Hurricane 64x64 L-band Matrix

Ultra compact with configurable inputs and outputs

ETL's ultra compact Hurricane matrix provides routing for up to 64 input and output feeds, with integrated LNB powering in a 4U high chassis. The configurable design offers a range of input and output modules (IO modules) with features to suit specific RF needs for each satellite feed. The matrix can be expanded from 8x8 up to 64x64 in blocks of 8.

Minimal downtime
All active components can be hot-swapped without the need to re-boot the matrix. This includes power supplies, CPU modules, RF modules & fan trays.

Temperature monitoring
With intelligent fan speed control

Power saving
Only active signal routes are powered. This provides a greatly reduced power consumption compared to traditional matrices.



Compact
4U high chassis providing
64 inputs x 64 outputs
Expandable in blocks of 8.

850 - 2450 MHz
Operating frequency range, Ka-band ready

Redundancy
Auto re-routing under certain fault conditions

LNB powering
13/18V & 22kHz tone available

Minimal training
Capacitive touchscreen controls, intuitive HMI and an improved web browser interface

Resilience
From dual redundant power supplies & CPU modules

IO Module Options

Standard
H-IO-01



- Passive input/output module (0dB gain matrix)
- RF power monitoring

Variable Gain
H-IN-02 / H-IN-05 / H-OP-08



- Variable gain input/output modules (-10 to +20dB in 0.5dB steps)
- Variable slope (0 to 6dB in 1dB steps)
- 13/18V & 22kHz tone LNB powering (H-IN-05 only)
- RF power monitoring

Fibre Input
H-IN-03



- Optical fibre input module
- AGC with settable output power level
- RF power monitoring

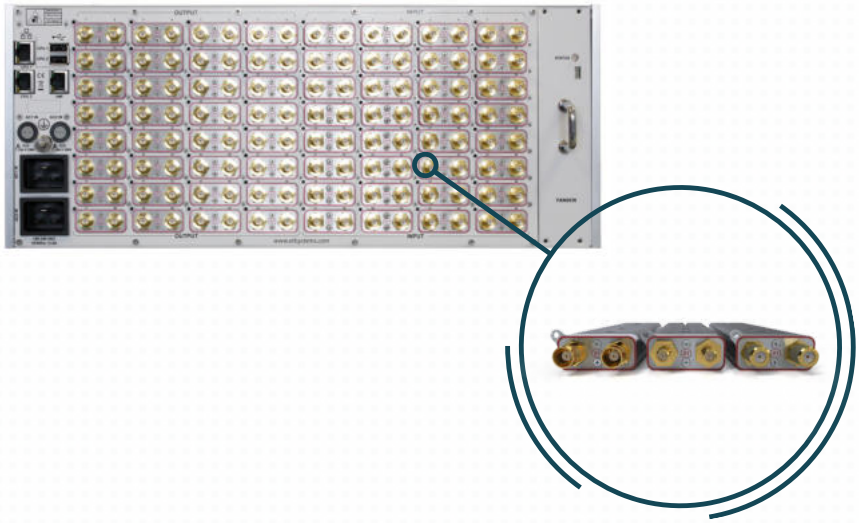
LNB Power
H-IN-04



- Passive input module (0dB gain matrix)
- 13/18V & 22kHz tone LNB powering
- RF power monitoring

Flexibility & Reliability

Tune the matrix for optimum system performance



IO (Input and Output) modules can be mixed and configured to exact earth station requirements within the same matrix.

- For distant antennas, fibre modules can be used on the inputs of the matrix
- For large antennas, passive input or output modules can be installed to provide unity gain
- For smaller antennas or weak signals, variable gain, active input modules are ideal

Impedance mismatch problems can be avoided with the option of mixed impedances on IO modules (input to input or input to output).

Enhanced Resilience



Hot-swap, input matrix cards (IMC), middle matrix cards (MMC) and output matrix cards (OMC)

Hot-swap, dual redundant CPU modules

Hot-swap fan modules

Hot-swap, dual redundant power supplies

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Configuration Options:

Active Input Module (H-IN-02) with Passive Output Module (H-IO-01) - No LNB option
Active Input Module (H-IN-05) with Passive Output Module (H-IO-01) - LNB option

