

# MODULAR BUILDING BLOCK GATEWAY



## ..... INCLUDED INSIDE:

- *Features*
- *Application Information*
- *AxxSys™ Earth Station Management System*
- *Specifications*



GLOBECOMM SYSTEMS INC.

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Telecommunications Solutions For The Global Community

## GENERAL DESCRIPTION

The Modular Building Block Gateway terminal product line provides flexibility within the context of a wide set of options available with the standard design. This terminal product line provides antenna sizes from 4.5 meters to 9 meters, with High-Power Amplifiers (HPA) from 50 Watts to 700 Watts in C- and Ku-bands. Standard single rack earth terminal designs minimize space requirements and cost. Industry standard 70 or 140 MHz Intermediate Frequency interfaces provide flexibility in choice of baseband modulation equipment. Both SCPC and TDMA baseband equipment options are available. Other options, such as uplink power control, deicing, tracking, uninterruptible power system/backup generator, and fully equipped equipment shelter are available as part of the standard product line.

## FEATURES

- G/T available from 24 to 31 dB/K at C-band
- G/T available from 30 to 37 dB/K at Ku-band
- EIRP available from 66 to 80 dBw at C-band
- EIRP available from 72 to 85 dBw at Ku-band
- Converter design supports one to four transponder operation
- Serial bus for all monitor and control interfaces
- Ease of use through Advanced AxxSys™ Earth Station Management System
- Uplink power control for Ku-band has beacon and loopback modes
- Full turnkey services worldwide
- ITU/Intelsat/ Eutelsat/ Asiasat/ FCC Compliant
- Reliability through environmental stress screening of critical components

## APPLICATION INFORMATION

The Globecomm Systems Modular Building Block Gateway product line is designed to provide reliable service in the most demanding applications of satellite communications data and voice networks. These terminals fall into the following general categories:

- SCPC voice/data network nodes
- TDMA voice/data network nodes
- VSAT hub terminals
- Digital video uplink terminals
- Intelsat IBS/IDR service
- Eutelsat SMS service

The following table provides additional application guidance for selecting a class of Intelsat transmit terminal, based on the receive terminal at the far end of the link. The capacity is specified in terms of an equivalent number of 64 Kbps circuits.

### Capacity Based on Receive Station Class

Transmit Earth Station	Std F1	Std F2	Std F3	Std B	Std A
Std E1	5	10	20	35	50
Std E2	10	20	40	70	100
Std E3	20	40	80	140	200
Std F1	5	10	20	35	50
Std F2	10	20	40	70	100
Std F3	20	40	80	140	200

Assumptions: HPA is maximum available in class per this data sheet; Intelsat VII; HEMI Beam.

## UP FRONT ENGINEERING

Globecomm Systems believes in simulation of system performance up front, in order to ensure that the station will meet or exceed all requirements. An example of the output that results from our simulations is presented on page 6. The Stage Output Level analysis and G/T versus Elevation Angle analysis are used by our installation engineers to assure the quality of the installed system. An example of a typical Block and Level diagram is also shown on page 6.

**Globecomm Systems**  
provides unparalleled  
Application Engineering  
support to its customers.

## EASE OF USE

Globecomm Systems applies the latest information technology to reduce the operating complexity and cost of Gateway Earth stations. Features include x-windows or Microsoft NT windows graphical user interface for ease of operator interaction with the system, and relational data base management system options for integration of maintenance and operations functions. Our AxxSys™ Earth Station Management System provides the ultimate in configurability by the user, based on software models of the earth station devices. This approach allows new systems to be generated quickly and cost effectively and allows upgrades to be handled without software development. Integration of maintenance and operations functions allows the user to minimize paperwork, manual processing of data, and consequently, the manpower required to operate a major gateway facility.

## AXXSYS™ EARTH STATION MANAGEMENT SYSTEM

The AxxSys™ Earth Station Management System consists of a computer workstation which interfaces with the RF equipment (and other system related hardware). The system constantly monitors the RF equipment for faults and, where applicable, provides the ability to control these items through their remote interfaces. The workstation can also be connected to another workstation which acts as an interface to a remote operator.

