Public Safety MARK-IV single or multichannel FCC Class-A Industrial Signal Booster (Channelized BDA-CRA-OCR-UDA) with Frequency-Shift Repeater capability (full-duplex) Supports Analog and Digital channels like P25 ph1&2, DMR, NXDN & TETRA Meets FCC part 90.219(d), NFPA72/1221/5000 and IFC 510.1 Fully Compliant (*)

M4D series

Rack-mount option

Wall-mount option

The CTI MARK-IV Channelized Bi-Directional Amplifiers (M4DBDA) are Class-A Signal Boosters per FCC 90.219 definition.

It has a rugged design for multi-carrier two-way rebroadcast systems, where a significantly high dynamic range is required on a channel-per-channel basis while delivering low propagation (group) delay.

Highlights & Applications:

- **Mission Critical Public Safety Industrial Signal Booster, outstanding in the market.** We will welcome any benchmark test challenge.
- **Single-band bidirectional** models for VHF, UHF, 700, 800 and 900 MHz PLMR. **Unidirectional** versions are also available.
- **Meets NFPA72/1221/1225/5000, IFC 510.1 and UL2524 (2ed) "Emergency Responder Communications Enhancer Systems" (ERCES/ERRCS).**

  Canam can deliver fully integrated systems including other rated products such as Dedicated Radio Consoles (DRC), ANNUNCIATOR panels, AC UPS or DC Battery Backup Units (BBU), Antenna Monitors, Enclosures, and interfaces with the FACP or SCADA.
- **Emergency Remote RF Power OFF (EPO, Mute/Standby),** via discrete I/O or software.
- **Enhanced Outdoor Radio macro network protection** includes smart Noise Jamming and Oscillation prevention, alarms, and automatic mitigation.
- **Intermediate/Frequency Shift Repeater (IFR/FSR) modes** can perform as full-duplex repeater for local tactical analog conventional channels without demodulating & remodulating the audio, while other channels can be configured as Off-Air On-Channel Rebroadcast BDA.
- **Example: NYC In-Buildings/In-Tunnels application:** A single box can deliver both FDNY Auxiliary Radio Communications System (ARCS) channels as Local Intermediate Frequency Repeater plus EMS off-air rebroadcast channels.
- **Another app example: COMBO of Mutual-Aid or maintenance local repeater plus Off-Air BDA for other channels.**
- **HIGHEST GAIN/HIGHEST COVERAGE IN THE MARKET:** up to **130 dB** gain per narrowband filter-window [(1)]. Input Rx sensitivity could be as low as -117 dBm for >20 dB SINAD (DAQ3.4).
- **Delivers and Exceeds the FCC part 90.219(d) rules** for Signal Boosters Good Engineering Practices, while simultaneously transmitting 10 or more carriers at full 5 or 20 watts composite output power.
- **Outstanding Near-Far Input Dynamic Range and Rx Intermod Rejection without desense: 70 dB** baseline with two-tones interfering a weak simultaneous signal. Resolves the Public Safety DAS system uplink near-far challenge, ensuring the effective recovery of weak signals from far-end or worst-case situation users, despite other on-scene strong simultaneous incoming signals that belong or not to the system.
- **Individual Equalizer Automatic Gain Control (eAGC) per filter-window (user selectable)**: the channels could be delivered at the same output level, regardless of their input level, with up to 70 dB delta between strong and weak signals. (channelized AGC Dynamic Range).
- **Individual Rx "squelch" per filter-window,** reduces false BDA activation by out-of-band channels and noise, keeps the output muted with no amplified noise if the channel is inactive.

  OPTIONAL: analog CTCSS or digital DCS coded-squelch per channel.
- **Supports all analog and digital modulation formats, including TDMA**.
- **High-selectivity filters with Low-Group Delay** to minimize TDI.
- **Easily replaceable modular plug-in parts. Low-cost maintenance.**
- **Fully network-able device** with embedded webserver, Optional SNMP V3 (authenticating and encrypting data packets) Agent and Traps, ModBus and ModBus/Moscad NYCT MCAS interpreter, MQTT Client.
- **Cybersecurity** Based on industrial framework, with optional TPM encryption.
- **Canam's Radio Network Management System (NMS)** is available for systems.
- **Several other Options available**, consult Canam. Examples:
  - Built-in RF-over-Fiber transceivers.
  - Paired BDAs assembly to provide N+N channels redundancy with RF Redundancy Switch.
  - Dual Power Supply Units, AC or DC input (rackmount version)

[(1)] subject to actual site deployment RF Isolation between Donor antenna and Service DAS.

