MODEL: M3D-options

SUMMARY: The MARK-III Digital is the AM & FM Digital Channelized Rebroadcast & Break-In System, core component of CANAM Technology, Inc.'s Rebroadcast Solutions.

It is a multi-channel AM & FM Signal Conditioner with multi-zone (tube) capability and independent break-in generators per tunnel zone output.

Software-Configurable number of channels:

- FM: 32 channels maximum
- AM: 32 channels maximum

The Mark-IIID delivers the same outstanding performance of its analog predecessor the Mark-IIIA, with significant advantages on size, power consumption, upgradeability, maintenance costs, support for current and future digital modulation formats, and much more.

The Mark-III Digital employs state-of-the-art programmable Digital Signal Processing (DSP) hardware plus high-linearity RF amplifiers and devices.

The channel parameters (frequency, receive threshold, power level, alarm thresholds and/or status.) are software programmable by means of a web-server interface.

The MARK-IIID is fully integrated with the VAR3 Controller software for Break-in operations and system-wide remote-control functionality. Full local and/or remote control over TCP/IP using the VAR3 Graphical User Interface.

The digital Break-in generator engines can override the off-air signal with a local alert message provided by the VAR3 or third-party PA manager (switching function).

OPTIONS SUMMARY:
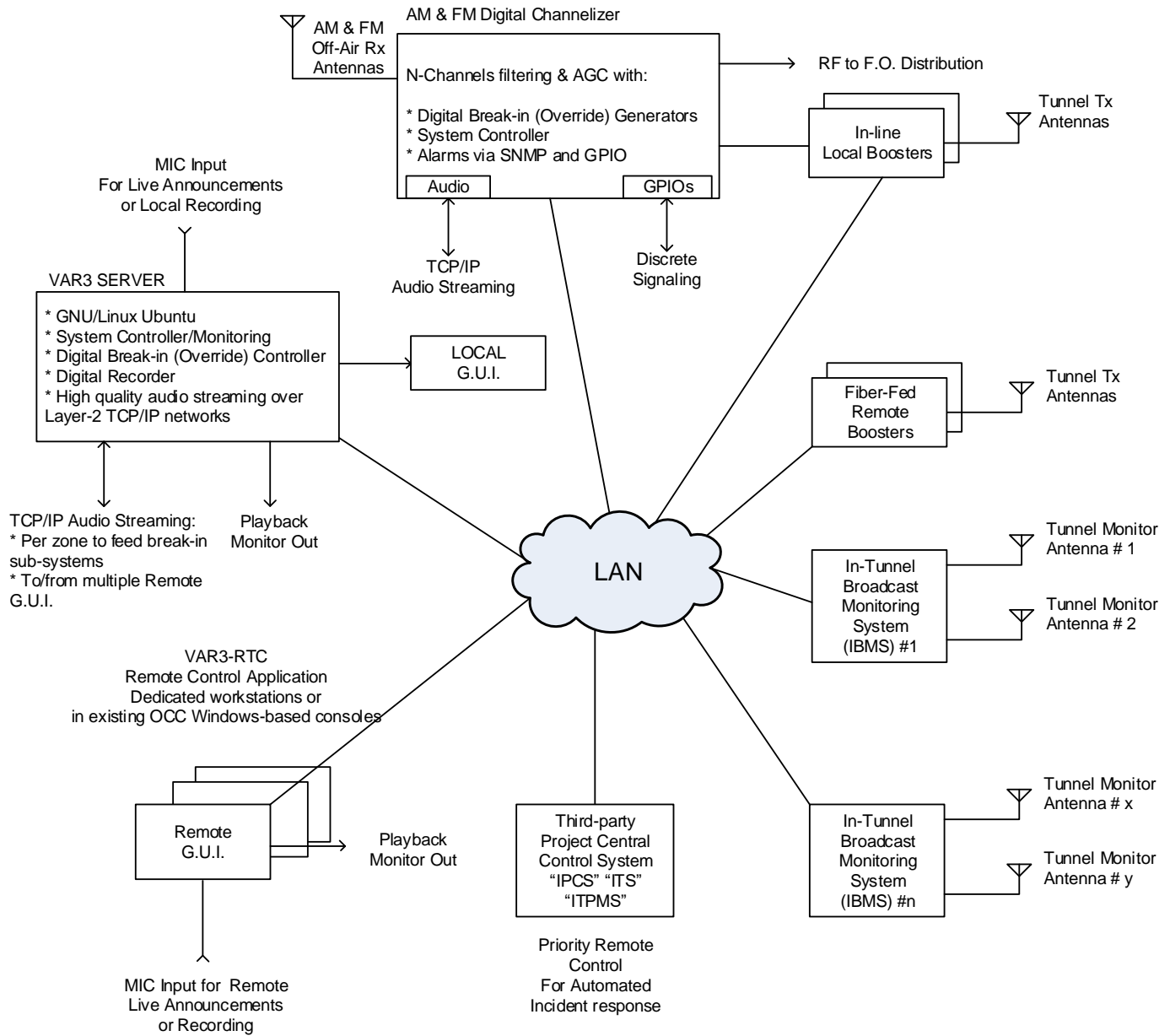
Model number: M3D-XX#C-nB

Option	Description
XX	AM or FM
#C	Number of channels per band
n	Number of outputs (bores)

Features:

- State-of-the-art Multi-channel digital processing system which allows flexibility, small footprint and low power consumption.