A key feature of the Globecomm Systems AxxSys™ Earth Station Management System is the ability to remotely log into the system to update software, or to perform software maintenance. This means our customers can obtain the latest version of software, or request software maintenance, without a Globecomm Systems representative on site, thereby saving time and money for everyone.

The workstation acts as a command console which enables constant monitoring, remote operator control, event logging, and system configuration. It is provided with a high-resolution color graphics monitor for displaying equipment status, as well as a printer for making hard copy of activity logs and reports. The software permits different security levels of operator interaction with the equipment. Monitor and Control of the Gateway Earth Station is possible from a remote location, using a second workstation connected to the local earth station control center computer.

The monitoring functions associated with the AxxSys™ Earth Station Management System include uplink/downlink frequency, HPA forward power, operational condition (online/standby), readiness condition (normal/alarm), and other system status indications for all uplink/downlink equipment. Control functions include HPA beam on/off, uplink/downlink frequency, and selection of online uplink/downlink equipment.

Earth station management software options include Operations Level and Enterprise Level.

The Operations Level includes a Training Mode, automatically generated Trouble Reports, Outage

Reports, Equipment History Logs, Equipment Inventory Reports, etc. The Enterprise Level integrates business functions like scheduling of traffic feeds, billing, payroll, accounting, etc. These options allow the earth station operator to reduce the cost of Operations and Maintenance by leveraging the capability of modern Relational Data Base Management System technology. This technology allows functions which previously required manual labor to be consolidated and automated.

**Advanced AxxSys™ Earth Station Management Systems reduce costs and expand digital transmission services.**



# UPLINK SYSTEM

The uplink system consists of the up converter and High-Power Amplifier (HPA) subsystems and an optional uplink power control subsystem. The up converter subsystem is supplied in a redundant configuration. Each up converter input path allows for monitoring. The IF input level to each up converter is adjustable in 0.25 dB steps over a 25 dB range. 1:N redundancy implementation allows for automatic replacement of a single failed up converter. Additional converters are easily added to the 1:N redundancy system without the addition of other hardware or software. Each up converter is a synthesized dual conversion unit capable of automatically tuning in 125 kHz steps to a locally or remotely selected frequency. The RF output of each up converter is monitored through a coupler. The output of the online up converter is connected to the HPA subsystem.

The HPA subsystem is comprised of redundant TWT amplifiers, with power output determined by the EIRP option selected on order. The online HPA feeds a waveguide transmission line which is connected to the antenna OMT through the RF Inter-Facility Link (RFIFL). The output of the standby HPA is connected to a dummy load.

## Uplink Subsystem Specifications

RF Frequency	5.850-6.425 GHz or 14.0-14.5 GHz (125 kHz steps)
IF Frequency	52 to 88 MHz
Amplitude Response (IDR)	0.5 dB p-p (0.6R)*
Group Delay (IDR)	10 nsec. p-p (0.6R)*
Input Level	-30 dBm, nominal
IF Level Adjustment Range	0 to 25 dB, 0.25 dB steps
RF Level Adjustment Range	0 to 20 dB, continuous
Level Stability (Constant Temp.)	±0.5 dB/ 24 hours
Intermodulation (two equal level carriers, 1 MHz apart, with a composite level 7 dB below rated saturated power)	-24 dBc
Harmonic Suppression	-60 dBc
Spurious Output Carrier Related	-65 dBc at saturation
IF Input Impedance	75 ohms, unbalanced
IF Input VSWR	1.25:1
Frequency Stability (Constant Temp.)	±1 x 10 <sup>-8</sup> /day
Spectral Purity	
Frequency Offset	Phase Noise (1 Hz, SSB)
100 Hz	-72 dBc
1 kHz	-79 dBc
10 kHz	-89 dBc
100 kHz	-100 dBc
1 MHz	-109 dBc

