Optical Access

TereScope702/ETH

TS10/A/ETH/VS

Installation Manual

March 2001

Document 4702500 Rev. 3.0

Rating: User selectable: 110V 60 Hz 45mA
or: 230V 50 Hz 20mA

Caution!
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure

Caution!
It is the responsibility of the installer that this system be installed in accordance with applicable building and installation codes

THIS DEVICE COMPLIES WITH PART 15 OF THE FOO RULES. OPERATION IS SUBJECT TO THE FOLLOWING CONDITIONS:

1. THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, &
2. THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

CE Mark

The CE mark symbolizes compliance with the EMC directive of the European Community. Such marking is indicative that the specified equipment meets or exceeds the following technical standards:

- EN 55024 - *Information Technology Equipment – Immunity Characteristics – Limits and Methods of Measurement.*
- IEC 61000-4-2: 1995 - *Electromagnetic Compatibility (EMC)-Part 4: Testing and Measurement Techniques-Section 2: Electrostatic discharge immunity tests.*
- IEC 61000-4-3: 1996 - *Electromagnetic Compatibility (EMC)-Part 4: Testing and Measurement Techniques-Section 3: Radiated, radio frequency, electromagnetic field immunity test.*
- IEC 61000-4-5: 1995 - *Electromagnetic Compatibility (EMC)-Part 4: Testing and Measurement Techniques-Section 5: Surge immunity test.*
- IEC 61000-4-6: 1996 - *Electromagnetic Compatibility (EMC)-Part 4: Testing and Measurement Techniques-Section 6: Immunity to conducted disturbances induced by radio-frequency fields.*
- IEC 61000-4-11: 1994 - *Electromagnetic Compatibility (EMC)-Part 4: Testing and Measurement Techniques-Section 11: Voltage dips, short interruptions and voltage variations. Immunity tests.*
- CISPR 16: 1993 – Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods, Part 1. Radio Disturbance and Immunity Measuring Apparatus.

A Declaration of Conformity, in accordance with the above standards, has been made and is on file at the Optical Access in Jerusalem.

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Introduction

The TS702/ETH is a wireless infrared communication link for 10Base T Ethernet, offering all-weather inter-building connectivity of up to 250 meters*. A wide-divergence transmission beam minimizes aiming complexity and sensitivity to misalignment by wind or vibrations. Utilizing new manufacturing technology, the TS702/ETH is low-cost, compact and easy to install, as compared to similar wireless communication links sold today.

General Description

Each TS702/ETH unit is comprised of a receiver, a transmitting block and an interface on the rear panel for the connection to the peripheral equipment. On the underside of the unit is a telescope holder, mounting bracket and pivot bolt.

Warning: Handle the transceiver with caution. Take particular care not to damage the front Plexiglas window.

Front View

Below the picture of the TS702/ETH shows the receiver side, including the transmitting block and the telescope holder.

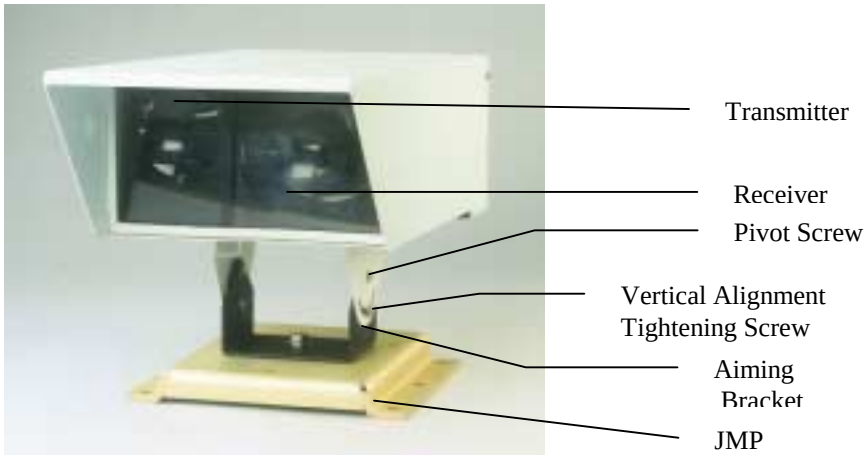
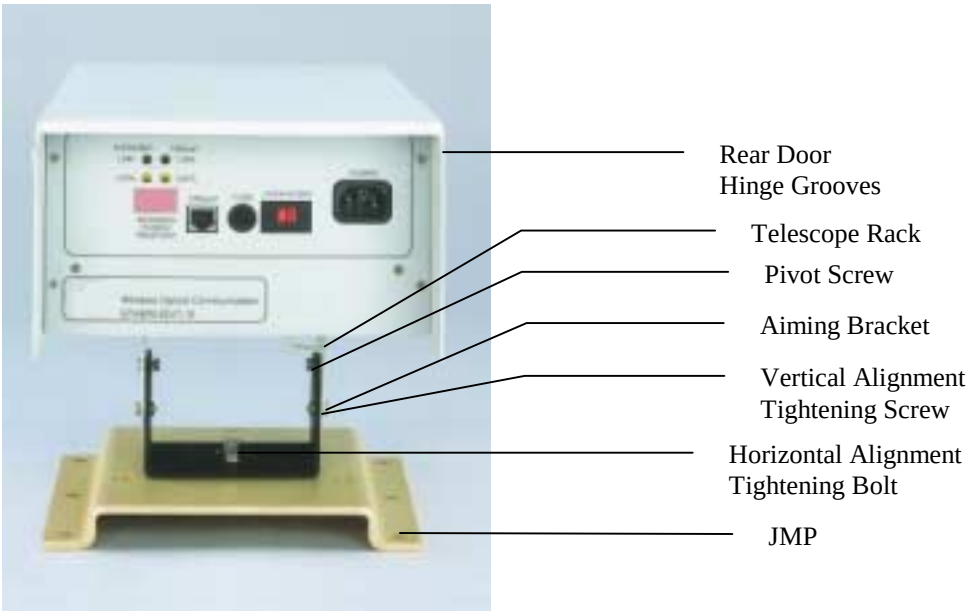


