ETL Systems

Excelling in RF Engineering

Model Number:
HUR-10

Watch video online

64 x 64 L-band Hurricane Matrix ultra compact, with configurable inputs & outputs

Typical applications:

- Managing multiple inputs for growing satellite teleports
- Extended L-band frequency for Ka-band & HTS applications
- Routing live traffic to multiple modems

ETL's new 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.

Configurable input and output modules with features to suit specific RF needs for each satellite feed, including fixed gain, variable gain, LNB powering & fibre inputs

IO Module Options

STANDARD

H-IO-01

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

VARIABLE GAIN

H-IN-02 &
H-IN-05
H-OP-08

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

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

LNB Powering 13/18V & 22kHz tone available

Power savings as only active signal routes are powered. This provides a greatly reduced power consumption compared to traditional matrices

Resilience from dual redundant power supplies & dual redundant CPU modules

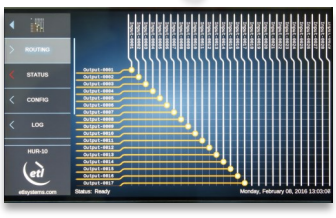
Minimal downtime in the unlikely event of a failure all active components can be hot-swapped without the need to re-boot the matrix. This includes power supplies, CPU modules, RF modules & fan trays

Redundancy and auto re-routing (under certain fault conditions)

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

850-2450 MHz operating frequency range. Ka-band ready.

Temperature monitoring with intelligent fan speed control



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Flexibility & Reliability

Tune the matrix for optimum system performance

Hurricane Rear Panel

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).

32 input modules and 32 output modules are installed on a fully populated 64 x 64 matrix.

Enhanced resilience

Hurricane Internal View

Hot-swap, dual redundant CPU modules

Hot-swap, dual redundant power supplies

Hot-swap, fan modules

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

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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

Technical specifications and operating parameters					
Capacity		64 inputs x 64 outputs			
Routing		Distributive, non-blocking		Any input can be connected to any number of outputs	
Frequency Range		850-2450 MHz (Extended L-band)			
Variable Gain Range	Gain Max.	+20 dB ± 2.5 dB		Relative to mean Gain	
	Gain Min.	-10 dB ± 2.5 dB			
Gain Step		0.5 ± 0.25 dB			
Gain Tracking 0 dB gain setting		4 dB		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 2150 MHz	
Slope Step		0.5 dB ± 0.5 dB			
RF Connectors & impedances		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Gain Flatness Typical values when slope is set to 0 dB. Any gain setting.	L-band (950-2150 MHz)	±1.75 dB	±1.75 dB	±2.75 dB	±2.75 dB
	Full band (850-2450 MHz)	±2.50 dB	±2.50 dB	±3.00 dB	±3.00 dB
	Any 36 MHz	±0.50 dB	±0.50 dB	±0.65 dB	±0.65 dB
Input Return Loss	Typical	17 dB	17 dB	16 dB	16 dB
	Minimum	13 dB	13 dB	12 dB	12 dB
Output Return Loss	Typical	17 dB	17 dB	16 dB	16 dB
	Minimum	13 dB	13 dB	12 dB	12 dB
Noise Figure L-band (up to 2150 MHz)	@ +20 dB gain	9 dB typical		10 dB typical	
	@ 0 dB gain	24 dB typical		25 dB typical	
	@ -10 dB gain	34 dB typical		35 dB typical	
Noise Figure Full-band (up to 2450 MHz)	@ +20 dB gain	10 dB typical		11 dB typical	
	@ 0 dB gain	25 dB typical		26 dB typical	
	@ -10 dB gain	35 dB typical		36 dB typical	
Group Delay Variation Peak - peak across specified bandwidth	950-2150 MHz	±0.5 ns pk-pk			
	850-2450 MHz	±0.5 ns pk-pk			
	Any 36 MHz	±0.25 ns pk-pk			
Isolation At 0 dB gain & 0 dB slope settings	I/P - I/P	70 dB typical, 60 dB minimum (Between any 2 input ports)			
	O/P - O/P	70 dB typical, 60 dB minimum (Between any 2 output ports)			
	I/P - O/P	60 dB typical, 50 dB minimum (Between any pair of input & output ports)			
Input P1dB 1 dB Gain Compression, output power	@ +20 dB gain	-20 dBm		-17 dBm	
	@ 0 dB gain	-3 dBm		0 dBm	
	@ -10 dB gain	+6.5 dBm		+9 dBm	
Output P1dB 1 dB Gain Compression, output power	@ +20 dB gain	+13 dBm		+15 dBm	
	@ 0 dB gain	+10 dBm		+12 dBm	
	@ -10 dB gain	+5 dBm		+7 dBm	
OIP3 3rd order intercept point, output power		+15 dBm		+12 dBm	
RF Input Power Sensing Range		-5 to –55 dBm			
Input RF Power		+20 dBm (100mW) Absolute maximum, damage level			
LNB Powering Available with H-IN-05 input IO 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			