RF Parameters					
Routing		Distributive, non-blocking; any input can be connected to any number of outputs			
Frequency Range		850 to 2450MHz (Extended L-band)			
Capacity		64 inputs x 64 outputs			
Variable Gain Range		Max.: +20 dB ± 2.5 dB / Min.: -10 dB ± 2.5 dB		Relative to mean gain	
Gain Step		0.5 ± 0.25 dB			
Gain Tracking		4 dB (At 0 dB gain setting; worst case difference in gain between any channel at a given frequency)			
Variable Slope Control		0 to 6 dB (±1 dB). Positive slope. Pivot point at 2150MHz			
Slope Step		0.5 ± 0.5 dB			
RF Connectors & Imp.		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Gain Flatness Typ. value when slope at 0dB. Any gain.	950-2150MHz	±1.75 dB	±1.75 dB	±2.75 dB	±2.75 dB
	850-2450MHz	±2.50 dB	±2.50 dB	±3.00 dB	±3.00 dB
	Any 36MHz	±0.50 dB	±0.50 dB	±0.65 dB	±0.65 dB
Input Return Loss (db)	Typ.	17	17	16	16
	Min.	13	13	12	12
Output Return Loss (dB)	Typ.	17	17	16	16
	Min.	13	13	12	12
Noise Figure (up to 2150MHz)	@ +20dB gain	9 dB typ.		10 dB typ.	
	@ 0dB gain	24 dB typ.		25 dB typ.	
	@ -10dB gain	34 dB typ.		35 dB typ.	
Noise Figure (up to 2450MHz)	@ +20dB gain	10 dB typ.		11 dB typ.	
	@ 0dB gain	25 dB typ.		26 dB typ.	
	@ -10dB gain	35 dB typ.		36 dB typ.	
Group Delay Variation (Peak-Peak across bandwidth)		950-2150MHz: ±0.5 ns / 850-2450MHz: ±0.5 ns / Any 36MHz: ±0.25 ns			
Isolation (At 0dB gain & slope)	Input-Input	70 dB typ., 60 dB min. (Between any 2 input ports)			
	Output-Output				
	Input-Output	60 dB typ., 50 dB min. (Between any pair of input & output ports)			
Input P1dB, Typ.	@ +20dB gain	-20 dBm		-17 dBm	
	@ 0dB gain	-3 dBm		0 dBm	
	@ -10dB gain	+6.5 dBm		+9 dBm	
Output IP3, Typ.	@ +20dB gain	+13 dBm		+15 dBm	
	@ 0dB gain	+10 dBm		+12 dBm	
	@ -10dB gain	+5 dBm		+7 dBm	
RF Input Power Sensing Range		-5 to -55 dBm			
Input RF Power		+20 dBm (100mw) Absolute maximum, damage level			
LNB Powering (with H-IN-05 module)		Voltages: 0/13/18VDC @ 400mA, 0/22 kHz tone, user selectable		Current: 250 mA nominal, 400 mA max. Fitted with short circuit protection	
Spec. Version		1.3			

Configuration Options:

Passive Input Module (H-IO-01) with Passive Output Module (H-IO-01) - No LNB option
Passive Input Module (H-IN-04) with Passive Output Module (H-IO-01) - LNB option

RF Parameters					
Routing		Distributive, non-blocking; any input can be connected to any number of outputs			
Frequency Range		850 to 2450MHz (Extended L-band)			
Capacity		64 inputs x 64 outputs			
Gain		0 dB ± 2 dB (Relative mean gain)			
Gain Tracking (at 0dB gain)		4 dB (Difference in mean gain between any 2 outputs when the same input is routed to both.)			
RF Connectors & Imp.		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Gain Flatness Any gain setting.	850-2450MHz	±2.50 dB	±2.50 dB	±2.75 dB	±2.75 dB
	850-2150MHz	±1.50 dB	±1.50 dB	±1.75 dB	±1.75 dB
	Any 36MHz	±0.50 dB	±0.50 dB	±0.65 dB	±0.65 dB
Input Return Loss (db)	Typ.	17	17	16	16
	Min.	13	13	12	12
Output Return Loss (dB)	Typ.	17	17	16	16
	Min.	13	13	12	12
Noise Figure	Up to 2150MHz	24.5 dB typ.			
	Up to 2450MHz	26 dB typ.			
Group Delay Variation (Peak-Peak across bandwidth)	950-2150MHz	±0.5 ns			
	850-2450MHz				
	Any 36MHz	±0.25 ns			
Isolation (At 0dB gain & slope)	Input-Input	80 dB typ., 60 dB min. (Between any 2 input ports)			
	Output-Output				
	Input-Output	60 dB typ., 50 dB min. (Between any pair of input & output ports)			
Input P1dB		+3 dBm typ., 0 dBm min. (1dB Gain Compression, output power)			
Output IP3		+15 dBm typ., +12 dBm min. (3rd order intercept point, output power)			
RF Input Power Sensing Range		-5 to -55 dBm			
Input RF Power		+20 dBm (100mw) Absolute maximum, damage level			
Signal Related Spurs, Max.		-60 dBc		Relative to carrier, in the 850-2450MHz band	
Signal Related Spurs, Max.		-110 dBm in 10kHz		Measured in a 10kHz bandwidth, DC-6GHz	
LNB Powering (with H-IN-04 module)		Voltages: 0/13/18VDC @ 400mA, 0/22 kHz tone, user selectable		Current: 250 mA nominal, 400 mA max Fitted with short circuit protection	
Spec. Version		1.3			