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- **KEY Special Features [(1)]**

OP#	Key Feature	OP#	Key Feature
OP1	Break-In Priority Override for local dispatch consoles. "Squelch defeat" Monitor.	OP15	N+N redundancy
OP2	Intermediate Freq. / Frequency Shift Repeater (IFR/FSR) modes. Off-air Repeater functionality without audio demodulation/ re-modulation, eliminates the interference in neighbor buildings' coverage overlap. Hybrid configurations are available having both Repeated Channels and Normal On-Frequency boosted Channels.	OP16	Modbus/Moscad NYCT MCAS interpreter
OP3	Added Marker Tone, without remodulating the off-air signal	OP17	Antenna Monitor accessory
OP4	Pilot Test carriers: CW or modulated with Marker Tone and Tx PL code Off-Air Break-In over the pilot carriers	OP18	MQTT
OP5	Tx Output CTCSS/DCS codes replacement	OP19	SNMP
OP6	Output Jamming monitoring, "denial of attack" prevention and reporting	OP20	I/O Extender
OP7	Equalizer eAGC modes	OP21	Cybersecurity
OP8	Trunking Signaling Block (TSBK) pass	STD	Feedback monitoring and Oscillation Prevention/ RF ISOLATION test
OP9	TDI optimization	STD	Emergency Remote RF Power OFF (Mute/Standby)
OP10	CTCSS or DCS squelch	STD	Configurable "building-blocks"
OP11	Built-in RF/Fiber	STD	Software-configurable
OP12	High Channels capacity	STD	External CAN bus
OP13	Preselector RF filters, Duplexers or Multiband combiners (multiplexers)	STD	Network Time Protocol (NTP)

[(1)] PLEASE CONSULT THE M4DBDA SERIES TECHNICAL BROCHURE FOR ADDITIONAL INFORMATION.

- **RF Specifications**

Parameter	Specification
Available Frequency bands (ranges) Contact Canam.	150-174, 380-430, 440-450, 450-470, 470-490, 490-512, 769-775, 799-805, 806-816, 851-861, 896-901, 935-940 MHz Custom passband windows can be accommodated within the uplink/downlink sub-bands.
Supported modulation formats	All analog and digital modulation formats, including time-multiplexed as FDMA, TDMA, P25-Ph1/Ph2, TETRA, NXDN, and Mototrbo DMR.
In-band and Out-of-band spurious & noise outputs are FULLY COMPLIANT with the new FCC §90.219(d) rules for Good Engineering Practices. See Figures 4 & 4A.	○ In-Band IMs: < -30 dBm over 10 kHz BW ○ In-Band Noise Floor: < -43 dBm over 10 kHz BW ○ Out-of-Band: < -70 dBm over 10 kHz BW
Minimum static Sensitivity (excluding external filtering)	-117 dBm input delivers >18 dB SINAD / £ 2 % BER
Input Dynamic Range and Rx IM Rejection 2-Tone 3rd order IM, per TIA standard	70 dB without descending the weak channel
Intermediate Frequency (IF) internal bandpass filters, to improve the rejection of undesired input signals and lower the out-of-band emissions.	Standard IF BWs: 3, 6 or 10 MHz Custom-build IF BWs: 1, 2.5, 20 MHz, among others, consult Canam.
Digital Filters Selectivity – Rejection mask aka Adjacent Channel Rejection (ACR)	20-80 dB, depending upon the digital filter mask (user selectable)
Example: “30Di” digital filter mask performance	BW= 50kHz @ 1 dB passband (typ.) Rejection= ≥ 65dBc @ +/- 45kHz (typ.) ≥ 75dBc @ +/- 90kHz (typ.) Group delay= 32 usec (typ.)
Channel Bandwidth and Spacing accommodations	6.25 kHz, 12.5 kHz, 25 kHz (0.1 kHz step)
RF frequency stability	On Frequency Mode: Tracks input signal exactly Repeat Mode < 1.5 ppm
Equalizer Automatic Gain Control -AGC range with constant output level (+/-2 dB typ.) regardless of input level variations (per filter window plus wideband front-end) **AGC MODES:** **Notes:** 1. Both the AGC per channel and the wideband iALC protections shall not produce spurs or interference even when operated well within their limiting range. 2. The user may select to have AGC enabled or disabled, per filter-window (channel) basis.	110 dB a) Standard: Desired output set-point level per filter window, based upon the whole filter-window average integrated power. b) Per Time-Slot: Desired output set-point level per filter window, based upon each time-slot integrated power. (OPTIONAL) c) Power sharing: composite desired output set-point level per path. The available power will be shared by the active signals at a given time, the composite effective output power will be automatically level controlled (OLC) to the user preset value. (OPTIONAL). d) None
Maximum input power (composite) for no-damage	-10 dBm (typ.), or custom factory-build option
Wideband input Automatic Level Control (iALC) range to prevent Rx/front-end undesired saturation.	0-40 dB, 2 dB digital step
Noise Figure (without external filtering or padding)	<9 dB (6 dB typ. at minimum sensitivity)
Overall output level adjustment range	1-30 dB typ., 1 dB digital step
System RF Input/Output Impedance	50 Ohm, 1.5:1 VSWR

