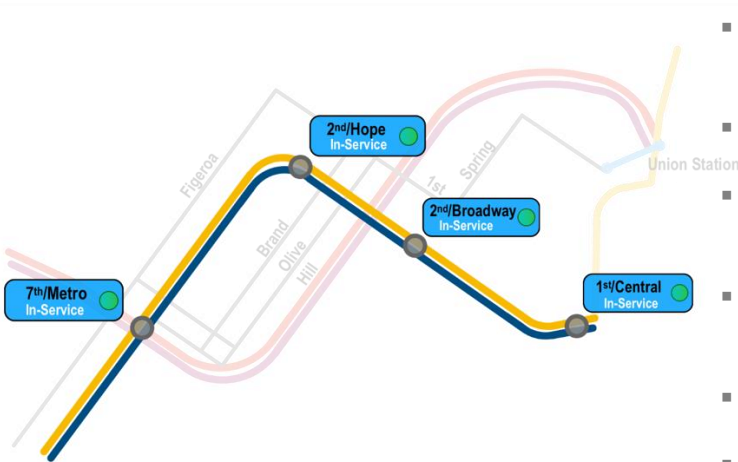


Network Management System

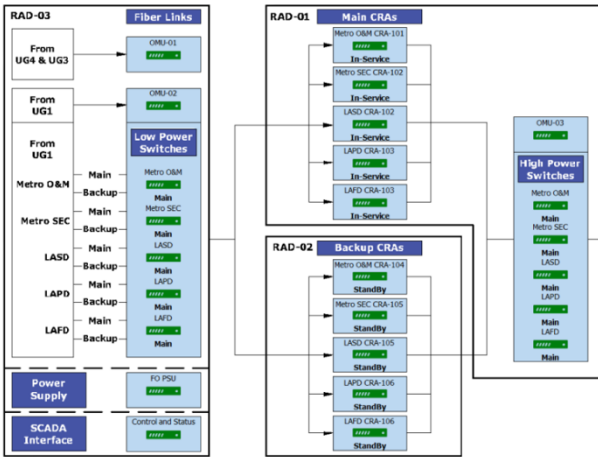
The Network Management System software monitors the health and controls the operation of active DAS radio equipment elements, such as Channelized RF Signal Boosters, Broadband BDAs, RF-over-Fiber links and RF switches, discrete digital I/O devices, and other equipment. The NMS client Graphical User Interfaces (GUI) shows detailed information including alarm indicators, equipment controls, and other management information.

Standard features:

- Monitor the functional and transmitting radio equipment status on the network, using standard protocols.
- Alarm conditions can trigger automatic actions, response or notifications.
- Control different equipment parameters from an integrated Graphical User Interface (GUI).
- Different levels of alarm: Critical, Non-Critical, and Warning.
- See detailed information about a single piece of equipment, including the description, location, status, serial number.
- Control functional parameters of individual pieces of equipment.
- Standard protocols: SNMP v1 & v2c, Modbus, TCP/IP.
- Email notifications upon equipment alarms.
- System events logging.
- User profiles-based access control.
- Completely configurable to match radio system architecture.
- NMS Servers runs on Linux®.
- NMS Client GUI application runs on Windows® and Linux®.
- Single or dual server cluster configuration.
- NMS supports new sites, zones or projects, subject to software upgrade.



Main Dashboard Multi-Sites view



- Multiple sites are monitored using the graphical user interface.
- Web browser interface allows access to all network devices from main dashboard, providing a detail equipment information to identify alarms origin notification, independent the network size.

General System Control

NMS Control Switch Dashboard:

- Define transmitting equipment per site and/or equipment.
- Enable manual control redundancy between sites and/or equipment.
- Show current system status, if main or backup equipment is ready to operate.
- Show current configuration status of Main/Backup system.
- Operate fail-over switching between hot/standby RF systems.
- Set all sites/equipment to standby if required.