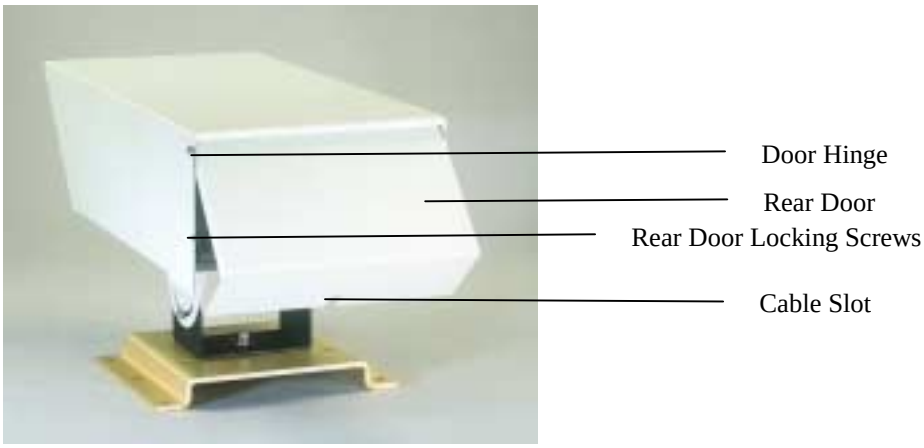
Figure 1: Front View of the TS702/ETH

* At 30 dB/km of atmospheric attenuation, which corresponds to a tropical storm, heavy snow, or moderate fog.

Rear and Side View



a. Rear Door removed to show the Back Panel



b. Rear Door protecting back panel and allowing cable entry

Figure 2: Rear View of the TS702/ETH

Back Panel Sketch

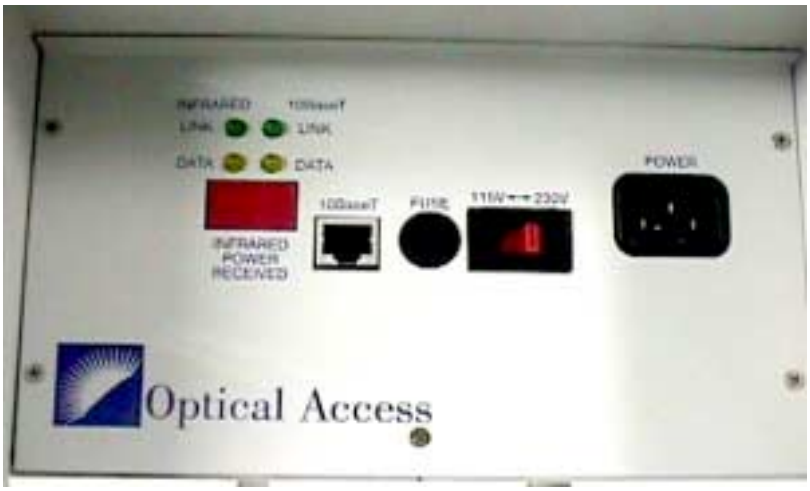


Figure 3: Back Panel Sketch of the TS702/ETH

Back Panel Description

Connector	POWER	Power source Inlet (Main or UPS).
	10BaseT (RJ-45 connector)	Copper STP-CAT-5 Interface for connection to peripheral equipment; MDI-X connection
Display	Infrared Link	Green LED indicates that the Airlink receiver has received a signal.
	Infrared Data	Yellow LED indicates Data transfer through the Airlink receiver.
	10BaseT Link	Green LED indicates a valid 10BaseT link.
	10BaseT Data	Yellow LED indicates Data transfer through the 10BaseT interface.
	Infrared Power Received	Digital readout indicates level of infrared received by the Airlink receiver.

Table 1: Back Panel Description

Technical Specifications

TS702/ETH		
Application	Wireless Ethernet 10 Mbps Full Duplex	
Performances	Rate	10 Mbps
	Maximum Range	600m
	All Weather Range*	250m
	Bit Error Rate	less than 10^{-9} (unfaded)
	MTBF	7-8 years
Transmitter	Light source	LED
	Wavelength	830 - 890nm (approximately)
	Output Power	3 mW
	Transmitter aperture	64mm
	Beam Divergence	12 milliradians
Receiver	Detector	Si PIN
	Field Of View	14 mrad (0.8 Degree)
	Sensitivity	-43dBm
Data Interface	Type	10Base-T
	Connectors	RJ-45
	Cabling	Shielded Twisted Pair (STP)
Power Supply	115/230 VAC User-selectable	7 VA max.
Environmental Information	Operating Temp.	-30°C to +50°C
	Storage Temp.	-50°C to +70°C
	Humidity	less than 90% non-condensing
	Housing	Weatherproof
Mechanical	Dimensions	430mm X 211mm X 123mm
	Weight	3.5 kg
Diagnostics	SNMP (Optional)	Manageable through the network
*	At 30 dB/Km of atmospheric attenuation, corresponding to tropical storm, heavy snow, or moderate fog.	

