Digital Recorder and Override Controller

The VAR3 is a computer-based multi-channel digital playback and controller system used to control several of the CANAM's AM/FM Radio Rebroadcast Systems and playback the public safety & service messages that could override ("break-in") the normal off-air radio stations being rebroadcast in highway and mass transit tunnels.

The VAR3 is also suitable for Public Announcement Systems (PA), Highway Advisory Radio (HAR), Radio Station Automation, and other applications where multiple flexible and programmable audio sources are required.

The VAR3 Server allows the same override advisory message to be broadcast on all configured AM and FM radio channels in MARK-IIID AM/FM Digital Channelizer at the same time within the same tunnel zone. The system could use the same or different simultaneous advisory messages to be broadcast simultaneously on all tunnel zones

Using the server selection user interface can access to several servers in different locations.

Figure 1- AM/FM Radio Rebroadcast User Interface

OPTIONAL Custom Configurations allows Concurrent multi-language break-in for each break-in zone. Each radio station can break-in its own assigned language group

Features:

- Independent or simultaneous playbacks of the same audio file.
- Audio quality: FM broadcast hi-fidelity (20 to 15.000 Hz typical).
- Audio streaming via TCP/IP allows audio distribution to multiple remote and/or local tunnel sites over layer 2 network links.
- Support up to 128 audio outputs (monaural) via network adapters.
- Microphone feed-through and "line-level" inputs from multiple remote sites for live broadcast capability.
- Local and remote speaker monitor capabilities.
- Locally and/or Remote Controlled using standard networking Internet Protocol TCP/IP. Can accept multiple client connections.
- Scheduling Agent to setup & edit play lists for pre-programmed automatic voice break-in. Ideal for regular public service & safety messages to be broadcasted.
- Supports Microphone recording and text-to-speech (TTS) message creation.
- Fully graphic and intuitive screen interfaces, language configurable.
- Hardware Management System monitor the status of radio equipment elements
- Activity log and Report generation
- Control for optional In-Tunnel Broadcast Monitoring System (IBMS)
- Discrete-Logic interfaces via Network Input/Output (NIO) adapters

