PEOPLE AND PROCESS EQUALS CUSTOMER SATISFACTION

MT3200A

TRAVELING WAVE TUBE MEDIUM POWER AMPLIFIER

FOR SATELLITE UPLINK APPLICATIONS

C-BAND: 400W
X-BAND: 400W
Ku-BAND: 400W
DBS-BAND: 270W
DUAL C-/Ku-BAND: 325W
DUAL Ku-/DBS-BAND: 350W

AVAILABLE SYSTEM OPTIONS:

MT3211A	1 + 1 Redundant System
MT3212A	1 + 2 Redundant System
MT32PCA	Phase Combined, Single Path Redundant System
MT32PC2A	Phase Combined, Dual Path Redundant System

Other Configurations Available Upon Request

AVAILABLE AMPLIFIER OPTIONS:

- Controller Bypass
- Parallel Remote Interface
- Manual Attenuator
- Internal Linearizer
- Extended Band Operations
- Remote Panel
- Sub Band Linearizer Optimization
- Output Isolator
- Block Upconverter (select models)

ISO 9001

UL REGISTERED FIRM NO. A3180 CE CCS RUSSIA

FEATURES:

Reduced Depth

Output RF Power Hold

Easily Accessible Diagnostic Port

Programmable Alarms

Event And Maintenance Logs

Ethernet Interface

Field Replaceable Modules For Unsurpassed Serviceability

Closed-Loop Forced Air Cooling

Typical Phase Noise 12 dB Below IESS-308

Control Dial For Easy Set-Up And Adjustment

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ELECTRICAL SPECIFICATIONS	DBS-BAND	DUAL C-/Ku-BAND		DUAL Ku-/DBS-BAND	
	270 W	C-BAND	Ku-BAND	Ku-BAND	DBS-BAND
Frequency Range (F_0) (Standard):	17.3 - 18.4 GHz	5.850 - 6.425 GHz	13.75 - 14.50 GHz	14.0 - 14.5 GHz	17.3 - 18.4 GHz
(Extended):	–	–	–	–	
Output Power (min.):					
Tube Output Flange:	270 W (54.3 dBm)	325 W (55.1 dBm)	325 W (55.1 dBm)	350 W (55.4 dBm)	300 W (54.8 dBm)
HPA Output Flange:	230 W (53.6 dBm)	290 W (54.6 dBm)	290 W (54.6 dBm)	310 W (54.9 dBm)	265 W (54.2 dBm)
Gain:					
At Rated Power (min.):	70 dB	62 dB	62 dB	60 dB	
Small Signal Gain (SSG) (typ.):	83 dB	67 dB	67 dB	70dB	
Attenuation Range:	32 dB (0.1 dB Inc.)	32 dB (0.1 dB Inc.)	32 dB (0.1 dB Inc.)	32 dB (0.1 dB Inc.)	
Maximum SSG Variation Over:					
Narrow Band:	1.0 dB/80 MHz	1.5 dB/40 MHz	1.3 dB/80 MHz	1.0 dB/80 MHz	
Per 500 MHz:	4.0 dB	2.5 dB	2.5 dB	4.0 dB	
Slope, Max.:	±0.04 dB/MHz	±0.04 dB/MHz	±0.04 dB/MHz	±0.04 dB/MHz	
Gain Stability:	±0.25 dB/24 hr. max. (constant drive, line voltage and temp.)	±0.25 dB/24 hr. max. (constant drive, line voltage and temp.)		±0.25 dB/24 hr. max. (constant drive, line voltage and temp.)	