Output Power Ratings UHF & 700/800 MHz bands	Superior Power	High Power	Low Power
Gain per filter window (all bands)	130 dB max.	130 dB max.	100 dB typ.
Multi-carrier Linearized Power Amplifier (MLPA) Output Power limit[(2)].	> 200W (53dBm)	> 50W (47dBm)	> 1mW (0dBm)
Output MLPA IMD having 10 channels transmitting simultaneously *(real application random channels spacing, 9 dB typ. Peak Average Power Ratio – PAR)*	≥ 60 dBc typ, 10CH @ +30dBm each (US)	≥ 60 dBc typ, 10CH @ +27dBm each (US) @ +25dBm each (EU)	≥ 60 dBc typ, 10CH @ -20 dBm each
VHF band			
Multi-carrier Power Amplifier (MCPA) Output Power limit[(2)].	n/a	> 20W (43dBm).	> 1mW (0dBm)
Output MCPA IMD having 10 channels transmitting simultaneously *(real application random channels spacing, 9 dB typ. Peak Average Power Ratio – PAR)*	n/a	≥ 60 dBc typ, 10CH @ +20 dBm each (US) @ +20 dBm each (EU)	≥ 60 dBc typ, 10CH @ -20 dBm each

[(2)] The deployed system output power level should be adjusted to comply with the market applicable limit for ERP, intermodal, and spurs. It depends on the number of carriers transmitting concurrently (at the same time) and the levels per carrier. Please ask CTI for scenarios.

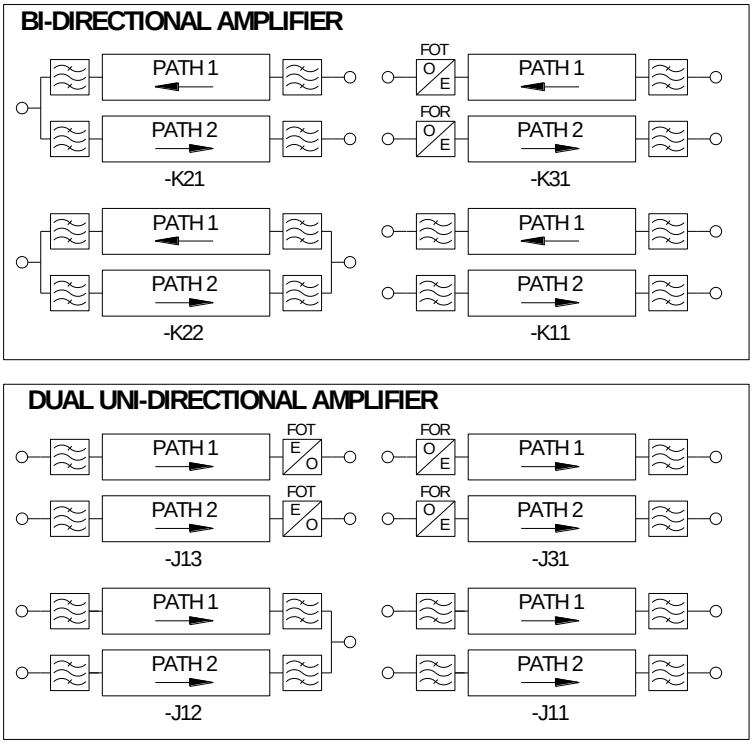
- **Mechanical, Electrical & Environmental Specifications**