GENERIC AM/FM RADIO SYSTEM BLOCK DIAGRAM

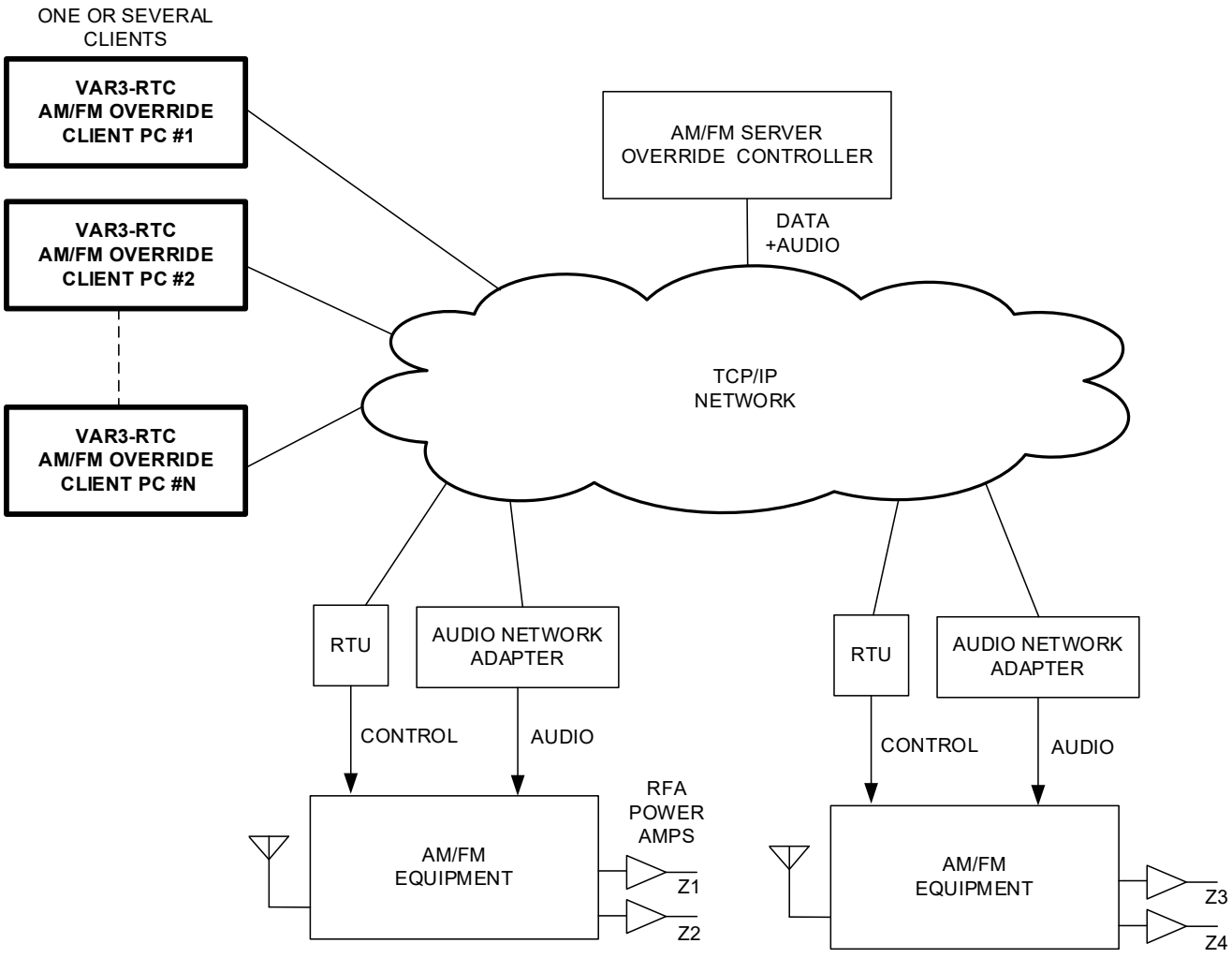


Figure 2- Generic AM/FM Radio System Block Diagram

VAR3 REMOTE TERMINAL CONTROLLER CLIENT GRAPHICAL USER INTERFACE

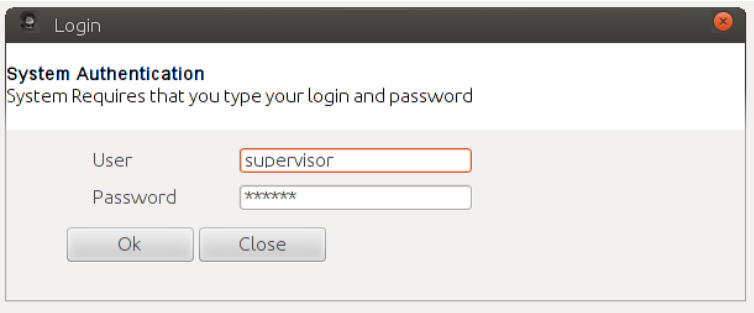


Figure 3- Login

User level controlled access

Different User Security Levels to allow a controlled access to the system.

VAR3 SINGLE-ZONE BREAK-IN LAYOUT

- A single screen user interface can monitor all zones.
- Each zone has a separated indicator for Playback, Override, Break-In

Figure 4- User Interface with the Playback, Override, Break-In

VAR3 VOICE BREAK-IN PLAYER INTERFACE

- Pre-recorded messages as well as live audio can be broadcast inside the tunnel.
- Each Zone can playback messages independently from the other zones.
- Playlist
- The IBMS can be monitored using the VAR3 Graphical User Interface.

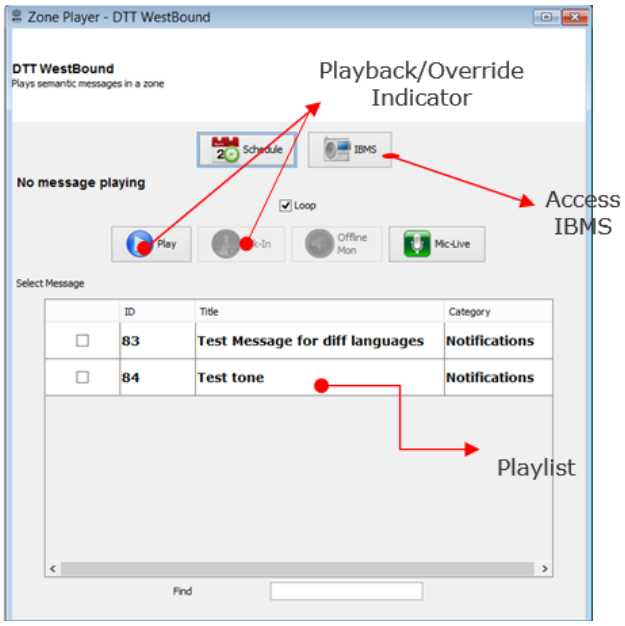
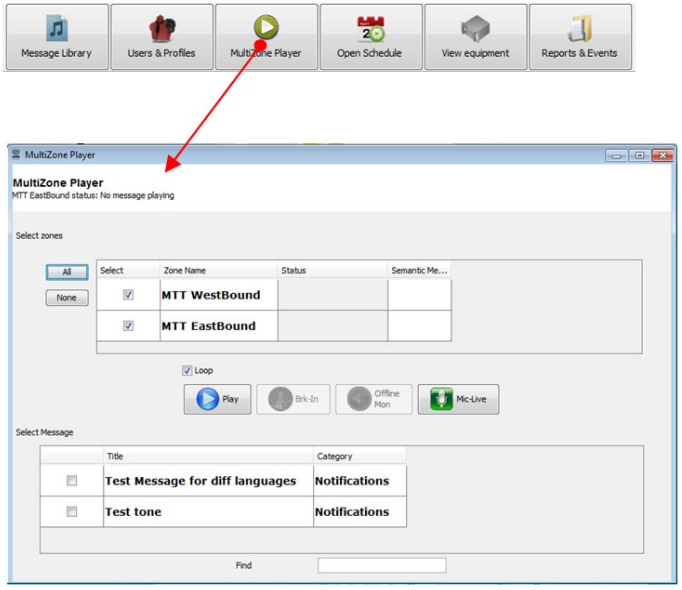


Figure 5- Zone Player

VAR3 MULTI-ZONE PLAYER

- The Multi-zone window allows simultaneous playback functions (using the same message or audio file)



IBMS MONITOR SYSTEM PLUG-IN

The IBMS is an optional monitoring component of the tunnel AM/FM Radio Rebroadcast system. The IBMS is an AM/FM tuner based system plus external RF switches and other control elements.

