinkable tube. The top of the cold-shrinkable tube should be 5 mm or less from the top of the spacer.



Figure 6-50



Figure 6-51

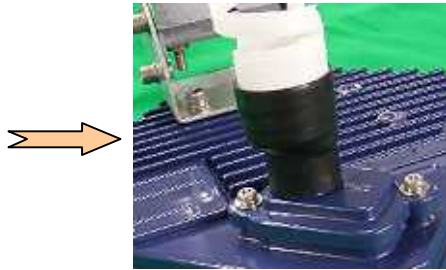


Figure 6-52

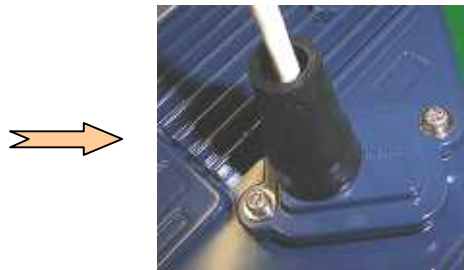




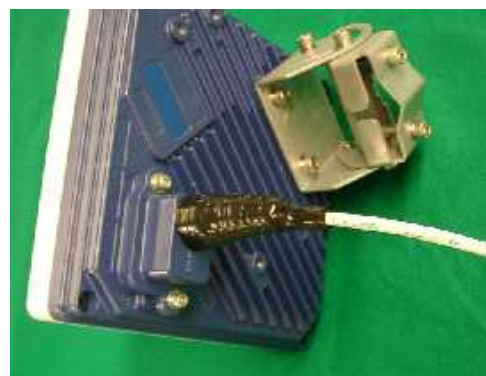
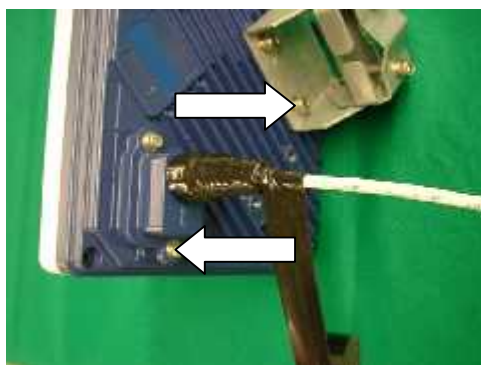
Figure 6-53

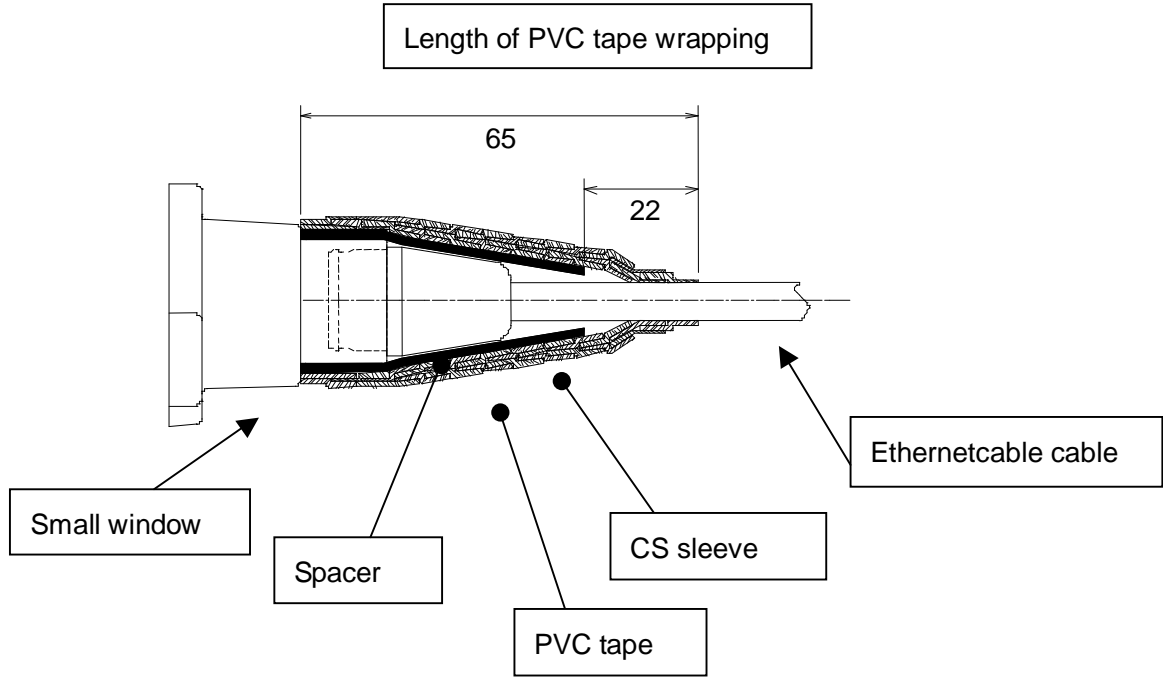
❗ • Slanted mounting of the cold-shrinkable tube as shown below will spoil the waterproofing effect. If the top of the cold-shrinkable tube is 5 mm or less from the top of the spacer, this will also spoil the waterproofing effect.

(6) Wrap the cable with PVC tape (for class 2 protection).

Apply the PVC tape so that the cold-shrinkable tube is completely hidden. Wrap the tape from the small Lid of the WT to the Ethernet cable, overlapping half of the previous layer. Next, reverse the wrapping direction and wrap one more time to the starting point.

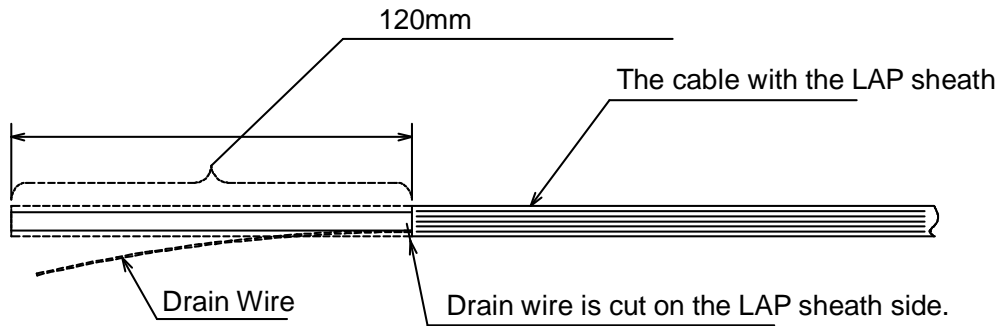




6.11. When you use the cable with the LAP sheath for outdoor

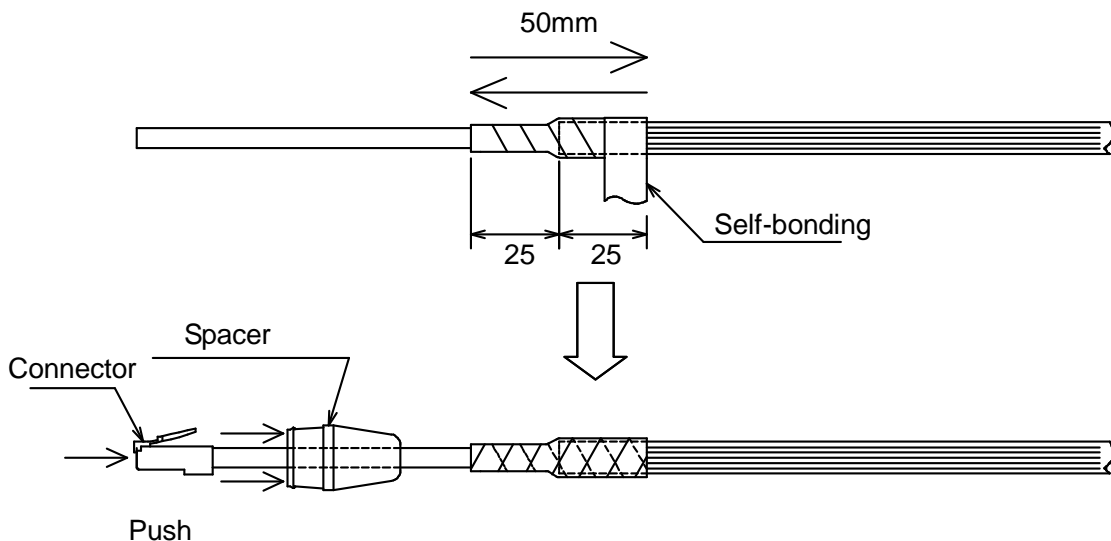
1 . Processing of LAP sheath

- The LPA sheath is peeled off from the cable point to 120mm.
- It cuts it in the part peeled off when there is drain wire.



2 . Processing of cutting part

- To prevent water being infiltrated in the wire, the self-bonding tape is rolled in the part where the LAP sheath was peeled off as shown in the figure below.
- The Ether plug is installed with the normal temperature shrinkage sleeve and Spasa passed.



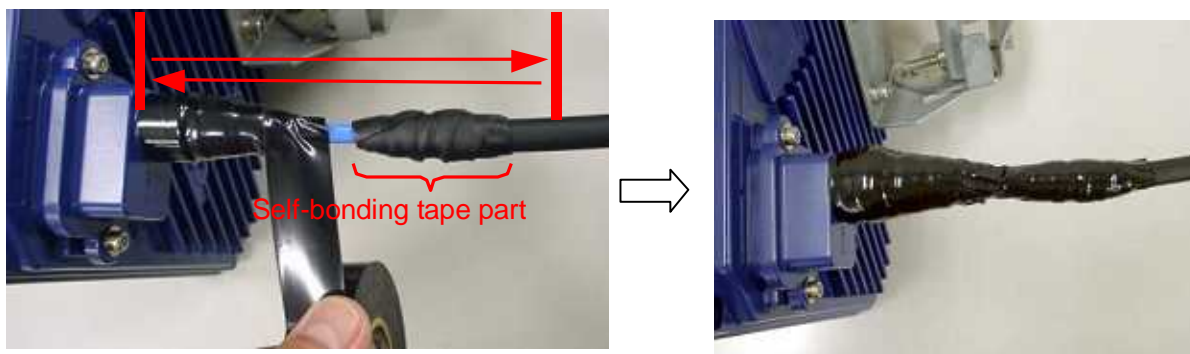
3 . Fixation of cable Ethernet, Installation of Spacer and normal temperature shrinkage sleeve

- See 「 6.9. Waterproofing WT small window 」

4 . Wrapping of PVC tape for protection

- It wraps until the self-bonding tape in the LAP sheath processing part is completely hidden

from a small window to the Ethernet cable side by 1/2 coming in succession, and 1 return round trip to the small window side.

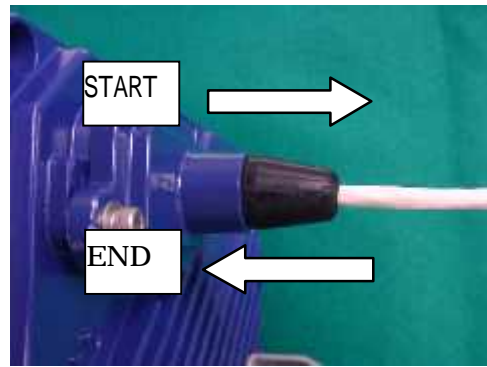


6.12. Waterproofing Without Using a Cold-Shrinkable Tube

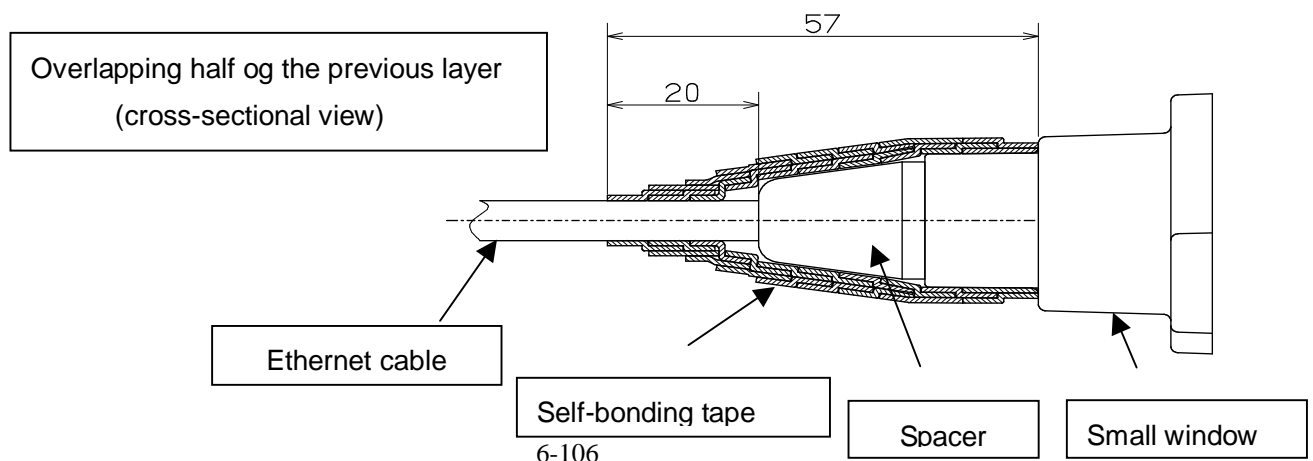
If installing a cold-shrinkable tube fails, use off-the-shelf self-bonding tape to provide the waterproofing.

(1) Securing the small Lid of the WT and the spacer

Using an appropriate length of self-bonding tape, wrap the tape around both the small Lid of the WT (at its base) and spacer one complete turn. After one turn, wrap about seven turns around the Ethernet cable by overlapping one-half of the previous turn. Reverse the wrapping direction and wrap about another seven turns back to the small Lid.



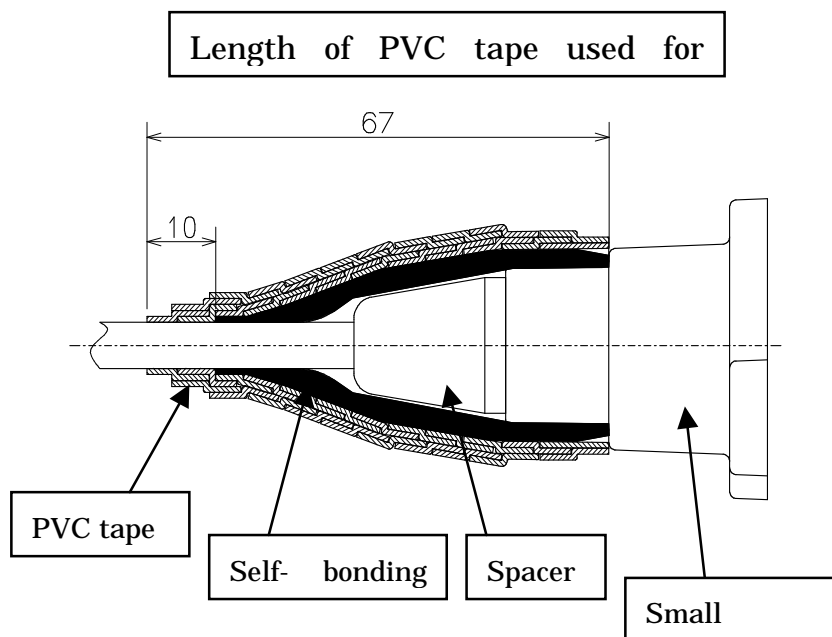
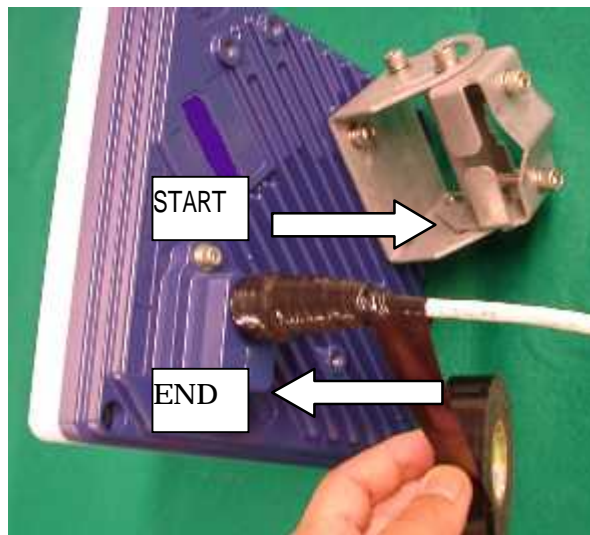
- For the stretching margin of self-bonding tape, see the instruction manual for the product.
- When wrapping self-bonding tape, start at the base of the small window and end at the end of the waterproof sleeve. Next, reverse the direction and end at the base of the small window. This procedure makes an attractive wrapping and improves the waterproof effect by making any air pockets less likely.
- Overlapping the wraps also protects against air pockets.
- Press evenly along the entire length of tape to remove air pockets.
- Make sure that there are no air pockets between the self-bonding tape and the small window of the WT or the rubber bushing. Air pockets will degrade the waterproofing effect.



(2) Wrapping protective PVC tape

Apply the protective PVC tape so that the cold-shrinkable tube is completely hidden. Wrap the tape from the small Lid of the WT to the Ethernet cable, overlapping half of the previous layer. Next, reverse the wrapping direction and wrap one more time to the starting point. Using the PVC tape will guard the self-bonding tape against ultraviolet and other rays. The wrapping also helps increase strength.

Key point: When wrapping PVC tape, be sure that the self-bonding tape is completely covered for its protection.



6.13. Testing

6.13.1. Perform a continuity test

Connect the OpS terminal to an AP, and run a loopback test with the following procedure:

Step 1: Click the Testing tab.

Step 2: Select a WT from the Select WT ID list.

Step 3: Select "Loop back Test."

Step 4: Click the **Execute** button to start the test.

Step 5: Check the test result:

- Accept : OK
- Result : OK
- Received frame length : 516
- Transmission time : The result will vary depending on the distance.

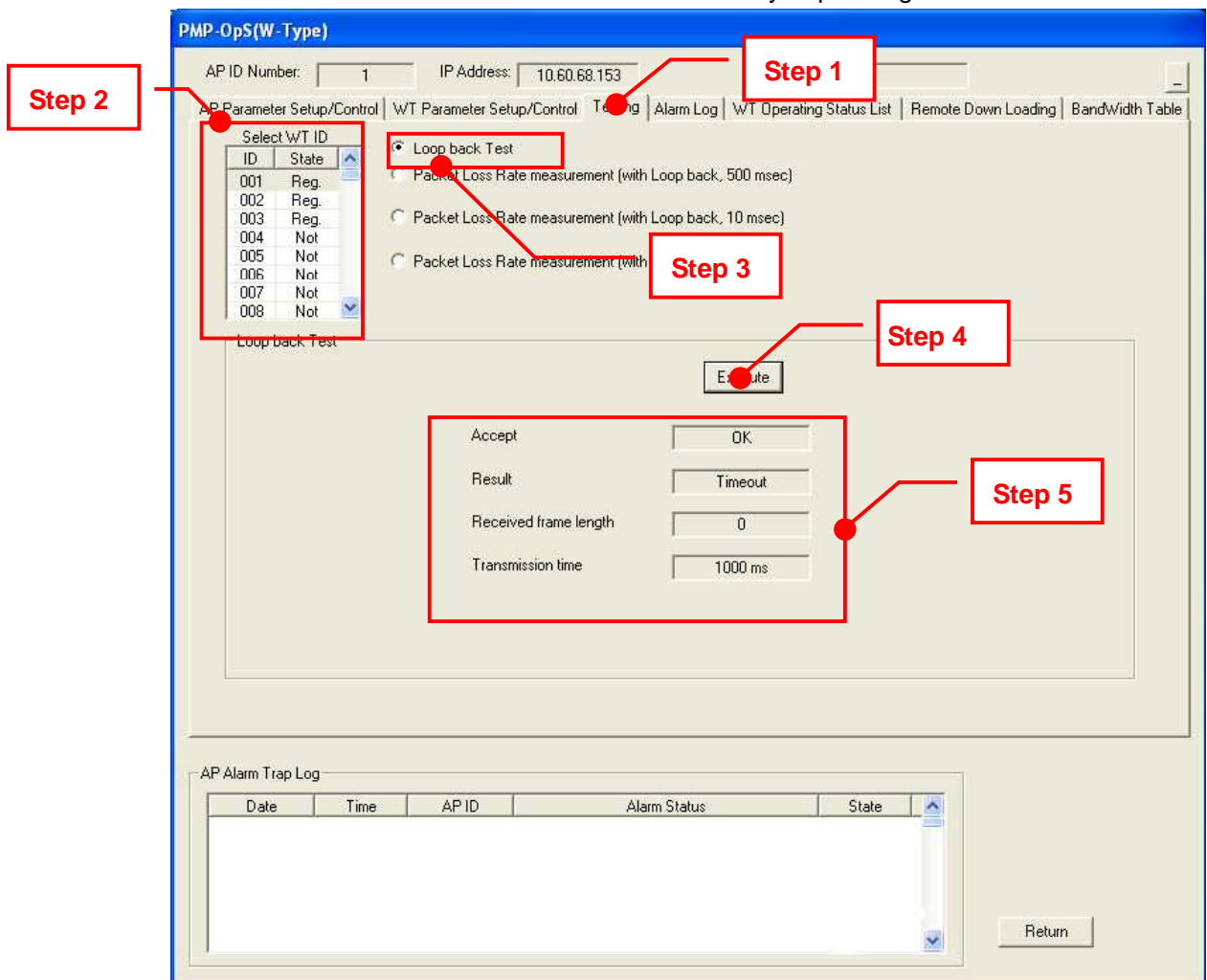


Figure 6-54 Perform a continuity test

6.13.2. Measure the packet loss rate

Connect the OpS terminal to an AP and measure the packet loss rate with the following procedure:

Step 1: Click the Testing tab.

