product data

2200/2240 Path Align-R™

Test Set for Antenna Alignment

OPTIMIZES THE MICROWAVE TRANSMISSION PATH

- Battery-powered alignment test set of two tranceivers
- Continuous Talk & Listen over link via included headsets
- Tuneable operating bands: 1.8 to 19.4 GHz (2200/2201), or 1.8 to 23.5 GHz (2240/2241)
- Available with Record-R™ Data Logging
- Tone ranging provides variable pitch indication of path loss
- Path loss displayed in dB
- Display updated every 300 ms

The Path Align-R™ (models 2200/01 & 2240/01*) test set is a high performance, affordable and complete test solution designed to quickly and accurately optimize the transmission path between two microwave antenna sites - all in a matter of minutes! Because the Path Align-R™ directly drives the site's antennas, the optimization process is done without the need of the antenna site's radios, expensive and complex test equipment, ground technicians, on-site AC power, cell phones, two-way radios, etc. All that is required are the antennas themselves! This means that the crew installing the antennas can align the link as soon as the antennas are hung - even before the rest of the equipment is on site! The Path Align-R™ comes complete with everything needed to align a microwave link and communicate between sites. All you'll need to supply is the appropriate waveguide-to coax adapters and the antennas!

Antenna Alignment Test Set

The Path Align-R™ set provides full-duplex FM voice communication over the link, allowing the tower technicians actually doing the alignment to talk to each other via included headsets - even before alignment begins! This feature alone can save hundreds of dollars and many man hours in dealing with the complexities and frustrations of communicating between ground personnel, tower technicians, and site to site coordination, while attempting to achieve link alignment.

Each Path Align-R™ is both a tuneable synthesized signal source and a narrow-band receiver. The transmitter's fixed output level (0 dBm) is powerful enough for long path lengths, yet low enough to virtually eliminate the possibility of interference to adjacent links. The receiver's sensitivity and narrow bandwidth allows for accurate measurement of the received signal while providing a very high rejection of adjacent signals. Front panel thumbwheel switches provide tuning within the frequency bands to a resolution of 1 MHz. An internal microcontroller controls the operation of the test set.

Both test sets transmit to, and receive from, one another continuously. This continuous communication, rapid update and fine resolution of the Path Align-R™ allows for fast and accurate adjustment of the antenna's azimuth and elevation. Alignment now takes only minutes instead of hours!

Record-R™ Internal Data Logging

Models 2201 & 2241*

The results of the antenna path alignment are logged into the Record-R™ internal memory. The Record-R™ contains an embedded GPS receiver, which provides accurate date/time and position information to be added to the frequency and path loss data. This logged data is saved in non-volatile memory for later transfer (download) to a PC where the data can be viewed, saved to disk and a hard copy printed or sent as an e-mail attachment over the Internet. A single front panel pushbutton activates the logging process. Up to 250 separate data records can be saved in the field for later download. Access to stored records is provided via USB or RS-232 connectors located on the rear panel.

The Log View-R™ software utility is also provided for interface between a PC and the instrument.

Note: The Record-R™ is installed internally in the Path Align-R™ (it is not a stand-alone unit).

Models 22(xx)A

Path Align-R™ models ending in 'A' (e.g. 2200A, 2241A, etc.) are offered without all four bands but must be ordered with at least one or more frequency band options.

Because of its rugged design and light weight (only 3.18 kg./ 7 lbs. including the back-pack and battery), the very portable Path Align-R™ can go anywhere. The test sets are delivered in custom designed weather-resistant instrument back-packs that include pockets for carrying the headset, cable, waveguide-to-coax adapters, and a spare battery. The back-pack also contains a large 'D' ring to facilitate attaching the test set to the tower using a carabineer and nylon runner, sling, or lanyard.

Aligning a microwave link with the Path Align-R™ provides accurate optimization, comparable to sophisticated test equipment, while reducing:

- the number of personnel required to two
- the cost and complexity of communication
- the need for expensive and complex test equipment
- the time required to complete the job

Note: The Path Align-R™ is sold as a set of two units, as system operation requires the use of two units for link alignment.