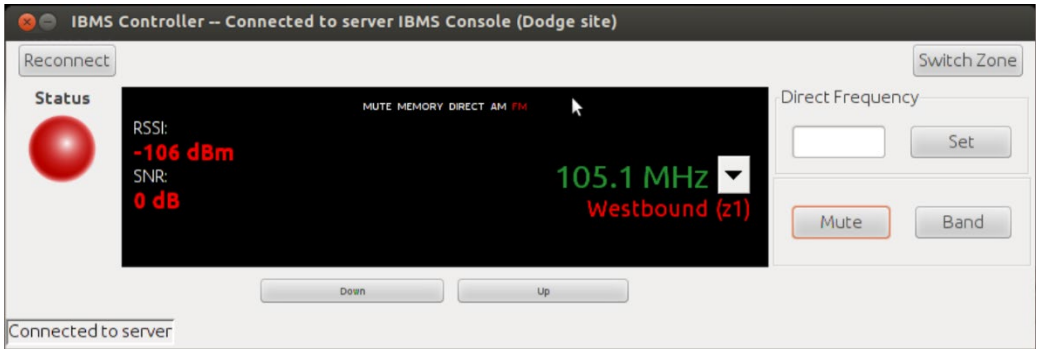
It allows monitoring of multi-zone systems (1, 2 or more tunnel bores or tubes, depending on configuration). The IBMS offers a practical option for hearing what is actually being rebroadcast in the tunnel. This allows tunnel personnel and operators to assess that the emergency messages are being heard by the commuters inside the tunnel.

The IBMS is composed of three main components:

- ☑ Capture Antenna (s)
- ☑ Tuner / Receiver with PC remote control option
- ☑ Control software installed in VAR3-nC / VAR3-RTC computers.

KEY FEATURES:

- AM, FM Band Selection
- Channel (frequency) selection
- Preset memories
- Auto-scan function
- Digital Display with Frequency, Band, Stereo, RDS and other indicators
- RDS reception in FM broadcasts (Europe RDS, US RBDS)
- Receiver's Local Button front panel
- Audio Output
- Integrated G.U.I. Control Panel in VAR3 software suite



VAR3 SCHEDULER GUI

- The schedule is a calendar GUI that- allows the operator to plan a head the playback of a message; the operator can select the date and time and will be able to create the event.
- Can select the message and break-in (tunnel)

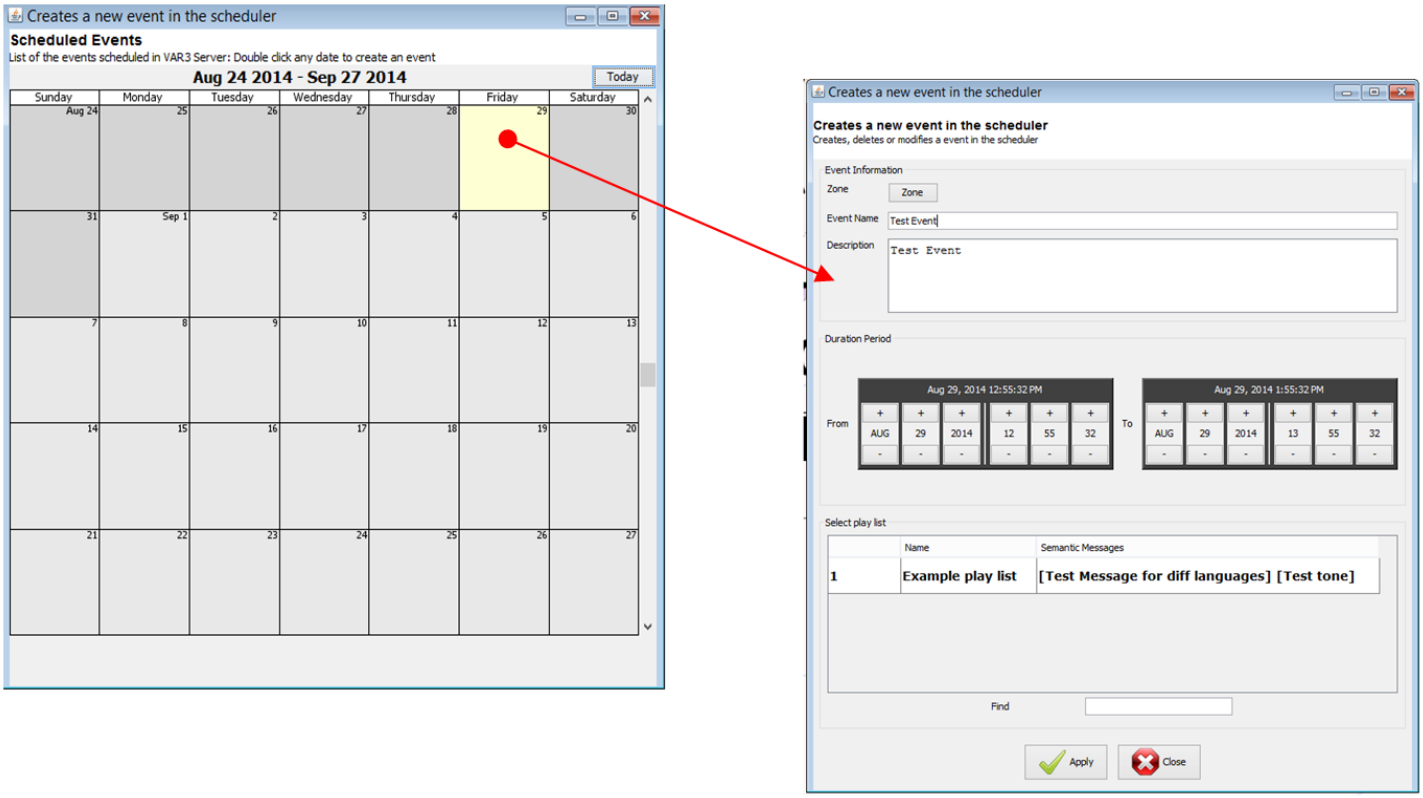


Figure 6 - Scheduler

MICROPHONE RECORDING

- The Recording allows the operator to record an audio file to be saved in the VAR3 Controller as a pre-recorded message and also this message can be broadcast inside the tunnel.