HEAD- END AND UG1 SUB-SYSTEM SWITCHOVER CONTROL

The controls by the NMS are ENABLED by the SCADA

Equipment	Ready to Operate Status Indicators	In-Service Status Indicators
Expo 18 Headend Metro Equipment	Main: ● Backup: ●	O&M: Main ● Standby ● SEC: Main ● Standby ●
Expo 18 Headend Agencies Equipment	Main: ● Backup: ●	LASD: Main ● Standby ● LAPD: Main ● Standby ● LAFD: Main ● Standby ●
TPSS8 DL Headend Metro Equipment	Main: ● Backup: ●	O&M: Main ● Standby ● SEC: Main ● Standby ●
TPSS8 DL Headend Agencies Equipment	Main: ● Backup: ●	LASD: Main ● Standby ● LAPD: Main ● Standby ● LAFD: Main ● Standby ●
UG1 Metro Equipment	Main: ● Backup: ●	O&M: Main ● Standby ● SEC: Main ● Standby ●
UG1 Agencies Equipment	Main: ● Backup: ●	LASD: Main ● Standby ● LAPD: Main ● Standby ● LAFD: Main ● Standby ●

Login

System Authentication

You are going to be logged in automatically in 8 seconds. Press 'Esc' to cancel.

User:

Password:

Ok Close

Metro O&M CRA-101

VHF Band

Location: TPSS8, RAD-01

System model: M4DBDAV Serial number: 1711007

[Click here to launch the equipment web page for more information](#)

Status	Description
ⓘ	Diagnostic Alarm is On
●	Major Alarm is Off
●	Minor Alarm is Off
●	Filter TX Timeout Alarm is Off
●	RF Output Power Timeout Alarm is Off
●	AIC Summary Alarm is Off
●	AIC Communication Alarm is Off
●	AIC Current Alarm is Off
●	AIC Temperature Alarm is Off
●	AIC Oscillator Alarm is Off
●	DSP Temperature Alarm is Off

User level-controlled access

- Different User Security Levels for controlled system access.

Detailed information

- The NMS enables detailed access to equipment description, location, model and serial number.
- The Equipment Detail Info window, generates detailed status information and allows control over main function commands for specific equipment.

NMS Discrete Digital I/O

- The NMS can drive NMS-I/O (NIO) interfaces, which are industry standard PLCs. The NMS can drive the NIO to control RF switches and control/monitor other devices via discrete I/O digital signals.
- NMS can also monitor multiple radio sites and generate discrete digital summary alarms for integration with external third-party SCADA systems.



SNMP MODBUS TCP/IP

Configurable and Platform Independent

- The NMS is configurable to monitor a 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, Moxa® data acquisition modules, PLC and others can be controlled and monitored.
- NMS multi-clients are platform independent, running on Microsoft Windows® and GNU/Linux® based systems.

Events and Alarms Information

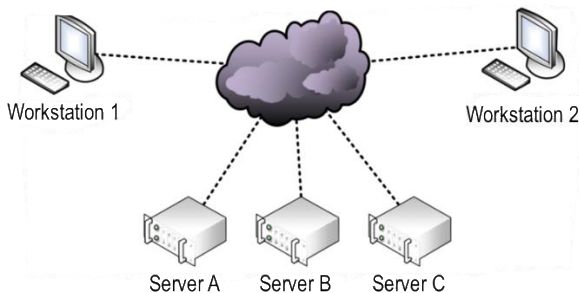
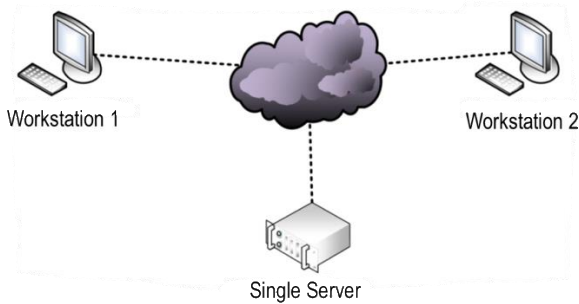
- The NMS keeps track of Radio System events and alarms, log information support filtering options by date, time, device, location, IP address, alarm and status to display only relevant data.
- Log information could be exported to an excel file.

Date	Time	Device	Location	IP Address	Alarm	Status
2020-Jun-04	09:12:33	Control and Status	TPSS8, RAD-03	172.18.64.147	Agencies Main CRA System Ready	Ready
2020-Jun-04	09:12:29	Agencies	TPSS8, RAD-03	N/A	Agencies Summary Fiber Link Major Alarm	On
2020-Jun-04	09:12:27	Agencies	TPSS8, RAD-03	N/A	Agencies Fiber PSU Major Alarm	On
2020-Jun-04	09:12:26	Agencies	TPSS8, RAD-03	N/A	Agencies Summary Fiber Link Major Alarm	Off
2020-Jun-04	09:12:26	Agencies	TPSS8, RAD-03	N/A	LAPD Main CRA Active ACK Status Major Alarm	Off
2020-Jun-04	09:12:26	Agencies	TPSS8, RAD-03	N/A	LASD Main CRA Active ACK Status Minor Alarm	Off
2020-Jun-04	09:12:26	Agencies	TPSS8, RAD-03	N/A	LAFD Backup CRA Status Minor Alarm	Off
2020-Jun-04	09:12:26	Agencies	TPSS8, RAD-03	N/A	LASD Main CRA Active ACK Status Major Alarm	Off
2020-Jun-04	09:12:26	Agencies	TPSS8, RAD-03	N/A	LAFD Backup CRA Status Major Alarm	Off
2020-Jun-04	09:12:26	Agencies	TPSS8, RAD-03	N/A	LAPD Backup CRA Status Minor Alarm	Off