## 6.1 Meter Ku-band Uplink

	6.1 Meter Ku-band Antenna	100 Watt, Ku-band, TWTA	2 Way Comb. 2 Way Div.	Ku-band Up Converter	Coaxial Cable	Uplink Power Control	
	Ant	EW132	HPA	COM/DI	U/C	RFC	UPC
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
RF Output 14000.0 MHz to 14500.0 MHz							
IF Input 52.0 MHz to 88.0 MHz							
<b>Gain/Loss (dB)</b>	57.10	-2.46	69.91	-6.30	18.43	-3.93	1.00
<b>1 db Compression Point (dBm)</b>	—	—	48.06	—	10.00	—	10.00
<b>3rd Order I/C Point (dBm)</b>	—	—	54.72	—	19.00	—	20.00
<b>Noise Figure (dB)</b>	—	—	20.00	—	13.00	—	5.00
<b>Noise Temperature (K)</b>	—	—	—	—	—	—	—
<b>WB Gain Slope p-p (dB)</b>	0.4	0.1	0.0	0.0	0.0	0.0	0.0
<b>NB Gain Slope p-p (dB)</b>	0.0	0.0	0.0	0.0	0.0	-0.6	0.0
<b>NB Freq Response p-p (dB)</b>	0.0	0.0	1.0	0.0	0.5	0.0	0.0
<b>Dependent Spur Level (dBm)</b>	—	—	—	—	-74.50	—	—
<b>Independent Spur Level (dBm)</b>	—	—	—	—	-80.00	—	—
<b>Input Level (dBm)</b>	46.7	49.1	-20.8	-14.5	-32.9	-29.0	-30.0
<b>Output Level (dBm)</b>	103.8	46.7	49.1	-20.8	-14.5	-32.9	-29.0
<b>Input Center Frequency (MHz)</b>	14250.0	14250.0	14250.0	14250.0	70.0	70.0	70.0
<b>Output Center Frequency (MHz)</b>	14250.0	14250.0	14250.0	14250.0	14250.0	70.0	70.0
<b>O/P Noise Contribution (dBm)</b>	—	—	6.59	—	11.72	—	0.80
<b>Stage Gain Compression (dB)</b>	0.00	0.00	2.09	0.00	0.00	0.00	0.00
<b>3rd Order Products (dBc)</b>	—	—	-11.22	—	-66.99	—	-98.00
<b>O/P Cumulative Noise (dBm)</b>	13.14	13.14	13.14	12.06	12.06	0.80	0.80

\*R = Transmission Rate in bits per second.

## DOWNLINK SYSTEM

The downlink system consists of the Low-Noise Amplifier (LNA) and down converter subsystems. The RF signals from the receive port of the antenna OMT are fed through a Transmit Reject Filter (TRF) to the Low-Noise Amplifier subsystem. LNA outputs are connected through a coaxial transmission line to the down converter subsystem.

The LNA subsystem consists of redundant GaAs FET amplifiers with a noise temperature consistent with the G/T for the antenna/frequency band selected at order. The redundant subsystem is mounted on a plate with a transmit reject filter and input/output waveguide switches. The plate is mechanically mounted inside of the antenna hub so that it rotates with feed polarization adjustment for linear polarization configurations.

The down converter subsystem is supplied in a redundant configuration. Each down converter input is monitorable through a coupler. The IF output of each down converter is available for signal monitoring. The IF output level of each down converter is adjustable in 0.25 dB steps over a 25 dB range. 1:N redundancy implementation allows for automatic replacement of a failed down converter. Additional down converters are easily added to the 1:N redundancy system without the addition of other hardware or software. Each down converter is a synthesized dual conversion unit capable of automatically tuning in 125 kHz steps to a locally or remotely selected frequency. The RF input to the down converter subsystem can be monitored.