- Air-Interface multi-channel rebroadcast system with dual output with independent break-in (switching) capability for dual bore applications.

- Digital filter implementations to support analog and digital broadcasting, AM, FM, HD, etc.

- High-linearity RF/analog processing blocks for multi-carrier performance.

- Built-in broadcast switch: normal off-air or advisory break-in (override) per tunnel zone (tube or same traffic direction). Digital break-in generators (AM/FM modulators).

- Per channel Digital Automatic Gain Control (AGC) delivers constant output power level per channel regardless of their input level variations and ensures effective recovery of weak signals from far-end or worst-case situations users, despite other strong simultaneous signals on-scene.

- Individual Rx. Threshold level (Squelch) per window ensures clean output spectrum with no amplified noise if un-active.

- Multi-zone override (break-in) capable of delivering independent break-in content per zone or concurrent multi-zone operations.

- Allows substitution of the normal station signal with locally generated messages to handle emergency situations and traffic advisories.

- Multi-language allows to configure individual channel to rebroadcast break-in message in a specific language.

- Fully integrated with the VAR3 Digital Recorder and Override Controller Software Application (VAR3) with Graphical User Interface and remote clients (VAR3-RTC).

- Embedded Web-server allows easy configuration from any networked workstation with a web browser.

- Break-in (Override) or HAR audio received via TCP/IP over layer 2 network links.
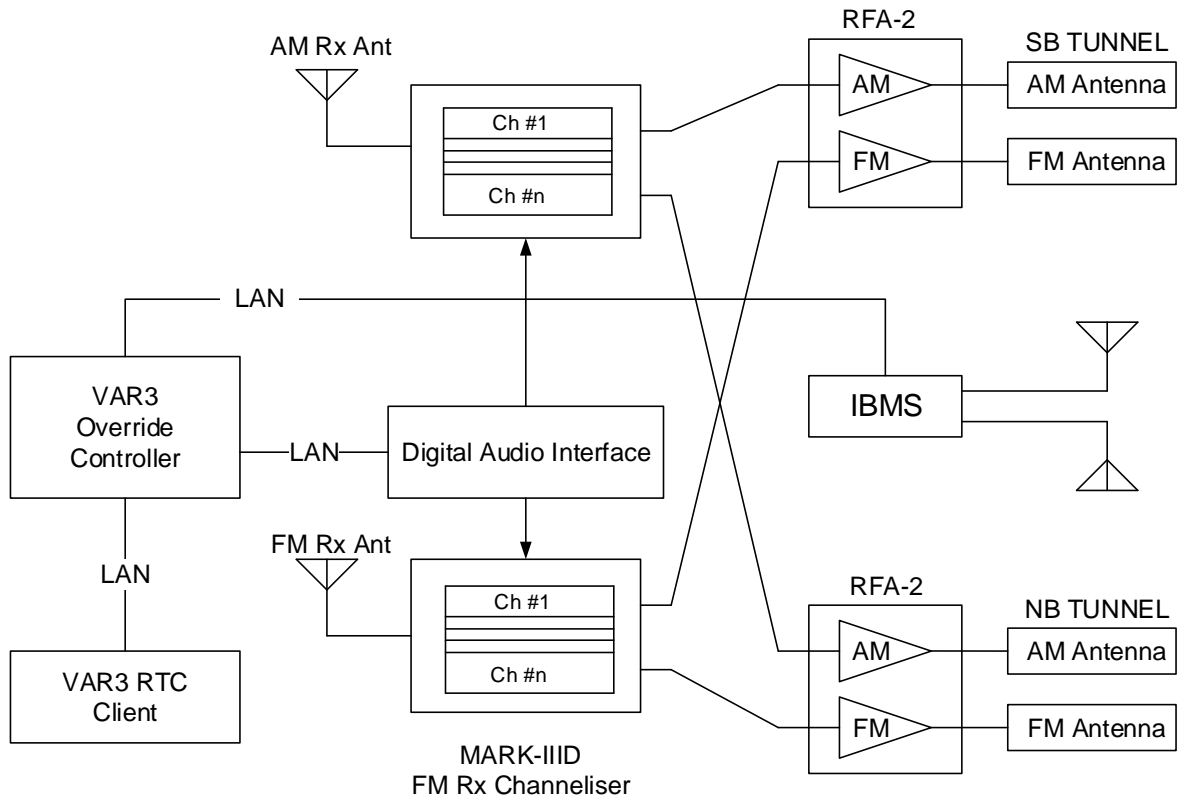
- **Generic System-wide architecture**

AM & FM Off-Air Rx Antennas

AM & FM Digital Channelizer

N-Channels filtering & AGC with:

* Digital Break-in (Override) Generators
* System Controller
* Alarms via SNMP and GPIO

Audio

GPIOs

RF to F.O. Distribution

In-line Local Boosters

Tunnel Tx Antennas

MIC Input For Live Announcements or Local Recording

TCP/IP Audio Streaming

Discrete Signaling

VAR3 SERVER

* GNU/Linux Ubuntu
* System Controller/Monitoring
* Digital Break-in (Override) Controller
* Digital Recorder
* High quality audio streaming over Layer-2 TCP/IP networks

LOCAL G.U.I.