NMS Servers architecture

The NMS can be deployed in two modes:

- **Single Server:**
Single computer (server) running server applications. In case of failure the system will be unavailable until the computer is repaired or replaced.
- **High Availability Cluster:**
Two or more servers which support the server applications. These are deployed in an active/standby architecture, providing 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.



Windows ® and Windows logo are registered trademarks of Microsoft Corporation.
Cisco is a trademark or registered trademark of Cisco Systems, Inc.
Linux® is the registered trademark of Linus Torvalds.
MOXA is a registered trademark of Moxa Inc.

Radio equipment Web browser interface

- Hyperlink to control, configure and monitor the operational parameters of each RF device to access the web interface. Typical operational parameters are frequency configuration, gain, amplifiers control, alarm threshold, settings files, log files, general and RF meters.
- User level-controlled access is also implemented on each Radio device for guest, operator, technician and administrator levels.

CSR-MA-026 800MHz BDA - Filters Status

Autofresh: 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.

Item	Name	Rx/Tx	Port	Center Freq (MHz)	Operational Freq (MHz)	RF Level (dBm)	OK	Warn	Err
UL Filter Windows									
1-OCR	WSP CH1	UL	Srv Rx	800.0375	-85	-103.10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2-OCR	WSP CH2	UL	Srv Rx	806.5375	-85	-107.25	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3-OCR	WSP CH3	UL	Srv Rx	807.0375	-85	-116.25	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4-OCR	WSP CH4	UL	Srv Rx	807.5375	-85	-100.25	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5-OCR	WSP CH5	UL	Srv Rx	808.0375	-85	-100.10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6-OCR	NOT USED	UL	Srv Rx	808.5375	-85	-112.80	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DL Filter Windows									
7-OCR	WSP CH1	DL	Srv Rx	851.0375	-85	< -120	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8-OCR	WSP CH2	DL	Srv Rx	851.5375	-85	< -120	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9-OCR	WSP CH3	DL	Srv Rx	852.0375	-85	< -120	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10-OCR	WSP CH4	DL	Srv Rx	852.5375	-85	< -120	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11-OCR	WSP CH5	DL	Srv Rx	853.0375	-85	< -120	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12-OCR	NOT USED	DL	Srv Rx	853.5375	-85	< -120	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Channel Line Settings

Line 1: Filter Windows 1

Line 2: UL Filter Windows 1

Line 3: DL Filter Windows 7

Apply Undo Typing

Note: Fine-Tune level shall be 6dB (min) for this model.

Filter	BW (MHz)	Name	Rx/Tx	Port	Center Freq (MHz)	Rx Thr (dBm)	HyTune (dB)	Fine Tune Output Level (dB)	Squelch Type	Tx AGC	To Time Out	Hot Test Cancel	Filter Conf	Marker Tone	Enable
UL Filter Windows															
* 1-OCR	24	NYSF CH1	UL	Srv Rx	806.0375	-85	0	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
* 2-OCR	24	NYSF CH2	UL	Srv Rx	806.5375	-85	0	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
3-OCR	24	NYSF CH3	UL	Srv Rx	807.0375	-85	4	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
4-OCR	24	NYSF CH4	UL	Srv Rx	807.5375	-85	4	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
5-OCR	24	NYSF CH5	UL	Srv Rx	808.0375	-85	4	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
6-OCR	24	NOT USED	UL	Srv Rx	808.5375	-85	4	0	CAS	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input type="checkbox"/>	<input type="checkbox"/>
Dev: 2.5 MHz															
DL Filter Windows															
7-OCR	24	NYSF CH1	DL	Srv Rx	851.0375	-85	4	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
8-OCR	24	NYSF CH2	DL	Srv Rx	851.5375	-85	4	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
9-OCR	24	NYSF CH3	DL	Srv Rx	852.0375	-85	4	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
10-OCR	24	NYSF CH4	DL	Srv Rx	852.5375	-85	4	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
11-OCR	24	NYSF CH5	DL	Srv Rx	853.0375	-85	4	0	CAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dev: 2.5 MHz															
12-OCR	24	NOT USED	DL	Srv Rx	853.5375	-85	4	0	CAS	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	MSK 600	<input type="checkbox"/>	<input type="checkbox"/>
Dev: 2.5 MHz															