  Notes:

  1. Record Messages will be available only to the user that has access permissions.
  2. Uses local microphone and speaker.

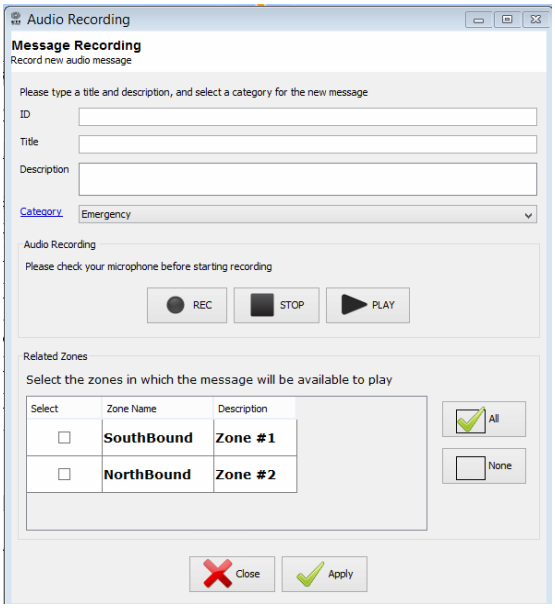


Figure 7- Audio Recording Window

TEXT TO SPEECH (TTS)

- The Text to Speech allows the operator to create an audio file using a text input. Requires a local speaker to verify the TTS audio output.

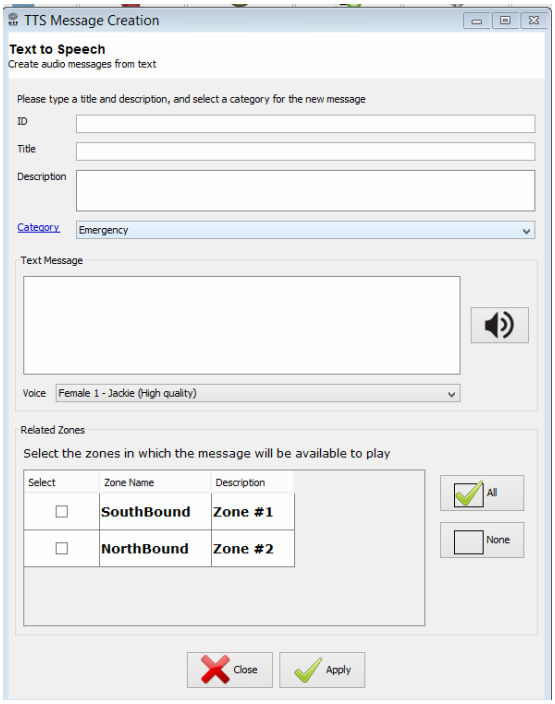


Figure 8- Text to Speech Window

AUDIO FILE UPLOAD

- Allows the operator upload audio files with format WAV created with external resources (recording studio or third party audio software tools).

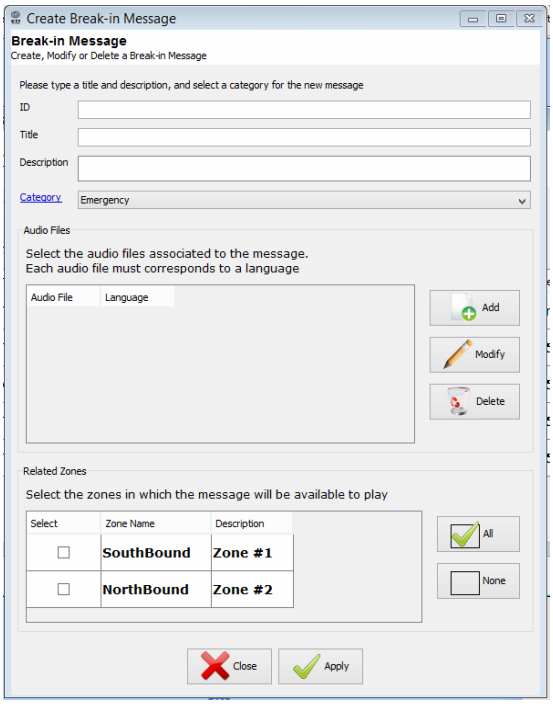


Figure 9-Create Semantic Message Window

VAR3 REPORTS

- The part of reports allow to the operator generate the report, to generate it shall select the Report on the toolbar and then will be displayed the reports available to be generated.

