



**400W C-Band GaN
 Compact Outdoor SSPA**

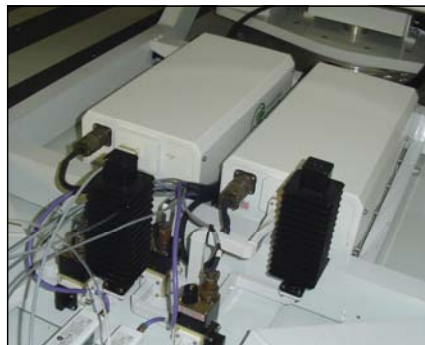
Description

The Teledyne Paradise Datacom Compact Outdoor Solid State Power Amplifier (SSPA) is built for extreme environmental conditions and high reliability operation. Along with the robust construction exists the highest power density in the industry. This allows solid state technology to be used in applications that have long been reserved for TWTAs. Weighing 44 lbs. (20 kg) and being only slightly larger than a shoe box, these SSPAs are available in output power levels of:

- S-Band: 50W, 100W, 200W, 300W, 400W, 500W**
- C-Band: 300W, 400W**
- X-Band: 300W, 400W**
- Ku-Band: 100W, 150W, 200W, 250W**



Antenna-mount 1:1 system w/ mounting frame



SNG-mount 1:1 system w/ side-mount AC input

FEATURES

- Compact size and weight
- CE Compliance Tested
- Integrated forced-air cooling system
- 20 dB RF Gain Adjustment
- Extreme Environmental Testing
- RF Output Sample Port
- Maintenance Free Operation
- Universal, Power Factor Corrected Power Supply
- Built-in 1:1 Redundancy Control
- Built-in Maintenance Switch Controller
- True Output Power Detection

OPTIONS

- Hand Held Controller
- Antenna Mounting Kit
- Remote Control Panel
- L-Band Input
- FSK monitor & control via IFL
- Phase Combined Systems
- Low line voltage operation
- Fiber Optic Input
- Optional side-mount AC input for SNG installations
- Receive Band Reject Filter
- -55 °C Operation

SPECIFICATIONS

- Compact Outdoor housing
 10.0 X 19.5 X 6.50 in
 254 X 495 X 165 mm
 44.0 lbs. / 20.0 kg
- White powder coat finish
- Operating temperature:
 -40 to +60 °C

Specifications, S-Band SSPAs

| PARAMETER | NOTES | LIMITS | UNITS |
|---|--|--|--|
| Frequency Range | Frequency selection "G" Frequency selection "A" Frequency selection "B" | 1.750 to 2.120 2.020 to 2.120 2.200 to 2.300 | GHz GHz GHz |
| Output Power Typical, P_{sat} Guaranteed minimum, P_{Linear}^1 | A Series HPAS2050ACXXXXXG HPAS2100ACXXXXXG HPAS2200ACXXXXXG HPAS2300ACXXXXXG HPAS2400ACXXXXXG HPAS2500ACXXXXXG B Series HPAS2050BCXXXXXG HPAS2100BCXXXXXG HPAS2200BCXXXXXG HPAS2300BCXXXXXG HPAS2400BCXXXXXG HPAS2500BCXXXXXG | P_{sat} / P_{Linear} 47.5 (56) / 43.0 (20) 50.0 (100) / 47.0 (50) 53.0 (200) / 50.0 (100) 54.8 (300) / 51.8 (150) 56.0 (400) / 53.0 (200) 57.0 (500) / 54.0 (250) 47.5 (56) / 43.0 (20) 50.0 (100) / 47.0 (50) 53.0 (200) / 50.0 (100) 54.8 (300) / 51.8 (150) 56.0 (400) / 53.0 (200) 57.0 (500) / 54.0 (250) | dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) |
| Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC) | power factor HPAS2050ACXXXXXG HPAS2100ACXXXXXG HPAS2200ACXXXXXG HPAS2300ACXXXXXG HPAS2400ACXXXXXG HPAS2500ACXXXXXG | .98 47 to 63 400 / 300 (90-265) 500 / 400 (90-265) 800 / 700 (90-265) 1300 / 1000 (180-265) ² 1600 / 1300 (180-265) ² 1800 / 1500 (180-265) ² | Hz W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) |
| Receive Band Noise Power Density | without optional filter with optional filter | - 95 - 155 | dBW / 4 KHz dBW / 4 KHz |

Note 1: P_{Linear} = maximum output power at which third order intermodulation products < -25 dBc (for two tones separated by 5 MHz) or spectral regrowth on a single QPSK at 1.5 x symbol rate or OQPSK at 1.0 x symbol rate is < -30 dBc.