Step 2: Select a WT from the Select WT ID list.

Step 3: Select the "Packet Loss Rate measurement (with Loop back, 10msec)" check box.

Step 4: Specify the following settings, and click the Execute button to start the test.

- Display Interval : 4 seconds
- Modulation Method (only Adaptive) : Select the current modulation method (check the WT Operation Status List in the OpS).
- Retry Time : 5 minutes

Step 5: Perform a time measurement and check the Packet Loss Rate column.

The screenshot shows the 'Testing' tab in the AP configuration interface. The 'Select WT ID Number' list has WT 002 selected. The 'Packet Loss Rate measurement (with Loop back, 10 msec)' option is selected. The settings are: Display Interval: 4 seconds, Modulation Method: 16QAM, and Retry Time: 5 minutes. The 'Execute' button is visible. Below the settings, there are two tables showing measurement results for AP and WT.

Time	Trans. Level dBm	Rec. Level dBm	BER	Packet Loss Rate	Ether Tx Packets	Ether Tx Loss Packets	Ether Rx Packets	Ether Rx Loss Packets
2005/09/24 15:33:59	14.0	-61.5	0.000000e-000	0.000000e-000	3069	0	3069	0
2005/09/24 15:34:03	14.0	-61.5	0.000000e-000	0.000000e-000	3473	0	3473	0
2005/09/24 15:34:07	14.0	-61.5	0.000000e-000	0.000000e-000	3877	0	3877	0
2005/09/24 15:34:10	14.0	-61.5	0.000000e-000	0.000000e-000	4281	0	4281	0
2005/09/24 15:34:14	14.0	-61.5	0.000000e-000	0.000000e-000	4685	0	4685	0
2005/09/24 15:34:19	14.0	-61.5	0.000000e-000	0.000000e-000	5089	0	5089	0

Time	Trans. Level dBm	Rec. Level dBm	BER	Packet Loss Rate	Ether Tx Packets	Ether Tx Loss Packets	Ether Rx Packets	Ether Rx Loss Packets
2005/09/24 15:33:59	14.0	-63.5	2.663125e-006	0.000000e-004	0	0	0	0
2005/09/24 15:34:03	14.0	-63.0	2.510143e-006	0.000000e-004	0	0	0	0
2005/09/24 15:34:07	14.0	-63.0	2.623270e-006	0.000000e-004	0	0	0	0
2005/09/24 15:34:10	14.0	-63.0	2.778676e-006	0.000000e-004	0	0	0	0
2005/09/24 15:34:14	14.0	-62.5	2.868511e-006	0.000000e-004	0	0	0	0
2005/09/24 15:34:19	14.0	-63.0	2.854808e-006	0.000000e-004	0	0	0	0

Figure 6-55 Measure the packet loss rate

6.14. Check sheet of WT Construction

Check the operation of the WT using the check sheet below.

Test procedure

(A) LED operation test

- Remove the AC adapter (to turn off the power) and make sure that all the LEDs are off.
- Insert the AC adapter (to turn on the power) and check the states of the LEDs.

(B) Loopback test between the WT and the WT adapter

- Press the TEST switch on the WT adapter and make sure that the ETHER LED goes out.
- Remove the cable from the WT adapter's PC port and make sure that the ETHER LED goes out.

(C) Receive level

- Connect the WT Local Management Tool to the WT and measure the receive level.

(D) Position of the AP-RFU in the field of view after direction adjustment

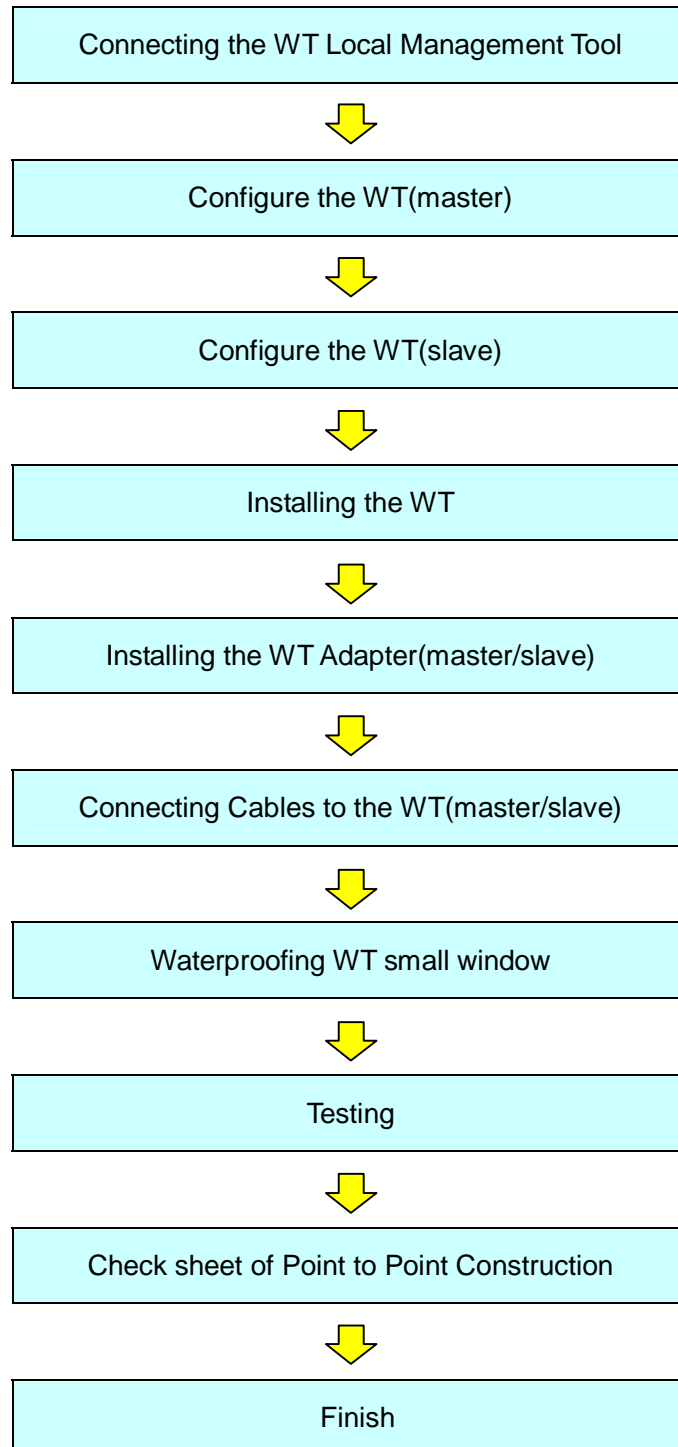
- After the direction is adjusted, look into the scope of the Antenna direction adjustment tool to visually check the position of the AP-RFU

Table 6-1 Check sheet

WT	Serial number		Test date		
Test type	Test condition	Check item		Pass/fail	Measured value
LED operation test	Remove the AC adapter.	Confirm that the POW LED on the WT adapter goes out.			-
		Confirm that the ETHER LED on the WT adapter goes out.			-
		Confirm that the ALM LED on the WT adapter goes out.			-
	Insert the AC adapter.	Confirm that the POW LED on the WT adapter lights green.			
		Confirm that the ETHER LED on the WT adapter flashes green.			
		Confirm that the ALM LED on the WT adapter flashes at 1-second intervals and then goes out.			
Loopback test between WT and WT adapter	Press the TEST switch on the WT adapter.	Confirm that the ETHER LED on the WT adapter goes out.			-
	Remove the cable from the WT adapter's PC port.	Confirm that the ETHER LED on the WT adapter goes out.			
Receive level	-	Connect the WT Local Management Tool to the WT and measure the receive level.			dBm

7. CONSTRUCTING A POINT-TO-POINT SYSTEM

7.1. Overview(WT Construction flow)



7.2. Connecting the WT Local Management Tool

Connect the local management tool terminal to the PC port of the WT adapter (Figure 7-1) using a straight Ethernet cable.

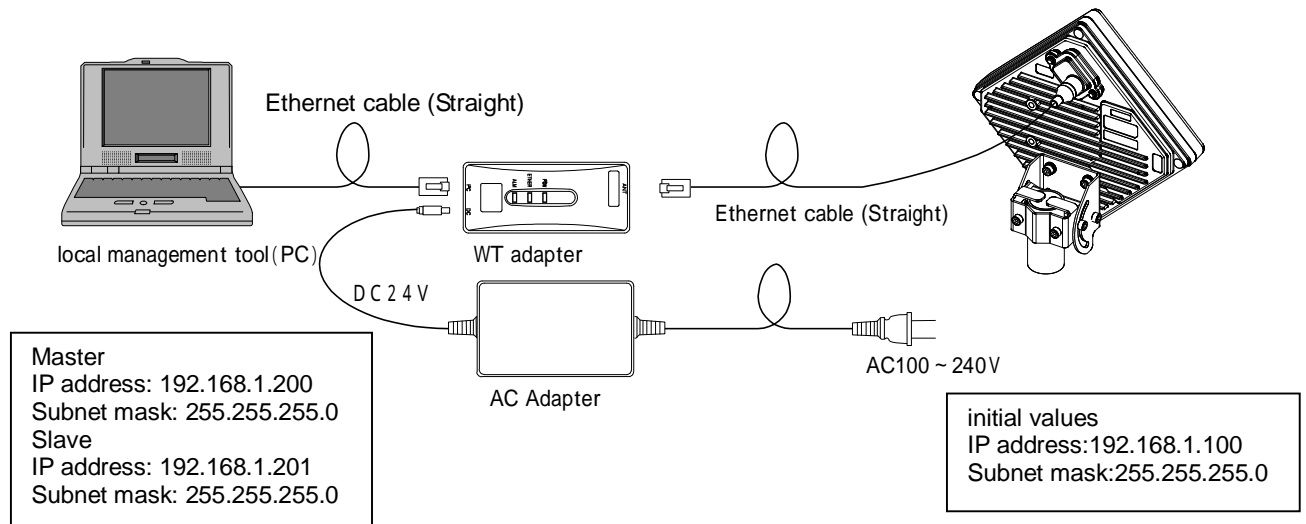


Figure 7-1 Connection



- When changing the IP address of the unit, set the IP address of the local management tool (PC) to an IP address belonging to the same network.
- When changing the IP address of the unit, restart the power of the hub if the unit is connected to the local management tool (PC) via a hub (because MAC address learning may fail and the connection may be dropped).

7.3. Configure the WT(master)

Change the WT's mode from P-MP to P-P(matser).

On the Setup screen in the WT Local Management Tool (Master in P-P mode, Administrator), specify the settings in the following procedure:

Step 1: Select the "Master" setup tab.

Step 2: Specify the settings under Setup for Setup Parameters.

- System ID Number: Set the system ID number.
- Serial number at opposite WT: Set the serial number at the opposite WT.
- Encryption Parameter: Set the encryption parameter.
- Trans. Level: Set the transmission level.
- Modulation Method: Set the modulation method to QPSK, 16QAM, or AUTO.
- Interface Class: Set the interface class to AUTO or 10BASE.
- Radio Frequency: Set the radio frequency.
- Reg. Status: Set the registration status to Reg.

Step 3: Set the Network configuration for Setup Parameters.

- IP Address: Set the IP address.
- Subnet mask: Set the subnet mask.
- Default gateway: Set the default gateway.
- Trap Des. IP Add1: Set "Reg." or "Not" and trap destination IP address 1. As required, you can also set Trap Des. IP Add2, and Trap Des. IP Add3.
- OpS Frame Priority: Set the OpS frame priority.
- OpS Frame Vlan-ID: Set the OpS frame Vlan-ID.
- ARP Request: Set the ARP request to ON or OFF.

Step 4: Click the **Setup** button.

Step 5 Make a clock setting in Setup Parameters2 and click the **Setup** button.

Step 6 Set RFU Transmission (Enable) in Setup Parameters3 and click the **Execute** button.

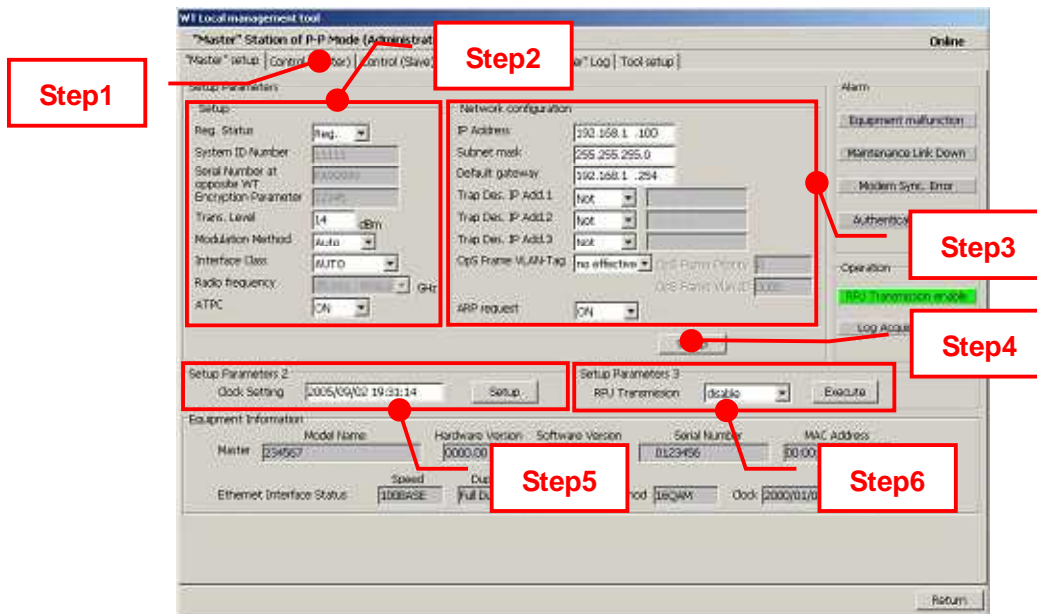


Figure 7-2 Configure the WT(master)

7.4. Configure the WT(slave)

Change the WT's mode from P-MP to P-P(slave).

On the Setup screen in the WT Local Management Tool (Slave in P-P mode, Administrator), specify the settings in the following procedure:

Step 1: Select the "Slave" setup tab.

Step 2: Specify the settings under Setup for Setup Parameters.

- System ID Number: Set the system ID number.
- Serial number at opposite WT: Set the serial number at the opposite WT.
- Encryption Parameter: Set the encryption parameter.
- Trans. Level: Set the transmission level.
- Interface Class: Set the interface class to AUTO or 10BASE.
- Radio Frequency: Set the radio frequency.

Step 3: Set the Network configuration for Setup Parameters.

- AP IP Address: Set the AP IP address.
- Subnet mask: Set the subnet mask.
- Default gateway: Set the default gateway.
- ARP Request: Set the ARP request to ON or OFF.

Step 4: Click the **Setup** button.

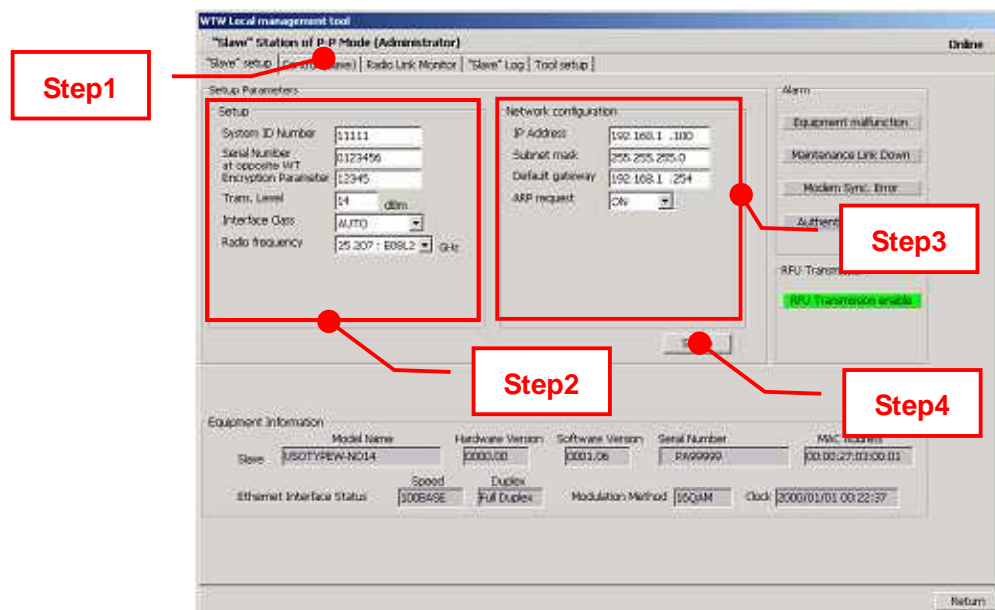


Figure 7-3 Configure the WT(slave)

7.5. Installing the WT

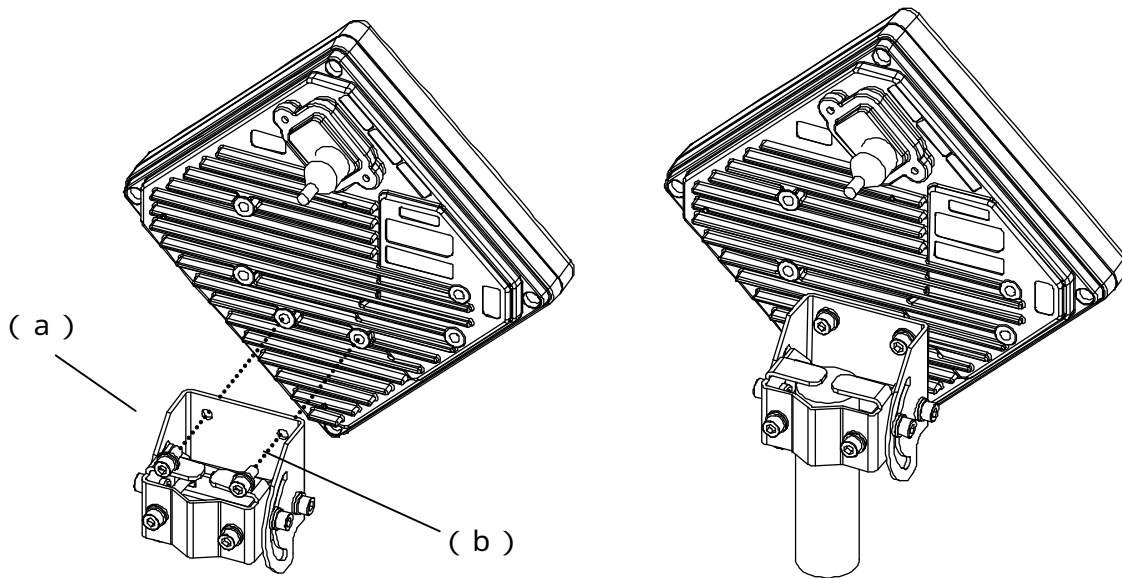
7.5.1. Installing the WT(master/slave)

Step1 Attach the WT mounting bracket to the WT using the bolts(a)and (b).

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

Step2 Secure the WT mounting bracket to the pole using the bolts.

Applicable pole diameter: From $\Phi 31.8\text{mm}$ to $\Phi 34\text{mm}$



Fi

Figure 7-4 Installing the WT

A builder prepares a steel pipe by the installation place (a wall, a pole or etc.), and it install.
 The required space of installation is shown below.