* Extended Range: Models 2240 and 2241 provide extended range Frequency Bands (see specifications). These models are otherwise identical to models 2200 and 2201.

2200/01 & 2240/41 Technical Specifications

Transmitter Section

Transmission: Full-Duplex (simultaneous transmission and reception).

Transmitter Output Power: 0 dBm, nominal.

Transmitter Stability: 5.1 x $10E^{-9}$/day (aging) + 1 x $10E^{-6}$ (temperature 0°C to 50°C)

Tuneable Frequency Bands:

Model numbers ending in A must be ordered with at least one Frequency Band Option.

Models 2200/2200A/2201/2201A

(Opt. 01) Band 1:	1.8-2.5 GHz, resolution 1.0 MHz
(Opt. 02) Band 2:	5.8-6.6 GHz, resolution 1.0 MHz
(Opt. 03) Band 3:	11.0-12.0 GHz, resolution 1.0 MHz
(Opt. 04) Band 4:	18.1-19.4 GHz, resolution to 1.0 MHz

Models 2240/2240A/2241/2241A

(Opt. 01) Band 1:	1.8-2.5 GHz, resolution 1.0 MHz
(Opt. 02) Band 2:	3.5-5.0 GHz & 5.8 to 6.6 GHz, resolution 1.0 MHz
(Opt. 03) Band 3:	7.5-10.0 GHz & 11.0-12.0 GHz, resolution 1.0 MHz
(Opt. 04) Band 4:	18.1-19.4 GHz & 22.0-23.5 GHz, resolution 1.0 MHz

Deviation: 50–100 kHz

Transmit/Receive Offset: 39 MHz (Transmit offset: Switch set to 'Master' = +20 MHz; 'Slave' = -19 MHz of Thumbwheel frequency setting)

Modulation: FM (Voice)

Modulation Input/Output: Headset w/10-foot coiled cord, terminated in a 3.5 mm Plug (Mic & Earpiece)

Receiver Section

Receiver Sensitivity: 100 dBm nom. (1.8–2.5 GHz); -95 dBm nom. (3.5–6.6 GHz); -90 dBm nom. (7.5–12.0 GHz); -90 dBm nom. (18.1–23.5 GHz)

Receiver Bandwidth: 100 kHz, nominal

Receiver Overload point: -30 dBm (damage level: +10 dBm)

Receiver Readout: LCD direct path loss in dB (equivalent to signal input level in dBm), 0.1 dB resolution, updated every 300 ms

External Readout: External readout of path loss with DVM (0–2 VDC), BNC connector, rear panel

Variable Alignment Tone: 600 Hz to 6 kHz, varies with signal strength, switch selectable

Internal Speaker Output: 350 mW max., variable, behind front panel

Earpiece Output: 250 mW max., variable, 3.5 mm front panel jack

Speaker/Earpiece Control: Variable (pot)

Record-R™ Specifications

(Models 2201/2201A/2241/2241A)

Data Recorded: Each record contains: Model No., Serial No., Date, Time (UTC), Longitude, Latitude, Frequency, & Path Loss

Data Record Time: 20 ms nominal

Max. No. of Records: 250 (stored in instrument's memory), Format: CSV (comma-separated variable)

Downloading Records: Records are downloaded, thru RS-232-C or USB 'B' rear panel connectors, Rate: 9600 Baud

Software (included): Log View-R™ Data Log Utility software for Windows 95/98 & 2000/XP operating systems. This software allows a PC to download, display, save and print data records, and clear the instrument's memory.

GPS:

Frequency:	L1 (1575.42 MHz), C/A code (SPS), 8-channel cont. tracking, 32 correlators
Accuracy Position:	±2 meters CEP (50%)
Accuracy Timing:	±95 ns.
Position Fix Update:	1 second
Time to Lock:	Cold Start: <130 seconds (90%); Warm Start: <45 seconds (90%); Hot Start: <20 seconds (90%)
Reacquisition Time:	<2 seconds (90%) after loss of signal

Environmental Data

Designed to meet MIL-T-28800D Type III, Class 5 or 6, Style E and EN 61010-1

Operating Temperature: -10°C to 40°C (14°F to 104ºF)

Storage Temperature: -40°C to 71°C (-40ºF to 160ºF)

Relative Humidity: 95% ±5% 10°C to 30°C; 75% ±5% to 40°C; 45% ±5% ab.40°C

Burn In: Failure-free burn in of no less than 100 hours at 40°C

Pollution Degree: 1 (no pollution) (EN 61010-1/3.7).