Stability, Any Freq. Over Entire Temp.:	±1 dB typ.				
Stability, Any Freq. ±10°C:	±0.75 dB max.				
Input VSWR:	1.20:1 max. with respect to 50 ohms				
Output VSWR:					
Without Isolator:	N/A	2.2:1 max. with respect to 50 ohms			
With Isolator:	1.25:1 max. with respect to 50 ohms	–		–	
Load VSWR:	2.0:1 max. without damage, continuous				
AM/PM Conversion:					
At Rated Power:	8.0°/dB	6.0°/dB		–	
6 dB Below Rated Power:	2.5°/dB	2.5°/dB		3.0°/dB	
Residual AM Noise, Max.:					
Below 10 kHz:	-50 dBc				
10 - 500 kHz:	-20 (1.5 + Log$f$ kHz) dBc				
Above 500 kHz:	-85 dBc max.				
Harmonic Output, Max.:	-60 dBc	75 W max. at -6 dB back-off	-12 dBc	-60 dBc	
Noise & Spurious, Max.:					
Receive Band (Standard):	-150 dBW/4 kHz, 10.7 - 12.75 GHz	-65 dBW/4 kHz, 3.4 - 4.2 GHz	-65 dBW/4 kHz, 10.7 - 12.5 GHz	-150 dBW/4 kHz, 10.7 - 12.75 GHz	
(Extended):	N/A	N/A	N/A	N/A	
Transmit Band (F_0):	-65 dBW/4 kHz, 12.75 - 21.00 GHz	-65 dBW/4 kHz, 5.85 - 6.425 GHz	-65 dBW/4 kHz, 13.75 - 14.5 GHz	-65 dBW/4 kHz, 12.75 - 21.00 GHz	
Phase Noise:	10 dB below IESS Phase Noise Profile				
AC Fundamental:	-50 dBc				
Sum Of All Except AC Fundamental:	-47 dBc				
Intermodulation	Total P_0 / IM Product	Total P_0 / IM Product		Total P_0 / IM Product	
(for 2 equal carriers relative	-4 dB / -18 dBc	-4 dB / -24 dBc	– / –	-4 dB / -16 dBc	
to single carrier rated output):	-7 dB / -24 dBc	– / –	-7 dB / -24 dBc	– / –	
with Linearizer Option:	-4 dB / -27 dBc	– / –	– / –	-7 dB / -22 dBc	
Group Delay:	Any 80 MHz Bandwidth	Any 40 MHz Bandwidth	Any 80 MHz Bandwidth		
Linear:	0.01 ns/MHz				
Parabolic:	0.005 ns/MHz^2				
Ripple:	0.5 ns p-p				
Prime Power:					
Voltage:	100 - 264 VAC, 1-phase, 47 - 63 Hz				
Power Consumption (at Rated RF Out):	1.3 KVA typ.	1.9 KVA typ.			
Power Factor:	0.95 min.				
In-Rush:	25A max.@ 120 VAC line	30A max.@ 120 VAC line			
Input Transients:	EN61000-4-4, 4-5, 4-11 (Surge, Fast Transients, Line Dropout)				

Note: Performance information is subject to change without notification. Contact MCL for the latest specifications (TN3200A-1).

MT3200A

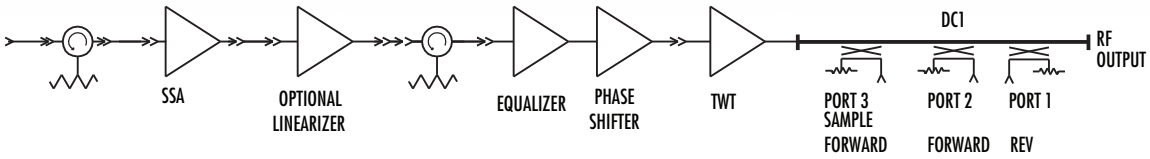
TRAVELING WAVE TUBE MEDIUM POWER AMPLIFIER

