

Total Facility Monitoring for the Modern Radio Station



unleash

Paul Shulins
Director of Technical Operations
Greater Media Boston

Telecommunications Act of 1996

- Signed into law February 8, 1996
- Objective was to open up markets to competition by removing regulatory barriers
- Major impact for Broadcasters expanding ownership opportunities

Current Ownership Rules:

- In a radio market with 45 or more stations, an entity may own up to eight radio stations, no more than five of which may be in the same service (AM or FM)
- In a radio market with 30 and 44 radio stations, an entity may own up to seven radio stations, no more than four of which may be in the same service
- In a radio market hosting between 15 and 29 radio stations, an entity may own up to six radio stations, no more than four of which may be in the same service
- In a radio market with 14 or fewer radio stations, an entity may own up to five radio stations, no more than three of which may be in the same service, as long as the entity does not own more than 50 percent of all radio stations in that market.

Results of Deregulation

- Single Owner with:
- Multiple Facilities
- Spread over wide geographical areas
- Often with a single technical staff to manage the entire markets assets
- Opportunity for creative technical solutions!

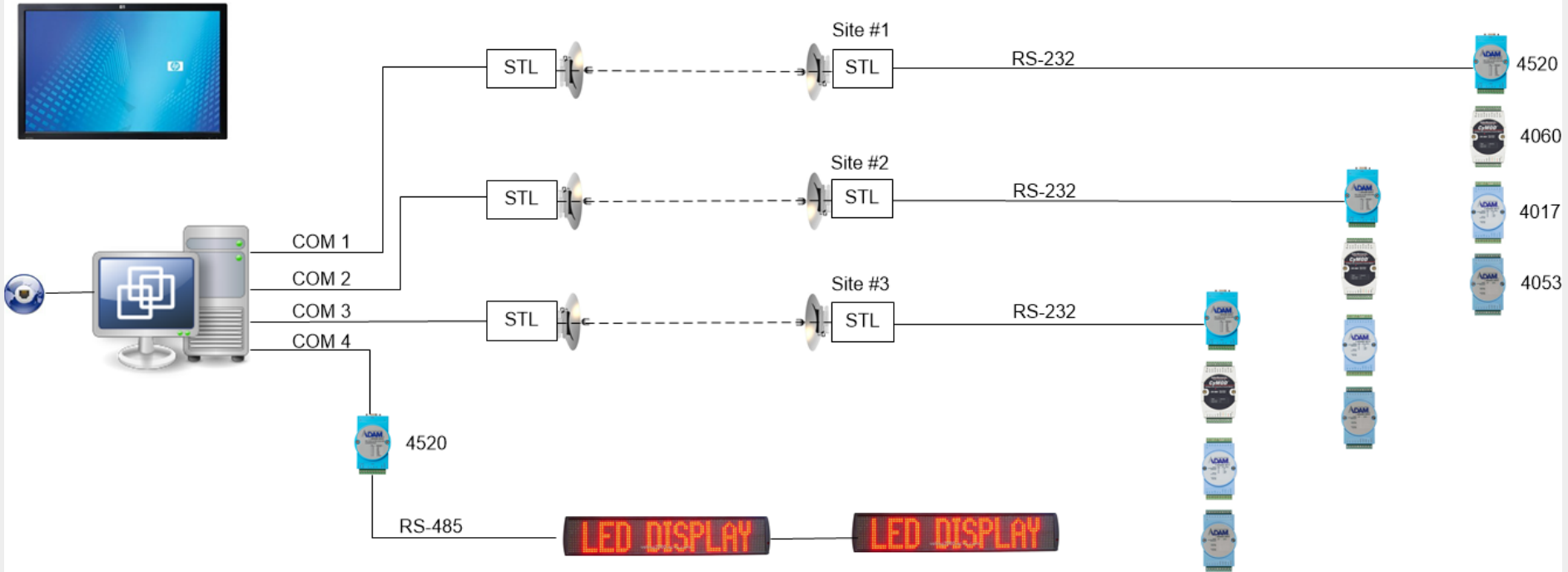
Some of the things we want to monitor:

- Transmitter Status (power levels, modulation, faults)
- Transmitter Room Temperatures
- Transmission Line Gas Pressures
- Backup Generator Status (fuel levels, fuel leak alarms etc.)
- Site Security
- STL Signal Strength
- PPM Integrity
- Audio Presence at Transmitter Sites

Entrance to Engineering Master Control

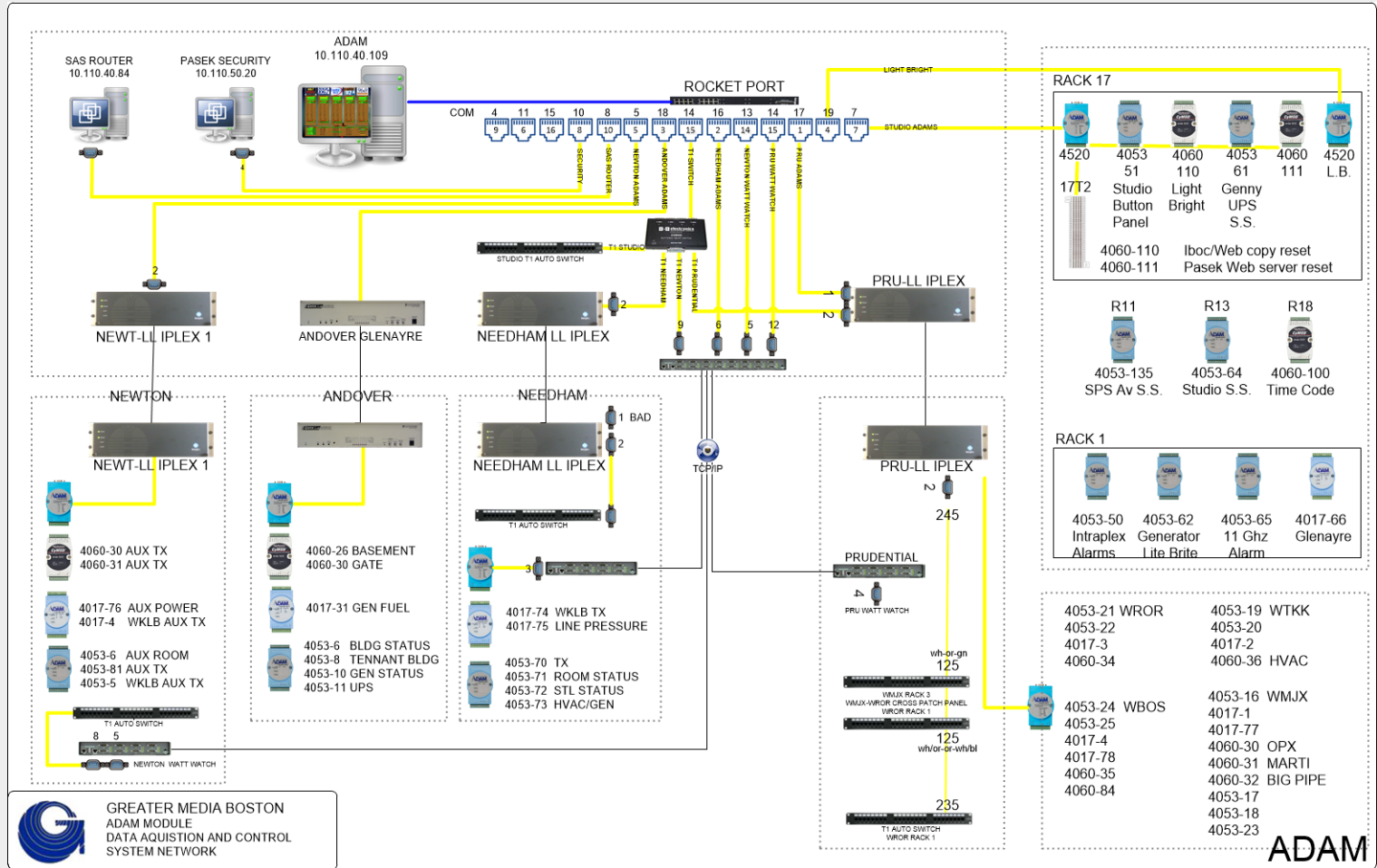


Data Acquisition Block Diagram

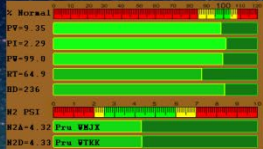


Data Acquisition Modules

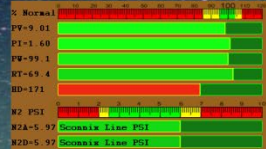
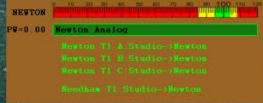