Table 2: Technical Specifications

Getting Started

Site Survey

Each site to be linked must be physically inspected prior to the installation. This is to ensure that the connection is feasible, to detect potential obstacles or difficulties and to decide on the exact location and mounting points of the transceivers.

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Line of Sight

Note: It is imperative that the two mounting sites are within clear view of each other in order to link two distant buildings.

In order to successfully mount the sites; be aware of the following potential obstacles:

- Growing vegetation and increasing foliage during the spring.
- Building sites (crane movement, etc.)
- Chimneys (where smoke could block the beam from time to time).

Orientation

Direct sunlight can overload the Airlink receiver. Avoid, where possible, any east to West path links.

Note: Where it is not possible to avoid an east to west path link, surrounding buildings can shield the transceiver from the direct sunlight. If there is nothing to shield the transceivers from direct sunlight, outages lasting several minutes (depending on the time of the year and the angle of the sun) can occur. The system will fully recover once the sun is out of the receiver field of view.

Location

The transceiver must be mounted in a rigid position in order to prevent the installation from twists of 3 milliradians or more. It is crucial to attach the mounting accessories to such strong mounting points as the following:

- Stiff building structures
- Concrete or reinforced concrete surfaces

Note: If strong, special mounting accessories and techniques must be considered and/or designed, see section **Special Installation Techniques**.

The following chart outlines the types of mounting surfaces to look for or to avoid:

Preferred	Avoid	Avoid if Possible
• Concrete Parapets • Structural walls or columns	• Old constructions • Soft material (asphalt, etc.) • Non uniform (uneven) surfaces • Wooden and metal structures	• Colored windows • Double glazing • The proximity of powerful radio antennas

Table 3: Mounting Surfaces

For reasons of convenience, it is preferable to install the units indoors where the required conditions previously described are satisfied and where the customer/building owner consents. If windows intervene with the beam path, the attenuating factor of the glass must be considered regarding the distance and the required fade margin.

Power and Cabling Requirements

The only infrastructure required for operating the transceiver and linking the sites is the Power and Data/Signal connection to the networking equipment. These must be ready prior to the Airlink installation.

At outdoor installations, use shielded and weather-proofed materials (cables, inlets, and connectors) that are compliant to the safety standards in force.

Connection Scheme

Use a *straight* STP cable where the peripheral equipment 10BaseT interface is MDI-X type. Use a *cross* STP cable where the peripheral equipment 10BaseT interface is other than MDI-X type.

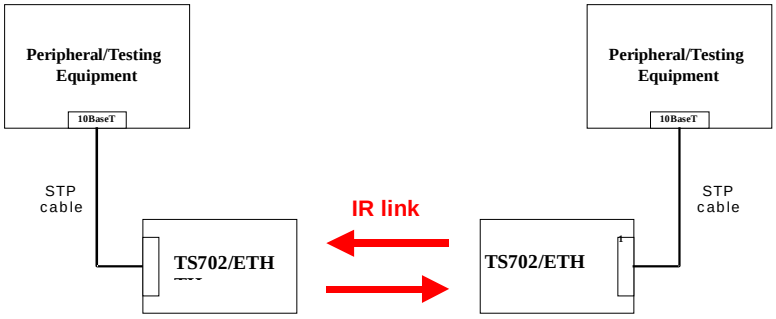

Figure 4: Connection Scheme

Power

Rating: User selectable: 110V 60 Hz 45µA
or: 230V 50 Hz 20µA

Source

The power requirement for standard units is either 117 VAC or 230VAC. An appropriate power supply inlet must be set on each site, one meter from the mounting point that was selected during the site survey (See section **Site Survey**).


For continued protection against risk of fire, replace fuses only with 40 mA T fuses for 230 VAC operation or 100 mA T for 117 VAC.

Cabling

Standard 3-conductor power cord is required.

Data/Signal Cabling

Type

An STP cable is required in order to connect each transceiver to the peripheral equipment.

Connectors

The cable is terminated with a RJ-45 connector at the Transceiver end. The MDI-X transceiver interface has the following pin connections:

Input (+)	Pin 1	Output(+)	Pin 3	Input (-)	Pin 2	Output (-)	Pin 6

Bench Test

The bench test is a test of the transceivers prior to being transported to the actual working location. It is strongly recommended to bench-test in order to locate failures, solve problems, check equipment compatibility and validate the configuration.

Compatibility

Peripheral Equipment

Check the operation of the peripheral equipment at both sites (see Configuration 1 below).

Interface

Check the specification compatibility (type, data rate, etc.) between the TS702/ETH and the peripheral equipment.

Testing Equipment

BER Tester

Choose an appropriate BER (Bit Error Rate) tester for checking the physical link quality. A portable BER tester is preferred for use in the field.

Ping Test/File Transfer

A Ping Test or a File Transfer between two workstations - connected to the networking equipment - is useful and easy to implement for testing the performance of the whole configuration.