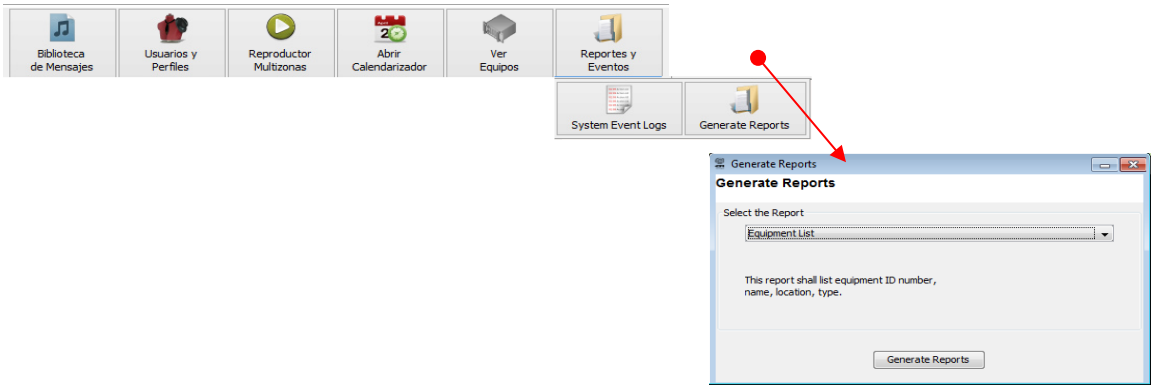
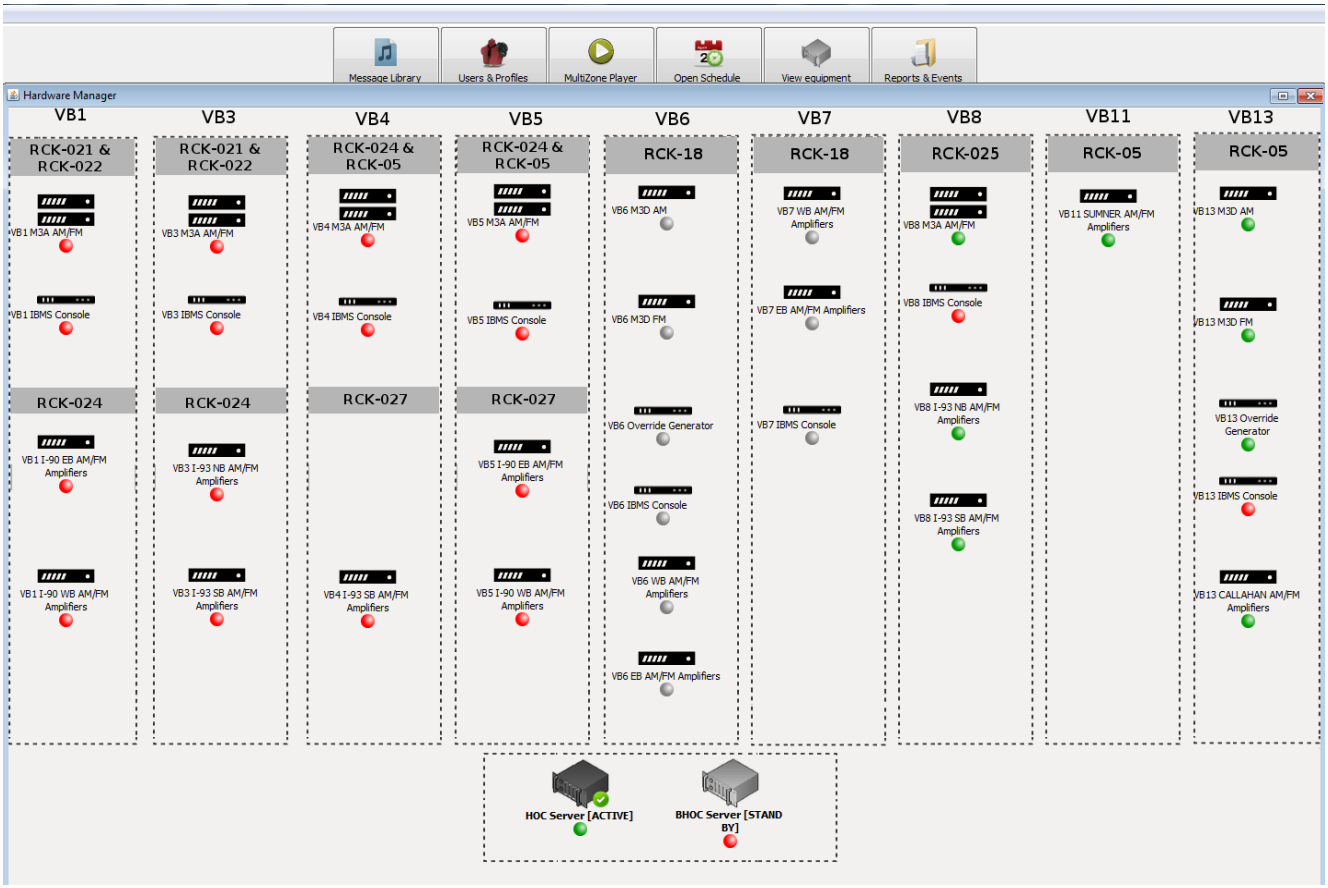


Figure 10- Generate Reports Window

Digital Recorder and Override Controller

The VAR3 AM/FM Override Controller includes Alarm Panel that allows operators be aware of alarm status for all devices in OVERRIDE SYSTEM



INDUSTRIAL DEVICES INTEGRATION

The VAR3 AM/FM OVERRIDE CONTROLLER is completely configurable and allows you to monitor a great variety of equipment via standard TCP/IP network protocols and/or via physical contacts. Using the industrial protocols SNMP and MODBUS TCP/IP devices like Cisco routers or Moxa data acquisition modules among others could be controlled and monitored.