Note 2: Low line voltage (90-265 VAC) option not available.

Specifications, C-Band SSPAs

| PARAMETER | NOTES | LIMITS | UNITS |
|---|---|--|---|
| Frequency Range | Frequency selection "L" Frequency selection "H" Frequency selection "C" ² Frequency selection "A" Frequency selection "B" ² Frequency selection "E" Frequency selection "F" | 4.400 to 5.000 5.715 to 5.790 5.750 to 6.670 5.850 to 6.425 5.850 to 6.725 6.425 to 6.725 6.725 to 7.025 | GHz GHz GHz GHz GHz GHz GHz |
| Output Power Typical, P_{sat} Guaranteed minimum, P_{Linear}^1 | HPAC2300ACXXXXXG HPAC2400ACXXXXXG | P_{sat} / P_{Linear} 54.8 (300) / 51.8 (150) 56.0 (400) / 53.0 (200) | dBm (W) dBm (W) |
| Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC) | power factor HPAC2300ACXXXXXG HPAC2400ACXXXXXG | .98 47 to 63 P_{sat} / P_{Linear} 1500 / 1300 (180-265) ³ 1800 / 1600 (180-265) ³ | Hz W (VAC) W (VAC) |
| Receive Band Noise Power Density | without filter | - 155 | dBW / 4 KHz |

Note 1: P_{Linear} = maximum output power at which third order intermodulation products < -25 dBc (for two tones separated by 5 MHz) or spectral regrowth on a single QPSK at 1.5 x symbol rate or OQPSK at 1.0 x symbol rate is < -30 dBc.

Note 2: Output power decreases over the extended portion of the frequency range. Both P_{sat} and P_{Linear} de-rate by 1 dB from 5.85 to 5.75 GHz and from 6.425 to 6.725 GHz.

Note 3: Available with low line voltage option, 90 to 265 VAC.

Specifications, X-Band SSPAs

| PARAMETER | NOTES | LIMITS | UNITS |
|---|---|---|------------------------------|
| Frequency Range | Frequency selection "F" Frequency selection "D" Frequency selection "A" | 7.10 to 7.40 7.70 to 8.40 7.90 to 8.40 | GHz GHz GHz |
| Output Power Typical, P_{sat} Guaranteed minimum, P_{Linear}^1 | HPAX2300ACXXXXXG HPAX2400ACXXXXXG | P_{sat} / P_{Linear} 54.8 (300) / 51.8 (150) 56.0 (400) / 53.0 (200) | dBm (W) dBm (W) |
| Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC) | power factor HPAX2300ACXXXXXG HPAX2400ACXXXXXG | .98 47 to 63 P_{sat} / P_{Linear} 1500 / 1300 (180-265) ² 2000 / 1700 (180-265) ² | Hz W (VAC) W (VAC) |
| Receive Band Noise Power Density | without optional filter with optional filter | - 85 - 155 | dBW / 4 KHz dBW / 4 KHz |

Note 1: P_{Linear} = maximum output power at which third order intermodulation products < -25 dBc (for two tones separated by 5 MHz) or spectral regrowth on a single QPSK at 1.5 x symbol rate or OQPSK at 1.0 x symbol rate is < -30 dBc.

Note 2: Available with low line voltage option, 90 to 265 VAC.