Test Configurations

Configuration 1

Peripheral Equipment Operating Test (including converters where necessary)

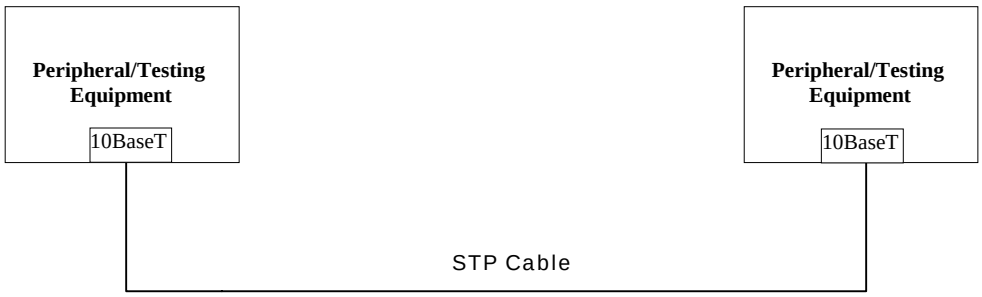

Figure 5: Peripheral Equipment Operating Test

Configuration 2

Airlink BER Test

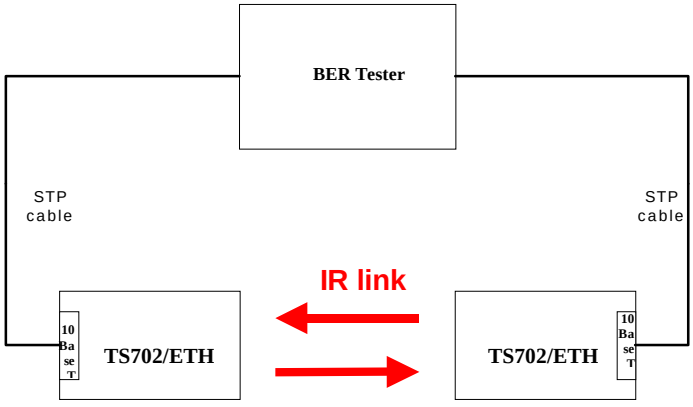

Figure 6: Airlink BER Test

Configuration 3

Airlink Ping/File Transfer Test

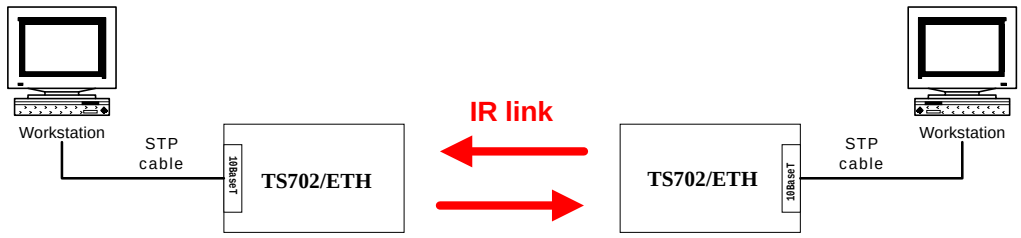

Figure 7: Airlink Ping/File Transfer Test

Configuration 4

Whole Configuration Operating Test (Ping Test or File Transfer)

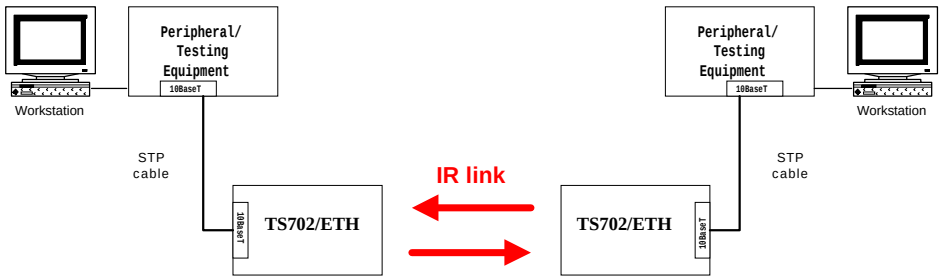

Figure 8: Whole Configuration Operating Test

Display and Results

Correct Display

Indicators

Indicator	Infrared		10BaseT	
	Link	Data*	Link	Data*
ON	X	X	X	X
OFF		X		X

***The Data indicators are ON as long as there is data transfer.

Table 4: Correct Indicator Display

Infrared Power Received

Infrared Power Received is indicated in the back-panel window. A correct reading must be below the lower and saturation limits, approximately 27 and 800 respectively. If the reading is too high, slightly misalign the transceivers.

Expected Results of the BER Tests

The BER must be less than 10^{-9} for lasting tests and display *NO ERRORS* for brief tests.

Installation

Installation deals with the physical mounting of the hardware and the unit at the selected site (see Appendix A for the required material).

Installation Procedure

The TS702/ETH transceiver is supplied with the Jolt Mounting Plate (JMP), which enables the transceiver to be mounted from either horizontal or, with optional JMB, from vertical surfaces.

JMP (Jolt Mounting Plate)

The JMP (dimensions in mm) is the base for mounting the TS702/ETH to a horizontal surface. The transceiver is attached with the Horizontal Alignment Tightening Bolt, through the mounting hole in the center.