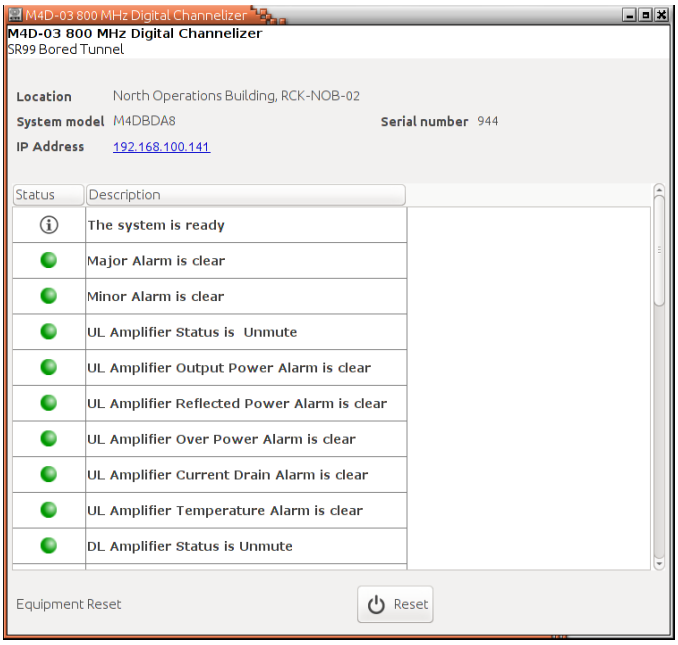
SNMP
MODBUS
TCP/IP

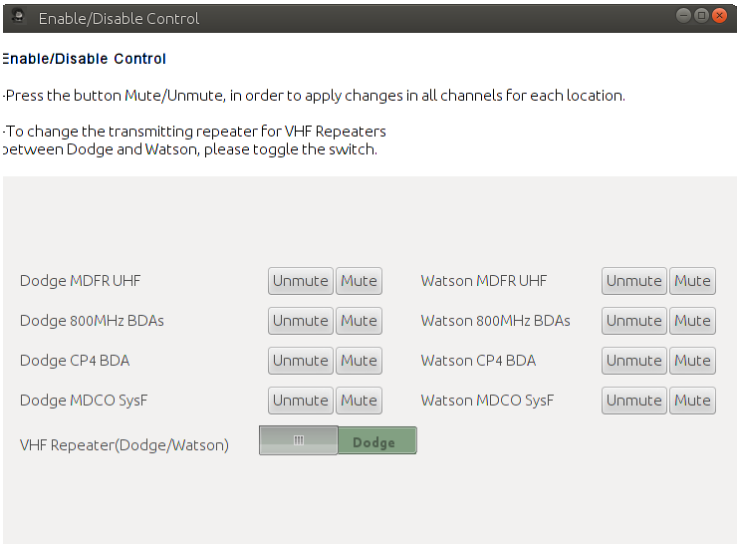
Digital Recorder and Override Controller

DETAILED INFORMATION

The VAR3 AM/FM Override Controller enables you to access detailed information of each piece of equipment, such as: equipment description, equipment location, model, serial number.

The Equipment Detail Info window also gives you detailed information of the status of a specific piece of equipment and have control over main functioning commands.





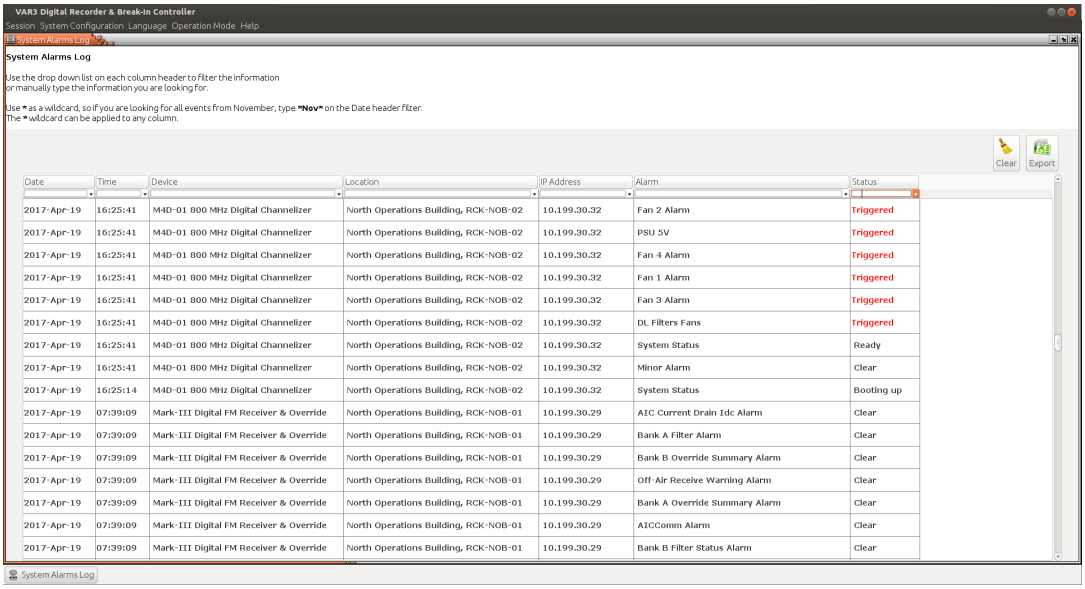
GENERAL SYSTEM CONTROL

VAR3 AM/FM Override Controller Control switches allow you to control the transmitting status between redundant sites and/or equipment, and at the same time know the current status of the system.

EVENTS AND ALARMS INFORMATION

The VAR3 AM/FM OVERRIDE CONTROLLER keep track of Radio system events and alarms, log information support filtering options by date, time, device, location, IP address, alarm and status to display only relevant data.

Log information could be exported to an spreadsheet file.



RADIO EQUIPMENT WEB BROWSER INTERFACE

The VAR3 AM/FM OVERRIDE CONTROLLER will have a hyperlink to each RF device in order to access the web interface for controlling, configuring, and monitoring the operational parameters. Typical operational parameters are frequency configuration, gain, amplifiers control, alarm thresholds, settings files, log files, and general and RF meters.

User-level controlled access is also implemented on each Radio device for guest, operator, technician, and administrator levels.

