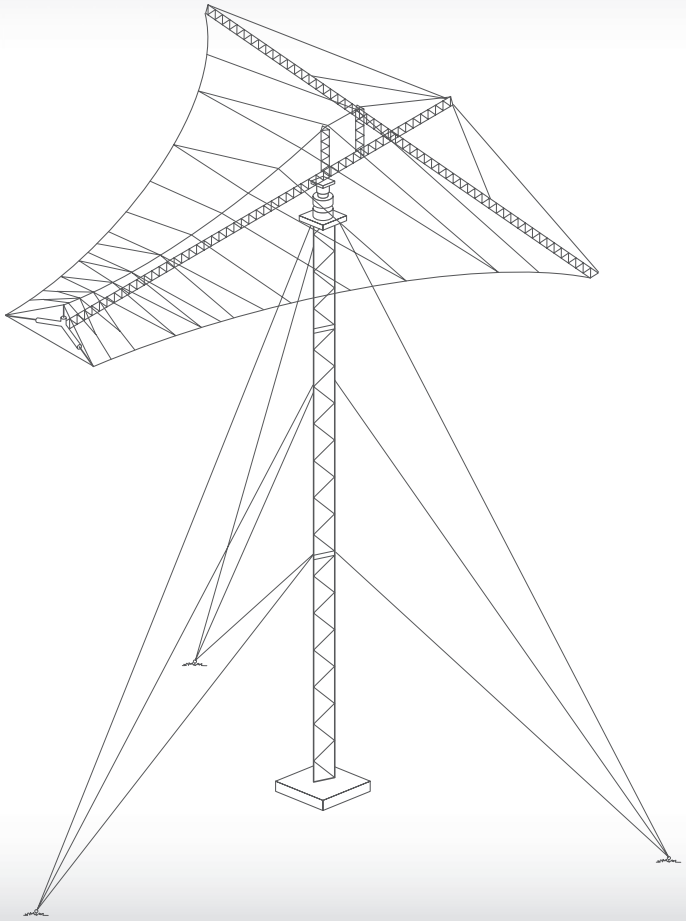


521 Rotatable Log-Periodic Antenna

Achieve greater bandwidth and performance with a compact structure.
A rotatable HF log-periodic antenna serves as a general-purpose solution. In this role, it must come as close as possible to the performance specifications of fixed directional antennas in terms of gain, bandwidth, power-handing capability, front-to-back ratio, and reliability. All of these performance requirements conflict directly with the economic and physical requirements regarding reliability, erectability, size, and cost. For example, the desire to serve lower frequencies reflects itself directly in a much larger radiating structure. In general, structural loads are proportional to the square of the largest linear dimension of the radiating structure. Thus, a lower cut-off frequency puts expensive demands on the size, cost, and erectability of the antenna.

TCI's unique design techniques have achieved a new standard in terms of bandwidth, gain, VSWR, and front-to-back ratio for a given-size structure. The result is the Model 521—a compact, easily erected antenna that has been providing highly reliable service since it was introduced in 1973.

Transmit and receive versions of the 521 are available covering the 4 to 30 MHz bandwidth. A high-power version of the antenna covering 5.95 to 26.1 MHz is also available for use at shortwave broadcasting stations.

KEY FEATURES

- Medium- and long-range coverage
- 70° Cardioid beamwidth
- Fully adjustable azimuthal direction via rotator
- Fully efficient: 2.0:1 VSWR
- Wide bandwidth: 4–30 MHz for transmit, full 2–3 MHz for receive only
- Hydraulic and control units at ground level
- All necessary erection equipment included
- Most assembly performed at ground level
- All-aluminum construction
- Special rotator assembly used by heavy-duty industrial cranes
- Compact, rugged and easy to erect
- Eliminates the need for multiple antennas
- High-environment version available