### 6.1 Meter Ku-band Downlink

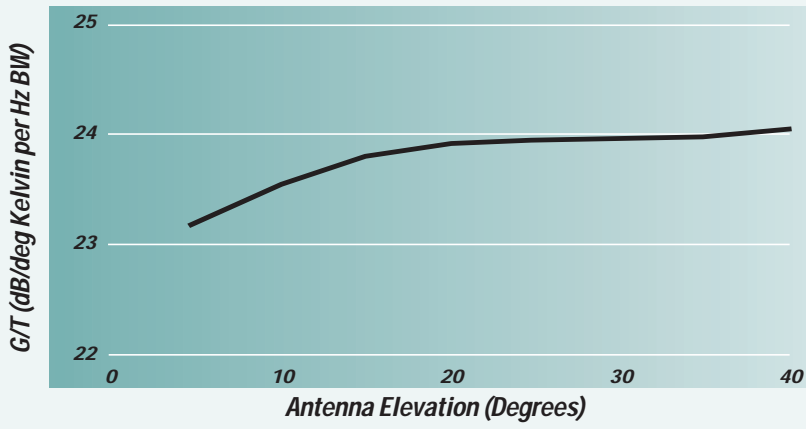
	6.1 Meter Ku-band Antenna	Ku-band Low Noise Amplifier	3/8" Coaxial Cable	4 Way Divider	Ku-band Down Converter	Coaxial Cable	IF Output 52.0 MHz to 88.0 MHz
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	
<b>Gain/Loss (dB)</b>	55.70	60.00	-7.57	-6.35	24.68	-5.92	
<b>1 db Compression Point (dBm)</b>	—	10.00	—	—	10.00	—	
<b>3rd Order I/C Point (dBm)</b>	—	20.00	—	—	20.00	—	
<b>Noise Figure (dB)</b>	—	1.40	—	—	12.00	—	
<b>Noise Temperature (K)</b>	47.22	110.04	—	—	4306.19	—	
<b>WB Gain Slope p-p (dB)</b>	0.4	0.0	-0.2	0.0	0.0	0.0	
<b>NB Gain Slope p-p (dB)</b>	0.0	0.0	0.0	0.0	0.0	-0.8	
<b>NB Freq Response p-p (dB)</b>	0.0	0.5	0.0	0.0	0.5	0.0	
<b>Dependent Spur Level (dBm)</b>	—	—	—	—	-66.55	—	
<b>Independent Spur Level (dBm)</b>	—	—	—	—	-80.00	—	
<b>Input Level (dBm)</b>	-133.0	-77.3	-17.3	-24.9	-31.2	-6.5	
<b>Output Level (dBm)</b>	-77.3	-17.3	-24.9	-31.2	-6.5	-12.5	
<b>Input Center Frequency (MHz)</b>	11950.0	11950.0	11950.0	11950.0	11950.0	70.0	
<b>Output Center Frequency (MHz)</b>	11950.0	11950.0	11950.0	11950.0	70.0	70.0	
<b>I/P Noise Contribution (dBm)</b>	47.22	110.04	0.00	0.01	0.11	0.00	
<b>Stage Gain Compression (dB)</b>	0.00	0.00	0.00	0.00	0.00	0.00	
<b>3rd Order Products (dBc)</b>	—	-74.60	—	—	-53.09	—	
<b>I/P Cumulative Noise (dBm)</b>	47.22	157.26	157.26	157.27	157.37	157.37	

