HUGHES
AIRCRAFT COMPANY
ELECTRON DYNAMICS DIVISION
Industrial Electronics Group

8000H SERIES
Instrumentation Amplifiers

FEATURES

- 1, 10 and 20 Watt Models
- 18 Models from 1—40 GHz
- High Efficiency Switching Regulator and Converter
- Lightweight-Compact
- Low Spurious Modulation
- Protective Features
- LED Fault Indicators
- Ease of Maintenance, Low MTTR
- Wide Range of Options
- Full One Year Warranty — No Hour Limit

DESCRIPTION

The Hughes 8000H Series of traveling-wave tube amplifiers offers even higher reliability than the previous series of TWTAs. This is achieved through an improved power supply design which reduces thermal dissipation.

Each amplifier consists of a PPM-focused metal-ceramic traveling-wave tube, a fully filtered, regulated solid state power supply and a complete air cooling system assembled within a compact instrument case.

The 8000H series incorporates a new modular design for ease of maintenance.

SPECIFICATIONS[1]

RF Performance

TWTA Model Number	TWTA Power Output (Watts)	Frequency (GHz)	STD Connectors In/Out	Replacement TWT
8001H11*-000	1	18.0 — 26.5	WR-42F	911H
8001H12*-000	1	26.5 — 40.0	WR-28F	912H
8010H09*-000	10	1.0 — 2.0	Type N	417HD
8010H01*-000	10	2.0 — 4.0	Type N	564H
8010H13*-000	10	3.0 — 8.0	Type N	646H
8010H16*-000	10[2]	3.9 — 11.7	Type N	664H
8010H02*-000	10	4.0 — 8.0	Type N	648HD
8010H06*-000	10[2]	4.0 — 10.5	Type N	648HDS
8010H07*-000	10	6.5 — 13.5	Type N	771HDS
8010H03*-000	10	8.0 — 12.4	Type N	771HD
8010H04*-000	10	12.4 — 18.0	SMA/SMA	848HD
8010H15*-000	10	8.0 — 18.0	SMA/SMA	846H
8020H09*-000	20	1.0 — 2.0	Type N	418H
8020H10*-000	20	1.4 — 2.4	Type N	419H
8020H01*-000	20	2.0 — 4.0	Type N	568H
8020H02*-000	20	4.0 — 8.0	Type N	640H
8020H03*-000	20	8.0 — 12.4	Type N	783H
8020H04*-000	20	12.4 — 18.0	SMA/WR-62F	856H
8020H15*-000	20	8.0 — 18.0	SMA/SMA	889H

Gain at Rated Power Output ..... 30 dB minimum
Duty ..... CW
Noise Figure ..... 35 dB maximum
Spurious Modulation (at saturation) ..... -50 dBc
Load VSWR ..... 2:1 maximum
Gain Stability ..... 0.25 dB/24 hours[4]

Electrical

Input Voltage ..... 99 to 132 VAC
Input Frequency ..... 47 to 63 Hz
Power Consumption ..... 8001H ..... 115 watts[3]
8010H ..... 250 watts
8020H ..... 280 watts

Mechanical

Size/Configuration ..... see drawing
Weight ..... 20 pounds (9.1 kg)

Environmental

Temperature (operating) ..... 0 to +50°C
Relative Humidity (without condensation) ..... 95% maximum
Altitude ..... 10,000 feet maximum[5]
Shock and Vibration ..... as normally encountered in commercial shipping and handling

Warranty

One full year regardless of the hours of operation

*Denotes RF connector placement: F – front panel, R—rear panel. Specify when ordering.
[1]Specifications subject to change without notice.
[2]Power and gain slightly lower at band edges.
[3]This indicated maximum power consumption of any model in that power range. Information on a specific model is available.
[4]At constant drive and temperature after warmup period.
[5]40°C maximum operating temperature above 6,000 feet.

OPERATIONAL FEATURES

Controls (front panel)
- Prime Power On/Off
- RF Operate/Standby
- Fault Reset

Operational Status Indicators (front panel)
- Prime Power On/Standby
- RF Operate
- Remote/Local (optional)

Metering (front panel)
- Helix Current
- RF Power Output (optional)

LED Fault Indicators (front panel)
- Helix Current Overload
- High TWT or Power Supply Temperature
- Low Line Voltage
- Safety Interlock Open

Protection
- Prime Power Fuse (rear panel)
- TWT Warm-up Delay
- Automatic Sequencing of High Voltage and Beam Current
- Helix Current Overload
- High TWT or Power Supply Temperature
- Low Line Voltage Shut Down
- Safety Interlocks

Automatic Recycle
In the event of a momentary fault condition, such as a line voltage surge or helix overload, the unit reverts to "ready". This feature automatically recycles the TWTA from "ready" to "RF on" after a proportionate time delay. Recycling is normally set to allow 2 cycles but can be set for 1 to 9 times. If the fault condition continues after the predetermined number of reset cycles, the unit will revert to the standby mode. The fault condition must then be cleared and the amplifier manually reset. This option, when used in conjunction with options D and F, is valuable in remote unattended sites, such as antenna ranges, satellite earth stations, and communication links.