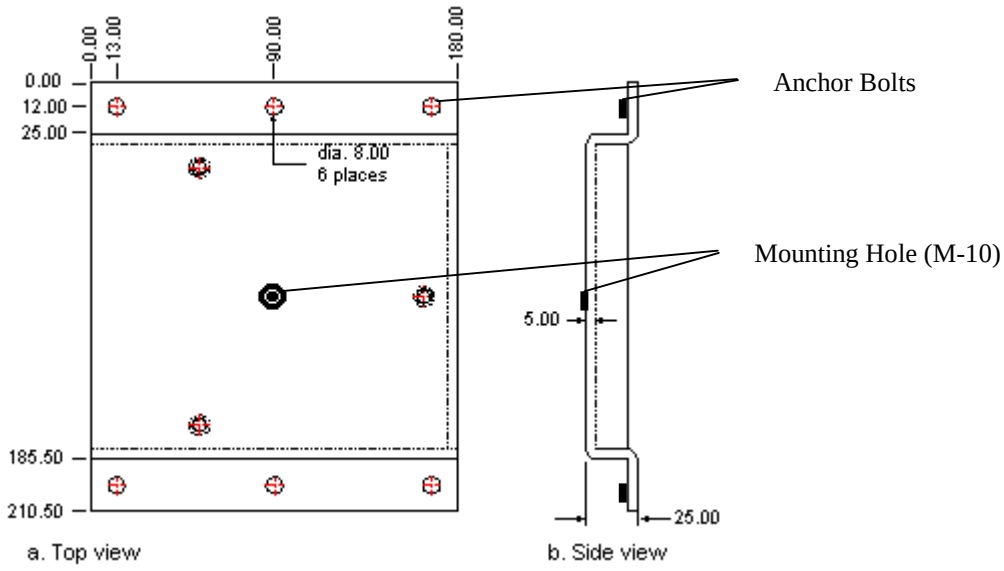

Figure 9: Jolt Mounting Plate

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Mounting on a Horizontal Surface (parapet, etc.):

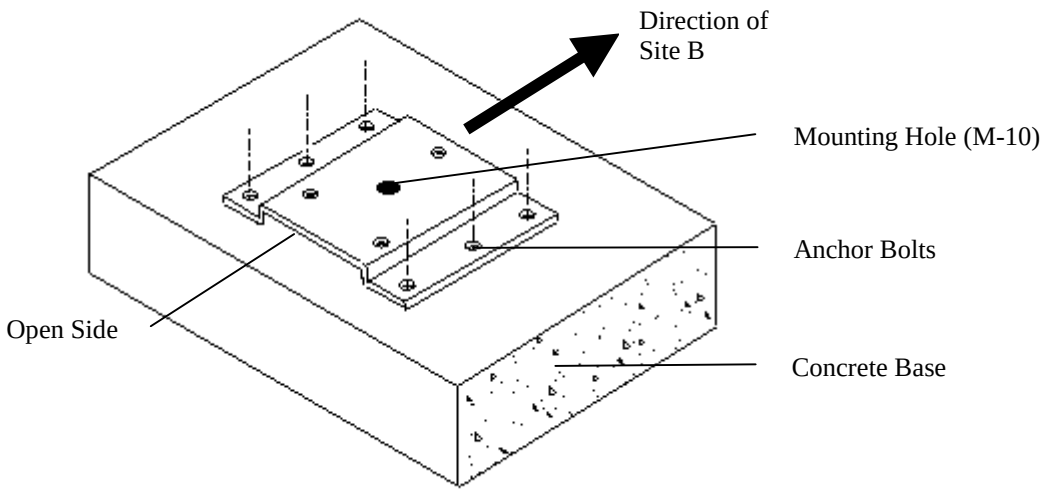


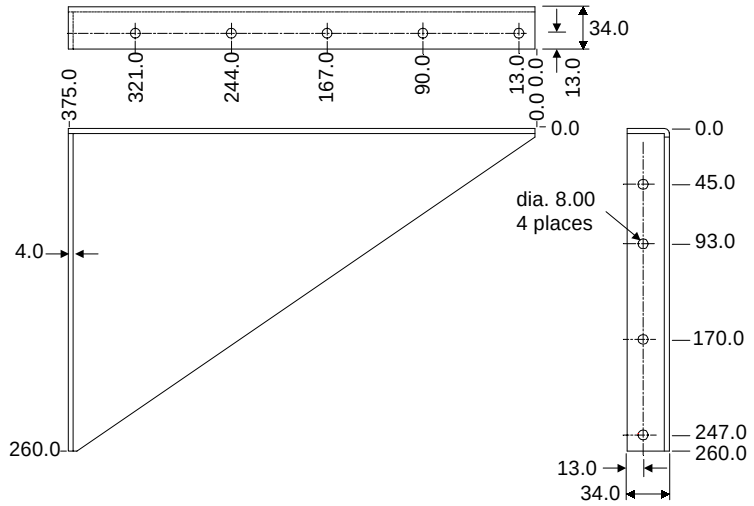
Figure 10: Mounting Surface

Note: The JMP should be oriented so that the “open side” under the accessory faces away from Site B.

Mounting on Vertical Surfaces (optional) (the accessories are sold separately)

In situations where a horizontal-mounting surface is not available, the transceiver can be mounted on a vertical surface through the use of the optional JMB (Jolt Mounting Bracket). The JMB is composed of left and right bracket.