TCI

Radiating Assembly

The 521's radiating assembly is a wire-strung, transposed dipole, log-periodic antenna. The elements are compound (i.e., made up of more than one wire) and, thus, have a low Q. This results in an improved VSWR, gain, and front-to-back ratio for a given amount of wire disposed within the envelope of the radiating structure. The antenna uses highly corrosion-resistant materials. Radiator wires are made from Alumoweld, including the support catenary, which is segmented by high-strength, glazed alumina ceramic insulators, and is employed as part of the radiating structure. Thus, all structural members are involved to the maximum extent possible in improving and optimizing the antenna's radiation performance. The masts and booms are made from 6061-T6 aluminum alloy. The support booms are aluminum tower sections, which minimize the wind drag of the structure. The radiating structure, balun, and rotating joint weigh a maximum of 3000 pounds (1360 kg, 110 mph).

Rotating Joint and Balun Assembly

The balun assembly is one of the standard antenna drive units manufactured for many years by TCI. A coaxial rotating joint is also employed. It has proven to be especially long-lasting and trouble-free.

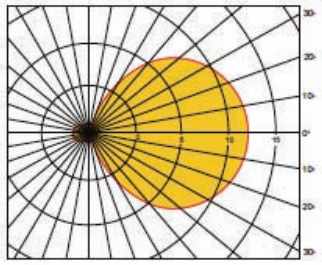
Rotating System

The antenna rotation system is highly reliable and easy to maintain. The rotators are hydraulic motors of the type used in construction cranes and marine winches. The hydraulic power pack and control unit are near ground level, making it easy to perform maintenance.

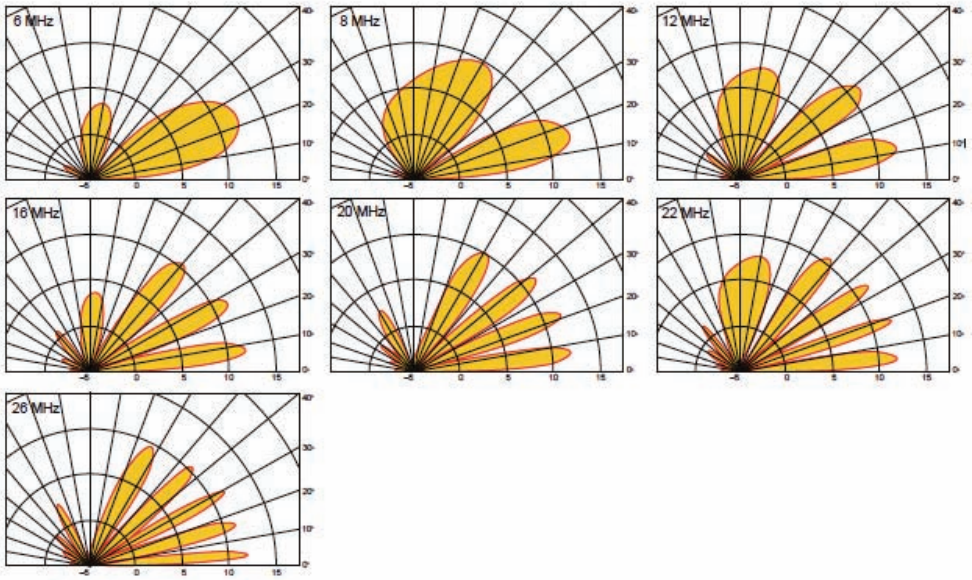
The usual rotating assembly, consisting of an electric motor, clutch, gear train assembly, and special bearings, has been a continual source of unreliability and difficulty. The 521 employs a very conservative, exhaustively proven hydraulic bearing and rotating system. This system has been employed for many years on industrial cranes subject to great loads in heavy-duty construction work in a wide range of environments.

The vast commercial experience with this hydraulic and bearing assembly ensures the mechanical integrity of the system. At TCI, this proven technology has been applied to the 521 antenna, and replaces the more traditional and unreliable clutch and gear system. In addition, since a hydraulic system is essentially constant torque, it provides smooth starting and braking action and avoids the very high inertial loads associated with a conventional clutch-and-gear system.

Azimuth and Elevation Patterns – gain in dBi



Typical azimuth pattern in the plane of the first beam from the ground.