Transient Overvoltage: Installation Category II (EN 61010-1/J)

Power

Power: Self Contained 12V, 2.3 Ah, rechargeable sealed Lead-Acid Camcorder Battery, 4 to 5 hours continuous operation @ 25°C (77°F). Low Battery indicator ON when approx. 15 min. operating time remains. Charge time approx. 3 hours.

Mechanical Data

Weight: Less than 3.2 kg (7 lbs) including instrument back-pack and battery

Dimensions (HxWxD): 89 mm x 213 mm x 333 mm (3.5 in. x 8.375 in. x 13.1 in.)

Connectors (RF In/Out): Super SMA male sparkplug (front panel), field replaceable

Supplemental Specifications

Warranty: One Year Limited Warranty

ISO 9000: XL Microwave's Quality System is registered to the Quality Assurance Standards of ISO 9001

CE (European Union): EN 55011:1998 w/A1:1999 Group 1 Class B (emissions); EN 61326-1:1997 w/A1:1998 (immunity)

Ordering Information

Basic Models

2200	Path Align-R™
2200A	Path Align-R™
2201	Path Align-R™ with Record-R™
2201A	Path Align-R™ with Record-R™
2240	Expanded Path Align-R™
2240A	Expanded Path Align-R™
2241	Path Align-R™ with Record-R™
2241A	Path Align-R™ with Record-R™

Included with Instrument

Each Path Align-R instrument, of a set of two, comes with (1 ea.):

Headset (earpiece with microphone) with 10-foot coiled cord

Coax cable assembly (SMA(m) to SMA(m), 3 meters)

Battery (12 VDC/2.3 Ah Rechargeable Sealed Lead/Acid)

Battery Charger (AC MAINS powered 90–264 VAC/47–63 Hz w/IEC-320 Input connector)

AC MAINS Power Cord (IEC-320 to NEMA type 5-15p plug)

Weather-resistant instrument back-pack

Operating Manual and laminated User card.

22xx models with Record-R™ additionally includes (1) ea.:

USB Cable Assembly (USB 'A' male to USB 'B' male, 2-meters/6.56 ft.)

Band Options for Models 2200(A) & 2201(A)

Option 01	1.8-2.5 GHz band
Option 02	5.8-6.6 GHz band
Option 03	11.0-12.0 GHz band
Option 04	18.1-19.4 GHz band

Band Options for Models 2240(A) & 2241(A)

Option 01	1.8-2.5 GHz band
Option 02	3.5-5.0 GHz & 5.8-6.6 GHz band
Option 03	7.5-10.0 GHz & 11.0-12.0 GHz band
Option 04	18.1-19.4 GHz & 22.0-23.5 GHz band

Accessories

Accessory 320	Battery: Spare 12V/2.3 Ah
Accessory 325	Adapter: in-line SMA(f) to N(m)
Accessory 330	Adapter: Waveguide-to-Coax N(f) CPR 137
Accessory 331	Adapter: Waveguide-to-Coax N(f) CPR 90
Accessory 333	Adapter: Waveguide-to-Coax SMA(f) CPR 42
Accessory 324	Cable: Coax Cable Assembly SMA(m) to SMA(m)

Specifications subject to change without notice

4031 622 41121 rev. 05 August 2006

US: Pendulum Instruments Inc
5811 Racine Street; Oakland, CA 94609-1519, USA
Voice:(510)-428-9488 Fax: (510)-428-9469

International: Pendulum Instruments AB
PO Box 20020, SE-16102 Bromma, Sweden
Voice: +46 8 598 51057 Fax:+46 8 598 51040

Pendulum Instruments
www.pendulum-instruments.com

- Experts in time & frequency calibration, measurement and analysis

pendulum

Incorporating XL Microwave