ELECTRICAL SPECIFICATIONS	C-BAND 400 W	X-BAND 400 W	Ku-BAND 400 W
Frequency Range (F_0) (Standard):	5.850 - 6.650 GHz	7.9 - 8.4 GHz	13.75 - 14.50 GHz
(Extended):	Option: 5.850 - 7.10 GHz	–	Option: 12.75 - 14.50 GHz
Output Power (min.):			
Tube Output Flange:	400 W (56.0 dBm)	400 W (56.0 dBm)	400 W (56.0 dBm)
HPA Output Flange:	360 W (55.5 dBm)	360 W (55.5 dBm)	360 W (55.5 dBm)
Gain:			
At Rated Power (min.):	73 dB	75 dB	73 dB
Small Signal Gain (SSG) (typ.):	86 dB	91 dB	86 dB
Attenuation Range:	32 dB (0.1 dB Inc.)	32 dB (0.1 dB Inc.)	32 dB (0.1 dB Inc.)
Maximum SSG Variation Over:			
Narrow Band:	1.0 dB/40 MHz	1.0 dB/40 MHz	1.0 dB/80 MHz
Per 500 MHz:	2.5 dB	2.5 dB	2.5 dB
Slope, Max.:	±0.03 dB/MHz	±0.03 dB/MHz	±0.04 dB/MHz
Gain Stability:	±0.25 dB/24 hr. max. (constant drive, line voltage and temp.)	±0.25 dB/24 hr. max. (constant drive, line voltage and temp.)	±0.25 dB/24 hr. max. (constant drive, line voltage and temp.)
Stability, Any Freq. Over Entire Temp.:	±1 dB typ.		
Stability, Any Freq. ±10°C:	±0.75 dB max.		
Input VSWR:	1.20:1 max. with respect to 50 Ohms		
Output VSWR:			
Without Isolator:	1.60:1 max. with respect to 50 ohms	1.60:1 max. with respect to 50 ohms	1.60:1 max. with respect to 50 ohms
With Isolator (option):	1.25:1 max. with respect to 50 ohms	1.25:1 max. with respect to 50 ohms	1.25:1 max. with respect to 50 ohms
Load VSWR:	2.0:1 max. without damage, continuous		
AM/PM Conversion:			
At Rated Power:	6.0°/dB		
6 dB Below Rated Power:	2.5°/dB		
Residual AM Noise, Max.:			
Below 10 kHz:	-50 dBc		
10 - 500 kHz:	-20 (1.5 + Log$f$ kHz) dBc		
Above 500 kHz:	-85 dBc max.		
Harmonic Output, Max.:	-60 dBc		
Noise & Spurious, Max.:			
Receive Band (Standard):	-150 dBW/4 kHz, 3.4 - 4.2 GHz	-65 dBW/4 kHz, 7.25 - 7.75 GHz	-150 dBW/4 kHz, 10.7 - 12.75 GHz
(Extended):	-150 dBW/4 kHz, 3.4 - 4.2 GHz	–	-150 dBW/4 kHz, 10.7 - 11.7 GHz
Transmit Band (F_0):	-65 dBW/4 kHz, 4.2 - 12.0 GHz	-65 dBW/4 kHz, 7.9 - 10.0 GHz	-65 dBW/4 kHz, 12.75 - 18.50 GHz
Phase Noise:	10 dB below IESS Phase Noise Profile		
AC Fundamental:	-50 dBc		
Sum Of All Except AC Fundamental:	-47 dBc		
Intermodulation (for 2 equal carriers relative to single carrier rated output):	Total P_0 / IM Product		
	-4 dB / -18 dBc		
	-7 dB / -24 dBc		
with Linearizer Option:	-4 dB / -27 dBc		
Group Delay:	Any 40 MHz Bandwidth		Any 80 MHz Bandwidth
Linear:	0.01 ns/MHz		0.01 ns/MHz
Parabolic:	0.005 ns/MHz^2		0.005 ns/MHz^2
Ripple:	0.5 ns p-p		0.5 ns p-p
Prime Power:			
Voltage:	100 - 264 VAC, 1-phase, 47 - 63 Hz		
Power Consumption (at Rated RF Out):	1.5 KVA typ.		
Power Factor:	0.95 min.		
In-Rush:	28A max.@120 VAC line		
Input Transients:	EN61000-4-4, 4-5, 4-11 (Surge, Fast Transients, Line Dropout)		

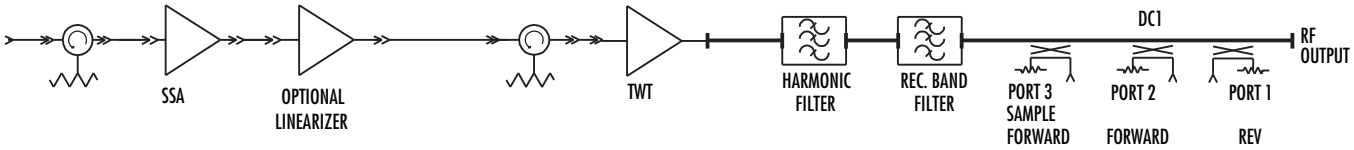
Note: Performance information is subject to change without notification. Contact MCL for the latest specifications (TN3200A-1).