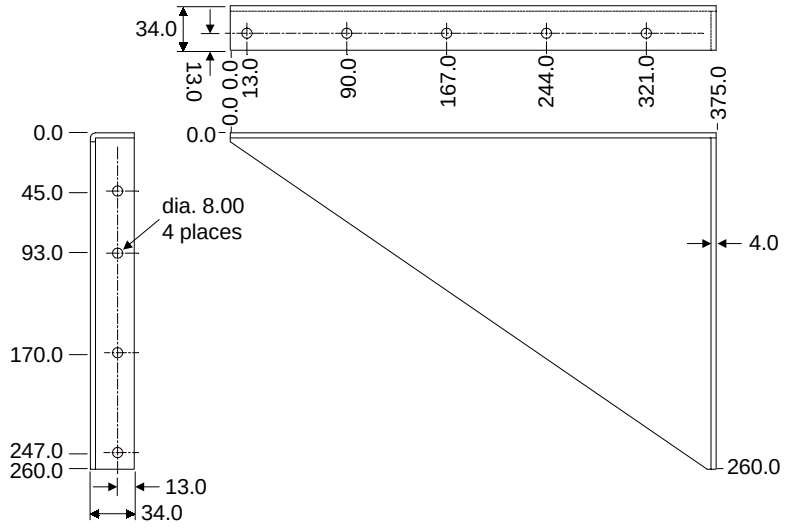
JMB Left (dimensions in mm)



a. JMB Left

Figure 11: Left Vertical Mounting Bracket

JMB Right (Dimensions in mm)



b. JMB Right

Figure 12: Right Vertical Mounting Bracket

Complete Vertical Bracket

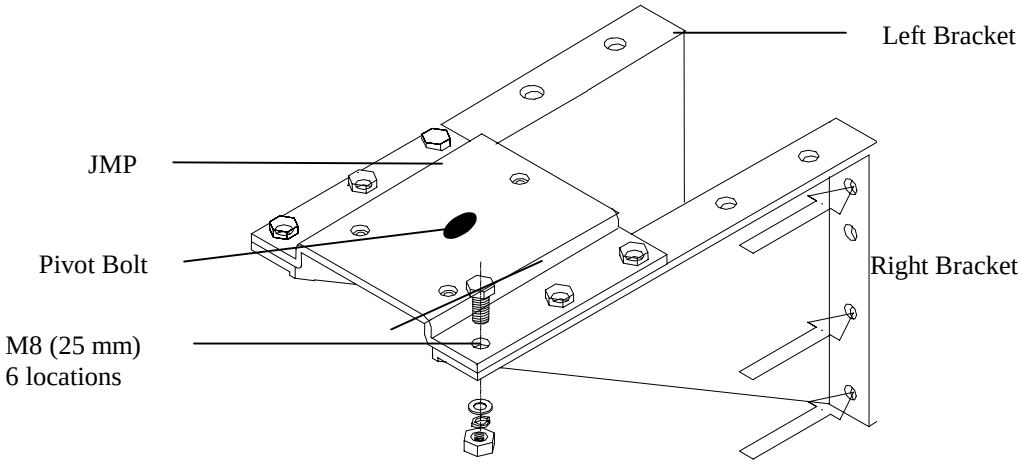


Figure 13: Complete Vertical Bracket

Note: 1.All bolts and nuts are included in the kit
2.For convenience, it is suggested to assemble the 3 parts of the JMB before mounting it on the surface.

Special Installation Techniques

This section describes two frequently encountered installation types.

Mounting on the Floor

In some cases the only place where the installation is acceptable, possible or authorized is on the floor (for example on a roof without any parapet or a roof with a metallic parapet). In such situations, drilling holes on the floor is out of the question.

In order to mount the TS702/ETH, a very stable post is fixed in the standing position to the concrete base. The transceiver is then attached on the top of the tower.

There are two techniques for stabilizing the post to the concrete base.

- The concrete slab is directly poured onto the base of the tower
- Four bolts are inserted into a concrete slab, which is placed on the floor. The post mount is fitted onto the inserted bolts, using appropriate nuts.

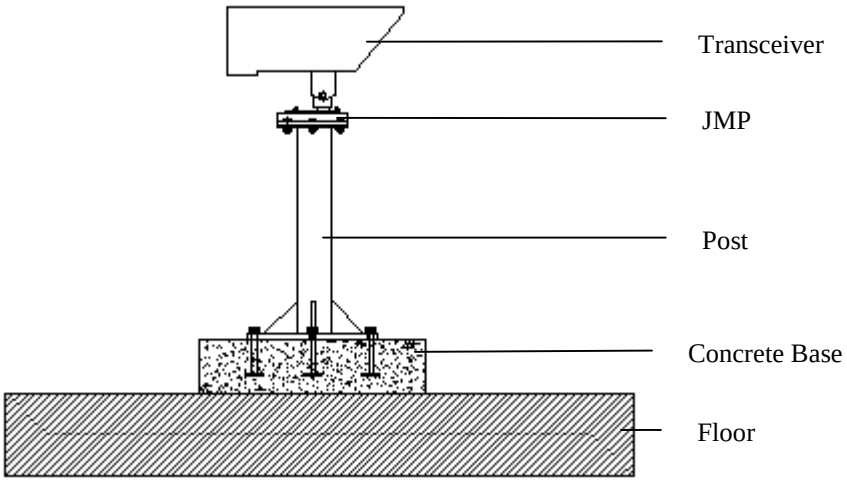


Figure 14: View of Post Mount

Note: Remove any intervening soft material, such as asphalt, from in between the base/post and the floor. After installation is completed, restore the roof waterproofing, around the base, with sealing material.