Specifications, Ku-Band SSPAs

| PARAMETER | NOTES | LIMITS | UNITS |
|---|---|---|--|
| Frequency Range | Frequency selection "F" Frequency selection "B" Frequency selection "A" Frequency selection "C" Frequency selection "D" | 12.75 to 13.25 13.75 to 14.50 14.00 to 14.50 14.50 to 14.70 15.10 to 15.40 | GHz GHz GHz GHz GHz |
| Output Power Typical, P_{sat} Guaranteed minimum, P_{Linear}^1 | HPAK2100ACXXXXXG HPAK2150ACXXXXXG HPAK2200ACXXXXXG HPAK2250ACXXXXXG | P_{sat} / P_{Linear} 50.0 (100) / 47.0 (50) 51.8 (150) / 48.8 (75) 53.0 (200) / 50.0 (100) 54.0 (250) / 51.0 (125) | dBm (W) dBm (W) dBm (W) dBm (W) |
| Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC) | power factor HPAK2100ACXXXXXG HPAK2150ACXXXXXG HPAK2200ACXXXXXG HPAK2250ACXXXXXG | .98 47 to 63 P_{sat} / P_{Linear} 900 / 750 (90-265) 1000 / 850 (90-265) 1200 / 920 (180-265) ³ 1500 / 1000 (180-265) ³ | Hz W (VAC) W (VAC) W (VAC) W (VAC) |
| Receive Band Noise Power Density ² | | - 155 | dBW / 4 KHz |

Note 1: P_{Linear} = maximum output power at which third order intermodulation products < -25 dBc (for two tones separated by 5 MHz) or spectral regrowth on a single QPSK at 1.5 x symbol rate or OQPSK at 1.0 x symbol rate is < -30 dBc.

Note 2: All Ku-Band SSPAs are fitted with a receive band reject bulkhead filter, standard. An optional pressure window is available.

Note 3: Available with low line voltage option, 90 to 265 VAC.

Common Electrical Specifications

| PARAMETER | NOTES | LIMITS | UNITS |
|---|---|---|---------------------|
| Gain | range | 55-75 | dB |
| Gain Flatness | full band | ± 1.0 | dB |
| | full band (Extended C-Band) | ± 1.5 | dB |
| | full band (S-Band) | ± 0.75 | dB |
| Gain Slope | per 40 MHz | ± 0.3 | dB/40 MHz |
| | per 10 MHz (S-Band) | ± 0.3 | dB/10 MHz |
| Gain Variation vs. Temperature | -40 °C to +60 °C | ± 1.5 | dB |
| Gain Stability | at constant temperature | ± 0.25 | dB/24 hours |
| Gain Adjustment | 0.1 dB resolution | 20 | dB |
| Intermodulation Distortion (Two-tone, 5 MHz spacing) | At P_{Linear} ($P_{sat} - 3$ dB) | -25 | dBc |
| AM/PM Conversion | @ rated P_{Linear} | ≤ 1.0 | °/dB |
| Spurious Harmonics (SSPA only) | @ rated P_{Linear} | -65 | dBc |
| | @ rated P_{Linear} | -50 | dBc |
| | @ rated P_{Linear} (S-Band) | -30 | dBc |
| Input/Output VSWR | Extended C-Band | 1.30:1 | |
| | Output VSWR: Ku-Band with bulkhead filter | 1.50:1 | |
| | | 1.40:1 | |
| Noise Figure | at maximum gain | 10 | dB |
| | at maximum gain (S-Band) | 8 | dB |
| Group Delay (per 40 MHz segment) | Linear | 0.01 | ns/MHz |
| | Parabolic | 0.003 | ns/MHz ² |
| | Ripple | 1.0 | ns p-p |
| Transmit Band Noise Output Power Density | TX Band | -75 | dBW/4 KHz |
| Residual AM Noise, typical | Offset frequency from carrier | | |
| | 1 Hz | -110 | dBc/Hz |
| | 10 Hz | -120 | dBc/Hz |
| | 100 Hz | -130 | dBc/Hz |
| | 1 KHz | -135 | dBc/Hz |
| | 10 KHz | -140 | dBc/Hz |
| | 100 KHz | -140 | dBc/Hz |
| | 1 MHz | -140 | dBc/Hz |
| Residual Phase Noise, typical (SSPA only) | Offset frequency from carrier | | |
| | 10 Hz | -90 | dBc/Hz |
| | 100 Hz | -100 | dBc/Hz |
| | 1 KHz | -110 | dBc/Hz |
| | 10 KHz | -120 | dBc/Hz |
| | 100 KHz | -125 | dBc/Hz |
| | 1 MHz | -130 | dBc/Hz |
| True RF Power Detector | Range Accuracy | P_{sat} to ($P_{sat} - 20$) ± 0.75 | dB dBm |

Specifications are subject to change without notice.