Configuration Options:

Optical Input Module (H-IN-03) with Passive Output Module (H-IO-01)

RF Parameters						
Input Plane: Optical Input Ports						
Capacity		64 inputs, non-blocking. Optical input ports.				
Optical Input Wavelength Range		1100 to 1650 nm				
Optical Input Power Range		-9.5 to +5 dBm Detector is limited to -9.5dBm. Lower inputs are functionally possible but detector will not provide accurate reading.				
Input Optical Connector Options		FC/APC & SC/APC Single mode fibre, angle polished connectors only.				
Output Plane: RF Output Ports						
RF Output Frequency Range		850 - 2450 MHz (Extended L-band)				
Gain Tracking		5 dB (Difference in mean gain between any two outputs when the same input is routed to both. Measured at 0dB gain.)				
RF Connectors & Imp.		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)	
Output Return Loss	Typ.	14 dB	14 dB	12 dB	12 dB	
	Min.	10 dB	10 dB	10 dB	10 dB	
System Performance: RF to Fibre & back to RF						
Gain		0 dB (±2 dB)		Test Condition: When passive IO module H-IN-01-XX is fitted at input and output ports		
Output IO Module Connectors		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)	Test Condition: Full TX & RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode.
Gain Flatness	850-2450MHz	±2.75 dB	±2.80 dB	±3.00 dB	±3.00 dB	
	850-2150MHz	±2.50 dB	±2.60 dB	±2.75 dB	±2.75 dB	
	Any 36MHz	±0.50 dB	±0.60 dB	±0.65 dB	±0.65 dB	
Output AGC Flatness		±3.50 dB, typ.		Test condition: Full TX & RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Input levels within –10 to –40 dBm.		
Group Delay Variation	950-2150MHz	±1.5 ns		Peak-Peak across specified bandwidth. Typical values. Test condition: Full TX &RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode.		
	850-2450MHz	±2.0 ns				
	Any 36MHz	±0.50 ns				
Isolation	Input-Input	70 dB typ., 55 dB min.		Between any 2 relevant ports. Test condition: Full TX &RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode.		
	Output-Output					
	Input-Output	60 dB typ., 50 dB min.				
Noise Figure		10dB, typ.		Test condition: SRY-TX-L1-103, 0 dB optical link loss, -50 dBm RF i/p power, -10 dBm o/p power		
CNR (any 36MHz)		38 dB, min.				
Output P1		+1 dBm, min.		Test condition: SRY-TX-L1-103, 0 dB optical link loss, -50 dBm RF i/p power, -10 dBm o/p power.		
Output IP3		18 dBm typ., 12 dBm min.		Test condition: SRY-TX-L1-103, 1m fibre, 10 dB gain, -22 dBm tones at 2150 and 2152 MHz.		
SFDR		105 dB typ., 100 dB min.		Test condition: SRY-TX-L1-103, 1m fibre, 10 dB gain, -22 dBm tones at 2150 and 2152 MHz.		
Spec. Version		1.4				

Configuration Options:

Passive Input Module H-IO-01 with Active Output Module H-OP-08

RF Parameters					
Frequency Range		850 to 2450MHz (Extended L-band)			
Capacity		64 inputs x 64 outputs, non-blocking			
Variable Gain Range	Max. Gain	±20 dB (±2.5 dB)		Relative to the mean gain across the frequency range.	
	Min. Gain	-10 dB (±2.5 dB)			
	Vari. Gain Step	±0.5 dB (±0.25 dB)			
Gain Tracking (at 0dB gain)		4 dB (Worst case difference in gain between any channel at a given frequency.)			
Variable Slope (Tilt) Control		0 dB to -6 dB (±1 dB)		Positive slope with pivot point at 2150MHz	
Slope Step		0.5 dB (±0.5 dB)			
RF Connectors & Imp.		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Input Return Loss (db)	Typ.	17	17	16	16
	Min.	13	13	12	12
Output Return Loss (dB)	Typ.	17	17	16	16
	Min.	13	13	12	12
Gain Flatness (Typ. when slope at 0dB, at any gain)	950-2150MHz	±1.75 dB	±1.75 dB	±2.75 dB	±2.75 dB
	850-2450MHz	±2.50 dB	±2.50 dB	±3.00 dB	±3.00 dB
	Any 36MHz	±0.50 dB	±0.50 dB	±0.65 dB	±0.65 dB
Group Delay Variation (Peak-Peak across bandwidth)		950-2150MHz: ±0.5 ns / 850-2450MHz: ±0.5 ns / Any 36MHz: ±0.25 ns			
Noise Figure	Up to 2150MHz	22 dB		25 dB	
	Up to 2450MHz	25 dB		28 dB	
RF Input Power Sensing Range		-5 to -55 dBm			
Absolute Max. RF Input Power		+20 dBm (100mW) No damage level. Operation beyond this level may cause damage to the product.)			
Input P1dB, Typ.	At +20dB gain	-8 dBm		-10 dBm	
	At 0dB gain	-6 dBm		-8 dBm	
	At -10dB gain	-2 dBm		-4 dBm	
Output IP3, Typ.	At +20dB gain	+25 dBm		+27 dBm	
	At 0dB gain	+8 dBm		+10 dBm	
	At -10dB gain	+0 dBm		+2 dBm	
Isolation	Input-Input	70 dB typ., 60 dB min. (Between any 2 input ports)			
	Output-Output				
	Input-Output	70 dB typ., 60 dB min. (Between any pair of input & output ports)			
Signal Related Spurs, Max.		-60 dBc		Relative to carrier, in the 850-2450MHz band	
Non-Signal Related Spurs, Max.		-110 dBm in 10kHz		Measured in a 10kHz bandwidth, DC-6GHz	
LNB Powering (with H-IN-04 module)		Voltages: 0/13/18VDC @ 400mA, 0/22 kHz tone, user selectable		Fitted with short circuit protection	
Spec. Version		1.2			

Control, Monitoring & Alarms		
Remote Control & Monitoring		Ethernet – RJ45 connector, 10/100/1000BaseTx, ETL Protocol over TCP, SNMP, Web Interface,
HMI		Capacitive touch screen
Secure Communications		HTTPS SNMPv3
ETL Protocol over TCP		Supports up to 32 concurrent connections
Web Browser		Full remote control via web browser for 5 connections
Alarms		Local and remote reporting. Comprehensive alarm status via HMI display and communication protocols.
Switching Time		50ms max. (Measured from receipt of command on serial port to establishment of RF signal)
Amplifier Status		All RF amplifiers monitored. Local and remote reporting.
Temperature Monitoring		All cards and modules individually monitored. Local and remote reporting.
Fan Speed Monitoring		All fans individually monitored. Local and remote reporting.
PSU Loading		All PSUs individually monitored. Local and remote reporting.
LNB Powering (via IO module)		
LNB Power		Dependent on IO module - refer to module spec. User selectable on inputs, up to maximum of 180W (e.g. 25 LNB feeds at 400mA each)
LNB Current Alarm	Over-current	450mA factory default, customer settable
	Under-current	50mA factory default, customer settable
LNB Short Circuit Protection		Electronic fuse. Automatic reset when short removed.
Physical & Environmental		
Dimensions		4U high x 650mm deep x 19” wide
Weight/Colour		40kg, RAL9023 – Pearl Dark Grey
Temperature		Operating: 0 to 45˚C / Storage: -20˚C to +75˚C
Location		Indoor use only
Humidity		20 to 90% non-condensing
Altitude		10,000ft Above Mean Sea Level
All RF Cards		Hot-swap
PSU Modules		Dual redundant & hot-swap. No external PSU required for LNB power.
CPUs		Dual redundant & hot-swap.
IO Modules		Hot-swap
Power		
PSU Power		85-264Vac (47/63Hz) Fused, 15A
Power Consumption		500W (with passive input and output modules, 64 paths routed) 1400W (max. allowed AC power consumption for any configuration, including LNB powering)
MTBF	Full 64 x 64 chassis	150,000 hours (17.1 years)
	Each IO module	200,000 hours (22.8 years)
	Each active RF card	180,000 hours (20.5 years)
MTTR		10 minutes (Assumes recommended spares are available)
Absolute Maximum Ratings		
Max. DC Voltage on IO Ports		48Vdc, all ports are DC blocked

Note 1: The specification is subject to regular reviews and will be updated from time to time as part of our continuing product development and improved spec accuracy.
Note 2: Operation beyond the quoted limits stated above may cause instantaneous and permanent damage.