The TCI Model 521—a compact, easily erected antenna that has been providing highly reliable service since it was introduced in 1973.

Figure 1: Completed assembly – rotatable position

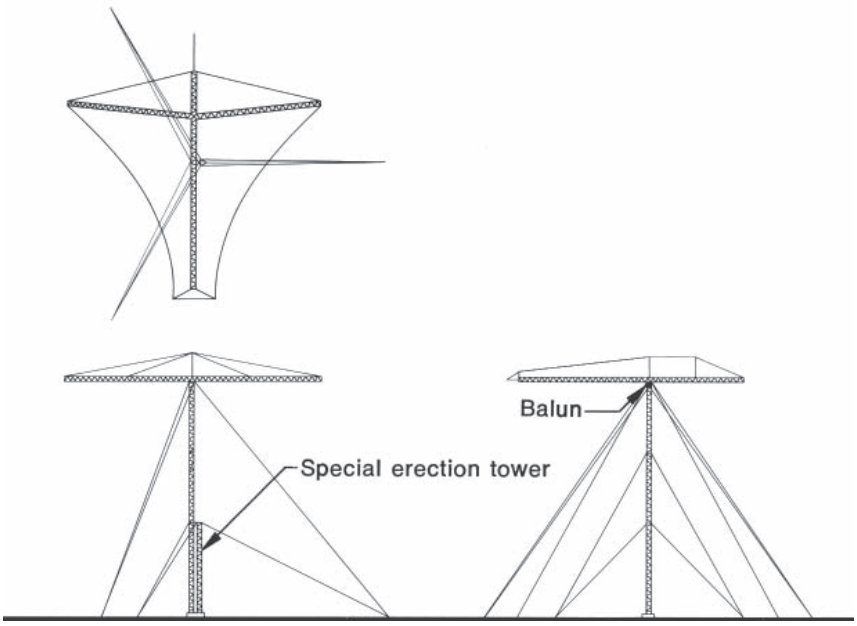
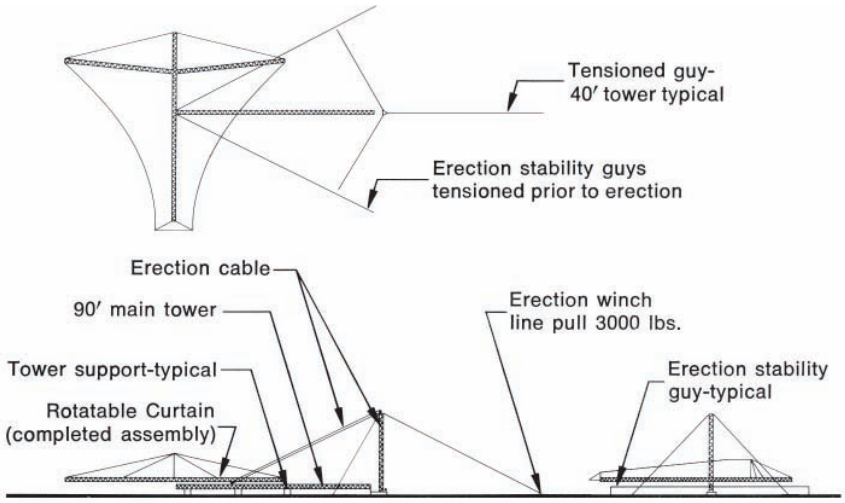


Figure 2: 90-foot tower shown in erection position

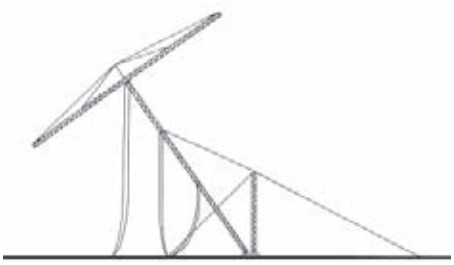


High-Frequency Rotatable LPAs are complicated electro-mechanical devices. They are subject to failure in adverse environments and require considerable maintenance. **Before purchase, the following facts should be considered:**

› During installation of the antenna, instructions in the installation drawings and manuals must be followed exactly. Improper installation of concrete or rigging of the antenna can result in failure during erection or operation. Improper power voltage can cause failure of the controls or components of the antenna. Periodic maintenance and an adequate supply of spare parts are required.