Fiber-Fed Remote Boosters

Tunnel Tx Antennas

TCP/IP Audio Streaming:
* Per zone to feed break-in sub-systems
* To/from multiple Remote G.U.I.

Playback Monitor Out

LAN

In-Tunnel Broadcast Monitoring System (IBMS) #1

Tunnel Monitor Antenna # 1

Tunnel Monitor Antenna # 2

VAR3-RTC
Remote Control Application
Dedicated workstations or
in existing OCC Windows-based consoles

Remote G.U.I.

Playback Monitor Out

Third-party Project Central Control System "IPCS" "ITS" "ITPMS"

In-Tunnel Broadcast Monitoring System (IBMS) #n

Tunnel Monitor Antenna # x

Tunnel Monitor Antenna # y

MIC Input for Remote Live Announcements or Recording

Priority Remote Control For Automated Incident response

- **Typical 2-zone system-wide layout**

- **RF Specifications**

Parameter	FM band	AM band
Frequency range	87.5 to 108 MHz	0.53 to 1.7 MHz
Number of channels	32 max.	32 max.
Channel frequency programming steps (Digital synthesized)	100 kHz	9 or 10 kHz
Typical Channel bandwidth (modulation response +/- 3 dB) (other configurations are possible)	± 200 kHz	15 kHz
Adjacent Channel Rejection	50 dBc typ. @ 400 kHz	50 dBc typ. @ 30 kHz
Sensitivity (Minimum input level) (Other settings are possible)	<-95 dBm	<- 80 dBm
Maximum input power level (composite) at antenna input, for no-damage	-30 dBm	-30 dBm
Automatic Gain Control (AGC)	60 dB	60 dB
Frequency stability and distortion: The system does not demodulate the input signals.	Tracks input signal frequency and modulation exactly	
Receive Inter-modulation (IM) Rejection (per TIA/EIA definition)	60 dB	60 dB
Number or RF outputs per system	2-zone standard (other configurations Available)	
Maximum output power per channel (typical)	-10 dBm	-10 dBm
Output level adjustment range	>25 dB	>25 dB
Maximum output level variation with input level variations within range	+/- 3 dB	+/- 3 dB
Spurious & harmonics outputs	> 50 dBc	> 50 dBc
Input & Outputs impedance (typical)	50 ohms	50 ohms

- **Mechanical, Electrical & Environmental Specifications**

Parameter	Specification
Enclosure Rating	EIA Rack-mount: NEMA Type 1 (IP20) equipment shell.
Outline dimensions The MARK-IIID Digital Channelizer includes: − One AM and/or FM Channelizer sub-rack. − Digital Audio Interface sub-rack.	19in Rack-mount units: − AM/FM sub-rack: 4RU high x 15in deep. − Digital Audio Interface: 1RU high x 10.35 in deep.
Weight	AM/FM sub-rack: 44 lbs. (20 Kg). Digital Audio Interface: 5 lbs. (2 Kg).
RF Connectors Input/Output	N-Female
Electrical Power requirements @ full load (actual power draw depends upon system configuration)	100-240 Vac 50/60Hz 300 Watt maximum including AM sub-rack, FM sub-rack and Digital Audio Interface
Duty cycle	100%
MTBF at maximum output power, 100% duty cycle	> 60,000 hours
Operating ambient temperature range	-30 to +60° Celsius
Heat load	AM/FM sub-rack: 440 BTU. Digital Audio Interface: 100 BTU.
Cooling	Forced ventilation

- **Interfaces, remote control and monitoring**

Parameter	Specification
Controller	Embedded website. SNMPv2 Notification Traps for integration with Canam's Network Management System (NMS) or with third-party managers.
Network remote control	Ethernet 10/100 RJ-45 port. TCP/IP: web server, SNMPv2 & Notification Traps VAR3 Controller software and remote clients
Non-intrusive RF coaxial test ports (using directional couplers on Rx paths).	Type-N (female), 50 Ohm.
HMI alphanumeric display	Rack-mount: LCD on front panel
Power ON/Summary Alarm(s) visual indicators	LEDs blinking to indicate controller is running.
Factory-Programmable-function Discrete Digital I/Os	a) Four (4) DPDT relay outputs, dual form-C dry contacts (voltage-free). b) 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 webpages 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: Over temperature, Tampering/Door open indicator, AC Power Loss, Fans failure, and other general purpose inputs or custom conditions.

Major Software Defined Field-Programmable settings and readings
Input (Rx) Threshold level, per individual narrowband window/filter ("CAS squelch")
Output Power level, fine tune per filter or overall
Receive Signal Strength Indicator level – RSSI, per filter window
Several alarm thresholds and calibration settings
Save & Load system settings, personality

- **Rack-mount mechanical layout**