### Downlink Subsystem Specifications

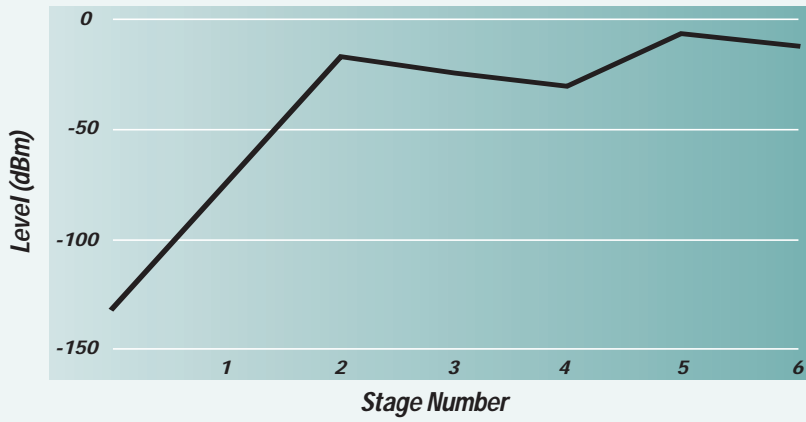
RF Frequency (125 kHz steps)	3.625 -4.2 GHz or 10.95 -11.7 GHz or 11.7 - 12.2 GHz or 12.2 - 12.75 GHz or 10.95 - 12.75 GHz (optional)
IF Frequency	52 to 88 MHz 104-176 MHz
Amplitude Response	0.5 dB p-p (0.6R)*
Group Delay	10 nsec. p-p (0.6R)*
Downlink Gain	80 dB, nominal
IF Level Adjustment Range	0 to 25 dB, 0.25 dB steps
Level Stability (Constant Temp.)	±0.5 dB/ 24 hours
Spurious Output Carrier Related	-65 dBc
IF Input Impedance	75 ohms, unbalanced
IF Input VSWR	1.25:1
Frequency Stability (Constant Temp.)	±1 x 10 <sup>-8</sup> /day
Spectral Purity	
Frequency Offset	Phase Noise (1 Hz, SSB)
100 Hz	-72 dBc
1 kHz	-79 dBc
10 kHz	-89 dBc
100 kHz	-100 dBc
1 MHz	-109 dBc

\*R = Transmission Rate in bits per second.

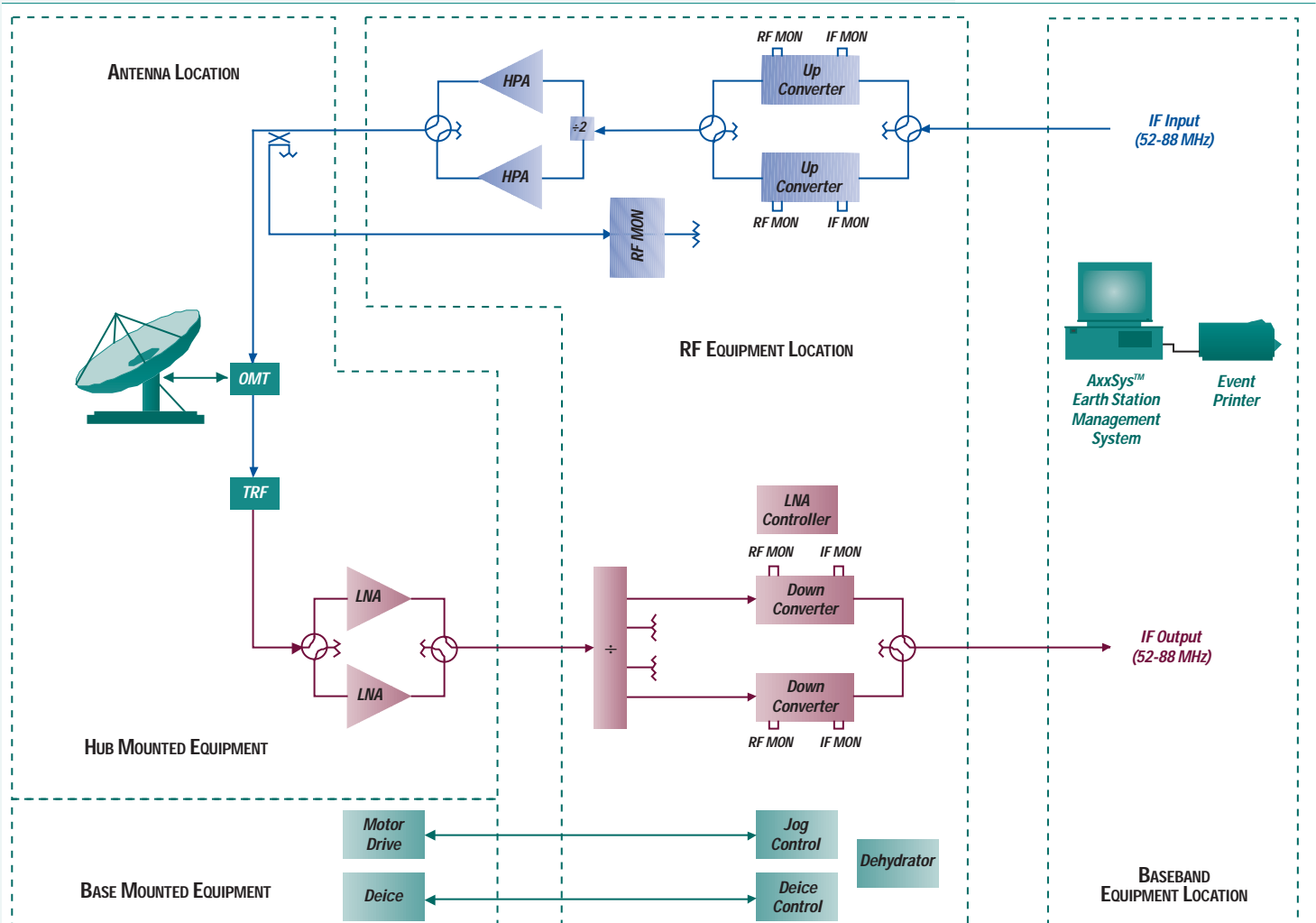
**G/T Versus Antenna Elevation for 6.1 Meter Ku-band**