L-Band Operation

Teledyne Paradise Datacom amplifiers are available with an integrated L-Band Block Up Converter. L-Band units utilize Teledyne Paradise Datacom's proprietary zBUC technology. Adding a zBUC[®] converter typically increases the gain by 2-4 dB. Advantages include:

- zBUC converter can detect and switch to an externally supplied reference.
- Optional internal high stability (10MHz) reference.
- zBUC converter can lock to an externally supplied reference of 10 or 50 MHz.
- zBUC converter can accept a wide range of external reference power (-10 to +5 dBm)
- zBUC converter can accept FSK monitor and control signal via the IFL for complete amplifier remote control.

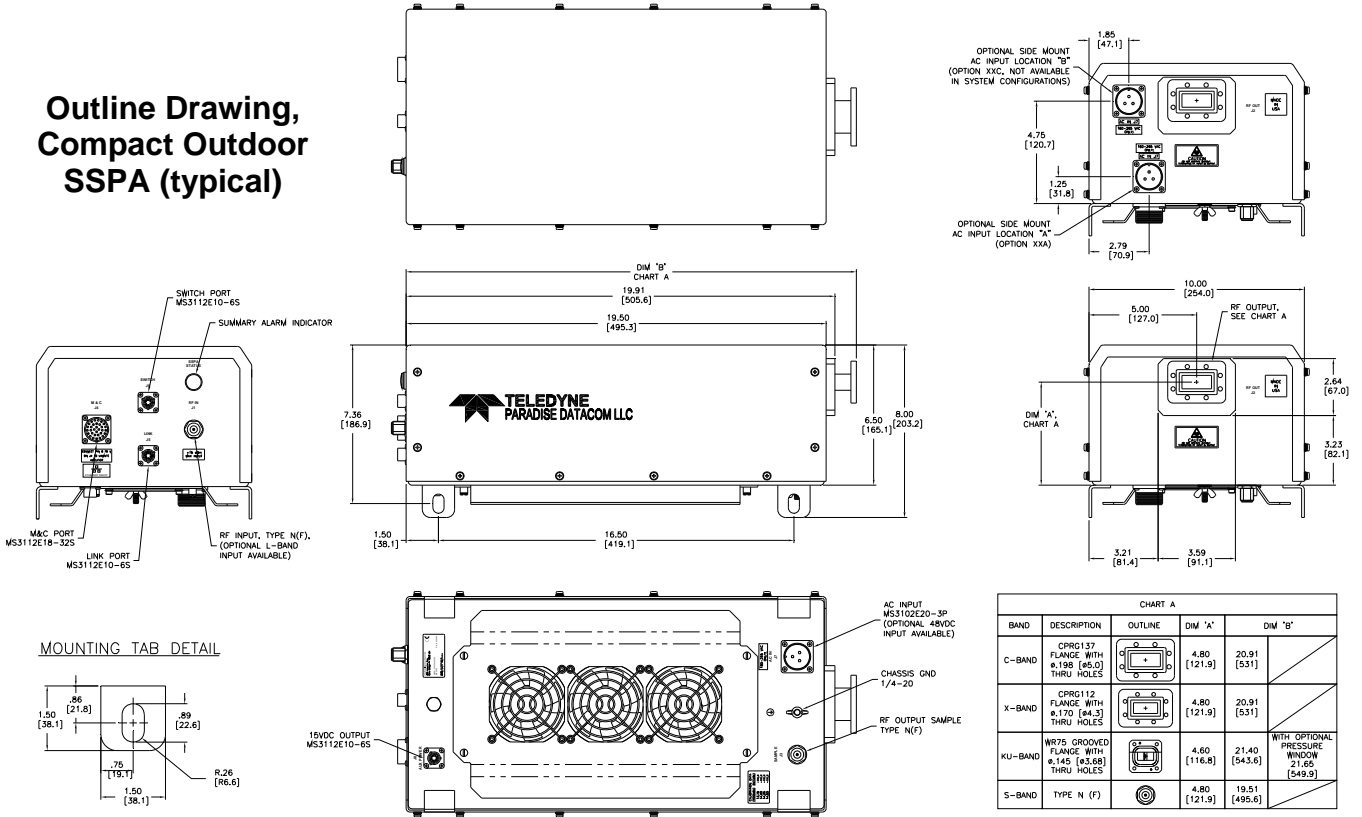
Available Frequency Plans

| Band | Frequency Plan | IF Input | LO Frequency | RF Output |
|------|----------------|-----------------|--------------|-------------------|
| C | Sub-Band "A" | 950 - 1525 MHz | 4.900 GHz | 5.850 - 6.425 GHz |
| C | Sub-Band "B" | 950 - 1825 MHz | 4.900 GHz | 5.850 - 6.725 GHz |
| C | Sub-Band "C" | 950 - 1870 MHz | 4.800 GHz | 5.750 - 6.670 GHz |
| C | Sub-Band "E" | 950 - 1250 MHz | 5.475 GHz | 6.425 - 6.725 GHz |
| C | Sub-Band "F" | 950 - 1250 MHz | 5.775 GHz | 6.725 - 7.025 GHz |
| C | Sub-Band "L" | 950 - 1550 MHz | 3.450 GHz | 4.400 - 5.000 GHz |
| X | Sub-Band "A" | 950 - 1450 MHz | 6.950 GHz | 7.900 - 8.400 GHz |
| Ku | Sub-Band "A" | 950 - 1450 MHz | 13.050 GHz | 14.00 - 14.50 GHz |
| Ku | Sub-Band "B" | 950 - 1700 MHz | 12.800 GHz | 13.75 - 14.50 GHz |
| Ku | Sub-Band "D" | 1350 - 1650 MHz | 13.750 GHz | 15.10 - 15.40 GHz |
| Ku | Sub-Band "F" | 950 - 1450 MHz | 11.800 GHz | 12.75 - 13.25 GHz |