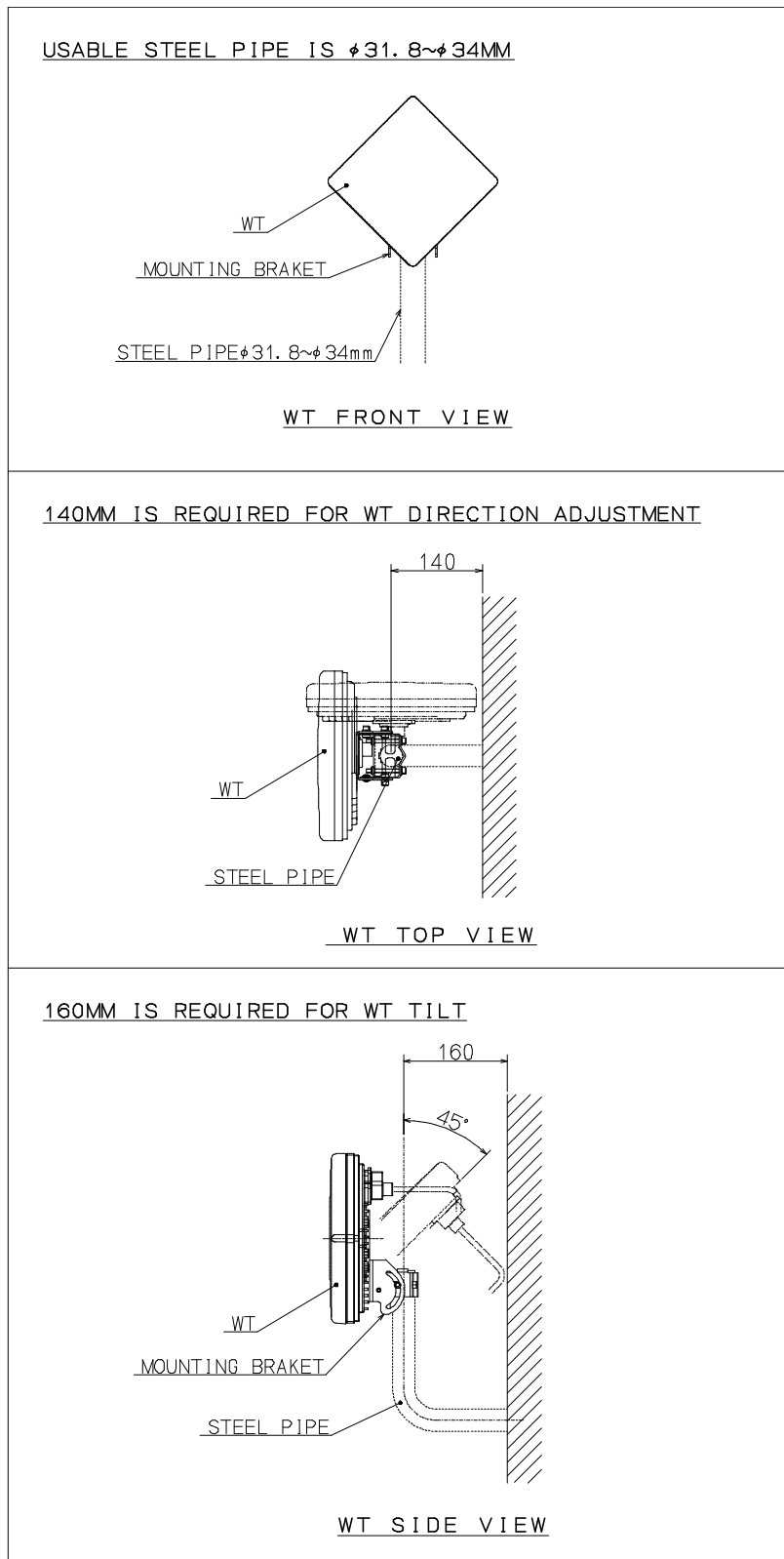


Figure 7-5 The required space of installation

7.5.2.Example of Installing the WT

(1) On a metal fence

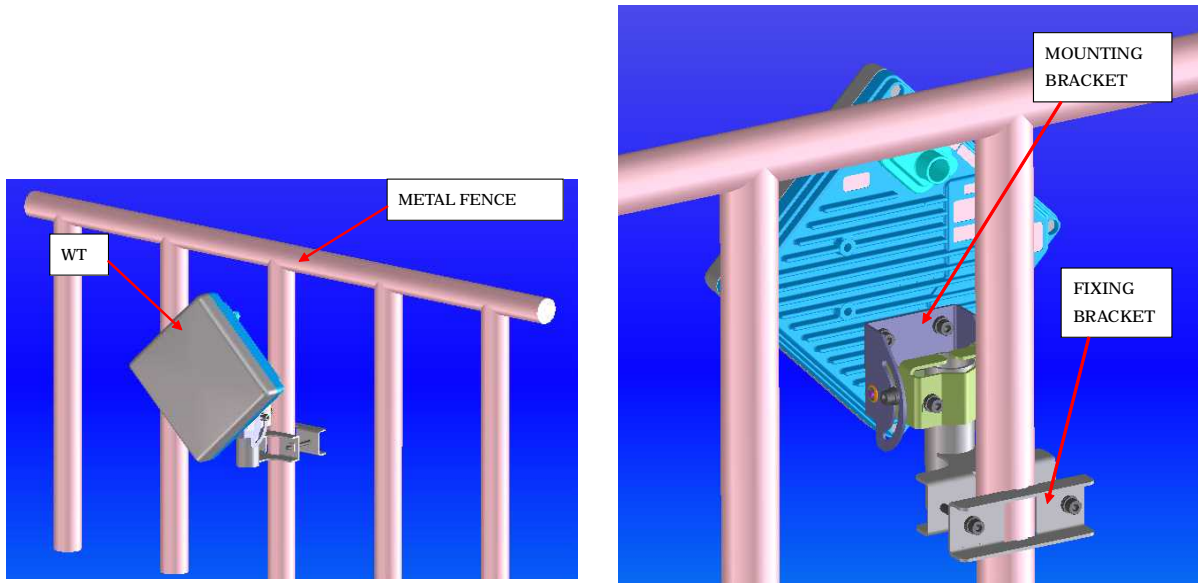


Figure 7-6 Installing on a metal fence

(2) On a house wall

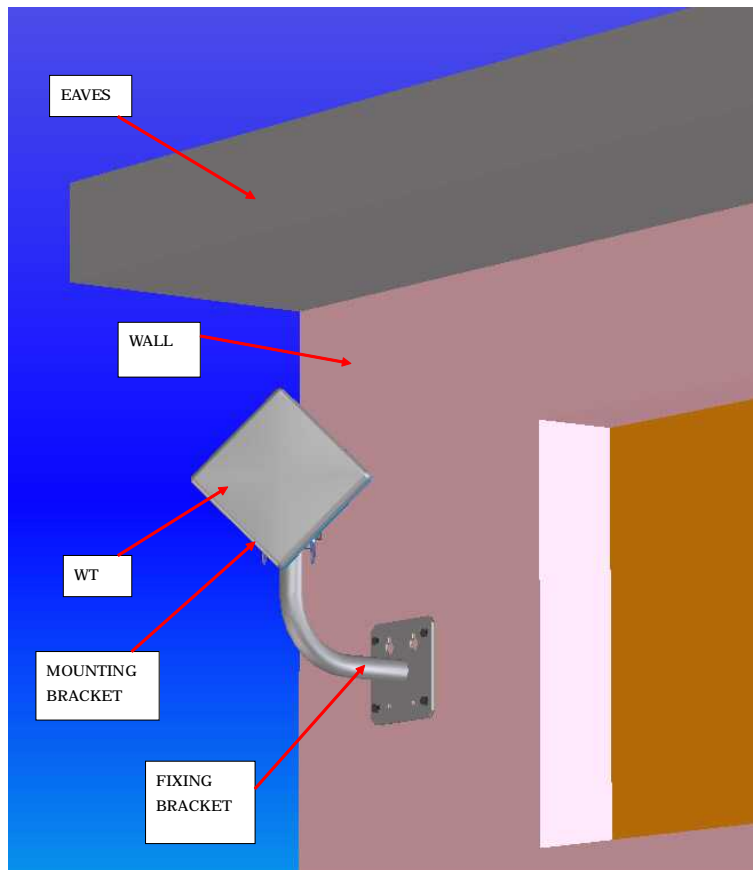


Figure 7-7 Installing on a house wall

7.5.3. Setting the WT for Vertical or Horizontal Polarization

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

For vertical polarization, position **TOP V** at the top.

For horizontal polarization, position **TOP H** at the top.

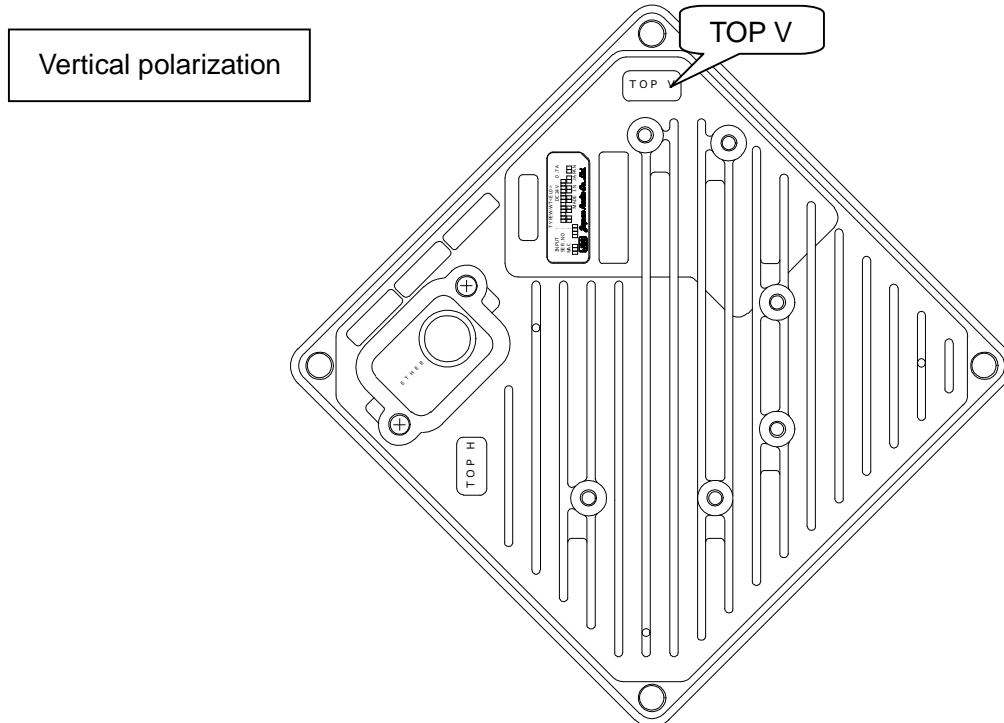


Figure 7-8 Vertical Polarization

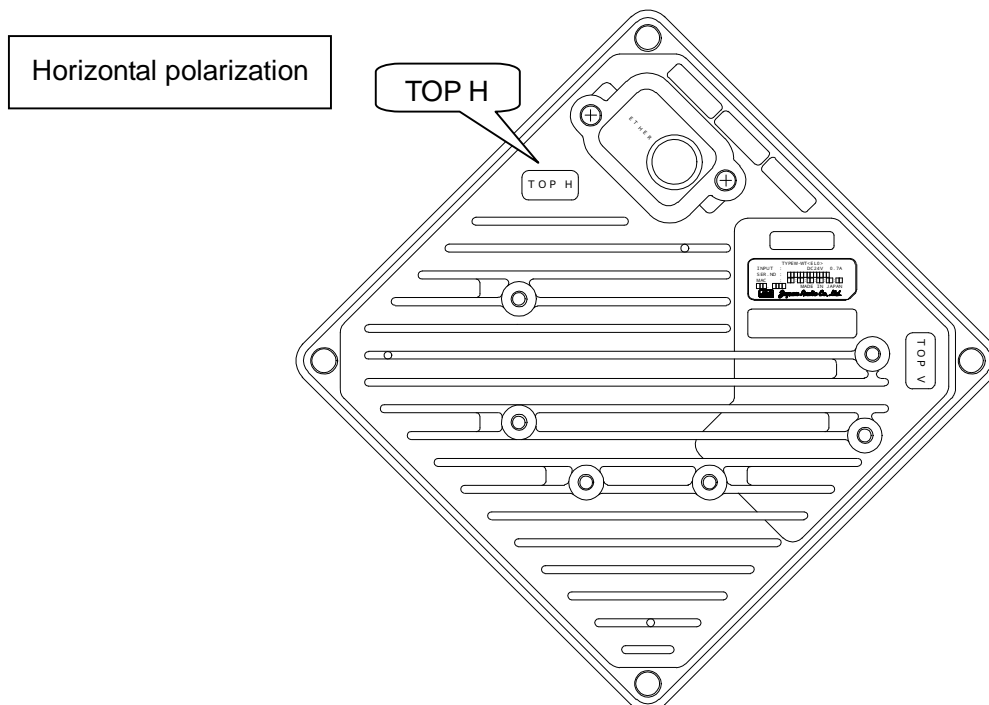


Figure 7-9 Horizontal Polarization

7.6. Installing the WT (External Antenna)

7.6.1. Installing the WT (External 30cm Antenna)

1. Φ30cm antenna installation procedure

1) According to the antenna manual of RADIO WAVES, INC., set it up on the pole. (Figure 7-10)

2) Spread specified grease on the O-ring.
The spreading method depends on the manual. (Figure 7-11)

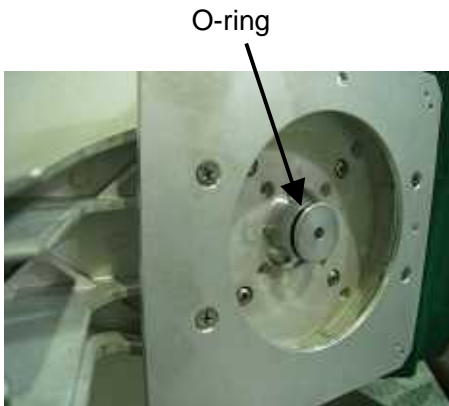


Figure 7-11



Figure 7-10 Φ30cm antenna

2. WT installation procedure

Attach the antenna adaptor to the WT with the O-ring using four M3 screws. (Figure 7-12 & Figure 7-13)

Tightening torque : 57 N·cm

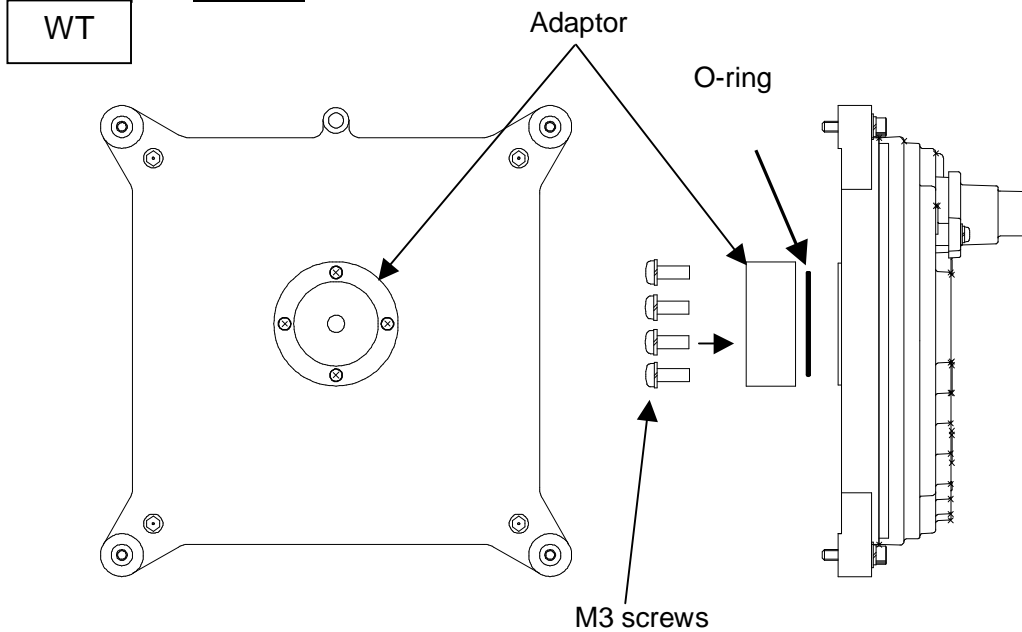
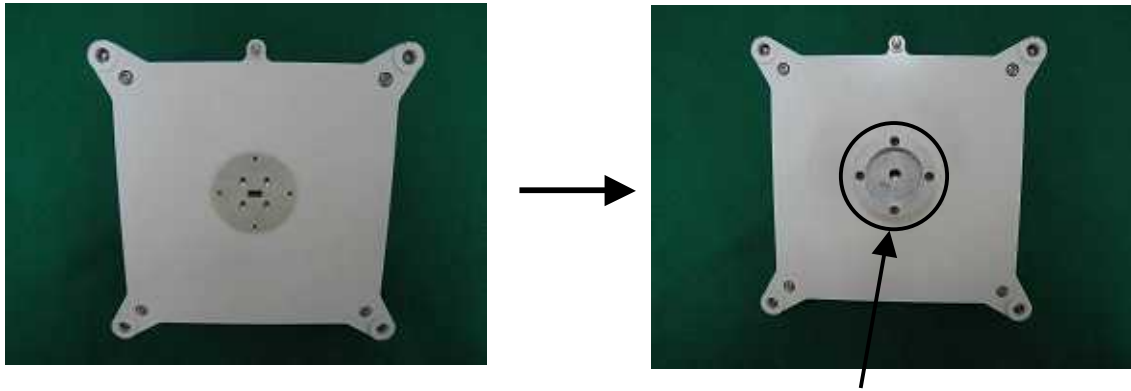


Figure 7-12



After installing the adaptor

Figure 7-13

3. Attachment of the WT to the antenna

1) V(ertical) polarization

When using the V polarization, the guide pin of the WT should be turned to right above and inserted into the V guide hole of the plate. (Figure 7-14 & Figure 7-15)



Guide pin



V polarization

Figure 7-15

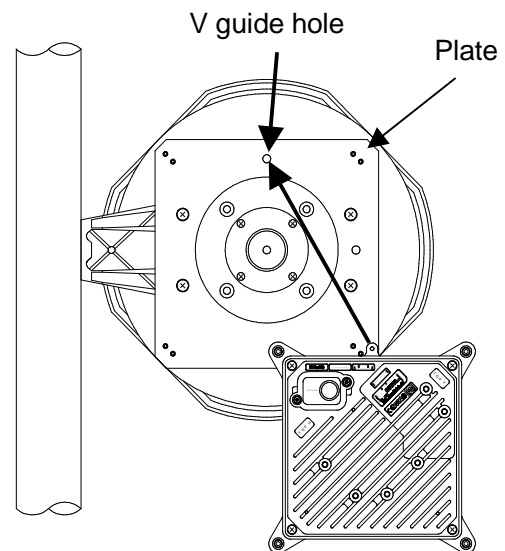


Figure 7-14

After inserting the guide pin of the WT into the guide hole, presses the WT to the plate.
While you are pressing the WT, you must be tightening the four M5 screws. (Figure 7-16)

Tightening torque : 265 N·cm

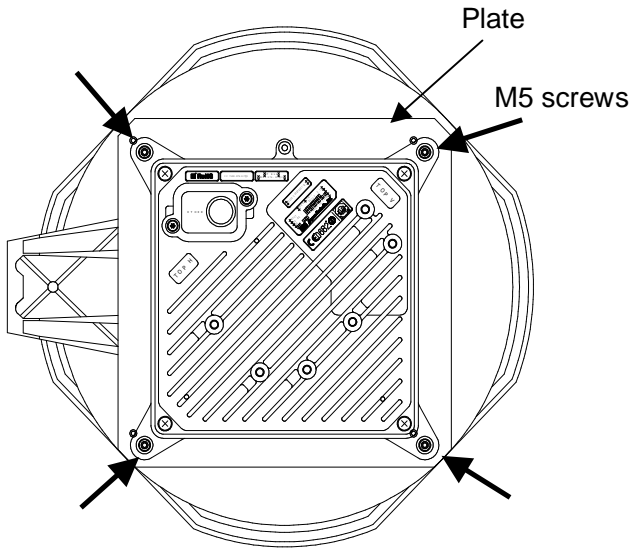


Figure 7-16

2) H(orizontal) polarization

When using H polarization, the guide pin of the WT should be rotated to the right and inserted into the H guide hole of the plate. (Figure 7-17 & Figure 7-18)