Parameter	Specification
Enclosure Rating	Wall-mount: UL50/50E NEMA Type 4X (IP67) rated enclosure. EIA Rackmount: NEMA Type 1 (IP20) equipment shell.
Optional dual independent power sources	Per NFPA, the BDA shall be powered from at least two independent power sources (one primary and one secondary), with 12-hour minimum backup time at full load.
AC/DC or DC/DC power supply unit (PSU) is UL/C-UL Recognized to UL IEC/EN 60950-1	Wall mount: single PSU. Rackmount: OPTIONAL dual redundant PSUs in parallel.
Electrical Power requirements @ full load (actual power draw depends upon system configuration)	350 Watt, typ. Standard AC: 100 - 240 Vac 47/63 Hz OPTIONAL DC: 24Vdc (20-36) or 48Vdc (36-72)
Duty Cycle	100%
Outline dimensions	Wall-mount enclosure: 18.5in x 20.50in x 9.25in (LxWxD) 19in Rackmount unit: 4RU or 6RU high x 15in deep.
Weight	Wall mount: 95 lbs (45 kg) max. Rackmount: 75 lbs (30 kg) max.
RF connectors, including test ports.	Low-PIM N-Female. OPTIONAL: Low-PIM 4.3-10 DIN female for Main Ports.
MTBF at maximum output power, 100% duty cycle	RF –only: >50,000 hours. Fiber-fed: >40,000 hours
Operating ambient temperature range	-20 to +50° Celsius
Heat load	1200 BTU/hr, typ.
Cooling	Wall-mount: Passive Convection Cooling. OPTIONAL: External IP67 fans on a front cover to improve thermal performance. Rackmount: Forced Ventilation (dual front & rear fans).

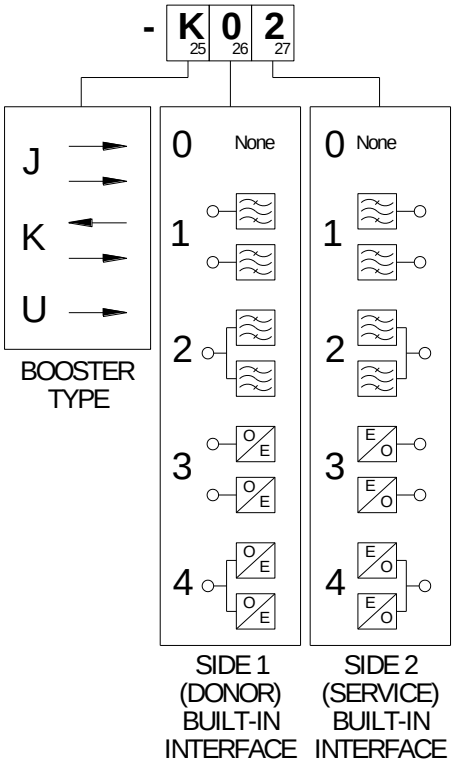
- **Interfaces, remote control, and monitoring**