**Downlink Analysis for Output Levels**



**Typical Modular Building Block Diagram**



Globecomm Systems will work with you to configure a totally integrated system to meet your specific needs with the following options:

<i>Item</i>	<i>Options</i>
<b>Antenna Size</b>	<b>4.5 Meter</b>
	<b>6.1 Meter</b>
	<b>7.2 Meter</b>
	<b>8.1 Meter</b>
	<b>9.0 Meter</b>
<b>High Power Amplifier</b>	<b>170 Watts TWT C-band</b>
	<b>400 Watts TWT C-band</b>
	<b>700 Watts TWT C-band</b>
	<b>125 Watts TWT Ku-band</b>
	<b>300 Watts TWT Ku-band</b>
	<b>600 Watts TWT Ku-band</b>
<b>Up Converter</b>	<b>1:1 to</b>
	<b>1:4</b>
<b>Down Converter</b>	<b>1:1 to</b>
	<b>1:4</b>
<b>Deice</b>	<b>Electric</b>
	<b>Propane</b>
<b>Uplink Power Control (Rain Fade Compensation)</b>	<b>Beacon Mode</b>
	<b>Demodulator AGC Mode (loopback)</b>
<b>Loopback Testing</b>	<b>RF Loop Test Translator</b>
<b>AxxSys™</b>	<b>Operations Level</b>
<b>Earth Station Management System</b>	<b>Enterprise Level</b>
	<b>Remote Workstation</b>

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*Leading-edge telecommunications systems...mission critical networks...  
high-quality, competitively priced satellite earth stations...out-of-this-world  
engineering, down-to-earth service...and exceptional value in everything that bears  
our name. That's Globecom Systems, the place where superb engineering  
intersects advanced information management technology to provide you with  
maximum productivity.*

*From requirements definition and simulation of solutions, through custom installation  
of hardware and software, Globecom Systems is a powerful ally when it comes to  
leveraging communications/satellite systems to your fullest advantage.*

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**GLOBECOMM SYSTEMS CAPABILITIES INCLUDE:**

- *Traffic Analysis*
- *Network Analysis, Design and Implementation*
- *Earth Station Analysis, Design and Installation*
- *Earth Station Products*
- *Network Management Systems*
- *Training and Customer Support*
- *Operations and Maintenance*

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**GLOBECOMM SYSTEMS EQUIPMENT AND SERVICES INCLUDE:**

- *Intelsat Standard A Gateways*
- *Modular Building Block Gateways*
- *Digital Satellite Communications Terminals*
- *Commercial Terminal Family*
- *Military and Commercial Portable Communications Systems*
- *System Engineering and Application*
- *Network Monitor and Control*
- *Hub Earth Stations*



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