Figure 7-17

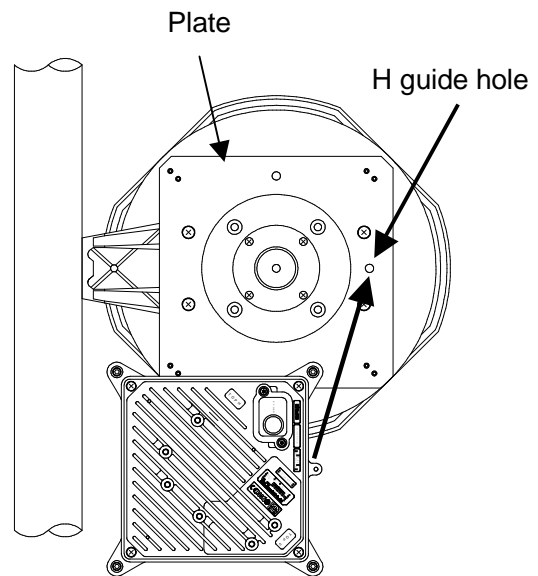


Figure 7-18

After inserting the guide pin of the WT into the guide hole, presses the WT to the plate.
While you are pressing the WT, you must be tightening the four M5 screws. (Figure 7-19)
Tightening torque : 265 N·cm

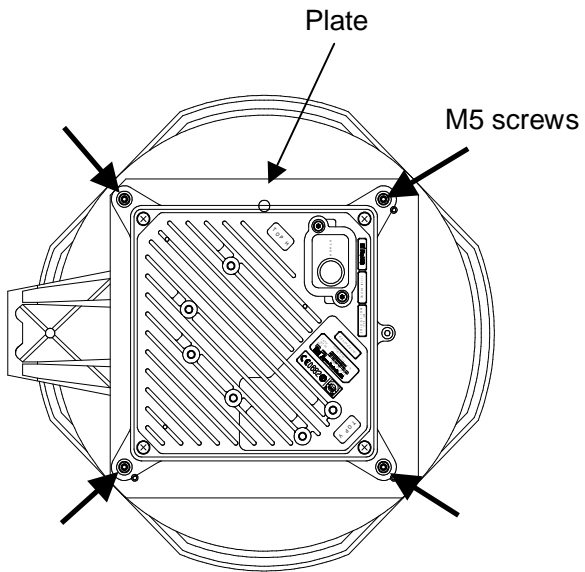


Figure 7-19

7.6.2. Installing the WT (External 60cm Antenna)

1. Φ60cm antenna installation procedure

1) According to the antenna manual of RADIO WAVES, INC., set it up on the pole. (Figure 7-20)

2) Spread specified grease on the O-ring.
The spreading method depends on the manual. (Figure 7-21)

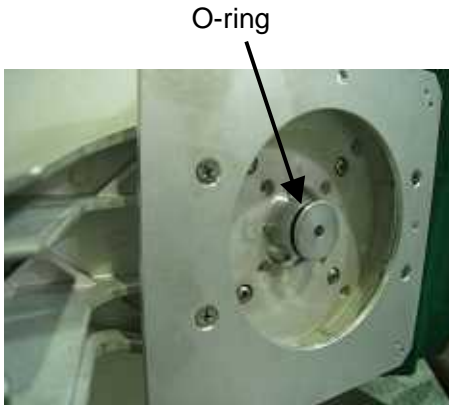


Figure 7-21



Figure 7-20 Φ30cm antenna

2. WT installation procedure

Attach the antenna adaptor to the WT with the O-ring using four M3 screws. (Figure 7-22 & Figure 7-23)

Tightening torque : 57 N·cm

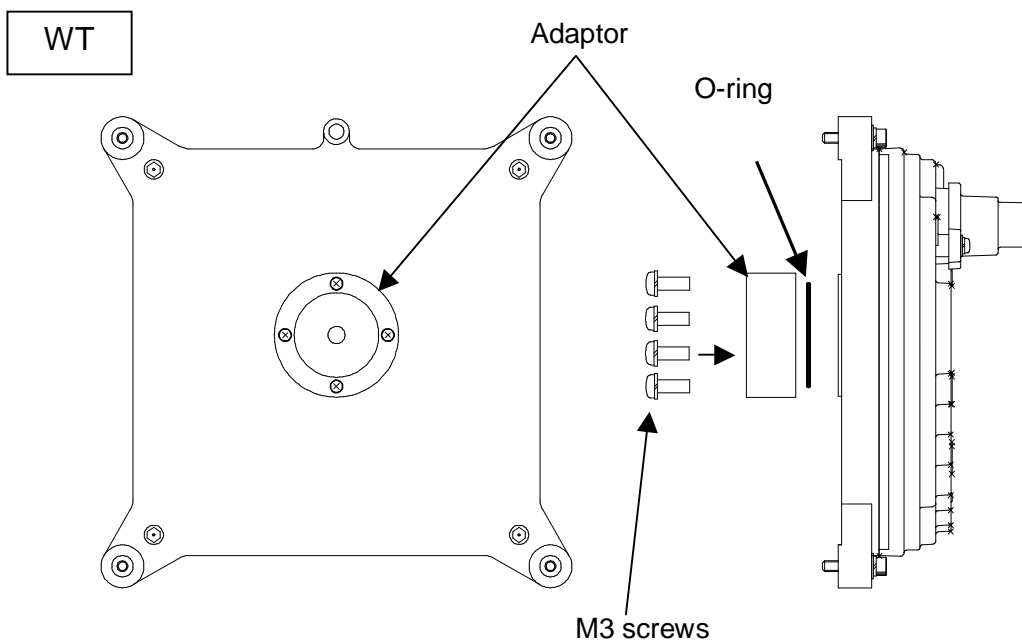
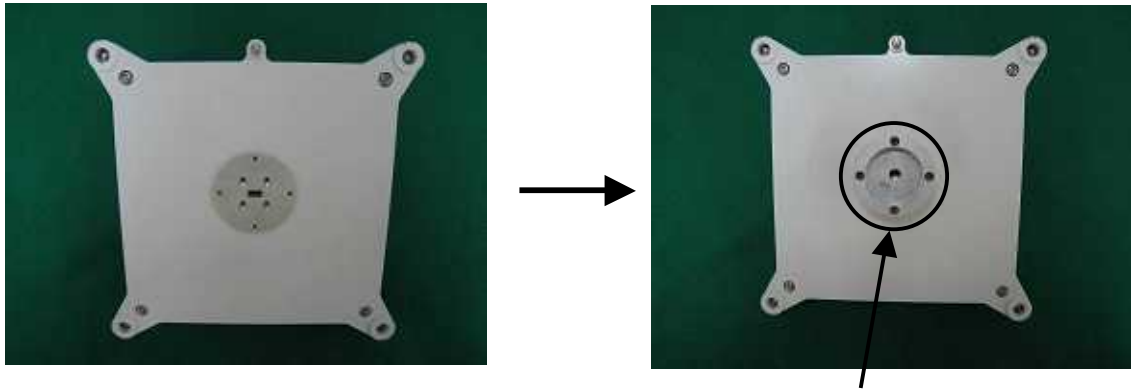


Figure 7-22



After installing the adaptor

Figure 7-23

3. Attachment of the WT to the antenna

1) V(ertical) polarization

When using the V polarization, the guide pin of the WT should be turned to right above and inserted into the V guide hole of the plate. (Figure 7-24 & Figure 7-25)



Guide pin



V polarization

Figure 7-25

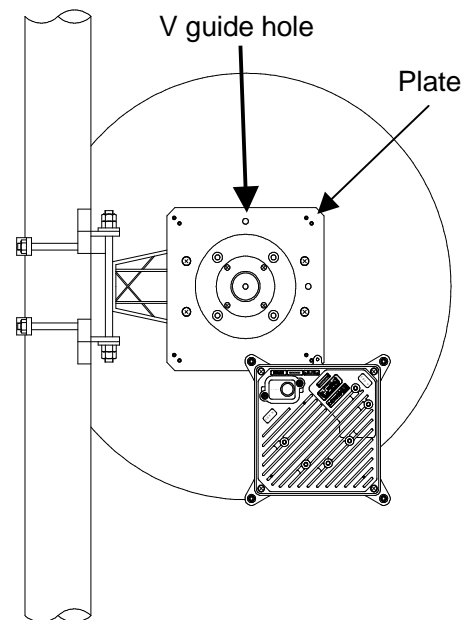


Figure 7-24

After inserting the guide pin of the WT into the guide hole, presses the WT to the plate.
While you are pressing the WT, you must be tightening the four M5 screws. (Figure 7-26)

Tightening torque : 265 N·cm

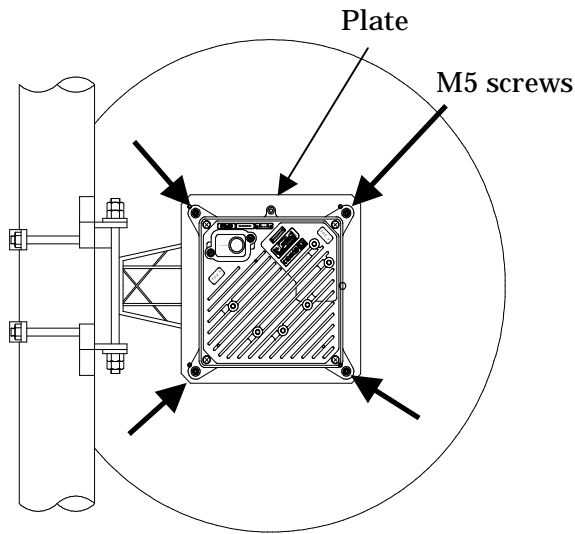


Figure 7-26

2) H(orizontal) polarization

When using H polarization, the guide pin of the WT should be rotated to the right and inserted into the H guide hole of the plate. (Figure 7-27 & Figure 7-28)



Figure 7-27

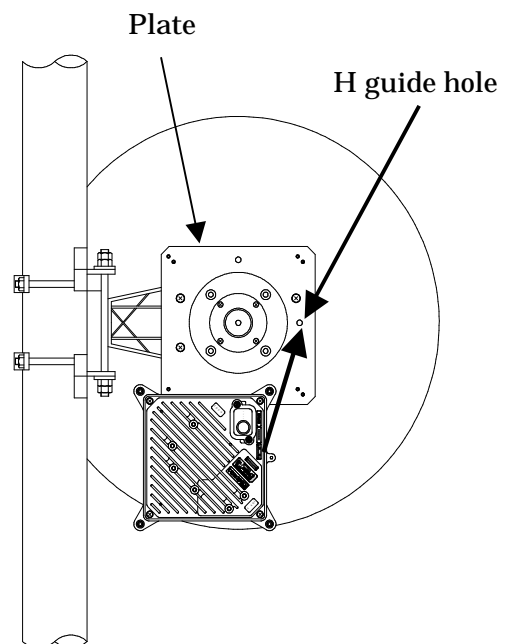


Figure 7-28

After inserting the guide pin of the WT into the guide hole, presses the WT to the plate.
While you are pressing the WT, you must be tightening the four M5 screws. (Figure 7-29)
Tightening torque : 265 N·cm

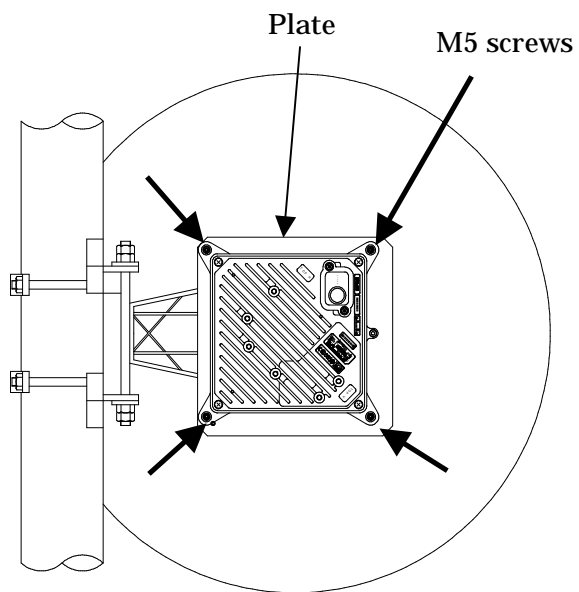


Figure 7-29

7.7. Adjusting the Direction of the WT

7.7.1. Adjusting the Direction of the WT

This section describes the procedure for adjusting the antenna direction when a Point-to-Point System is used.

When adjusting the direction of the WT antenna, use the “Antenna direction adjustment tool” together with the WT Local Management Tool.

Step 1: Connection between WT (master/slave) and WT Local Management Tool and display the Receiving Level.

See Subsection 7.7.1.1

- Method of adjustment for near-distance installation

If circuit design calls for a receive level of -35 dBm or higher, you need to reduce the transmission level according to the following procedure:

WT (Master) Trans Level : 14dBm → -6dBm (see Subsection 7.7.1.1 (4))

WT (Slave) Trans Level : 14dBm → -6dBm (see Subsection 7.7.1.1 (4))

Step 2: Rough adjustment for the WT (Master)

- Install the Antenna direction adjustment tool.
- See Subsection 7.7.1.2
- Remove the Antenna direction adjustment tool.

Step 3: Rough adjustment for the WT (Slave)

- Install the Antenna direction adjustment tool.
- See Subsection 7.7.1.2
- Remove the Antenna direction adjustment tool.

Step 4: Fine adjustment for the WT (Slave)

- See Subsection 7.7.1.3

Step 5: Fine adjustment for the WT (Master)

- See Subsection 7.7.1.3

Step 6: Verification

- After fine adjustment, use the WT Local Management Tool to final check the receive level. If the receive level value is within the standard range, the procedure for adjusting the antenna direction has been completed.
If the receive level value is lower than a standard value, you need to perform Steps 4 and 5 again.

Step 7: Exit the WT Local Management Tool, and remove the cable from the WT adapter.

7.7.1.1. Connecting the WT Local Management Tool

(1) As shown in Figure 7-30, connect the WT Local Management Tool (PC) to the WT adapter.

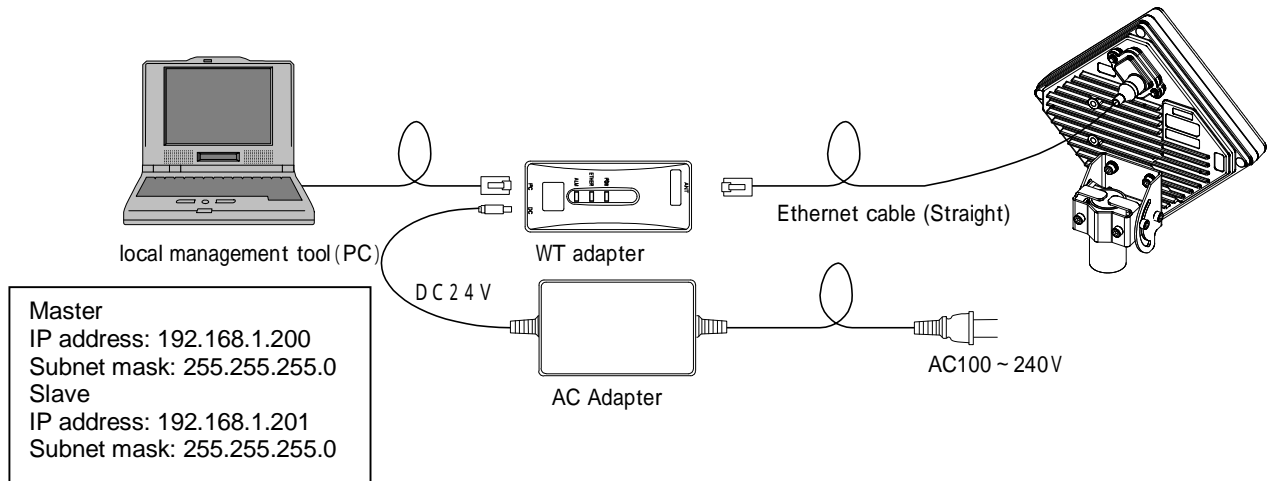


Figure 7-30 Connecting the WT Local Management Tool

(2) Measuring the receive level the WT (master in P-P mode)

- Start the WT Local Management Tool and select P-P mode.
- On the Radio Link Monitor screen in the master station in P-P mode, measure the "Receiving Level" value.

The procedure is shown in Figure 7-31.

! • The minimum display interval is 1 second, and you need to adjust the antenna direction slowly.

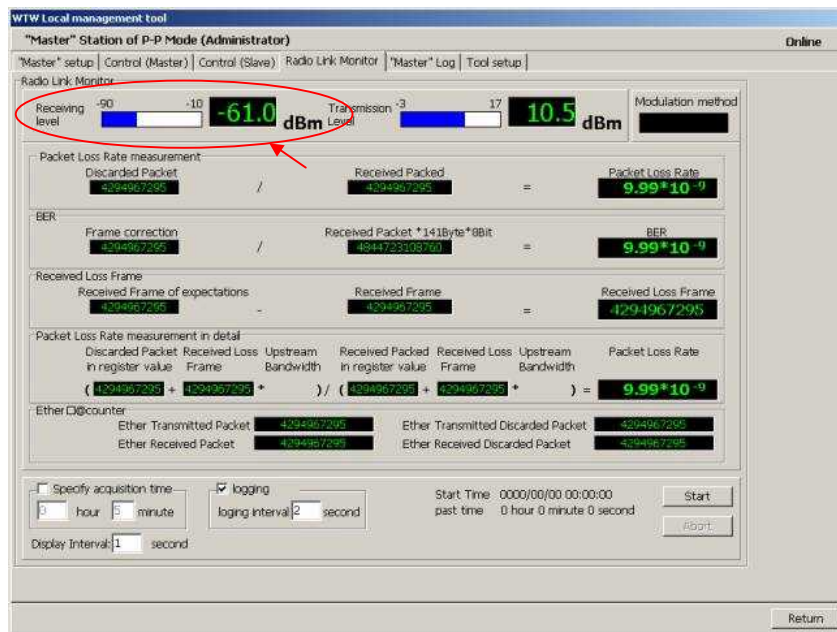


Figure 7-31 Measuring the Receive Level (Master)

(3) Measuring the receive level of the WT (slave in P-P mode)

- Start the WT (slave in P-P mode) and select P-P mode.
- On the Radio Link Monitor screen in the slave station in P-P mode, measure the "Receiving Level" value.

The procedure is shown in Figure 7-32.

! • The minimum display interval is 1 second, and you need to adjust the antenna direction slowly.

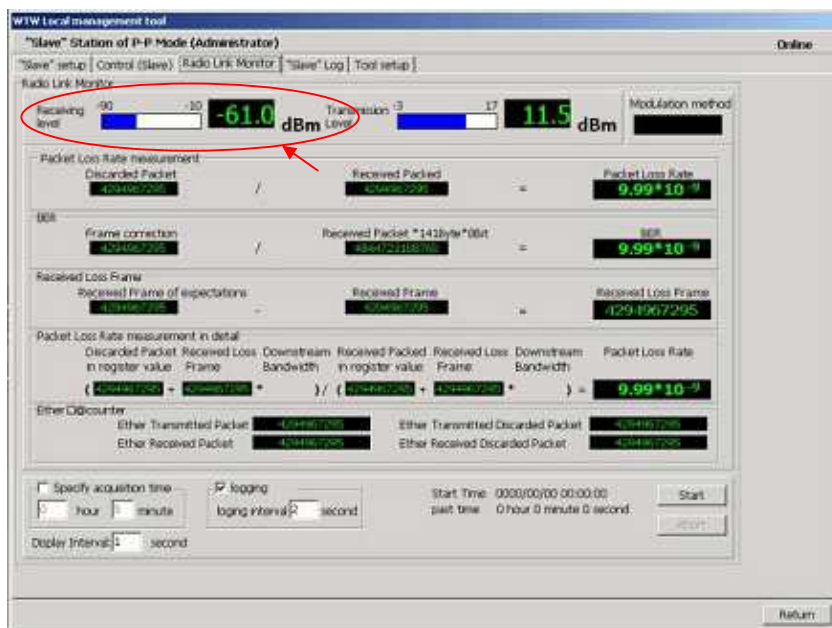


Figure 7-32 Measuring the Receive Level (Slave)

(4) Method of adjustment for near-distance installation

If circuit design calls for a receive level of -35 dBm or higher, use the following procedure:

- Start the WT Local Management Tool and select P-P mode.
- On the Master Setup screen in the master station in P-P mode, change "Trans.Level" from 14[dBm] to -6[dBm]. After the change, click the SETUP button.