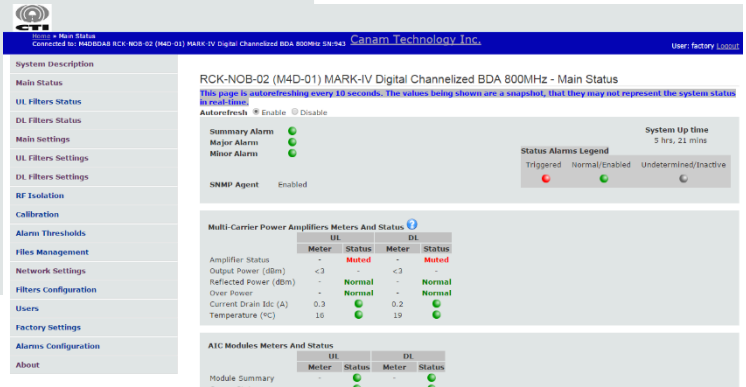
Digital Recorder and Override Controller

MARK-IV Digital Channelized BDA 800MHz (M4D-01) - DL Filters Status

Autorefresh Enable Disable

This page is autorefreshing every 10 seconds. The values being shown are a snapshot. It may not represent the system status in real-time.

DL Channels				
Filter Number	Center Frequency (MHz)	Rx Level (dBm)	Tx	Rx
1	851.0625	< -120		
2	851.0875	< -120		
3	851.1625	< -120		
4	851.3625	< -120		
5	851.5375	< -120		
6	851.6375	< -120		
7	851.8125	< -120		
8	852.9625	< -120		
9	852.1625	< -120		
10	852.2125	< -120		
11	852.2875	< -120		
12	852.4125	< -120		
13	852.8375	< -120		
14	852.8625	< -120		
15	853.4250	< -120		
16	853.4500	< -120		
17	854.0875	< -120		



RCK-NOB-02 (M4D-01) MARK-IV Digital Channelized BDA 800MHz - Main Settings

System Desired Output

The "Maximum Desired Output Level" can be automatically reduced upon Rx Threshold changes in order to guarantee the 120 dB for UL, 120 dB for DL, maximum gain per filter window.See this page for information about this setting.

Maximum Desired Output Level	UL	DL
Maximum Desired Output Level per filter (dBm)	24	24

Input Attenuation

Autoset Input Attenuator Response		Fixed Input Attenuation	
UL	DL	UL	DL
OFF	OFF	5	5

Multi-Carrier Power Amplifiers Control

The following functions can be controlled either by hardware (external input) or by software, depending upon the following setting:

Control by: Hardware / Software

	UL	DL
Output MCPA Mute	✓	✓
Reset reflected power alarm	Reset	Reset

Enable Automatic Mute upon Reflected Power Alarm

Enable Reflected Power Alarm Status Latch

Apply Undo typing

Contact Canam Technology Inc.

Contact Canam Technology Inc.

Filter Number	Filter Bandwidth (kHz)	Center Frequency (MHz)	Rx Threshold (dBm)	Hysteresis (dB)	Fine Tune Output Level(dBc)	Tx Enable	AGC Enable	Pilot Test Carrier	Filter Type
UL Channels									
1	28	806.0625	-70	3	0	✓	✓		40Di
2	28	806.0875	-70	3	0	✓	✓		40Di
3	28	806.1625	-70	3	0	✓	✓		40Di
4	50	806.3625	-70	3	0	✓	✓		30Di
5	28	806.5375	-70	3	0	✓	✓		40Di
6	28	806.6375	-70	3	0	✓	✓		40Di
7	50	806.8125	-70	3	0	✓	✓		30Di
8	24	806.9625	-70	3	0	✓	✓		80Di
9	28	811.0000	-70	3	0	✓	✓		40Di
10	50	807.2125	-70	3	0	✓	✓		30Di
11	50	807.2875	-70	3	0	✓	✓		30Di
12	28	807.4125	-70	3	0	✓	✓		40Di

CONFIGURABLE AND PLATFORM INDEPENDENT CLIENT

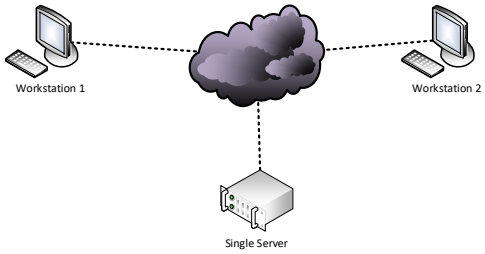
The VAR3-RTC client-PC application is a remote terminal controller for the VAR3 multi-channel digital recorder/playback and override controller system. The VAR3-RTC runs on standard Personal Computer (PC) hardware, used to control several of the AM/FM Rebroadcast Systems and playback the public safety & service messages that could override (“break-in”) the normal radio stations being rebroadcast in highway and mass transit tunnels.

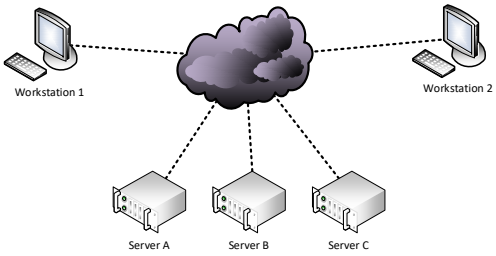
Multi-clients are platform independent, running on Microsoft Windows based systems (Windows 7, Windows 8 or 8.1, Windows 10), and GNU/Linux based systems (Ubuntu 16.04 LTS).

VAR3 AM/FM OVERRIDE CONTROLLER SERVERS ARCHITECTURE

The VAR3 AM/FM OVERRIDE CONTROLLER can be deployed in two different modes

Single Server: only one physical computer (server). This individual computer will run the server applications and in case of any failure the system will be unavailable until the computer is repaired or replaced.





High Availability Cluster: Two or more physical computers (servers) which support the server applications. These are deployed in an active/standby architecture which provides continued service when failure occurs. In this configuration one computer is normally active while the other(s) are in standby mode and, in case of a crash, the system will failover to one of the backup computers and continue to provide the service.