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Model Number: HUR-10

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

Technical specifications and operating parameters					
Capacity		64 inputs x 64 outputs			
Routing		Distributive, non-blocking		Any input can be connected to any number of outputs	
Frequency Range		850-2450 MHz (Extended L-band)			
Gain		0 dB ± 2 dB		Relative mean Gain	
Gain Tracking 0 dB gain setting		4 dB		Difference in mean gain between any two outputs when the same input is routed to both. Measured at 0dB gain	
RF Connectors & impedances		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Gain Flatness Any gain setting	Full band (850-2450 MHz)	±2.50 dB	±2.50 dB	±2.75 dB	±2.75 dB
	Full band (850-2150 MHz)	±1.50 dB	±1.50 dB	±1.75 dB	±1.75 dB
	Any 36 MHz	±0.50 dB	±0.50 dB	±0.65 dB	±0.65 dB
Input Return Loss	Typical	17 dB	17 dB	16 dB	16 dB
	Minimum	13 dB	13 dB	12 dB	12 dB
Output Return Loss	Typical	17 dB	17 dB	16 dB	16 dB
	Minimum	13 dB	13 dB	12 dB	12 dB
Noise Figure Typical	L-band (up to 2150 MHz)	24.5 dB typical			
	Full band (up to 2450 MHz)	26 dB typical			
Group Delay Variation Peak - peak across specified bandwidth	950-2150 MHz	±0.5 ns			
	850-2450 MHz	±0.5 ns			
	Any 36 MHz	±0.25 ns			
Isolation At 0 dB gain & 0 dB slope settings	I/P - I/P	80 dB typical, 60 dB minimum (Between any 2 input ports)			
	O/P - O/P	80 dB typical, 60 dB minimum (Between any 2 output ports)			
	I/P - O/P	60 dB typical, 50 dB minimum (Between any pair of input & output ports)			
Input P1dB 1 dB Gain Compression, output power		+3 dBm typical, +0 dBm minimum			
OIP3 3rd order intercept point, output power		+15 dBm typical, +12 dBm minimum			
RF Input Power Sensing Range		-5 to –55 dBm			
Input RF Power		+20 dBm (100mW) Absolute maximum, damage level			
Signal Related Spurs (Max)		-60dBc		Relative to carrier, in the 850-2450 MHz band	
Signal Related Spurs (Max)		-110dBm in 10kHz		Measured in a 10kHz bandwidth, DC-6GHz	
LNB Powering Available with H-IN-04 input IO 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			

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Model Number: HUR-10

Configuration Options:

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

Technical specifications and operating 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				
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 & Impedances		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)	
Output Return Loss	Typical	14 dB	14 dB	12 dB	12 dB	
	Minimum	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)	
Gain Flatness	Full band 850-2450 MHz	±2.75 dB	±2.80 dB	±3.00 dB	±3.00 dB	**Test Condition:** Full TX & RX link with 1m fibre link using transmitter SRY-TX-L1-103 (1310nm). Fixed gain mode.
	Full band 850-2150 MHz	±2.50 dB	±2.60 dB	±2.75 dB	±2.75 dB	
	Any 36 MHz	±0.50 dB	±0.60 dB	±0.65 dB	±0.65 dB	
Output AGC Flatness		±3.50 dB typical				**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	950-2150 MHz	±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
	850-2450 MHz	±2 ns				
	Any 36 MHz	±0.5 ns				
Isolation	I/P - I/P	70 dB typical, 55 dB minimum				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
	O/P - O/P	70 dB typical, 55 dB minimum				
	I/P - O/P	60 dB typical, 50 dB minimum				
Noise Figure		10dB typical				**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 minimum				
Output P1		+1 dBm minimum				**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 typical, 12 dBm minimum				**Test condition:** SRY-TX-L1-103, 1m fibre, 10 dB gain, -22 dBm tones at 2150 and 2152 MHz
SFDR		105 dB typical, 100 dB minimum				**Test condition:** SRY-TX-L1-103, 1m fibre, 10 dB gain, -22 dBm tones at 2150 and 2152 MHz
Spec Version		1.4				

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Model Number: HUR-10

Configuration Options:

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

Technical specifications and operating parameters					
Capacity		64 inputs and 64 outputs		Non-blocking	
Operating Frequency Range		850 to 2450 MHz			
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)			
	Variable gain step	0.5 dB (± 0.25 dB)			
Gain Tracking		4 dB		Worst case difference in gain between any channel at a given frequency.	
Variable Slope (Tilt) control Slope step		0 dB to –6dB (±1 dB) 0.5dB (±0.5 dB)		Positive slope with pivot point at 2150MHz	
Connectors & impedances		50Ω SMA (S5)	50Ω BNC (B5)	75Ω BNC (B7)	75Ω F-type (F7)
Input Return Loss		Typ. 17 dB Min. 13 dB	Typ. 17 dB Min. 13 dB	Typ. 16 dB Min. 12 dB	Typ. 16 dB Min. 12 dB
Output Return Loss		Typ. 17 dB Min. 13 dB	Typ. 17 dB Min. 13 dB	Typ. 16 dB Min. 12 dB	Typ. 16 dB Min. 12 dB
Gain Flatness Typical values when slope is set to 0dB , at any gain setting.	L-band 950-2150 MHz	±1.75 dB	±1.75 dB	±2.75 dB	±2.75 dB
	Full band 850-2450 MHz	±2.50 dB	±2.50 dB	±3.00 dB	±3.00 dB
	Any 36 MHz	±0.50 dB	±0.50 dB	±0.65 dB	±0.65 dB
Group Delay Variation Peak to peak, across the specified bandwidth.	950-2150 MHz	±0.5 ns pk-pk			
	850-2450 MHz	±0.5 ns pk-pk			
	Any 36 MHz	±0.25 ns pk-pk			
Noise Figure (Typ.)	L-band (Up to 2150 MHz)	22 dB		25 dB	
	Full band (Up to 2450 MHz)	25 dB		28 dB	
RF Input Power Sensing Range		-5 to –55 dBm			
Absolute Maximum RF Input Power:		+20 dBm (100mW) No damage level. Operation beyond this level may cause damage to the product.			
Input P1dB (Typ.)	At +20 dB gain	-8 dBm		-10 dBm	
	At 0 dB gain	-6 dBm		-8 dBm	
	At –10 dB gain	-2 dBm		-4 dBm	
Output IP3 (Typ.)	At +20 dB gain	+25 dBm		+27 dBm	
	At 0 dB gain	+8 dBm		+10 dBm	
	At –10 dB gain	+0 dBm		+2 dBm	
Isolation values	I/P - I/P	Typ. 70 dB Min. 60 dB (Between any 2 input ports)			
	O/P - O/P	Typ. 70 dB Min. 60dB (Between any 2 input ports)			
	I/P - O/P	Typ. 60 dB Min. 50 dB (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 (Typ.)		-110dBm in 10kHz		Measured in a 10kHz bandwidth, DC-6GHz	
LNB Powering Available with H-IN-04 input IO module		Voltages: 0/13/18VDC @ 400 mA max, 0/22 kHz tone, user selectable		Fitted with short circuit protection.	
Spec Version		1.2			

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Common System Performance - applicable to all IO modules

Technical specifications and operating parameters

LNB Powering (via IO module)			
LNB Power		Dependent on IO module - refer to IO module	User selectable on inputs, up to maximum of 180W (e.g. 25 LNB feeds at 400mA each)
LNB Current Alarm	Over-current	450mA	Factory defaults (customer settable)
	Under-current	50mA	
LNB Short Circuit Protection		Electronic fuse	Automatic reset when short removed

System Control		
Remote Control	Ethernet port (RJ45) 10/100/1000 Base Tx ETL protocol over TCP, supports up to 32 concurrent connections SNMP Web browser interface, for 5 connections Grass Valley NVision NV9000 (in development)	
Local Control	HMI capacitive touch screen	
Secure Communications	HTTPS SNMPv3 IPSEC	
Alarms	Local & 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
RF Level Alarms	Configurable upper and lower RF level alarms	
Amplifier Status	All RF amplifiers monitored	Local & remote reporting
Temperature Monitoring	All cards & modules monitored individually	Local & remote reporting
Fan Speed Monitoring	All fans are monitored individually	Local & remote reporting
PSU Loading	All PSUs are monitored individually	Local & remote reporting

Environmental		
Operating temperature	0 to 45˚C	
Gain Stability versus Temperature	0.05dB/°C	
Location	Indoor use only	
Storage temperature	-20˚C to +75˚C	
Humidity	20 to 90% non-condensing	Relative humidity
Maximum Altitude	10,000 feet AMSL	Above Mean Sea Level

Physical	
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
Dimensions	4U high x 650mm deep x 19" wide
Weight	40 kg
Colour	RAL9023 – Pearl Dark Grey

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 incl. LNB powering)	
MTBF	150,000 hours (17.1 years)	Fully populated 64x64 chassis
	200,000 hours (22.8 years)	Each IO module
	180,000 hours (20.5 years)	Each active RF card
MTTR	10 minutes	Assumes recommended spares are available

Absolute Maximum Ratings		
Max DC Voltage on IO Ports	48Vdc	All ports are DC blocked

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