Parameter	Specification
Controller	Embedded website for easy configuration. SNMPv2, v3 & Notification Traps for integration with Canam's Network Management System (NMS) or with third-party managers. OPTIONAL: ModBus/Moscad plus NYCT MCAS interpreter.
Network remote control	Ethernet 10/100 RJ-45 port. TCP/IP: web server, SNMPv2, v3 & Notification Traps
LOGs with date and time stamp	Built-in real-time clock with battery backup to keep the date and time. It also allows date and time synchronization with servers using the Network Time Protocol (NTP). The Events and Alarms Logs can be retrieved from the network interface.
Self-Oscillation prevention RF Isolation Test feature	**These units do not self-oscillate.** In addition, they have an embedded measurement function that aids the user in preventing feedback distortion during start-up optimization and normal operation.
Non-intrusive RF test ports	OPTIONAL: Available upon request. SMA or Type-N (female), 50 Ohm.
HMI alphanumeric display	Rackmount: LCD on the front panel Wall-mount OPTIONAL: external IP65-rated HMI, on the optional external fan cover.
Power ON & Summary Alarms visual indicators	Rackmount: LEDs on front & rear panels (blinking to indicate the controller is running) Wall-mount: one LED on the bottom panel, multicolor and blinking.
Factory Programmable-function Discrete Digital I/Os, fully compliant with NYC ARCS ordinance, NFPA72/1221/1225 codes, and/or UL2524 monitoring requirements.	The output dry contacts shall facilitate the field installation of end-of-line sensors that will be monitored by the supervisory circuits. Two separate sets of dry contacts can be provided on different connectors, one to interface to the FACP/SCADA, and the other one to drive an optional discrete Annunciator. a) Four (4) DPDT relay outputs, dual form-C dry contacts (voltage-free). • Donor antenna disconnection (by Antenna Monitor) • Active RF emitting device ("BDA") malfunction • Active system components malfunction, other than passive components. • Donor antenna malfunction (by Antenna Monitor) b) Four (4) Supervised Inputs (optional Class-A or Class-B), with an ACK output each. • FDNY HT11 ch RPT enable/disable (Tx mute), or general purpose • FDNY HT12 ch RPT enable/disable (Tx mute), or general purpose • EMS off-air BDA channels enable/disable (Tx mute), or general purpose • Local Console Monitor, or general-purpose • Two (2) opto-isolated general-purpose inputs, perhaps for door tampering & others.
Health monitoring: several internal meters and sensors do monitor the status and trigger alarm conditions by user-defined thresholds.	Additional status conditions and all meters are shown in the embedded web pages and SNMP data, in addition to the alphanumeric human-machine-interface (HMI) display. Typical meters: Per Modules' Temperature, DC Current, DC Voltage, Input RF composite power, Output RF composite power, Receive Signal Strength Indicator level – RSSI per filter window, among others. Additional alarm conditions: Low Forward transmit power, High Reflected Power or VSWR, Over-temperature, AC Power Loss, fan failure, and other general-purpose inputs or custom conditions.
Standard cybersecurity	Role-based access control and privilege management. Critical data and system configuration backup and recovery function for rapid restoration. Tampering alarm: built-in for wall mount, optional cabinet supervision for rackmount.