› Rotatable antennas of this size are designed for normal weather conditions where storms may occasionally occur. If the antenna is subjected to hostile environments, such as constant high buffeting winds or corrosive elements, the possibility of fasteners loosening, components fatiguing, or material failing is high. Proper maintenance is required for antenna safety. Fixed antennas such as the TCI 540 Omni-Gain antenna are a much better choice in such environments for a trouble-free operation. If a rotatable antenna is installed in a hostile environment, frequent periodic maintenance is required to repair minor problems before they can cause catastrophic failures.

Figure 3: Rotatable curtain shown in erection position



Erection and Configuration

The 521 employs an erection procedure with two very important safety and performance advantages:

› A 40-foot (12.1-meter) erection tower that is in continuous contact with the main antenna support tower during erection and lowering. The loads in the erecting cables are a small fraction of those in older designs.

› The antenna and tower are completely erected and permanently guyed before it is necessary to climb the tower to complete the final connections.

Figures 1 through 3 illustrate the antenna configuration and erection. General configuration is shown in Figure 1. Figure 2 illustrates the first step in antenna erection. The antenna support tower is erected on the ground. The radiating curtain assembly is assembled and attached to the support tower on the ground. The 40-foot tower is erected. Side guys are installed to stabilize the support tower during lifting. A double pulley arrangement is used between the 40-foot erection tower and the main support structure. The maximum tension in the erection lines during the process of raising the support tower and radiating structures is 3000 pounds (1360 kg).

The antenna kit includes a manually operated winch for raising and lowering the antenna.

TCI
An SPX Company

Model 521
Specifications

Polarization	Horizontal
Gain of Principal Lobe	12 dB nominal 4–30 MHz
Front-to-Back Ratio	8 dB at 4 MHz 13 dB minimum 4.6 to 30 MHz
Azimuth Beamwidth	70° nominal
Side Lobe Level	–13 dB maximum
Input Impedance	50 ohms nominal
VSWR	2.0:1 maximum
Speed of Rotation	0.4–1 RPM (0.5 RPM for 521-4-100)
Rotation Positions	12
Environmental Performance (see note on page 3)	Designed in accordance with EIA Specification RS-222C to withstand force of 177 km/h (110 mi/h) wind, no ice or 145 km/h (90 mi/h) wind, 0.6 cm (1/4") radial ice
Optional	225 km/h (140 mi/h wind, no ice), 145 km/h (90 mi/h) wind, 0.6 cm (1/4") radial ice
Rotating Assembly	Hydraulic
Weight	521-1-N: 5300 lbs. (2404 kg) 521-4-100: 12,300 lbs. (5579 kg)
Volume	521-1-N: 216 cu. ft. (6.1 cu. m) 521-4-100: 583 cu. ft. (16.5 cu. m)

Size

Model Number	Frequency (MHz)	Height		Length*		Boom Length		Guy Radius*	
		ft.	m	ft.	m	ft.	m	ft.	m
521-1-N	4–30	109	33.2	102	31.1	110	33.5	80	24.4
521-4-100	5.95–26.1	109	33.2	102	31.1	110	33.5	80	24.4

* Measured from extreme guy points

Power and Impedance Data

Model Number	Impedance	Power	Connector
521-1-06	50 ohms	Receive up to 1kW PEP	Type N Female
521-1-03	50 ohms	10 kW Avg/50 kW PEP	1-5/8" EIA Female
521-4-100	300 ohms	150 kW Avg/400 kW PEP	Balanced

* Additional 160 feet required to lower antenna.

TCI INTERNATIONAL, INC.
3541 Gateway Blvd.
Fremont, CA 94538-6585 USA

TEL: 1-510-687-6100
USA: 1-800-824-8074
FAX: 1-510-687-6101
www.tcibr.com

SPX

521-11-05-12