Electrical Specifications for Compact Outdoor SSPA with ZBUC converter

| PARAMETER | NOTES | LIMITS | | | | UNITS |
|---|---|------------------------|----------------------|----------------------|-----------------------|-----------|
| Gain | Nominal setting | 75 | | | | dB |
| Gain Flatness | full band (C-,X-,Ku-bands) | ± 2.0 | | | | dB |
| Gain Slope | per 40 MHz (C-,X-,Ku-bands) | ± 0.5 | | | | dB/40 MHz |
| Gain Adjusted Range | | 20 | | | | dB |
| | Typical C-Band Adj. Range | 60 - 80 | | | | dB |
| | Typical Ku-Band Adj. Range | 57 - 77 | | | | dB |
| Gain Stability | -40 to +60 °C | ± 1.5 | | | | dB |
| Phase Noise | Offset frequency from carrier | <u>Absolute max.</u> | <u>C-band (typ.)</u> | <u>X-band (typ.)</u> | <u>Ku-band (typ.)</u> | |
| | 10 Hz | -30 | -60 | -58 | -56 | dBc/Hz |
| | 100 Hz | -60 | -74 | -70 | -67 | dBc/Hz |
| | 1 KHz | -70 | -84 | -80 | -78 | dBc/Hz |
| | 10 KHz | -80 | -100 | -94 | -91 | dBc/Hz |
| | 100 KHz | -90 | -105 | -97 | -94 | dBc/Hz |
| | 1 MHz | -90 | -125 | -122 | -120 | dBc/Hz |
| Spurious | In-Band Signal Related (C-/Ku-Band) (Extended C-Band) | -50 | | | | dBc |
| | Close to Carrier Spurious (≤ 20 MHz) | -40 | | | | dBc |
| | Local Oscillator | -50 | | | | dBc |
| | | -30 | | | | dBm |
| Noise Figure | At Maximum gain | 20 | | | | dB |
| Transmit Band Noise Output Power Density | Tx Band at Maximum gain | -65 | | | | dBW/4kHz |
| Input VSWR | L-Band | 1.5 : 1 | | | | |
| Internal Reference Option | Reference Accuracy (initial) | ± 1 • 10 ⁻⁸ | | | | |
| | Aging per day (after 30 days) | ± 1 • 10 ⁻⁹ | | | | |
| | Aging per year (after 30 days) | ± 6 • 10 ⁻⁸ | | | | |
| | Reference Stability over Temperature (-40 to +40 °C, ambient) | ± 1 • 10 ⁻⁸ | | | | |