Mounting on a Fragile/Crumbly Wall

At sites where the installation on fragile (pre-fab) or crumbly (old building) walls is unavoidable, the best way to securely fix the JMB is to use a metallic clamping plate on the other side of the wall, as sketched below.

In this technique, a large section of the wall is clasped providing higher rigidity and stability.

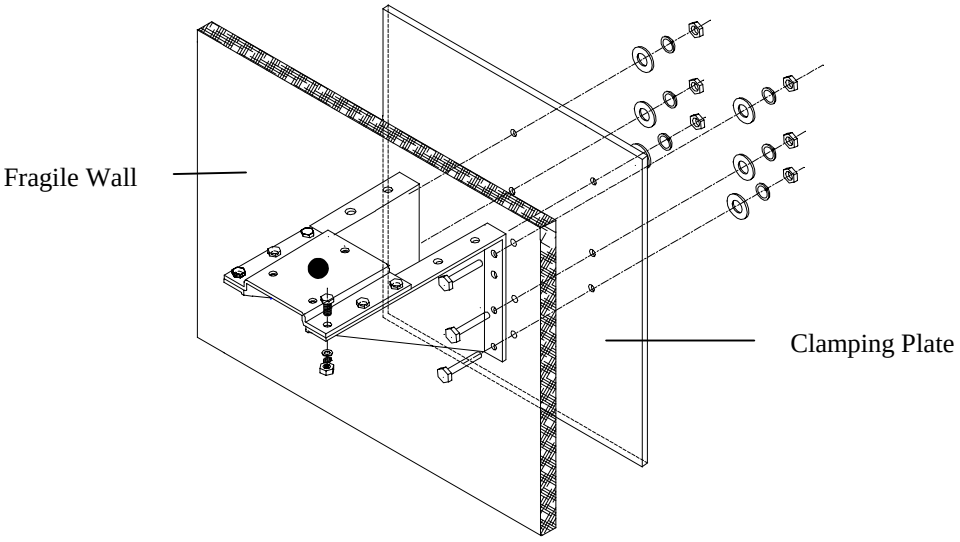


Figure 15: Wall Clasp

Note: The transceiver post and the clamping plate are not provided with the equipment and should be supplied by the installer.

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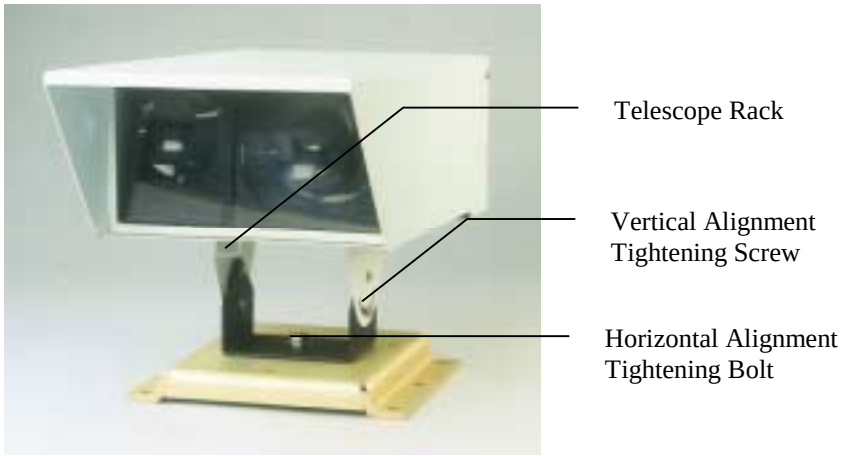
Aiming Procedure

Point to point connections require the face-to-face orientation of both "transceiving" ends of the link. With wireless optical links, symmetrically positioning the beam all around the remote receiver should be carried out as accurately as possible. The aiming procedure requires two installers, one at each site, and each installer should have a communication device (ie. walkie-talkie or cellular phone).

To aim the transceivers, carry out the following steps:

1. At both sites, mount the transceiver onto the JMP using the Horizontal Alignment Tightening Bolt. Do not tighten the bolt but loosen the Vertical Alignment Tightening Screws.
2. Connect the transceivers to the electrical power. Do not, at this stage, connect the 10BaseT data cable.
3. Insert the telescopes into the racks with the narrow end facing the opposite site (the telescope is sold separately as model number J-TEL).
4. Adjust the transceiver orientation so that the opposite site appears on the telescope crosshairs.
5. Carry out steps 3 and 4 at the opposite site. At this point, there should be a DVM reading at both sites.
6. At site A, tighten the Horizontal Alignment Tightening Bolt and the Vertical Alignment Tightening Screw.
7. At the site B, slightly tighten Horizontal Alignment Tightening Bolt and the Vertical Alignment Tightening Screws, allowing for small rotations of the transceiver.
8. Rotate the site B transceiver slightly from side to side, while the installer at the opposite site reports the DVM reading.
9. Set the final position where the maximum reading is obtained, and then tighten the Horizontal Alignment Tightening Bolt.
10. Slightly tilt the transceiver up and down. Find the maximum reading reported by the installer at the opposite site, then tighten the Vertical Alignment Tightening Screws.
11. The installer at site A should now slightly loosen the alignment bolt and screws, allowing for small rotations of the transceiver.
12. Perform steps 9-11.
13. Remove the telescopes.
14. Connect the 10BaseT data cable.