RF BLOCK DIAGRAMS

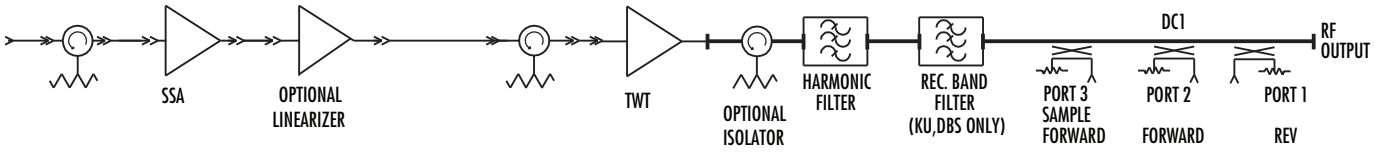
DUAL-BAND, C/Ku



DUAL-BAND, Ku/DBS



C, Ku, DBS BAND



CONTROL AND STATUS CAPABILITIES

TYPE	FUNCTION		
Controls	Filament ON/OFF/Delay Transmit/Standby RF ON/OFF Reset Attenuation	Units Select Hold Power ON/OFF Auto Switching (1:1) Manual Switching (1:1) Set Time/Date	Fault Counter ON/OFF/Time Antenna Position (1:1) Load Position (1:1) Local/Remote/Computer
Adjustable Parameters	Auto Power Tube Temperature Alarm RF Low Alarm Comm Address Date	Tube Overdrive Alarm RF Reflected Power Alarm RF High Alarm Comm Band Rate Time	Tube Overdrive Fault RF Reflected Power Fault Filament Under Current Fault Comm Protocol Linearizer Band Selection
Displays	RF Forward Power Helix Voltage Filament Delay	Tube Drive Helix Current Tube Temperature	RF Reflected Power Filament Current PS Temperature
Faults (Notification, RF & HV Shutdown)	Tube Temperature Switch Tube Temperature Analog Helix Run Current HV Under Voltage User Interlock	WG Pressure WG Arc Helix Surge Current HV Over Voltage	Arc Test Failed PS Temperature Chassis Interlock Filament Under Current
Alarms (Notification Only)	RF High RF Reflected Blower Failed Exciter	RF Low Tube Temperature AC Low Line	Tube Overdrive PS Temperature RF Switch Failed
Additional Status	Delay Summary Alarm Computer Tx Remote Rx Maintenance Log	Transmit Selected Summary Fault Computer Rx Event Log	Sampler Port Cal Table RF Low Switching ON/OFF Remote Tx Fault Log