OPTIONS LIST

Option A 220/240 V Input Voltage
This option provides for 198 to 264 VAC, 47 to 63 Hz operation.

Option D Unattended Protection
This option is for use in unattended applications such as ranges, component aging, ground terminals, communication links, etc. This feature protects the amplifier from possible damage due to extended operation in the standby mode by reverting the unit to "off" after the predetermined number of auto recycles have been completed. In order to restore the unit to "RF on," the prime power switch must be manually reset, either locally or remotely, if used in conjunction with options F or H. The unit will then time-in with normal (heater warm-up) time delay.

Option E Rackmounting
This option allows the unit to be mounted in a standard EIA 19 inch cabinet.

Option F Local/Remote
This option provides remote control of the amplifier's on/off prime power switch and the RF (operate) on/off switch. The status of the amplifier's faults and an analog voltage, proportional to the amplifier's helix current, is also made available. The distance can be up to 150 meters and is limited by the impedance of the cable used to connect the remote panel to the unit.

Option G 380 to 420 Hz
This option provides the capability of operating from a primary AC power source at an input frequency from 380 to 420 Hz.

Option H Logic Circuit (TTL)
This option consists of computer-compatible transistor-transistor logic (TTL) command and control circuitry which provides turn-on, turn-off, and reset functions, as well as full status indication. The prime power for these control circuits is normally supplied internally but may be supplied from an external source (contact factory). This option replaces the relays used in option F with logic (5 V) circuits and also provides TTL-compatible drivers for the status and fault lines.

Option I 28 V Input Voltage

This option allows the unit to operate from either a negative or a positive 28 (±3) volt dc bus for various airborne and communications applications or special lab requirements. (Polarity must be specified at time of order). This option is not available for all units.

Option J Isolators/Circulators

This option protects the traveling-wave tube from varying VSWR conditions. All isolators are mounted within the amplifier. Due to the insertion loss of the isolator, the output power will be slightly lower (0.5 dB typical) than the level normally available from these units.

Option K High Gain

This option adds a solid state amplifier at the input to the traveling-wave tube in order to provide higher gain when minimal drive power is available.

Option M 48 V Input Voltage

This option allows the amplifier to be operated from either a negative or a positive 48 (-4, +8) Vdc bus. This option is designed for telecommunication applications. (Polarity must be specified at time of order.)

Option N Input Attenuator

This option allows the amplifier gain to be reduced by 20 dB for those applications which can provide excessive drive power to the input of the TWTA or for those applications requiring RF gain adjustment.

Other options may be available upon request.

RF INTERFACE

Model Number	Input Location	Input Type	Output Location	Output Type
8001H11	C	WR42, UG596	A	WR42, UG596
8001H12	C	WR28, UG600	A	WR28, UG600
8010H01	D	N	B	N
8010H02	D	N	B	N
8010H03	D	N	B	N
8010H04	D	SMA	B	SMA
8010H06	D	N	B	N
8010H07	D	N	B	N
8010H09	D	N	B	N
8010H13	D	N	B	N
8010H14	D	N	B	N
8010H15	D	SMA	B	SMA
8010H16	D	N	B	N
8020H01	D	N	B	N
8020H02	D	N	B	N
8020H03	D	N	B	N
8020H04	D	SMA	B	WR62, UG419
8020H09	D	N	B	N
8020H10	D	N	B	N
8020H15	D	SMA	B	SMA

J1 REMOTE CONTROL INTERFACE (OPTION F)
CANNON DBMA-25S OR EQUIVALENT

Pin Number	Nomenclature	Characteristics
Commands		
1	Power On	Form "A" contact to ground 150 mA maximum
2	Operate	Form "A" contact to ground 65 mA maximum
13	Command Enable +15 VDC	+15 VDC ±0.5 @ 215 mA maximum user supplied
Status		
3	Power On	Open collector darlington output (emitter grounded) +50 V maximum standoff
5	Operate	Open collector darlington output (emitter grounded) +50 V maximum standoff
22	Remote Indicator	Form "A" contact to ground 100 mA maximum
Faults		
4	Summary Fault	Open collector darlington output (emitter grounded) +50 V maximum standoff
6	Line Under Voltage	Open collector darlington output (emitter grounded) +50 V maximum standoff
7	Interlock	Open collector darlington output (emitter grounded) +50 V maximum standoff
8	Thermal	Open collector darlington output (emitter grounded) +50 V maximum standoff
9	Helix Current	Open collector darlington output (emitter grounded) +50 V maximum standoff
14	Summary Fault (VPC/RCU subsystem use)	Low=Fault (<1 V), Z_{out} = 1 KΩ, High=Norm (APX 14 V)
15	Low RF (RCU option)	High-Fault (APX 14 V), Low-Norm (<1 V), Z_{out}=1 KΩ
Analog		
10	Helix Current	0 to 5 V full scale, Z_{out}=1 KΩ
11	RF Power (RCU option)	0 to 5 V full scale, Z_{out}=1 KΩ
17	Ground	Chassis