The procedure is shown in Figure 7-33.

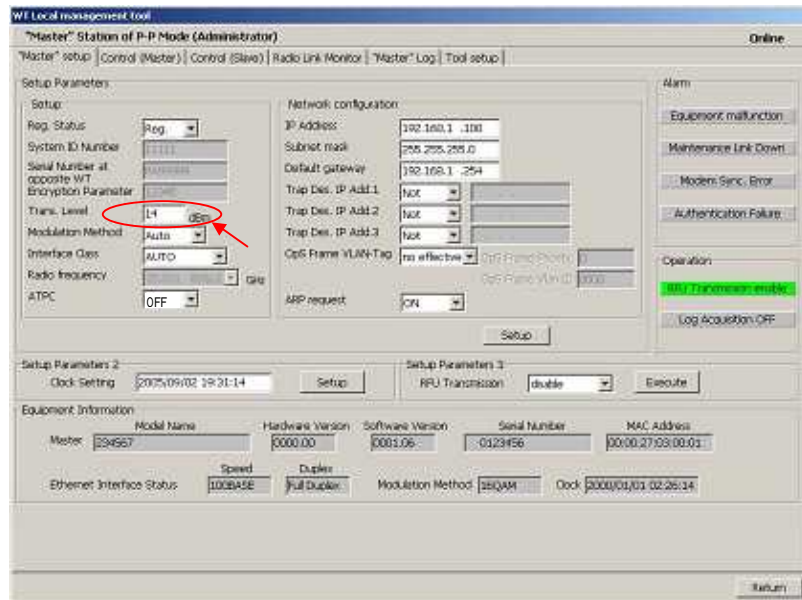


Figure 7-33 Setting "Trans.Level" for the WT (Master)

- On the Slave Setup screen in the slave station in P-P mode, change "Trans.Level" from 14[dBm] to -6[dBm]. After the change, click the SETUP button.

The procedure is shown in Figure 7-34.

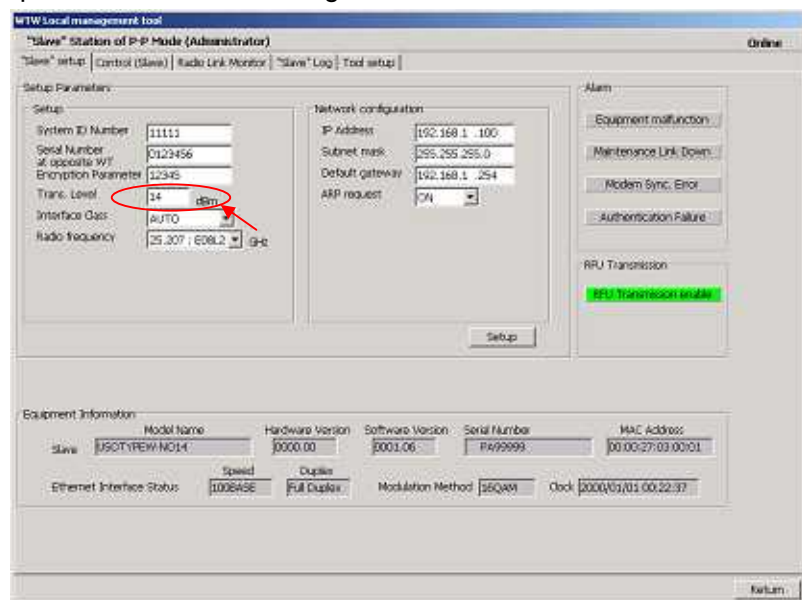


Figure 7-34 Setting "Trans.Level" for the WT (Slave)

7.7.1.2. Roughly Adjusting the Direction

- Step1 As shown in Figure 7-35 and Figure 7-36, use the wing bolt (a) to attach the Antenna direction adjustment tool.
- Step2 As shown in Figure 7-37, loosen the hexagonal socket head bolts (b) and (c) securing the mounting bracket and swing the antenna left or right. Adjust the antenna approximately for the WT direction and finger-tighten the bolts (b) and (c).
- Step3 As shown in Figure 7-38, loosen the bolts (d), (e), and (f) and tilt the antenna up or down. Perform vertical-direction adjustment so that the WT of the opposite station can be seen through the scope of the Antenna direction adjustment tool.

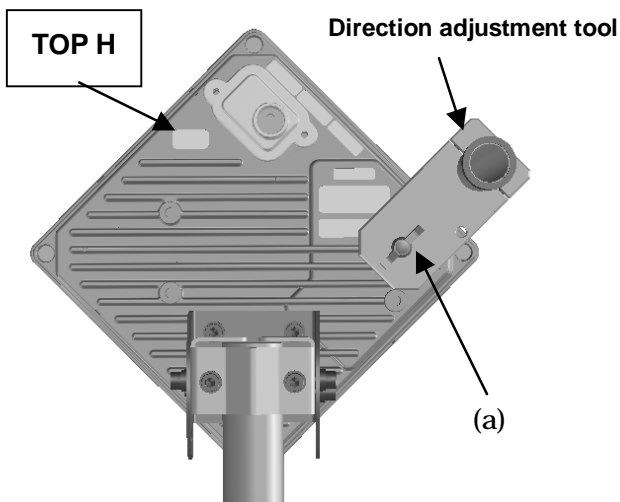


Figure 7-35 How to Install Direction Adjustment tool when the antenna type is the horizontal polarization

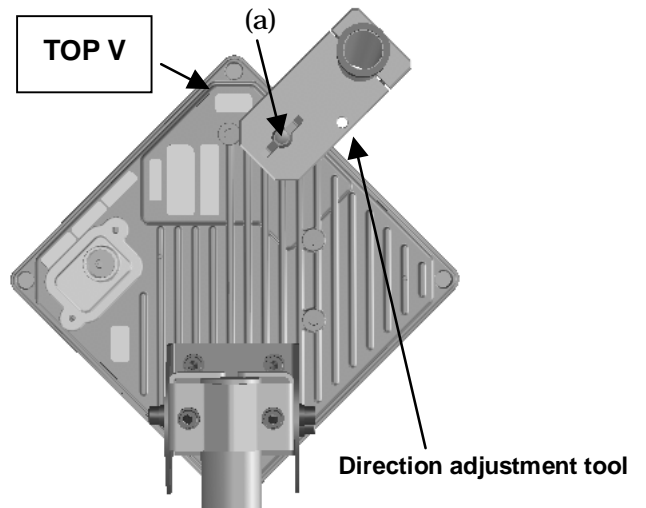


Figure 7-36 How to Install Direction Adjustment tool when the antenna type is the vertical polarization

In Figure 7-37 and Figure 7-38 is an example when the antenna type is the horizontal polarization.

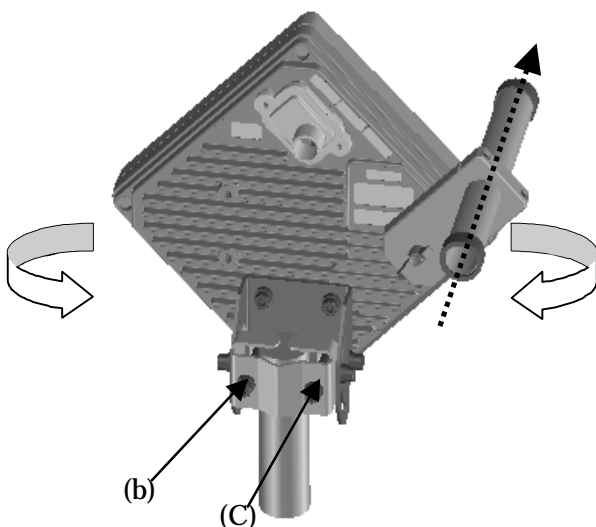


Figure 7-37 Rough-adjusting Horizontal Direction

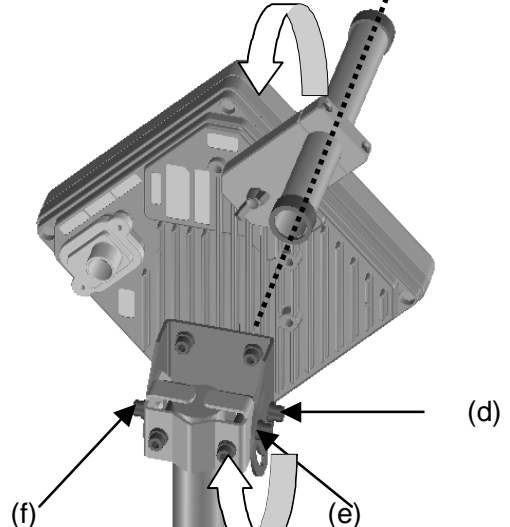


Figure 7-38 Rough-Adjusting the Vertical Direction

! • Never look at the sun directly. Doing so may seriously damage the eyes.

7.7.1.3. Finely Adjusting the Direction

Step 1: Horizontal direction

As shown in Figure 7-39, loosen the hexagonal socket head bolts (a) and (b) securing the mounting bracket and swing the antenna left or right. Adjust the antenna direction so that the receive level indicates the maximum value, and finger-tighten the bolts (a) and (b).

Step 2: Vertical direction

As shown in Figure 7-40, loosen the hexagonal socket head bolts (c), (d), and (e) securing the mounting bracket and tilt the antenna up or down. Adjust the antenna direction so that the receive level indicates the maximum value. Tighten the bolts at a point showing the maximum receive level (tightening torque: 8.5N•m). Tighten the bolts (c), (d), and (e) and make sure that the point showing the maximum receive level is maintained. This concludes the procedure for vertical-direction adjustment.

Step 3: Horizontal direction

Finely adjust the horizontal direction by slightly loosening the bolts (a) and (b) again. Once again, locate the point where the receive level reaches the maximum value and hold that point. Finally, tighten the bolts (a) and (b) (tightening torque: 8.5N•m) while making sure that the point showing the maximum receive level is maintained. This concludes the procedure for horizontal-direction adjustment.

The figures show examples of horizontal polarization setup.

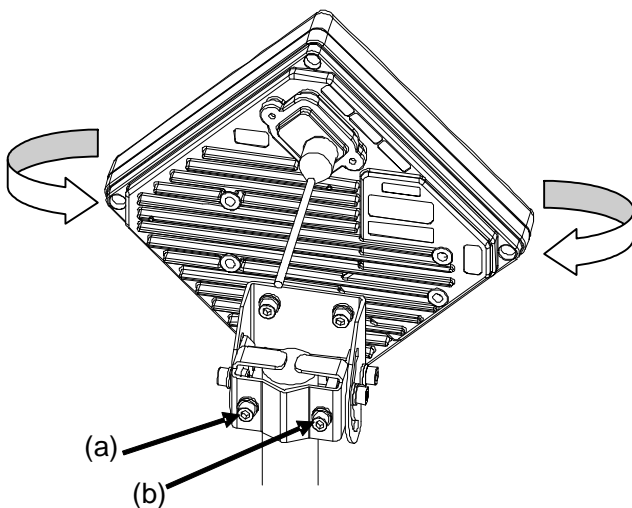


Figure 7-39 Finely Adjusting the Horizontal Direction

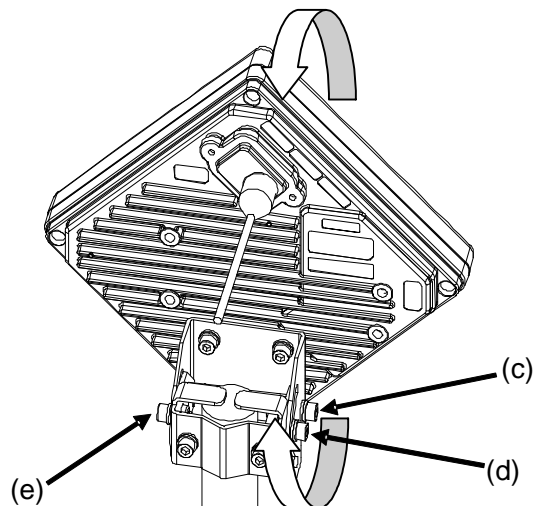


Figure 7-40 Finely Adjusting the Vertical Direction

Note : When adjusting the antenna direction
When adjusting the direction, you might mistakenly take the antenna's side lobe as the maximum receive level. For fine adjustment, therefore, you should move the antenna some more after the receive level has reached the maximum value to make sure that you have not caught a side lobe.

7.7.2. The receive level and the distance

In a point-to-point system, the receiving level at clear sky and the distance are related as shown in Figure 7-41.

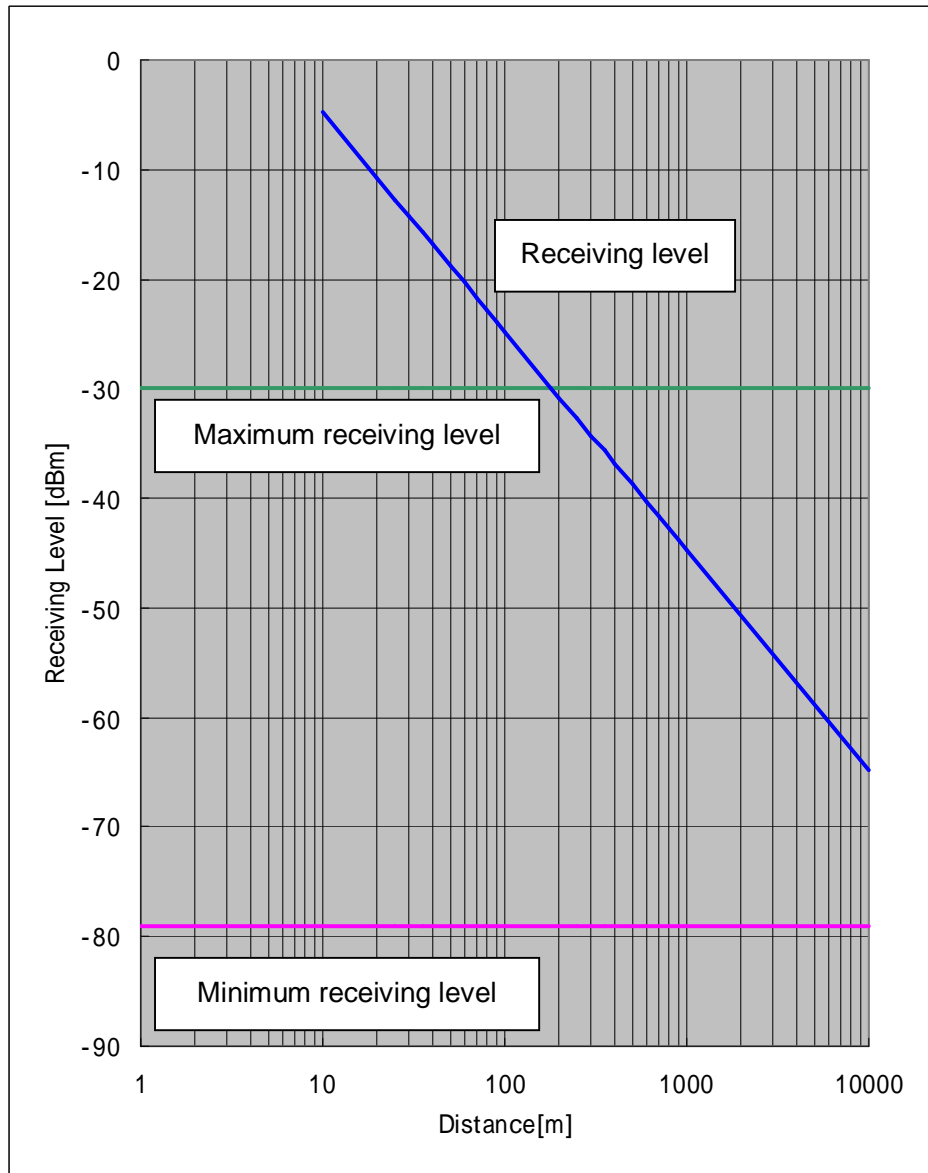


Figure 7-41 Receiving Level and Distance (QPSK)

Transmission level (QPSK)	14 [dBm]
Frequency	26 [GHz]
Antenna gain[TX+RX]	62 [dBi]
TX WT Antenna Gain:31dBiTYP	
RX WT Antenna Gain:31dBiTYP	

Free space loss L_p [dB]

$$[m] = \frac{c [m]}{f [Hz]}$$

$$L_p = 20 \log \left[\frac{4 d}{\lambda} \right]$$

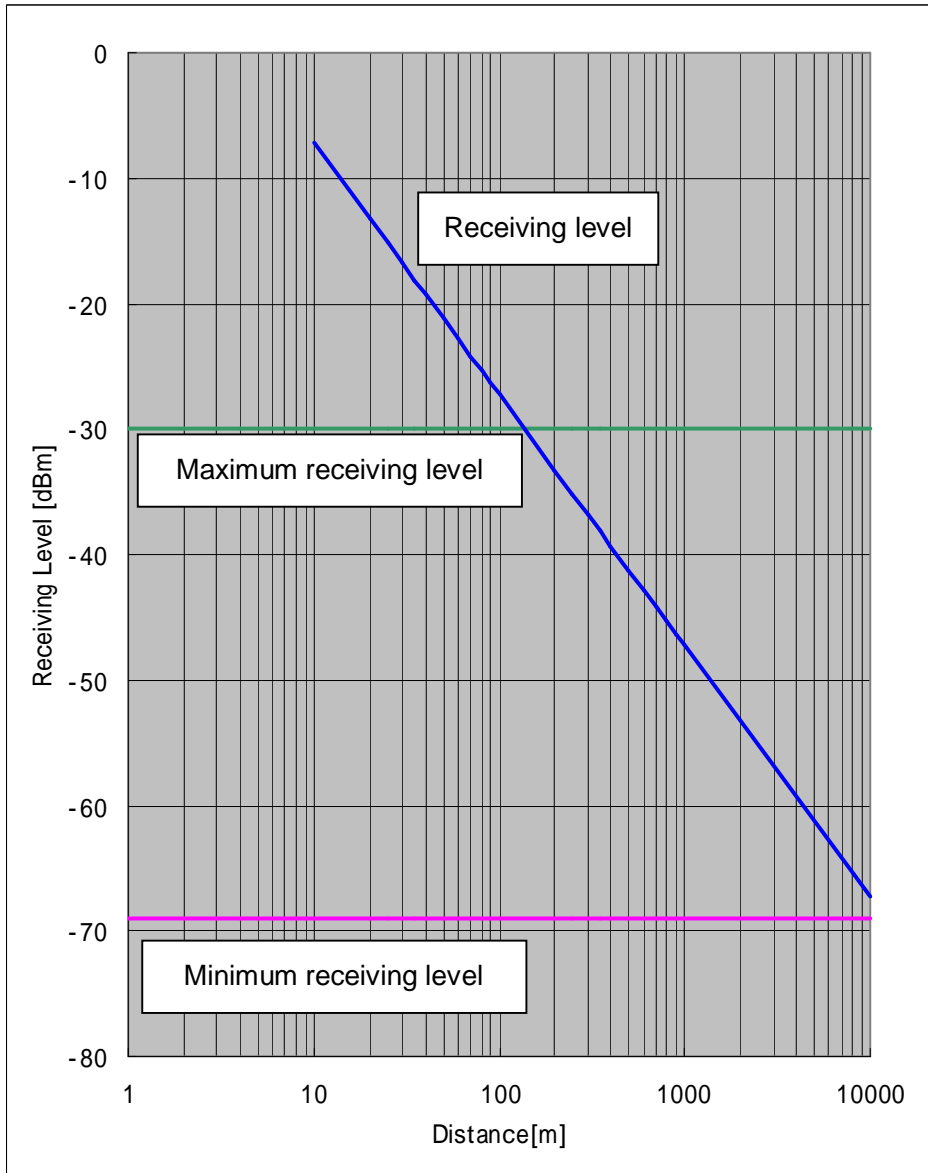


Figure 7-42 Receiving Level and Distance (16QAM)

Transmission level (16QAM)	14	[dBm]
Frequency	26	[GHz]
Antenna gain[TX+RX]	62	[dBi]
TX WT Antenna Gain:31dBi_TYP		
RX WT Antenna Gain:31dBi_TYP		

Free space loss L_p [dB]

$$[m] = \frac{c [m]}{f [Hz]}$$

$$L_p = 20 \log \left[\frac{4}{d} \right]$$

7.8. Installing the WT Adapter(master/slave)

WT Adapter is installed in indoor

It is an example of installing the appended wood screw.