Apply Undo Typing

NMS Software Functionality & Components Specification

Parameter	Specification
Minimum NMS Server Computer Requirements	<ul style="list-style-type: none"> ▪ Processor: <ul style="list-style-type: none"> ▪ Clock speed 2.4 GHz or more. ▪ 4 cores or more. ▪ x64-bit processor. ▪ Disc drive: 250GB or more. ▪ Ram Memory: 8GB or more. ▪ Network: Dual 10/100/1000 Ethernet RJ45 port. ▪ Power supply: Dual redundant AC/DC power supplies recommended. ▪ Computer Operating System shall be Linux 16.04.
Minimum NMS Remote Workstation Computer Requirements	<ul style="list-style-type: none"> ▪ Processor: <ul style="list-style-type: none"> ▪ Clock speed 2.4 GHz or more. ▪ 4 cores or more. ▪ x64-bit processor. ▪ Disc drive: 250GB or more. ▪ Ram Memory: 8GB or more. ▪ Network: 10/100/1000 Ethernet RJ45 port. ▪ Computer Operating System shall be Windows 10 / Linux 16.04.
NMS Server Functionality	<ul style="list-style-type: none"> ▪ The NMS is capable of monitoring and controlling CANAM Radio equipment among others. ▪ Control and communication with NMS remote I/O extender modules (NIO) using standard protocols. ▪ Standard industrial Protocols supported: <ul style="list-style-type: none"> ▪ SNMP v1, v2. ▪ MODBUS-TCP/IP. ▪ Digital inputs read status from NMS remote I/O extender modules. ▪ Digital output activation from the NMS remote I/O extender modules. ▪ All managed devices monitoring provides Third Party Systems (SCADA) summary indicators to perform actions or take decisions over the radio system (failover operations). ▪ Detailed system alarm and event logging. ▪ Date and time are registered in logging information. ▪ Email notification upon alarm configurations. ▪ Users accounts with password protected login. ▪ NMS connectivity with sites, zones or projects, subject to software capacity upgrade provide by CTI.
Remote NMS I/O extender modules	<ul style="list-style-type: none"> ▪ Discrete digital input/output extensions to the NMS server at all radio locations. ▪ Network: 10/100 Ethernet RJ45 port. ▪ Relay Digital Outputs and digital inputs. ▪ Support for SNMP v2 and/or Modbus-TCP over the network. ▪ Dual-redundant AC/DC power supplies.

NMS Software Functionality & Components Specification

Parameter	Specification
NMS Client software, Graphical User Interface (GUI)	<ul style="list-style-type: none"> ▪ Operator access to all managed devices. ▪ Can be installed on system designated PC workstations. These computers could be supplied by customer or by CTI upon contract specification. ▪ GUI is compatible with Linux or MS-Windows7/10 Operating Systems. ▪ CTI will provide the corresponding workstation licenses purchased by customer. ▪ On software screens the summary status of all managed devices is displayed. ▪ Integrates direct access to web-browser interfaces to each managed device when supported. ▪ Display and generates reports for logs and events.

Ordering Part Number and Options

Part Number	Description
1. NMS-SRV-CORE	NMS Server software license, for a single server standard configuration. (Perpetual license)
2. NMS-RN	Redundant Server Cluster, dual is the basic configuration. One NMS Server software license is required per server. (Perpetual license)
3. NMS-CLIENT	NMS Client software license, single computer. (Perpetual license)
4. NMS-#IO	NMS Discrete Input/Output software module. PLC not included. Contact Canam for project specific requirements.
5. NMS-SUB-PLAN	NMS Paid Subscription Plan after the second year post radio system integrated test (Radio SIT). The first year after Radio SIT is covered by the warranty. It is normally used to add new features and provide software updates to the perpetual license.

Additional NMS Components (Contact CANAM)	<ol style="list-style-type: none"> 1. 1U Server computer 2. LAN Ethernet Switch (ESW). 3. IP-switched AC Power Distribution Unit (PDU). 4. LCD Display and Keyboard, Video and Mouse switch (KVM).
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