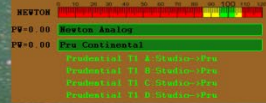
ADAM



TX A FIL:OK TX B FIL:OFF
TX A PLT:OK TX B PLT:OFF
HD TX A :OK HD TX B :OFF
INHIBIT :OK SWAP :OK
TITUS A :50 TITUS B :50
UPS A :OK UPS B :OK
ENG :OK DOOR :CL
AN BIRD :OK DI BIRD :OK
18 GRZ N:OK 18GRZ W:OK
OPE VLT :OK APT :OK
HVAC 1 :OK HVAC 2 :OK
HVAC AIR:OK HVAC AIR:OFF
HVAC CLD:OK HVAC CLD:OFF
XFER SW :RBL NSTAR :OK
EAS WEEK:14 EAS MONT:14
EAS2WEEK:14 EAS2MONT:14
AUX SITE



TX A FIL:OK TX B FIL:OFF
TX A PLT:OK TX B PLT:OFF
HD TX A :OK HD TX B :OFF
INHIBIT :OK SWAP :OK
TITUS A :50 TITUS B :50
UPS A :OK UPS B :OK
ENG :OK DOOR :CL
CONTINER:OK BIRD W:OK
18 GRZ S:OK 18GRZ W:OK
OPE VLT :OK APT :OK
HVAC 1 :OK HVAC 2 :OK
HVAC AIR:OK HVAC AIR:OFF
HVAC CLD:OK HVAC CLD:OFF
XFER SW :RBL NSTAR :OK
EAS WEEK:19 EAS MONT:19
EAS2WEEK:19 EAS2MONT:19
AUX SITE



POWER PLANTS
STUDIO GENERATOR : OFF
PRUDENTIAL GENERATOR : OFF
ANDOVER GENERATOR : OFF
NEEDHAM GENERATOR : OFF
NEWTON GENERATOR : OFF
STUDIO CELLWATCH : OK
ANDOVER CELLWATCH : OK
STUDIO UPS ALARM : OK
ANDOVER UPS ALARM : OK
NEWTON UPS ALARM : OK



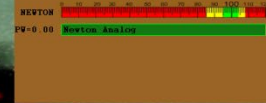
TX A FIL:OK TX B FIL:OFF
TX A PLT:OK TX B PLT:OFF
HD TX A :OK HD TX B :OFF
INHIBIT :OK SWAP :OK
TITUS A :50 TITUS B :50
UPS A :OK UPS B :OK
ENG :OK DOOR :CL
AN BIRD :OK IL TI D :OK
18 GRZ N:OK 18GRZ PR:OK
OPE VLT :OK APT :OK
HVAC 1 :OK HVAC 2 :OK
HVAC AIR:OK HVAC AIR:OFF
HVAC CLD:OK HVAC CLD:OFF
XFER SW :RBL NSTAR :OK
EAS WEEK:119 EAS MONT:119
EAS2WEEK:119 EAS2MONT:119
AUX SITE



TOWER LIGHTS
PRUDENTIAL TWR LIGHTS:OFF
ANDOVER TOWER LIGHTS :OK
ANDOVER TWR LT MODE :OK
NEEDHAM TOWER LIGHTS :OFF
NEWTON TOWER LIGHTS :OFF
STL SYSTEMS
STUDIO-PRU 110k2:OK
STUDIO-NEWTON 110k2:OK
NEWTON-NEEDHAM 180k2:OK
STUDIO-PRU 5.0k2:OK
STUDIO-ANDOVER 2.4k2:OK