Outline Drawing, Compact Outdoor SSPA (typical)



Mechanical & Environmental Specifications

| PARAMETER | NOTES | LIMITS | UNITS |
|---------------------------|--|--|--|
| Size | width X length X height | 10.0 X 19.5 X 6.50 254 X 495 X 165 | inches mm |
| Weight | Base Unit With Internal zBUC | 44 (20.0) ± 3% +1.7 (+0.8) | lbs.(kg) lbs.(kg) |
| Finish | | Paint | White; powder coat |
| Connectors | RF Input RF Output (S-Band, to 300W) RF Output (S-Band, > 300W) RF Output (C-Band) RF Output (X-Band) RF Output (Ku-Band) RF Output Sample Line Power Monitor and Control Link Port Redundancy Switch Auxiliary +15VDC LNB Power (500 mA) | Type N Type N 7/16 DIN WR137 Waveguide WR112 Waveguide WR75 Waveguide Type N 3-pin MS-type 32-pin MS-type 6-pin MS type 6-pin MS-type 6-pin MS-type | Female Female Female CPR137G flange (PDR-70) CPR112G flange (PDR-84) Grooved flange Female Plug Socket Socket Socket Socket |
| Operating Temperature | Ambient | -40 to +60 | °C |
| Relative Humidity | Condensing | 100 | % |
| Cooling System | Integrated, Forced air | 103 | CFM |
| Ingress Protection Rating | With connectors properly sealed | IP 54 | |
| Audible Noise | Measured 1m from unit, at P _{sat} | 74.0 | dBA |
| Altitude | No temperature de-rating up to 10,000 ft. (3,000 m) De-rate maximum temperature by 2 °C per 1,000 ft (300 m) beyond 10,000 ft. | | |
| Shock | 50 g p-p, 11 msec pulses | | |
| Vibration | 3g rms 30 min. 5-2000 Hz | | |

Optional Accessories

Remote Control Panel (RCP2-1000-CO)



The RCP2-1000-CO is a Remote Control Panel for the Compact Outdoor SSPA. It requires 1RU of cabinet space and provides a similar local interface as exists on Teledyne Paradise Datacom Indoor Rack Mount amplifiers. Reference specification sheet **209728**.

The controller communicates with the outdoor amplifier via a RS485 link. The controller then provides a wide range of interface capability including Ethernet communications. The following communication links are available at the Remote Control Panel:

- RS232 or Addressable RS485 Serial Data
- Discrete (Parallel) Interface - Form C contact outputs & Opto Isolated Inputs
- Ethernet Interface - A full compliment of Ethernet Communications including UDP, SNMP, and an internal web browser.
- Local (Manual) interface via front panel LCD display

Universal Handheld Controller (RCH-1000)

The Universal Handheld Controller (RCH-1000) is a versatile device used to interface with a variety of Teledyne Paradise Datacom amplifiers, including Compact Outdoor SSPA, Mini Compact Outdoor SSPA, or H-Series High Power Outdoor SSPA. Reference specification sheet **211667**.