TYPICAL SETUP EXAMPLES



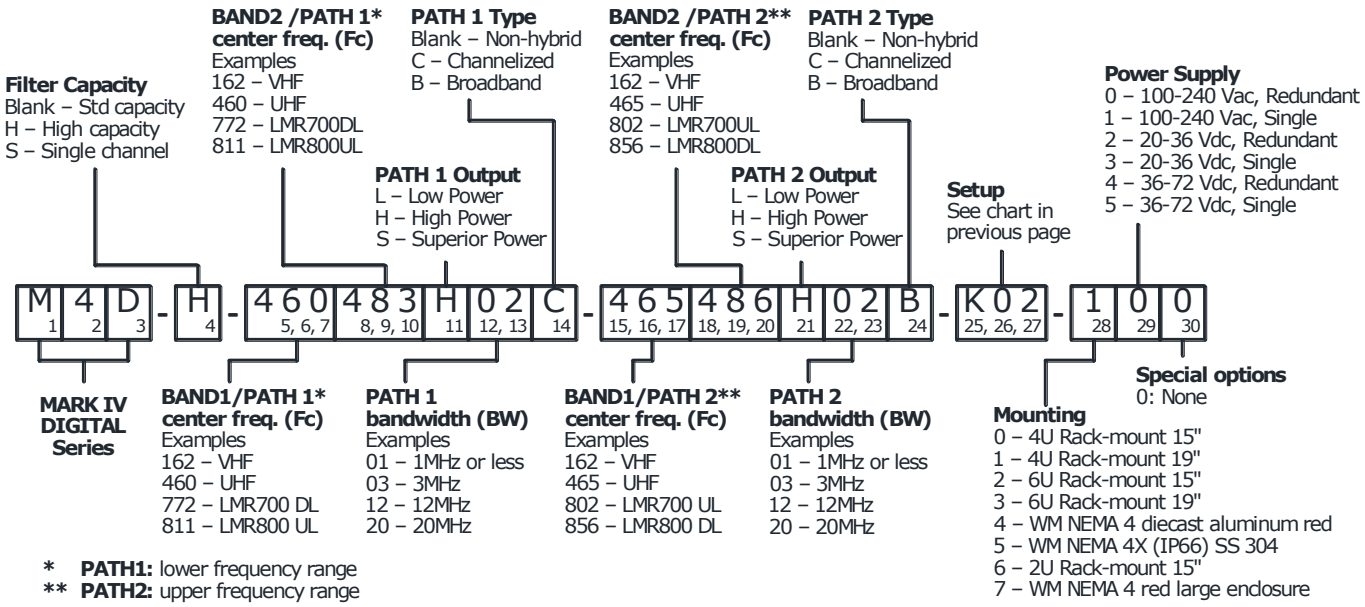
SETUP CHART



NOTES:

1. Basic configurations –J00, –K00, -U00 could be omitted (leave blank). There are no built-in filters or fibers.
2. For **unidirectional amplifier (UDA)** configurations use -U[0,1,3][0,1,3], for example: -U31, -U01, or –U00 for a 2RU chassis with no built-in filters no fibers, which could be omitted (path 2 also omitted).
3. Fiber transmitters (FOT) or receivers (FOR) are provided according to the signal path flow.
4. Pre-selector RF Band-pass filters could be built in depending on the selected enclosure size, the RF band, and the selectivity requirements. Please consult Canam.

- **Configuration numbering (3)**



Notes:

1. Field 4 could be S for a "single channel OCR" unidirectional setup with a single path in a 2RU chassis or leave it blank or H for multiple channels.
2. Fields 8 ~ 10 and 18 ~ 20 are omitted (leave blank) for single band units.
3. Fields 14 and 24 are omitted (leave blank) for standard channelized in both paths.
4. Fields 15 ~ 24 are omitted (leave blank) if only one path (unidirectional) is required.
5. Fields 25 ~ 27 could be omitted (leave blank) if default configurations –K00, -J00, -U00 are chosen.
6. Fields 28 ~ 30 are omitted (leave blank) if default configuration -000 is chosen.
7. Field 30 - Special options, contact Canam or consult the technical brochure. This field could be omitted if the value is 0 (zero)

(*) Compliant with NFPA72 (2019), NFPA1221 (2019), NFPA1225 (2022), NFPA5000 (2018) and IFC (2018) editions. Meets UL2524 (2nd edition), pending certification.

FCC Part 90 Signal Boosters THIS IS A 90.219 CLASS A DEVICE

TCJ-M4DBDAV, TCJ-M4DBDAU, TCJ-M4DBDA7, TCJ-M4DBDA8

WARNING. This is NOT a CONSUMER device. It is designed for installation by FCC LICENSEES and QUALIFIED INSTALLERS. You MUST have an FCC LICENSE or express consent of an FCC License to operate this device. You MUST register Class B signal boosters (as defined in 47 CFR 90.219) online at *www.fcc.gov/signal-boosters/registration*. Unauthorized use may result in significant forfeiture penalties, including penalties in excess of $100,000 for each continuing violation."

(3) PLEASE CONTACT CANAM WITH YOUR CUSTOM REQUIREMENTS.