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.

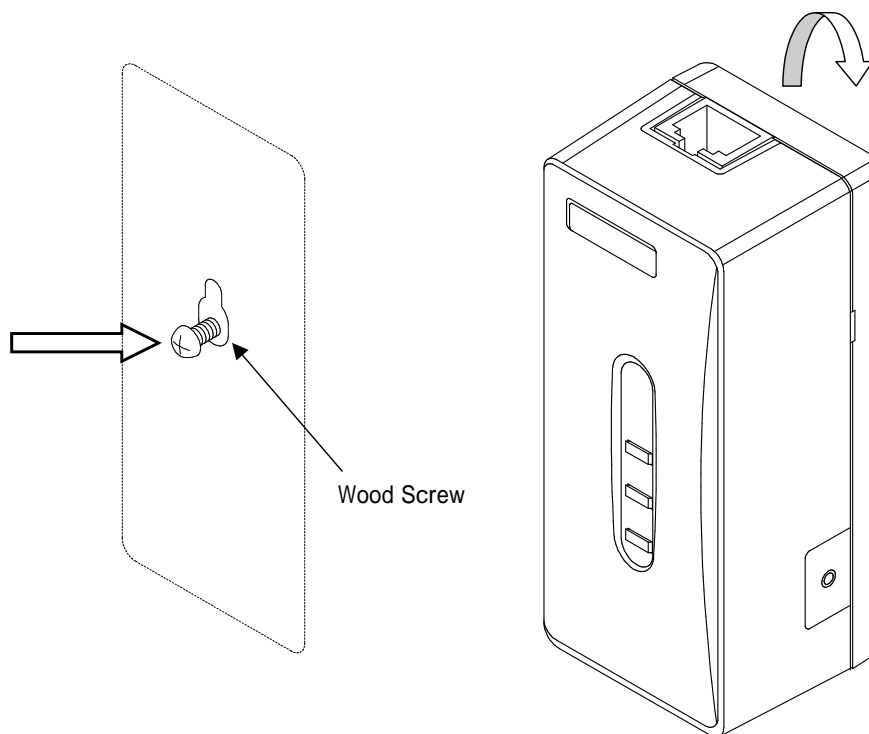


Figure 7-43 Installing the WT Adapter on the Wall

7.9. Connecting Cables to the WT(master/slave)

Use an Ethernet cable (straight) to connect the WT and the WT adapter as shown in Figure 7-44.

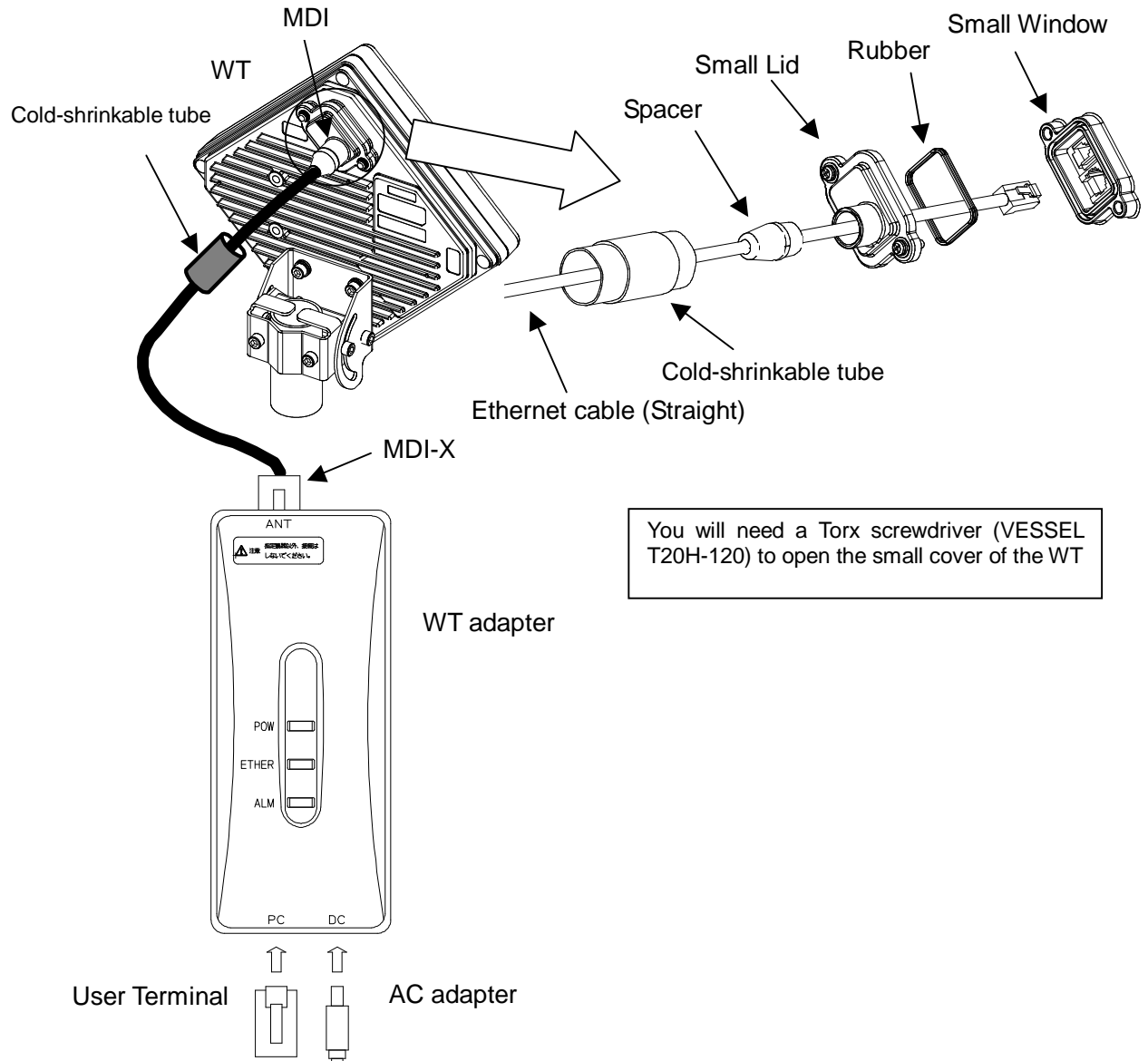


Figure 7-44 Connecting Cables to the WT



(1) Connected cable between WT and ANT port of WT adapter

Cable	
Cable type	Ethernet cable for outdoor, straight
Range of applicable outer diameter	φ5.0 mm ~ 5.7mm
Cable length	50m (maximum)
Connector of both side	
Shape	RJ-45
Cable connection	Straight connection - WT : MDI - ANT port of WT adapter : MDI-X An Ethernet cable has eight signal lines. Four lines are used to carry Ethernet signals. The remaining four lines are used as power lines and LED control lines.

(2) Connect the user terminal to PC port of WT adapter

Interface	
Interface	10BASE-T / 100BASE-TX
Connector	
Shape	RJ-45
Pin assign	Ethernet signal (MDI-X)
Cable	
Communication terminal	Cable connection
PC	straight
HUB	crossover
ROUTER	straight

(3) Connect the AC adapter to DC port to the WT adapter

-  • Never connect your personal computer to the ANT port of the WT adapter. Doing so may damage your personal computer.
-  • 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.
- When closing the small window, make sure that the rubber packing of the small window is free from any foreign matter.
- The cable connecting the WT and WT adapter is a straight cable. Wrong connection may damage the unit.
- The Equipment for connection to WT adapter PC-interface(RJ-45) shall be appropriate to connect to TNV-1 circuits.
- For the connection WT adapter to WT and a cable suitable for outdoor use shall be installed.

7.10. Waterproofing WT small window

- (1) Pass the Ethernet cable through the cold-shrinkable tube (a) from the bonded portion of the spiral tube. Pay attention to the insertion direction (Figure 7-46).

Applicable LAN cable diameter: 5.0 mm to 5.7 mm

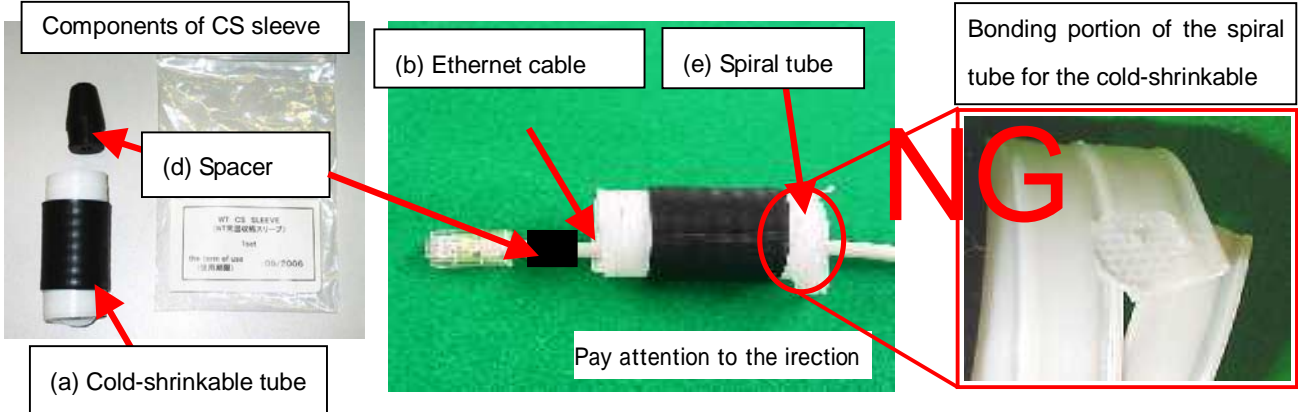


Figure 7-45

Figure 7-46

- (2) Connect the Ethernet cable to the WT (Figure 7-47).
- (3) Using cable ties (c) or the like, secure the Ethernet cable to the supporting bracket. Attach the cable ties 70 to 100 mm from the end of the supporting bracket. The cable is approximately 300 mm long measured from the cable joint (with a diameter of approximately 200 mm) to the first cable tie (Figure 7-48).



Figure 7-47

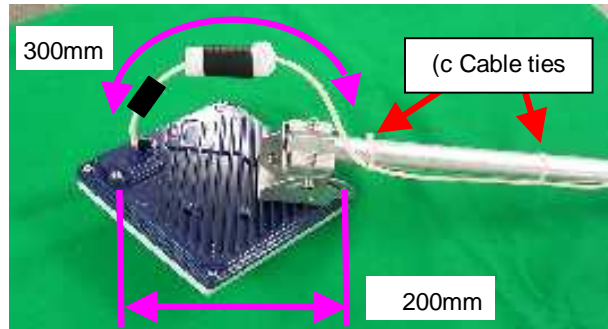
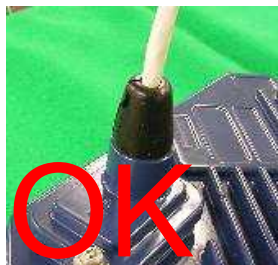


Figure 7-48



- Never allow the inside of the small window to become wet. Dampness may cause a malfunction. Connect the Ethernet cable perpendicular to the WT. Failure to do so will spoil the waterproofing effect, resulting in a device malfunction.

Cable perpendicular
to the WT



Bent cable



(4) Mounting spacer (d)

- Mount the spacer on the Ethernet cable
- Make sure that the spacer is fully inserted in the small Lid of the WT (Figure 7-50).

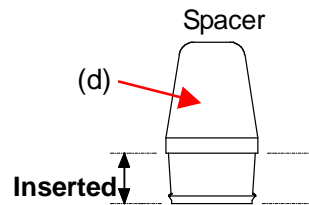


Figure 7-49



Figure 7-50

! • Insert the spacer into the small window fully. Partial insertion of the spacer will spoil the waterproofing effect.

(5) Mounting cold-shrinkable tube (a)

- Place the cold-shrinkable tube on the spacer and small Lid (Figure 7-51).
- Butt the end of the cold-shrinkable tube against the base of the small Lid. Pulling white spiral tube (e) to the very edge of the cold-shrinkable tube eases the subsequent procedure (Figure 7-51).
- Pull the spiral tube to mount the edge of the cold-shrinkable tube on the small Lid (Figure 7-52). Make sure that there is no gap between the cold-shrinkable tube and the base of the small Lid and between the spacer and the small Lid.
- Pull the spiral tube to mount the cold-shrinkable tube, paying attention so the spacer is not lifted (Figure 7-53 and Figure 7-54). Make sure that the spacer is not protruded from the cold-shrinkable tube. The top of the cold-shrinkable tube should be 5 mm or less from the top of the spacer.



Figure 7-51



Figure 7-52

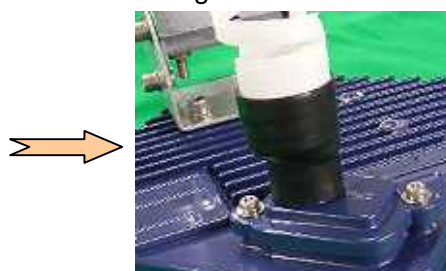


Figure 7-53

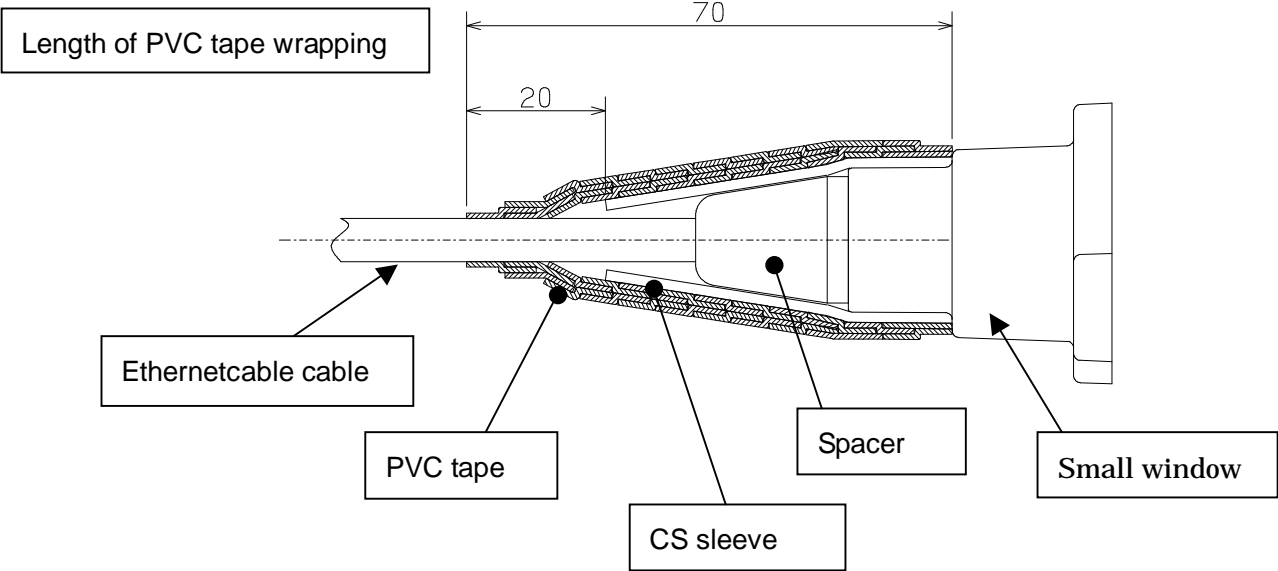
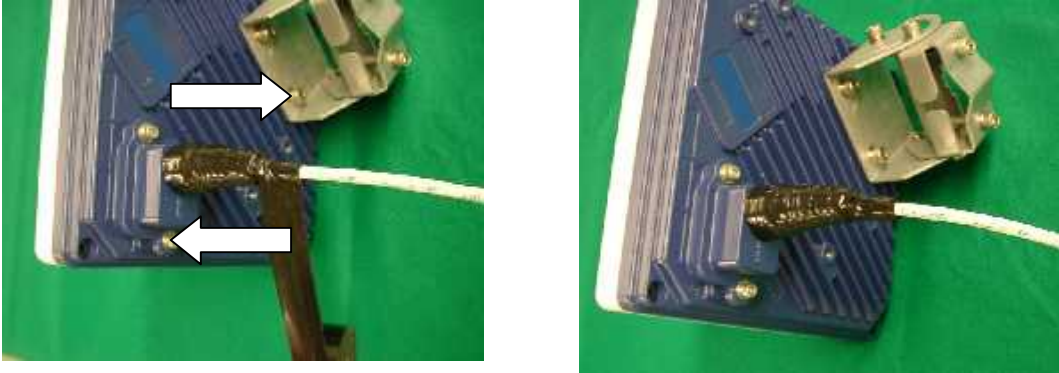


Figure 7-54

❗ • Slanted mounting of the cold-shrinkable tube as shown below will spoil the waterproofing effect. If the top of the cold-shrinkable tube is 5 mm or less from the top of the spacer, this will also spoil the waterproofing effect.

(6) Wrap the cable with PVC tape (for class 2 protection).

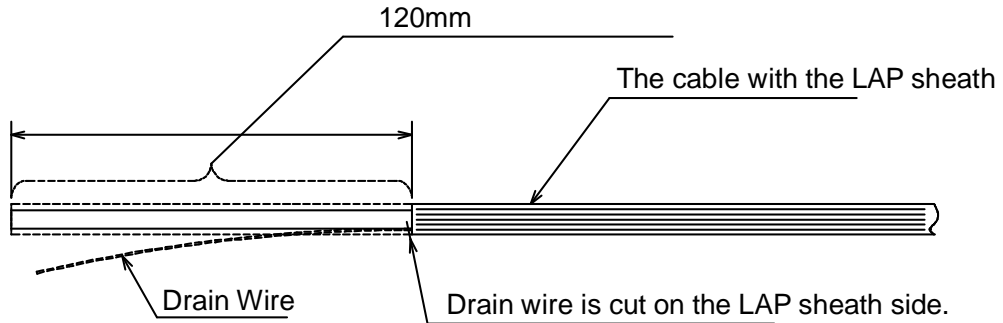
Apply the PVC tape so that the cold-shrinkable tube is completely hidden. Wrap the tape from the small Lid of the WT to the Ethernet cable, overlapping half of the previous layer. Next, reverse the wrapping direction and wrap one more time to the starting point.



7.11. When you use the cable with the LAP sheath for outdoor

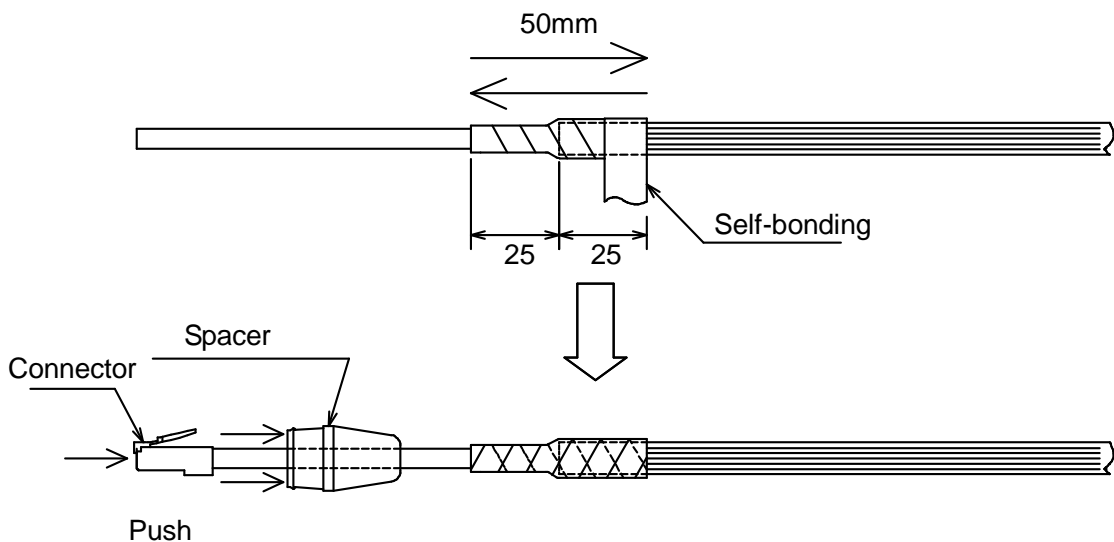
1 . Processing of LAP sheath

- The LPA sheath is peeled off from the cable point to 120mm.
- It cuts it in the part peeled off when there is drain wire.