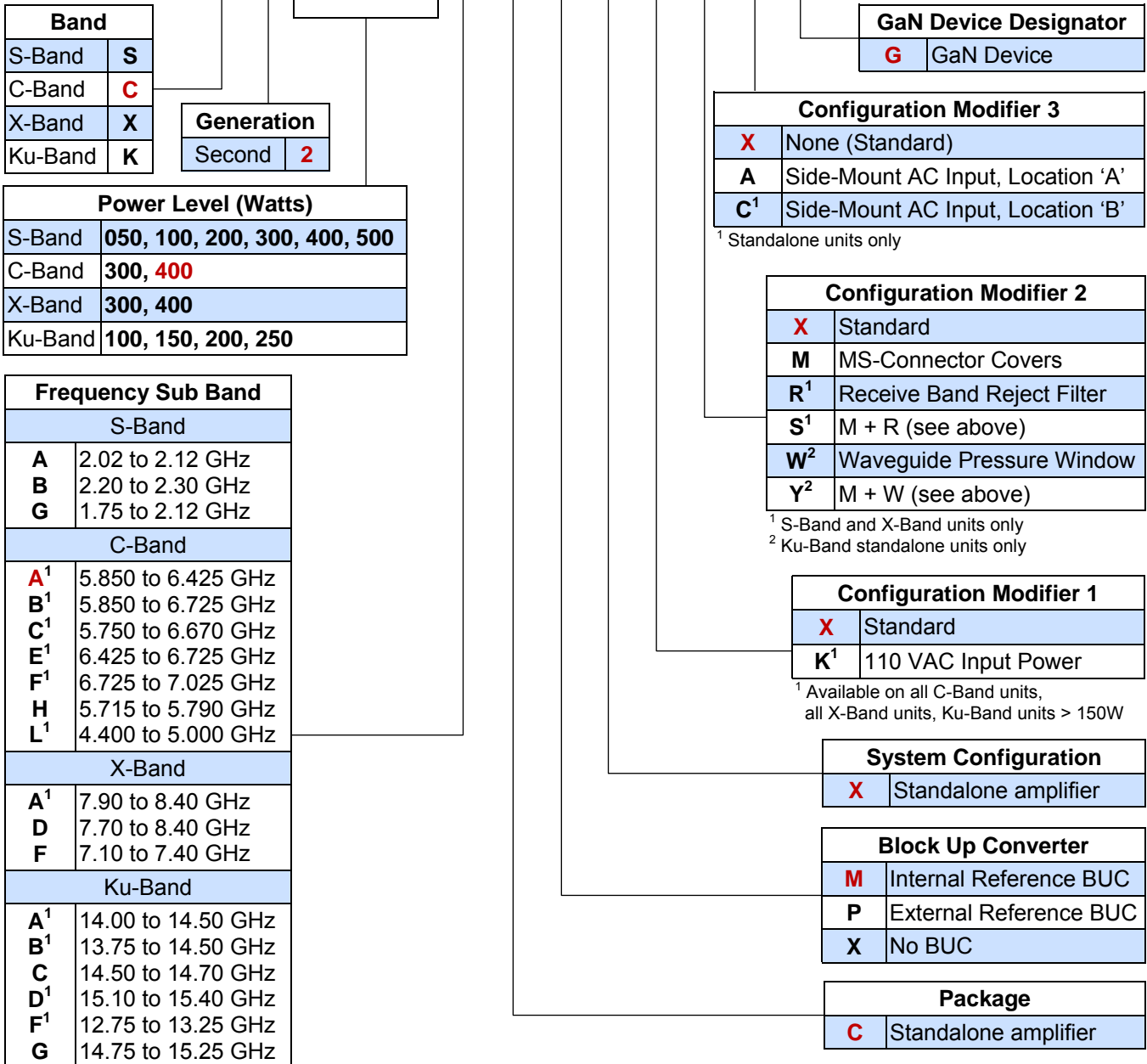
The device is housed in a ruggedized enclosure that is environmentally sealed to IP65 levels. This allows the Universal Handheld Controller (RCH-1000) to be used in most outdoor environments. The rugged construction of the device enclosure provides protection from impact and vibration.



This device allows the operator to adjust the attenuation of the connected unit, and control the mute/unmute selection, as well as monitor the status, conditions and settings of the connected unit via a serial RS-485 connection. Fault conditions and other events are tracked in the controller's internal log.

Part Number Configuration Matrix

HPA **C 2 4 0 0 A C M X X X X G**



¹ Available with optional BUC

Use and Disclosure of Data: The items described herein are controlled by the U.S. Government and authorized for export only to the country of ultimate destination for use by the ultimate consignee or end-user(s) herein identified. They may not be resold, transferred, or otherwise disposed of, to any other country or to any person other than the authorized ultimate consignee or end-user(s), either in their original form or after being incorporated into other items, without first obtaining approval from the U.S. government or as otherwise authorized by U.S. law and regulations.

Proprietary and Confidential: The information contained in this document is the sole property of Teledyne Paradise Datacom. Any reproduction in part or as a whole without the written permission of Teledyne Paradise Datacom is prohibited.

Specifications are subject to change without notice.