VAR3 AM/FM OVERRIDE CONTROLLER SERVER EQUIPMENT

The VAR3 AM/FM OVERRIDE CONTROLLER servers cluster is integrated by physical servers, PDUs (Power Distribution Units), Ethernet switch and LCD KVM switch.

LCD KVM switch is an integrated LCD console and keyboard, video, and mouse (KVM) switch that offers access to VAR3 AM/FM OVERRIDE CONTROLLER servers and mounted in only 1U of rack space. It features an independently retractable LED-backlit LCD monitor and keyboard with built-in touchpad and KVM switch. For added convenience it also supports an external USB mouse

One or More physical servers which support the VAR3 AM/FM OVERRIDE CONTROLLER application should be installed. When redundancy is needed, these servers are deployed in an active/standby architecture. Servers are also built in redundant power supply.

SPECIFICATIONS

Parameter	Specification
• **Computer platform**	
Minimum base-computer components	Intel 64-bit Dual Core, 1 GHz, 8 GB RAM Integrated Video/Graphics controller (VGA type) Dual 250 GB SSD, RAID-1 configuration USB ports (minimum): 2 rear, 1 front. Dual Gigabit Ethernet (regular LAN traffic)
Rack-mount Chassis	Computer 4U Rack-mount chassis 10.4”x19”x20” (WxHxD).
Server digital audio network PCIe adapter maximum audio capacity	• Dual Gigabit Ethernet • Up to 128 audio channels
Power supply	Dual Redundant Power Supplies 85-250 VAC 50/60 Hz, 300 Watt
• **External Audio Adapters**	
Number of audio channels	Add suffix “xC” to model number, where x is the number of required audio channels. Configurable from 8 up to 128 independent audio inputs and outputs. Audio Channels are available in block of 8 channels mapped in the audio network adapter
Analog Audio Inputs & Outputs Balanced Line Level: 0.0 dBu	• 2 Line/MIC inputs, and 2 outputs (-2C option) • 8 Line input and 8 outputs (-8C option) • 16 line input and 16 outputs (-16C option)
Digital Audio Inputs & Outputs Balanced AES3	• 8 input and 8 outputs (-8CD option) • 16 input and 16 outputs (-16CD option)
Supported sample rates	48kHz
• **Discrete-Logic Digital Input/Output Signals**	
Network I/O (NIO) adapter	There are available different versions: • Standard I/O options are: - 6 Form-A (SPDT COM/NO) isolated Relay digital outputs - 6 Opto-isolated digital inputs • Other industrial I/O modules supported (via ModbusTCP and SNMP network protocols). Contact Canam.
• **Application features**	
Remote Client Application	VAR3-RTC
Number of messages	> 9999

Parameter	Specification
Audio file types supported	Format: WAV Sample Rate: 48 kHz Sample Size: 16 bit
Software Operating System compatibility	Server: GNU/Linux Ubuntu 16.04 LTS Clients: GNU/Linux Ubuntu 16.04 LTS MS Windows7, Windows 8/8.1/Windows10 Java Runtime Environment (JRE) 1.6.x is also required in Server and Clients computers.
Single zone or simultaneous multi-zone playback & control mode.	
Multi-user level controlled access.	
Customer configurable background screen images.	
Alarms and Events Reports	
Multi-Language voice break-in option	
Text-to-Speech option	

Table 1- Networking Requirements

General Requirements	Managed Ethernet switches with Gigabit ports DHCP service Transport over Layer-2 Contact Canam if different subnets are used, and/or IP routing is required.	
- Energy-Efficient-Ethernet (EEE) - Green Ethernet	Disabled	
- Multicast Audio	Enable IGMP snooping in switches	
Quality of Service (QoS) Four queues, Diffserv (DSCP) QoS with strict priority		
DSCP Value	Priority	Usage
CS7	High	Time critical PTP
EF	Medium	Audio, PTP
CS1	Low	(reserved)
BestEffort	None	Other Traffic

Table 2- Typical Bandwidth Requirements

Bandwidth requirements Dante Audio	Each Dante Audio pipe can carry 1-4 channels, at 24 bit/48 KHz, each audio pipe requires < 8 Mbps depending upon traffic.
Control/Data	< 1 Mbps typical.

ORDERING PART NUMBER:

PART NUMBER: VAR3-xC-#IO- (see table below)

DESCRIPTION: DIGITAL AUDIO PLAYBACK AND MULTI-ZONE REBROADCAST CONTROLLER SERVER

OPTIONS SUMMARY:

Part number= VAR3-xC-#IO-optional features

OPTION letter	OPTION brief description
-xC	Number of audio channels in external network adapter interface box -2C: Analog, 2 Line/MIC level inputs, and 2 Line-level outputs -8C: Analog, 8 Line-level inputs, and 8 Line-level outputs -16C: Analog, 16 Line-level inputs, and 16 Line-level outputs -8CD: AES3 Digital, 8 inputs, and 8 outputs -16CD: AES3 Digital, 16 inputs, and 16 outputs
#IO	Number of Discrete Logic Digital Input/Output signals Standard option: -6IO (six Form-A relay outputs and six opto-isolated inputs) Contact Canam for additional options.
-F	Graphical User interface Plug-in In-tunnel Broadcast Monitoring (IBMS). Note: IBMS is sold separately
-Rn	Redundant Server Clusters -R2: 2 servers in cluster configuration
-TTS	Text-to-Speech function (English and Spanish options. Contact Canam for further options)
-S	In-rack 1U amplified monitor speaker
-ML	Multi-language voice break-in, up to four languages -2L (2 languanges, English and Spanish)