Digital Readout vs. Distance

Distance (m)	Reading
100	500
150	360
200	300
230	270
250	240
300	150
350	100

Note: Variations of ±10% can occur in actual reading .

Link Operating Test

1. At both sites, connect the STP cables leading from the peripheral equipment to the 10BaseT port of the transceiver.
2. Turn ON the power to the peripheral equipment; the 10BaseT Link indicator switches ON.
3. It is recommended to carry out a BER test; where there isn't an available BER tester, it is advisable to check system performance with the end-user (see the chapter **Bench Test**).

Installation Log

Record all of the information concerning the installation (including digital readout and the setup of the transceivers) in the Installation Log. This information will be a valuable reference for future maintenance or troubleshooting visits.

An installation form is proposed as an example in Appendix B

Sealing the Units

When sealing the unit, carry out the following steps:

1. Check that the cables are well engaged in the connectors.
2. Close the rear door by passing the cables through the slot designed for this purpose on the bottom edge of the door.
3. Lock the door with the Door Locking Screws located on the sides of the transceiver.

Note: At outdoor installations, use shielded and weatherproofed materials (cables, inlets, connectors) that are compliant to the safety standards in force.

Maintenance

Periodic Visits

Carry out yearly visits every in order to:

- Check the mounting and carry out a general overview.
- Clean the optical aperture of the transceivers by wiping with a dry cloth, if required.
- Clean the building windows of indoor installations if required.
- Check the display for a change of more than 10%.
- Check all cables for wear and/or damage.

When cleaning the equipment, the digital readout should be marked down in a service logbook. After the optical aperture is cleaned, if the reading is substantially lower than the reading noted at installation time, the aiming accuracy should be examined and restored if necessary.

Note: To check aiming accuracy, insert and look through the portable telescope and compare the present scene sighting to the scene sketched in the Installation Log at installation time.

Appendix A

Tool Kit, Equipment and Materials

Tools

- Electric drill (impact for masonry), reversible, with speed control and 0-13mm chuck
- Drills set High Speed Steel (HSS) 3-12mm.
- Concrete carbide bit drills; 6,8,9 and 10mm (regular and long shank).
- Adjustable (crescent) wrench 6", 10".
- Open-ring wrenches (spanners), standard and metric.
- Vise grip pliers 10-12"
- Cutter, long nose pliers, electrician's pliers (insulated).
- Pen, Pencil, Permanent markers.
- Lens cleaning cloths.
- Screwdrivers (flat and Philips) sizes 1, 2, 3 + power screwdriver bits.
- 50m extension cable + 3 outlet multiple electrical tap
- 200g hammer.
- Blade knife.
- Ratchet handle driver.
- Socket wrenches 8mm, 10mm, 11mm, 13mm, 14mm, ½".
- Allen 8mm.

Materials

- Anchors (wall plugs) "UPAT" 10mm diameter
- Hex-head screws to fit wall plugs 40, 60, 75mm length.
- Assortment of screws, nuts, washers, spring washers.
- Electric insulation tape.
- Super glue, tie wraps (Panduit™).
- 20 mm fuse, SB or T. For 230 VAC; 40 mA; for 115 VAC, 100 mA.

Electronic and General Equipment

- Digital voltmeter (DVM)
- Two-way radio or cellular phones.

Lab Equipment

- Ethernet testing equipment (preferably portable) or
- Two portable PCs provided with a fiber optic Ethernet card.

Appendix B

Installation Log for TS702/ETH

B.1. Client / Dealer Details

	Customer	Dealer
Company Name		
Address City Country		
Contact Person		
Tel		
Fax		
e-mail		

B.2. Application details

Product	
Evaluated distance by customer	
Address of installation (site A)	
Address of installation (site B)	

B.3. Sketch of the area

B.4. Site Survey

Completed by	
Customer representative	
Distance	
Date	

	Site A	Site B
Location		
Floor		
Orientation (NSEW)		
Installation site scheme		
Indoor / Outdoor		
Plate JMP / Bracket JMB		
Window attenuation		
On-line UPS		
Voltage required (110V / 230V)		
Grounding		
Radio antenna field		

Associated interface equipment	Site A	Site B
Manufacturer		
Type		
Model number		
Interface type		

B.5. Installation

Completed by	
Customer representative	
Date	

	Site A	Site B
System model		
Serial number		
Location: Same as site survey. If not provide details		
Accessories: Same as site survey. If not, provide details		
Digital readout		
BER test		
BER equipment type		
Error type (random, burst)		
Brief interruption test		

B.6. System Failure

Visit made by	
Customer representative	
Date	

	Site A	Site B
Sketch of telescope view		
Digital readout		
Failure detail		
Action items		

Visit made by	
Customer representative	
Date	

	Site A	Site B
Sketch of telescope view		
Digital readout		
Failure detail		
Action items		