2 . Processing of cutting part

- To prevent water being infiltrated in the wire, the self-bonding tape is rolled in the part where the LAP sheath was peeled off as shown in the figure below.
- The Ether plug is installed with the normal temperature shrinkage sleeve and Spasa passed.



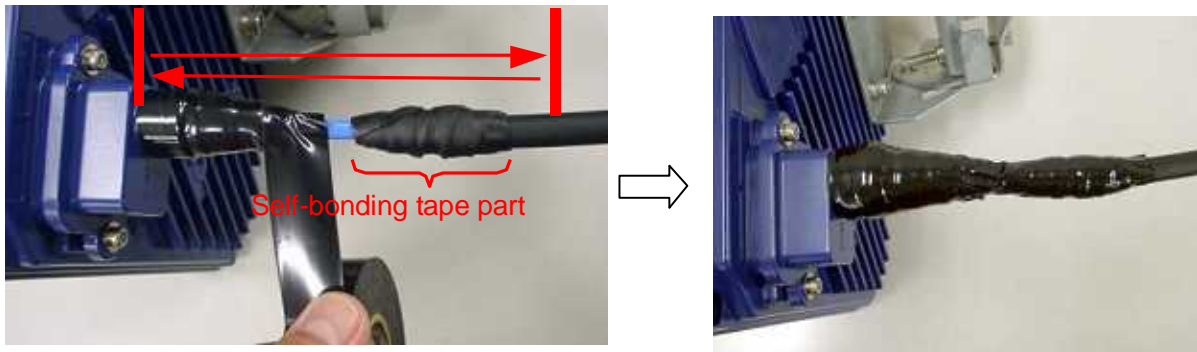
3 . Fixation of cable Ethernet, Installation of Spacer and normal temperature shrinkage sleeve

- See 「6.9. Waterproofing WT small window」

4 . Wrapping of PVC tape for protection

- It wraps until the self-bonding tape in the LAP sheath processing part is completely hidden

from a small window to the Ethernet cable side by 1/2 coming in succession, and 1 return round trip to the small window side.

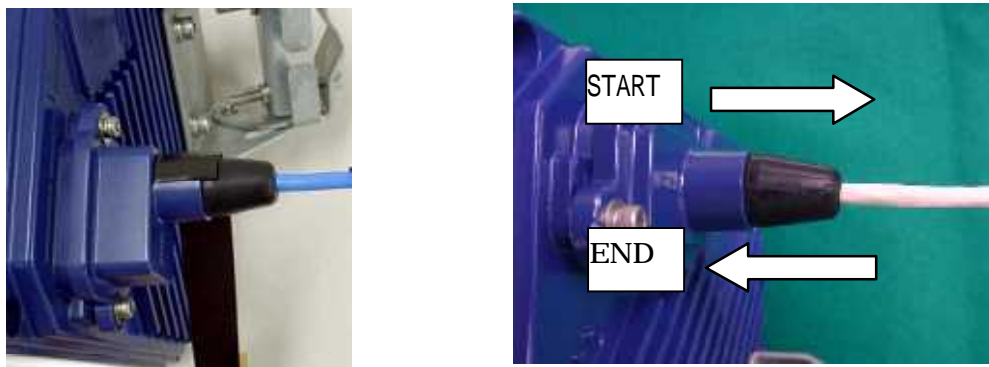


7.12. Waterproofing Without Using a Cold-Shrinkable Tube

If installing a cold-shrinkable tube fails, use off-the-shelf self-bonding tape to provide the waterproofing.

(1) Securing the small Lid of the WT and the spacer

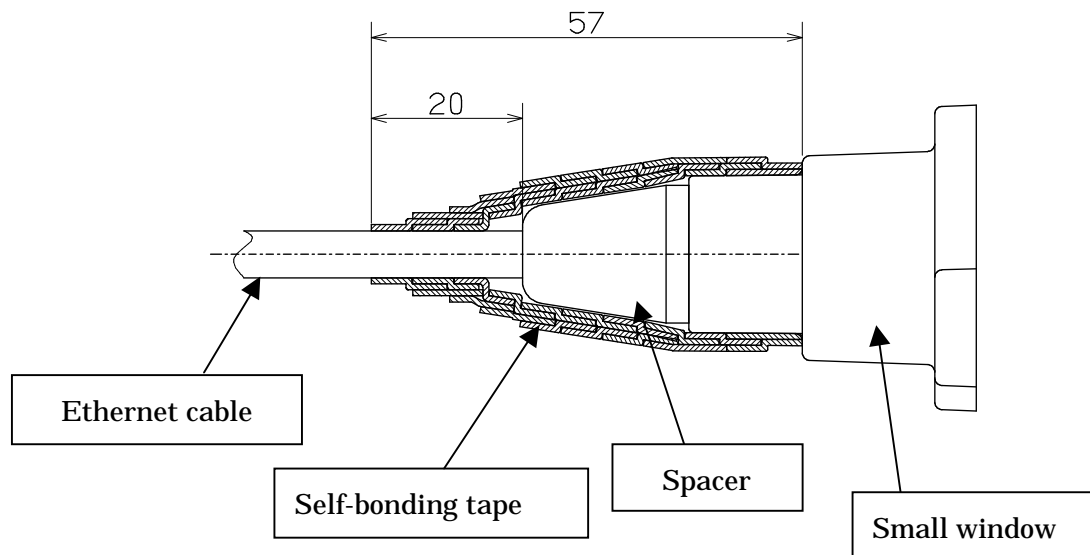
Using an appropriate length of self-bonding tape, wrap the tape around both the small Lid of the WT (at its base) and spacer one complete turn. After one turn, wrap about seven turns around the Ethernet cable by overlapping one-half of the previous turn. Reverse the wrapping direction and wrap about another seven turns back to the small Lid.





- For the stretching margin of self-bonding tape, see the instruction manual for the product.
- When wrapping self-bonding tape, start at the base of the small window and end at the end of the waterproof sleeve. Next, reverse the direction and end at the base of the small window. This procedure makes an attractive wrapping and improves the waterproof effect by making any air pockets less likely.
- Overlapping the wraps also protects against air pockets.
- Press evenly along the entire length of tape to remove air pockets.
- Make sure that there are no air pockets between the self-bonding tape and the small window of the WT or the rubber bushing. Air pockets will degrade the waterproofing effect.

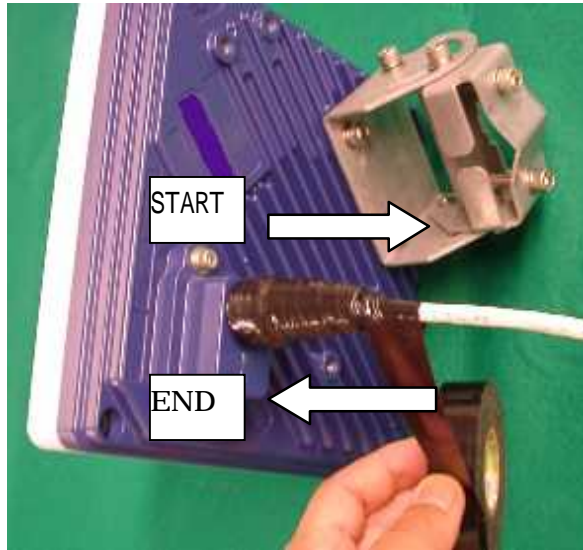
Overlapping half of the previous layer
(cross-sectional view)



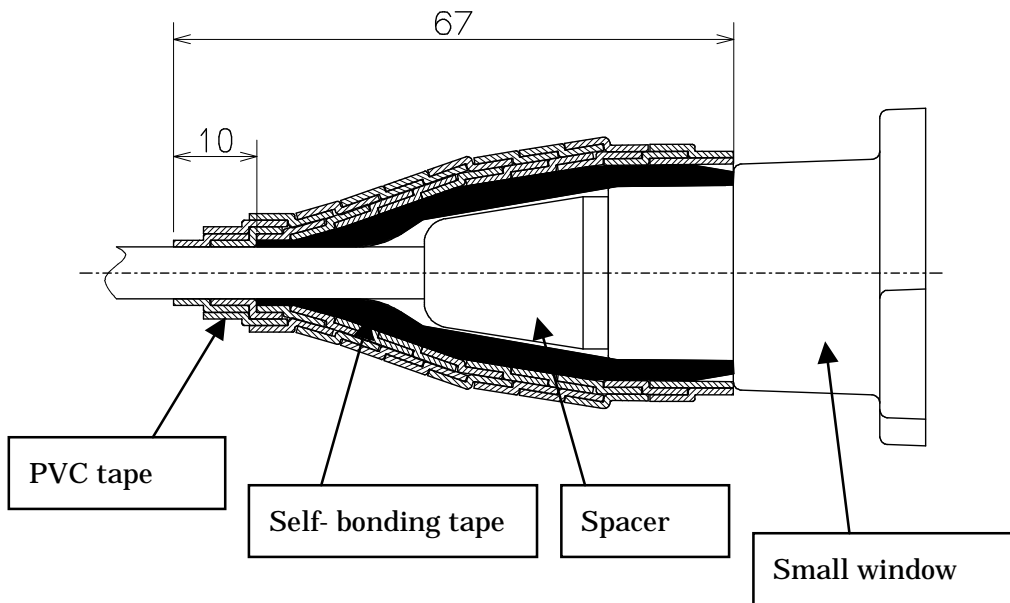
(2) Wrapping protective PVC tape

Apply the protective PVC tape so that the cold-shrinkable tube is completely hidden. Wrap the tape from the small Lid of the WT to the Ethernet cable, overlapping half of the previous layer. Next, reverse the wrapping direction and wrap one more time to the starting point. Using the PVC tape will guard the self-bonding tape against ultraviolet and other rays. The wrapping also helps increase strength.

Key point: When wrapping PVC tape, be sure that the self-bonding tape is completely covered for its protection.



Length of PVC tape used for wrapping



7.13. Testing

7.13.1. Ping test

Connect the WT and the PC as shown in Figure 7-55. Use the PC to perform a ping test in the following procedure.

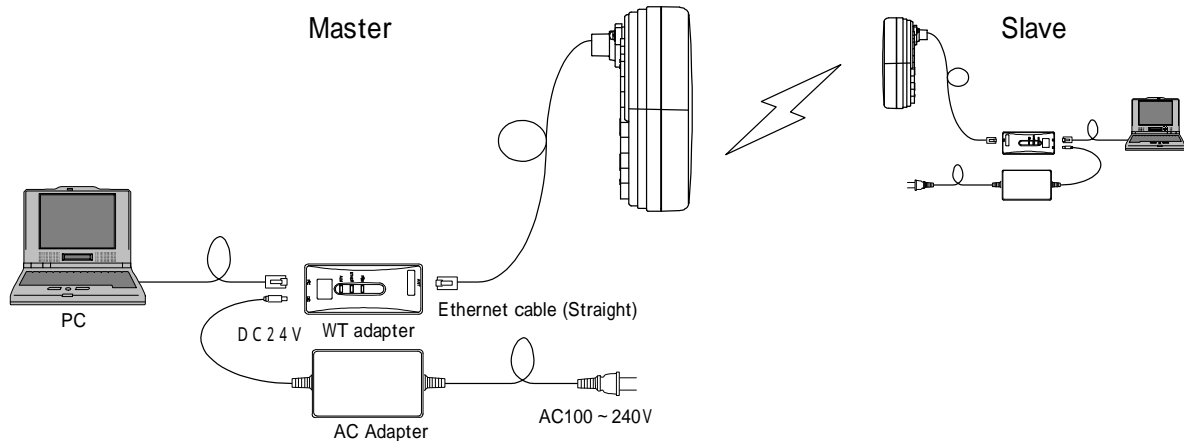


Figure 7-55 Ping Test System Diagram

Step 1: Start the Windows command prompt.

Step 2: Type the following command and press the Return key.

Ping xxx.xxx.xxx.xxx, where xxx.xxx.xxx.xxx shows the IP address of the opposite PC.

Step 3: After the command is run, check that a reply as shown in Figure 7-56 returns.

```
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright: 1985-2000 Microsoft Corp.

C:\Documents and Settings\Unknown User>ping 192.168.1.201

Pinging 192.168.1.201 with 32 bytes of data:

Reply from 192.168.1.201: bytes=32 time<10ms TTL=128
Reply from 192.168.1.201: bytes=32 time<10ms TTL=128
Reply from 192.168.1.201: bytes=32 time<10ms TTL=128
Reply from 192.168.1.201: bytes=32 time<10ms TTL=128

Ping statistics for 192.168.1.201:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Documents and Settings\Unknown User>
```

Figure 7-56 Ping Test

7.13.2. Measure the packet loss rate (with WT Local management tool)

Connect the WT Local Management Tool and measure the packet loss rate in the following procedure:

Step 1: Start the WT Local Management Tool and select P-P mode.

Step 2: Select the Radio Link Monitor tab.

Step 3: Set "Display Interval" to 1.

Step 4: Click the Start button to start traffic measurement.

Step 5: After traffic measurement for any length of time, click the Abort button to end traffic measurement.

Step 6: Check "Packet Loss Rate."

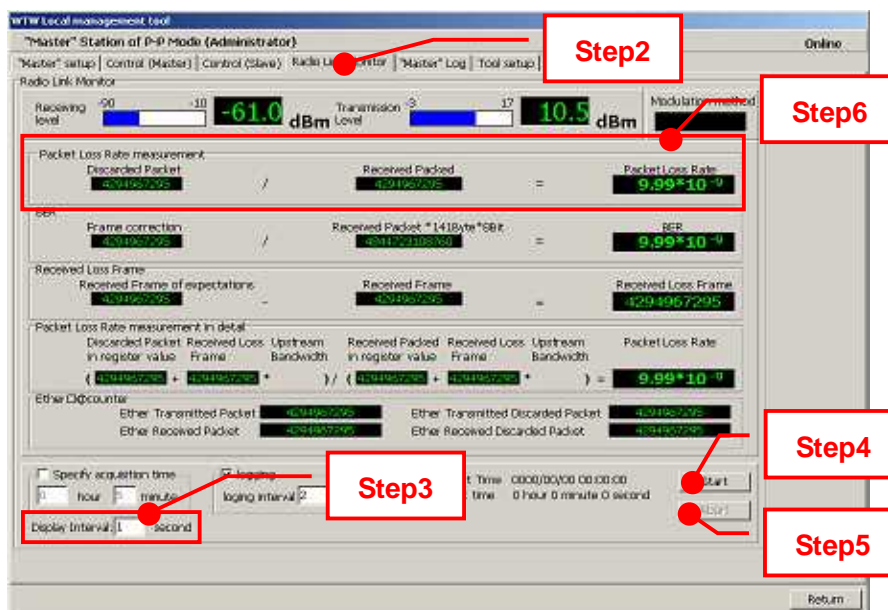


Figure 7-57 Measure the packet loss rate

7.13.3. Measure the packet loss rate (with OpS)

Connect the OpS terminal to the WT (Master) and measure the packet loss rate in the following procedure.

Step 1: Select the Traffic Information tab.

Step 2: Set "Display Interval" under "Traffic Acquisition."

Step 3: Select Save File as ON or OFF.

Step 4: Click the Execute button under "Traffic Acquisition" to start traffic measurement.

Step 5: After traffic measurement for any length of time, click the Abort button under "Traffic Acquisition" to end traffic measurement.

Step 6: Check "Packet Loss Rate."

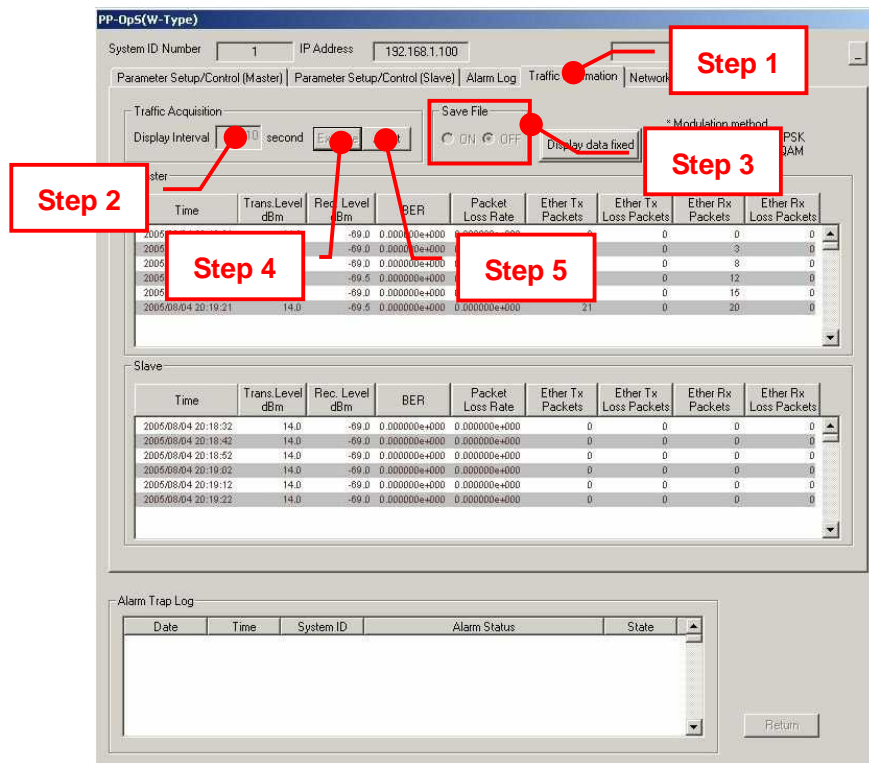


Figure 7-58 Measure the packet loss rate

7.14. Check sheet of Point to Point Construction

Check operation of the WT (Master/Slave) using the check sheet below.

Test procedure

(A) LED operation test

- Remove the AC adapter (to turn off the power) and make sure that all the LEDs go out.
- Insert the AC adapter (to turn on the power) and check the states of the LEDs.

(B) Loopback test between the WT and the WT adapter

- Press the TEST switch on the WT adapter and make sure that the ETHER LED goes out.
- Remove the cable from the WT adapter's PC port and make sure that the ETHER LED goes out.

(C) Receive level

- Connect the WT Local Management Tool to the WT and measure the receive level.

Table 7-1 Check sheet

WT	Serial number		Test date		
Test type	Test condition	Check item		Pass/fail	Measured value
LED operation test	Remove the AC adapter.	Confirm that the POW LED on the WT adapter goes out.			-
		Confirm that the ETHER LED on the WT adapter goes out.			-
		Confirm that the ALM LED on the WT adapter goes out.			-
	Insert the AC adapter.	Confirm that the POW LED on the WT adapter lights green.			
		Confirm that the ETHER LED on the WT adapter flashes green.			
		Confirm that the ALM LED on the WT adapter flashes at 1-second intervals and then goes out.			
Loopback test between WT and WT adapter		Confirm that the ETHER LED on the WT adapter goes out.			-
	Press the TEST switch on the WT adapter.	Confirm that the ETHER LED on the WT adapter goes out.			
Receive level	Remove the cable from the WT adapter's PC port.	Connect the WT Local Management Tool to the WT and measure the receive level.			dBm

8. Standard Tools to be Used

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

Table 8-1 Tools Used

No.	Unit name	Used for:		Tightening torque [N•cm]	Tool
1	AP-IFU	Door	M5	265	Torx driver (VESSEL T25H-120)
2		Power board	M4	127	Phillips screwdriver
3		Cable clamp	M4	118	Phillips screwdriver
4		Ground	M4 nut	127	Socket driver (Width across flats: 7)
5		SC lock(cap)	G3/8 nut	110 to 150	Spanner wrench (Width across flats: 22)
6	WT	Small window	M4	127	Torx driver (VESSEL T20H-120)
7		Mounting bracket	M6	850	Allen wrench (Width across flats: 5)
8		Ethernet cable			Crimping tool for RJ-45 (Release-after-crimp type)
9	AP-RFU (Omni)	Mounting bracket axis tightening	M6 M16	850 9410	Socket wrench (Width across flats: 24)
10	AP-RFU (Sectoral-Horn)	Mounting bracket	M6	850	Allen wrench (Width across flats: 5)

The appropriate tightening torque is $\pm 10\%$ of the value indicated in the table.

9. INITIAL VALUES

9.1. Point to Multipoint system

The factory-set initial values for a point-to-multipoint system are shown below.

9.1.1. Initial values for AP parameters (Point to Multipoint System)

Table 9-1 shows the AP initial values.