J1 TTL REMOTE CONTROL INTERFACE (OPTION H)
CANNON DBMA-25S OR EQUIVALENT

Pin Number	Nomenclature	Characteristics
Commands		
1	Power On	1 TTL load, 0.1 μF input, Low=True
2	Operate	1 TTL load, 0.1 μF input, Low=True
25	Reset	1 TTL load, Low=True
Status		
3	Power On	Open collector darlington output (emitter grounded) +50 V maximum standoff
5	Operate	Open collector darlington output (emitter grounded) +50 V maximum standoff
14	Fault	Open collector darlington output (emitter grounded) +50 V maximum standoff
16	Power On	TTL output, Fanout=2
17	Ground	Chassis
19	Ready	TTL output, Fanout=2
20	Ready	Open collector darlington output (emitter grounded) +50 V maximum standoff
23	Operate	TTL output, Fanout=2
24	Fault	TTL output, Fanout=2

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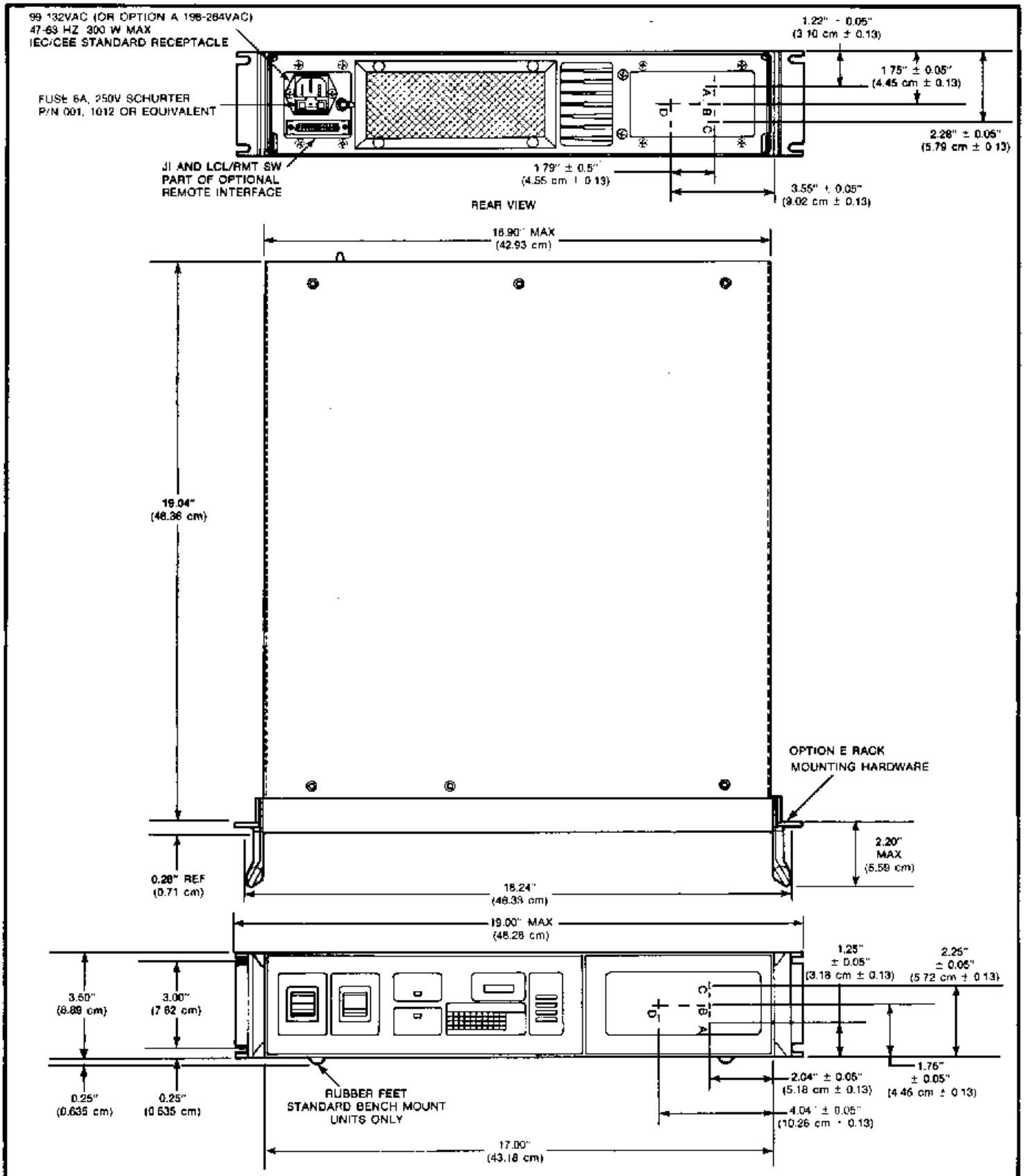

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