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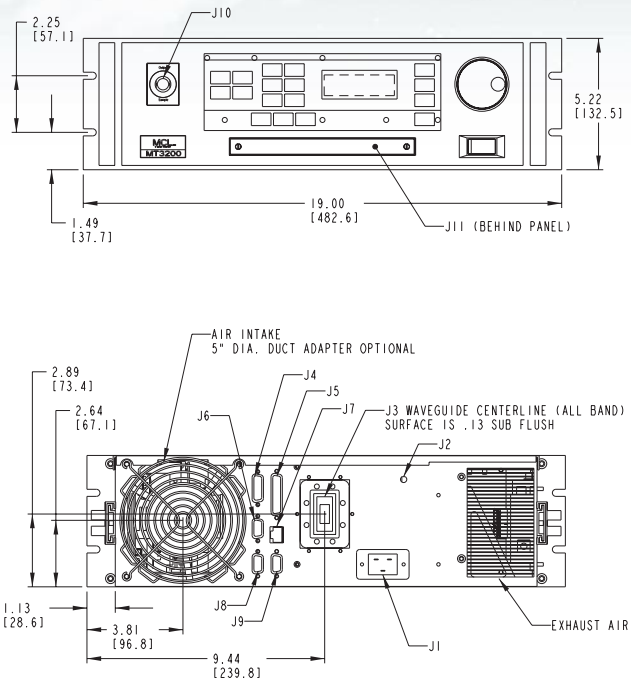
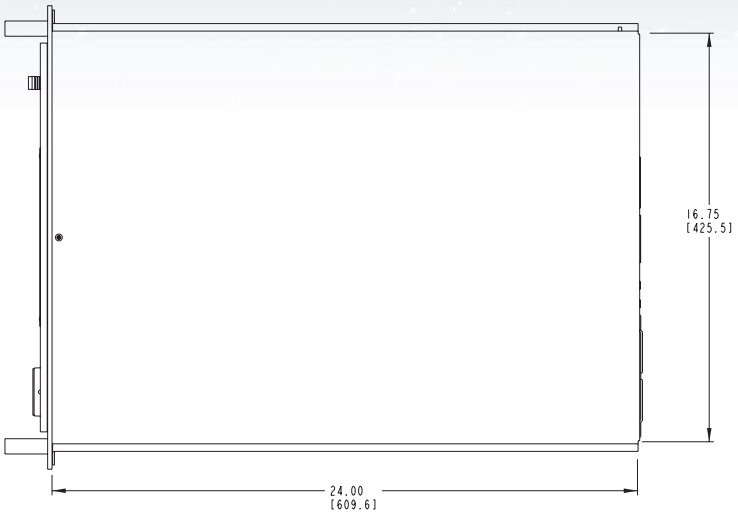
OUTLINE DRAWING





CONNECTOR CHART		
DSGN	**DESCRIPTION**	**CONNECTOR**
J1	AC INPUT	3P, AC, IEC 320 C-20
J2	RF INPUT	SMA FEMALE
J3	RF OUTPUT	WAVEGUIDE FLANGE
J4	USER INTERFACE	"D" CONN. 15 PIN
J5	SWITCHOVER INTERFACE	"D" CONN. 25 PIN
J6	REMOTE (RS485)	"D" CONN. 9 PIN
J7	ETHERNET	RJ45
J8	COMPUTER (RS232)	"D" CONN. 9 PIN
J9	COMPUTER (RS485)	"D" CONN. 9 PIN
J10	RF SAMPLE	N TYPE FEMALE
J11	DIAGNOSTIC INTERFACE	"D" CONN. 9 PIN

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature:
-10°C to +50°C (derated 1.9°C per 1,000 ft. above sea level)

Non-Operating Temperature:
-40°C to +70°C

Relative Humidity:
95%, non-condensing

Operating Altitude:
10,000 ft. above sea level (3,048 m)

Non-Operating Altitude:
50,000 ft. above sea level (15,000 m)

Vibration:
Basic Transportation Method 514-4 of MIL-STD-810E Procedure 1, Figures 514.4-1, 514.4-2, 514.4-3

Shock:
10g, 11ms half sine pulse along each of 3 orthoginal axes

MECHANICAL SPECIFICATIONS

RF Connectors:
Input: Type SMA female
Output: (Waveguide Flange)

C-Band:	CPR137F
X-Band:	WR112F
Ku-Band:	WR75F
DBS-Band:	WR62F
Dual-Band C-/Ku:	WRD-580D28
Dual-Band Ku-/DBS:	WR62F

Installed Weight:
65 lbs. nominal

Cooling:
Closed-loop forced air with integral blower

Acoustic Noise:
<65 dBA at 1 meter (from front panel)

PHYSICAL SPECIFICATIONS

Dimensions:
5.25" H (3RU) (134 mm)
19.00" W (483 mm)
24.00" L (610 mm)

Air Flow:
100 CFM

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