Table 9-1 Initial values for AP parameters

Parameters	Initial values	Setting range	Parameter which can be set up	
			Local management tool	PMP-OpS
Registered in AP-RFU memory				
AP transmission level	14	+14	<i>invalid</i>	valid
RFU transmission state	disable	disable/enbale	<i>invalid</i>	valid
Radio frequency	Not registered	Depends on the content of the registration of "ini FILE"	valid	<i>invalid</i>
Registered in AP-IFU memory				
AP ID number	0	0 ~ 65535	<i>invalid</i>	valid
AP registration status	Not registered	Registered/Not registered	<i>invalid</i>	valid
Upstream arbitration bandwidth	2	1 ~ 8 (Total bandwidth corresponds to 10)	<i>invalid</i>	valid
OpS frame VLAN priority	4	0 ~ 7	valid	<i>invalid</i>
User frame VLAN priority	0	0 ~ 7	valid	<i>invalid</i>
OpS frame VLAN-ID	0	2 ~ 4094	valid	<i>invalid</i>
Modulation method	Mixed	QPSK/16QAM/Mixed	<i>invalid</i>	valid
IP address	192.168.0.1	0.0.0.0 ~ 255.255.255.255	valid	<i>invalid</i>
Subnet mask	255.255.255.0	0.0.0.0 ~ 255.255.255.255	valid	<i>invalid</i>
Default gateway	192.168.0.254	0.0.0.0 ~ 255.255.255.255	valid	<i>invalid</i>
Trap destination 1 status	Registered	Registered /Not registered	valid	valid
Trap destination IP address 1	192.168.0.2	0.0.0.0 ~ 255.255.255.255	valid	valid
Trap destination 2 status	Not registered	Registered /Not registered	valid	valid
Trap destination IP address 2	192.168.0.3	0.0.0.0 ~ 255.255.255.255	valid	valid
Trap destination 3 status	Not registered	Registered /Not registered	valid	valid
Trap destination IP address 3	192.168.0.4	0.0.0.0 ~ 255.255.255.255	valid	valid

Trap destination 4 status	Not registered	Registered /Not registered	<i>invalid</i>	valid
Trap destination IP address 4	192.168.0.5	0.0.0.0 ~ 255.255.255.255	<i>invalid</i>	valid
Trap destination 5 status	Not registered	Registered /Not registered	<i>invalid</i>	valid
Trap destination IP address 5	192.168.0.6	0.0.0.0 ~ 255.255.255.255	<i>invalid</i>	valid
Trap destination 6 status	Not registered	Registered /Not registered	<i>invalid</i>	valid
Trap destination IP address 6	192.168.0.7	0.0.0.0 ~ 255.255.255.255	<i>invalid</i>	valid
Trap destination 7 status	Not registered	Registered /Not registered	<i>invalid</i>	valid
Trap destination IP address 7	192.168.0.8	0.0.0.0 ~ 255.255.255.255	<i>invalid</i>	valid
Trap destination 8 status	Not registered	Registered /Not registered	<i>invalid</i>	valid
Trap destination IP address 8	192.168.0.9	0.0.0.0 ~ 255.255.255.255	<i>invalid</i>	valid
Trap destination 9 status	Not registered	Registered /Not registered	<i>invalid</i>	valid
Trap destination IP address 9	192.168.0.10	0.0.0.0 ~ 255.255.255.255	<i>invalid</i>	valid
Trap destination 10 status	Not registered	Registered /Not registered	<i>invalid</i>	valid
Trap destination IP address 10	192.168.0.11	0.0.0.0 ~ 255.255.255.255	valid	<i>invalid</i>
Ether-IF 1	Active	Active/Non-active	valid	<i>invalid</i>
Ether-IF 2	Non-active	Active/Non-active	valid	<i>invalid</i>

9.1.2. Initial values for WT(1 - 239) parameters (Point to Multipoint system)

Table 9-2 Initial values for WT(1 - 239) parameters (Point to Multipoint system)

Parameters	Initial values	Setting range	Parameter which can be set up	
			Local management tool	PP-OpS
Registered in AP-IFU memory				
WT serial number	All space	ASCII: 7 characters	invalid (Only display)	valid
Authentication parameter	All space	ASCII: 10 characters	invalid (Only display)	valid
VLAN-tag control	Non transparent	Non transparent /transparent	invalid (Only display)	valid
Interface class	AUTO	AUTO/10BASE	invalid (Only display)	valid

9.1.3. Initial values for VID(2 - 4094) table parameters (Point to Multipoint system)

Table 9-3 Initial values for VID(2 - 4094) table parameters (Point to Multipoint system)

Parameters	Initial values	Setting range	Parameter which can be set up	
			Local management tool	PP-OpS
Registered in AP-IFU memory				
WT ID number	0	0 ~ 239	invalid (Only display)	valid
Service status	Out of service	Out of service /In service	invalid (Only display)	valid

9.1.4. Initial values for AP-IFU swiches

Table 9-4 Initial values for AP-IFU swiches

Iteme	Initial values
ETHER1 AUTO/100FULL SW	100FULL
ETHER2 AUTO/100FULL SW	100FULL

9.1.5. Initial values for WT(Master) parameters (Point to point System)

Table 9-5 lists the WT defaults set in the factory.

	Parameters	Initial values	Setting range	Parameter which can be set up	
				WT Local management tool	PP-OpS
1	Registered information	Not registered	Registration/Not registration	valid	valid
2	System ID number	0	1-65535	valid	valid
3	Opposite-station serial number	11 blank characters	7 single-byte alphanumeric characters	valid	<i>invalid</i>
4	Encryption parameter	10 blank characters	5 single-byte alphanumeric characters	valid	<i>invalid</i>
5	Send level	14dBm	-6 - +14dBm	valid	valid
6	Modulation method	16QAM	16QAM/QPSK/AUTO(reserved)	valid	valid
7	Interface	AUTO	AUTO/10BASE	valid	<i>invalid</i>
8	Radio frequency	Not set	Based on the registered ini file	valid	<i>invalid</i>
9	Master ATPC	OFF	OFF/ON	valid	valid
10	IP ADDRESS	192.168.1.100	0.0.0.0 - 255.255.255.255	valid	<i>invalid</i>
11	Subnet mask	255.255.255.0	0.0.0.0 - 255.255.255.255	valid	<i>invalid</i>
12	Default gateway	192.168.1.254	0.0.0.0 - 255.255.255.255	valid	<i>invalid</i>
13	Trap destination 1 to 10	0.0.0.0	0.0.0.0 - 255.255.255.255	valid (only 1 - 3)	valid
14	VLAN tag	OFF	OFF/ON	valid	<i>invalid</i>
15	OpS VID	0	1 -4094	valid	<i>invalid</i>
16	OpS priority	0	0 - 7	valid	<i>invalid</i>
17	ARP response	ON	ON/OFF	valid	<i>invalid</i>
18	Disable transmission	OFF	ON/OFF	valid	valid
19	Slave ATPC	OFF	OFF/ON	valid	valid
20	Read community name	public	10 single-byte characters	valid	<i>invalid</i>
21	Write community name	public	10 single-byte characters	valid	<i>invalid</i>
22	Trap community name	public	10 single-byte characters	valid	<i>invalid</i>

9.1.6. Initial values for WT (Slave) parameters (Point to point System)

Table 9-6 lists the WT defaults set in the factory.

	Parameters	Initial values	Setting range	Setting tool	
				WT Local management tool	PP-OpS
1	System ID number	0	1-65535	valid	<i>invalid</i>
2	serial number at Opposite WT	11 blank characters	7 single-byte alphanumeric characters	valid	<i>invalid</i>
3	Encryption parameter	10 blank characters	5 single-byte alphanumeric characters	valid	<i>invalid</i>
4	Transmit level	14dBm	-6 - +14dBm	valid	<i>invalid</i>
5	Interface class	AUTO	AUTO/100BASE	valid	<i>invalid</i>
6	Radio frequency	Not set	Based on the registered ini file	valid	<i>invalid</i>
7	IP ADDRESS	192.168.1.100	0.0.0.0 - 255.255.255.255	valid	<i>invalid</i>
8	Subnet mask	255.255.255.0	0.0.0.0 - 255.255.255.255	valid	<i>invalid</i>
9	Default gateway	192.168.1.254	0.0.0.0 - 255.255.255.255	valid	<i>invalid</i>
10	ARP response	ON	ON/OFF	valid	<i>invalid</i>

10. System example Point to Multipoint system

An example point-to-multipoint system configuration is shown in Figure 10-1.

The settings of this system configuration are as follows:

AP setting: Table 10-1

WT setting: Table 10-2

VLAN switch setting: Figure 10-2

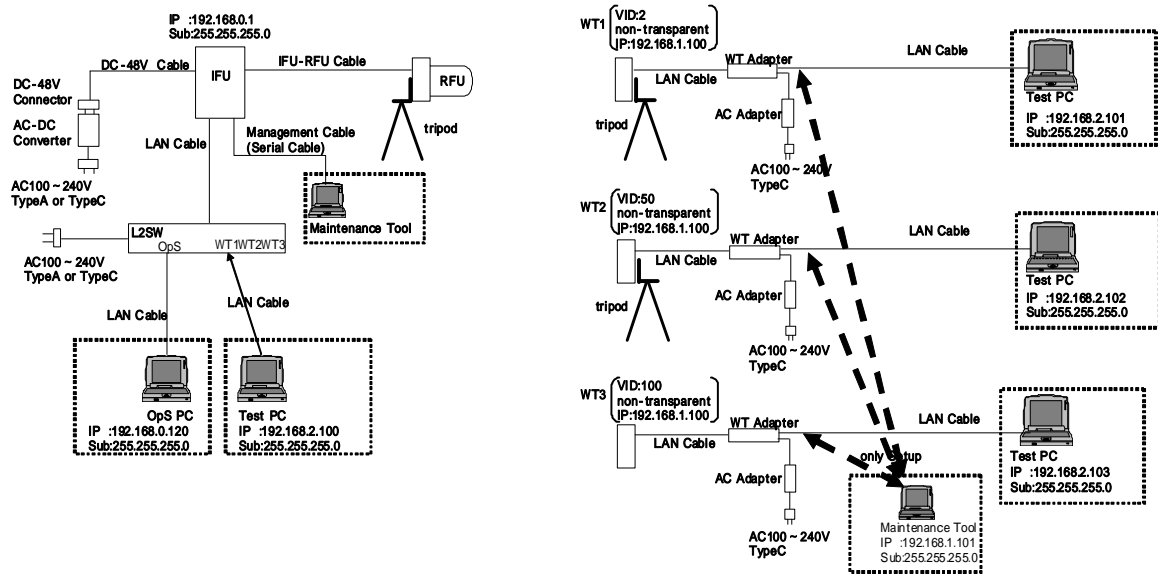


Figure 10-1 System example Point to Multipoint

Table 10-1 Setup parameters AP(Point to Multipoint)

AP		
Item	Value	Tool
OpS Frame Priority	4	Management Tool
User Frame Priority	0	Management Tool
OpS Frame Vlan-ID	500	Management Tool
AP IP address	192.168.0.1	Management Tool
Subnet mask	255.255.255.0	Management Tool
Default gateway	192.168.0.254	Management Tool
Trap Des. IP1	192.168.0.120	Management Tool
Trap Des. IP2	non-Reg	Management Tool
Trap Des. IP3	non-Reg	Management Tool
Ether-IF1	Active	Management Tool
Ether-IF2	non-Active	Management Tool
Radio frequency		Management Tool
AP ID number	1	OpS
Upstream Arbi.BW	2	OpS
AP Trans. Level	14	OpS
AP Reg. Status	Reg	OpS
RFU Transmission	Enable	OpS
Modulation Method	Mixed	OpS

Table 10-2 Setup parameters WT(Point to Multipoint)

WT	WT1	WT2	WT3	
Item	Value	Value	Value	Tool
WT ID Number	1	2	3	Management Tool
AP ID Number	1	1	1	Management Tool
Encryption Parameter	1234567890	0987654321	9876543210	Management Tool
Select WT ID number	1	2	3	OpS
VLAN-TAG Cont	non-transparent	non-transparent	non-transparent	OpS
Authen. Param	1234567890	0987654321	9876543210	OpS
Serial number (example)	NJJW000011T	NJJW000012T	NJJW000013T	OpS
WT Reg. Status	Reg	Reg	Reg	OpS
Modulation Method	adaptive	adaptive	adaptive	OpS
Interface Class	Auto	Auto	Auto	OpS
RFU Transmission	Enable	Enable	Enable	OpS
VLAN-ID	2	50	100	OpS
VLAN-ID Registration Status	Reg	Reg	Reg	OpS
Out of Service / In Service	In Service	In Service	In Service	OpS

Point to Multipoint VLAN SW parameters

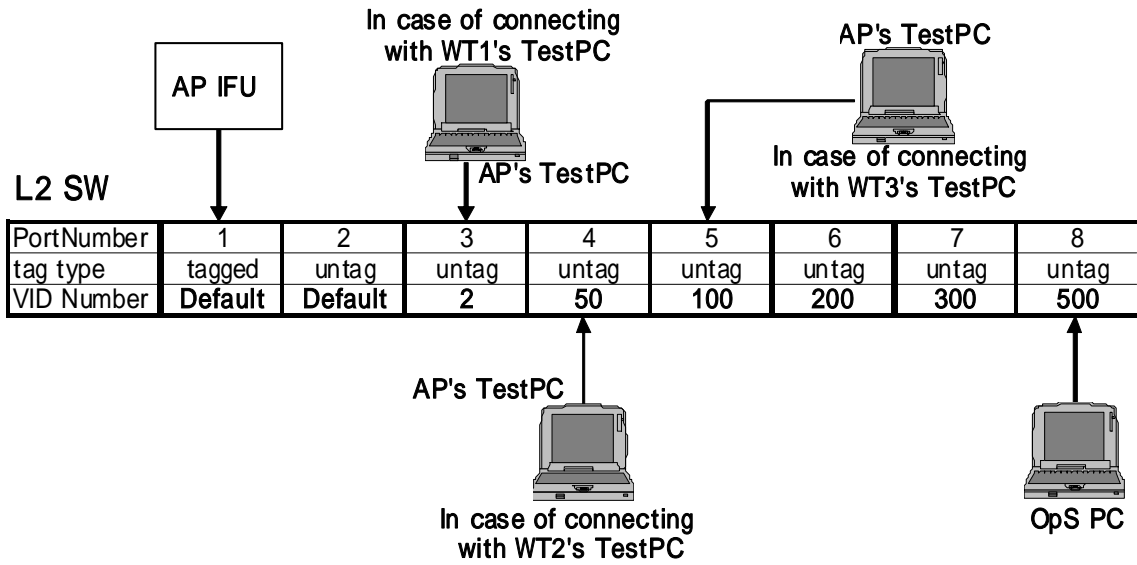


Figure 10-2 Point to Multipoint VLAN SW parameters

11. System example Point to Point

An example point-to-point system configuration is shown in Figure 11-1.

The settings of this system configuration are as follows:

setting: Table 11-1

VLAN switch setting: Figure 11-2

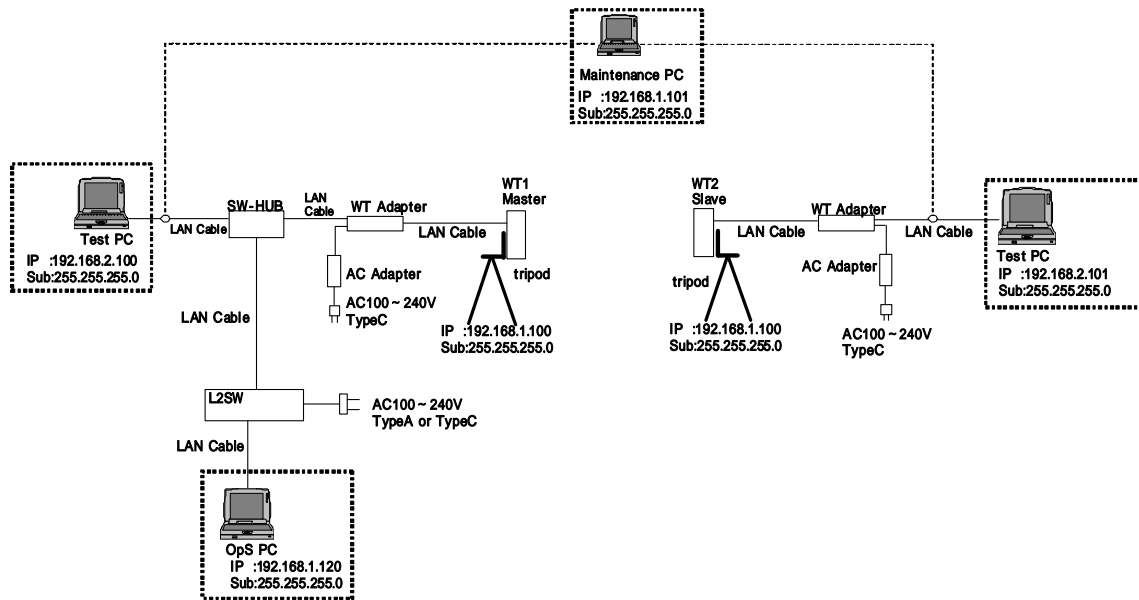


Figure 11-1 System example Point to Point

Table 11-1 Setup parameters WT(Master) / WT(Slave) (Point to Point)

	WT1 (Master)	WT2 (Slave)	
Item	Value	Value	Tool
System ID number	11111	11111	Management Tool
Encryption Parameter	12345	12345	Management Tool
Sireal No.			Management Tool
Trans. level	14	14	Management Tool
OpS Fra. Praiority	0	-	Management Tool
OpS Fra. Vlan-ID	500	-	Management Tool
IP address	192.168.1.100	-	Management Tool
Subnet mask	255.255.255.0	-	Management Tool
Default gateway	192.168.1.254	-	Management Tool
Trap Des. IP Add.1	192.168.1.120	-	Management Tool
Trap Des. IP Add.2	non-Reg	-	Management Tool
Trap Des. IP Add.3	non-Reg	-	Management Tool
Interface Class	AUTO	-	Management Tool
Reg. Status	Registered	-	Management Tool
RFU Transimission	Enable	-	Management Tool /OpS
Radio frequency			Management Tool
ATPC	off	off	Management Tool

Point to Point VLAN SW parameters

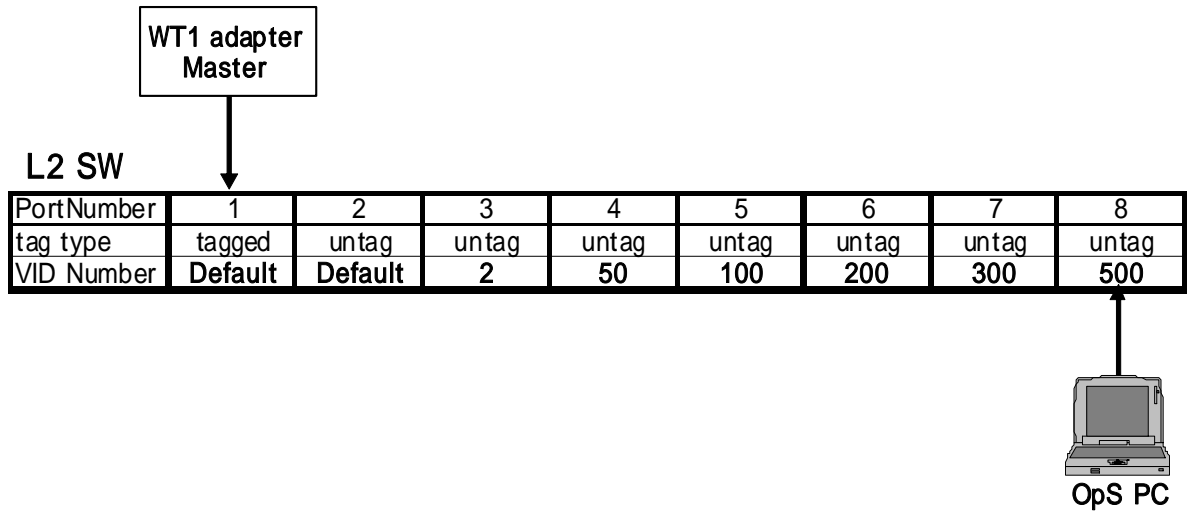


Figure 11-2 Point to Point VLAN SW parameters

**JRC FWA SYSTEM
Instruction Manual
H-7YZCM0101B**

Rev. 3.4

24/SEP./2008

JRC *Japan Radio Co., Ltd.*