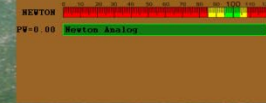
TX A FIL:OK TX B FIL:OFF
TX A PLT:OK TX B PLT:OFF
HD TX A :OK HD TX B :OFF
INHIBIT :OK SWAP :OK
TITUS A :50 TITUS B :50
UPS A :OK UPS B :OK
ENG :OK DOOR :OK
AN BIRD :OK DI BIRD :OK
18 GRZ N:OK 18GRZ PR:OK
OPE VLT :OK APT :OK
HVAC 1 :OK HVAC 2 :OK
HVAC AIR:OK HVAC AIR:OFF
HVAC CLD:OK HVAC CLD:OFF
XFER SW :RBL NSTAR :OK
EAS WEEK:14 EAS MONT:14
EAS2WEEK:14 EAS2MONT:14
AUX SITE



ANDOVER STATUS
ANDOVER ENGINEER :YES
ANDOVER GATE :OK
ANDOVER TX BLDG DOOR :OK
ANDOVER TX BLDG WATER:OK
ANDOVER TENANT DOOR :OK
ANDOVER TENANT SMOKE :OK
ANDOVER BASEMENT ENG :OK
ANDOVER BASEMENT DOOR:CL
ANDOVER BASEMENT WATER:OK



TX A FIL:OK TX B FIL:OFF
TX A PLT:OK TX B PLT:OFF
HD TX A :OK HD TX B :OFF
INHIBIT :OK SWAP :OK
TITUS A :50 TITUS B :50
UPS A :OK UPS B :OK
ENG :OK DOOR :CL
AN BIRD :OK DI BIRD :OK
18 GRZ N:OK 18GRZ PR:OK
OPE VLT :OK APT :OK
HVAC 1 :OK HVAC 2 :OK
HVAC AIR:OK HVAC AIR:OFF
HVAC CLD:OFF HVAC CLD:OFF
XFER SW :RBL NSTAR :OK
EAS WEEK:14 EAS MONT:14
EAS2WEEK:14 EAS2MONT:14
AUX SITE



PRU COMBINER ROOM
TEMP
RT-72.9
COMBINER ROOM WATER :OK
Tuesday 09-06-2011 16:36:28
Cycle 489 10 TCP to Web GOOD
Program Version: 46.0
WMJX HVAC Air Flow Cold
16:33:28 09-06-2011

Heartbeat

- Application that is running routinely produces a text file containing the time and date every 2 minutes
- The text file is automatically sent via FTP to the web server
- Web Server runs a program that compares the last update to the current updated file
- If the time is the same on the two files, the web page lists the machine as off line and sends a text message

Result of Heartbeat Tabulations

Verizon 9:34 AM 95%

pshuli.com

System Machine Status
Created on 04-12-2016 AT 09:34:12

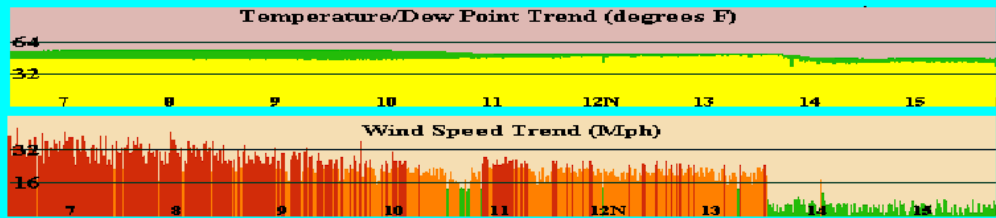
Adam PC	09:34:45
PPM PC	09:34:36
WROR TX Touch PC	09:33:41
WMJX TX Touch PC	09:33:05
WKLB TX Touch PC	09:32:21
WBOS TX Touch PC	09:32:55
WBQT TX Touch PC	09:32:51
WROR	09:34:07
WMJX	09:34:16
WKLB	09:34:19
WBOS	09:34:35
WBQT	09:34:17
Prudential Interlock	09:32:21
ATC 3104181U Interlock	09:32:49
ATC 3104181L Interlock	09:31:04

Environmental Considerations:

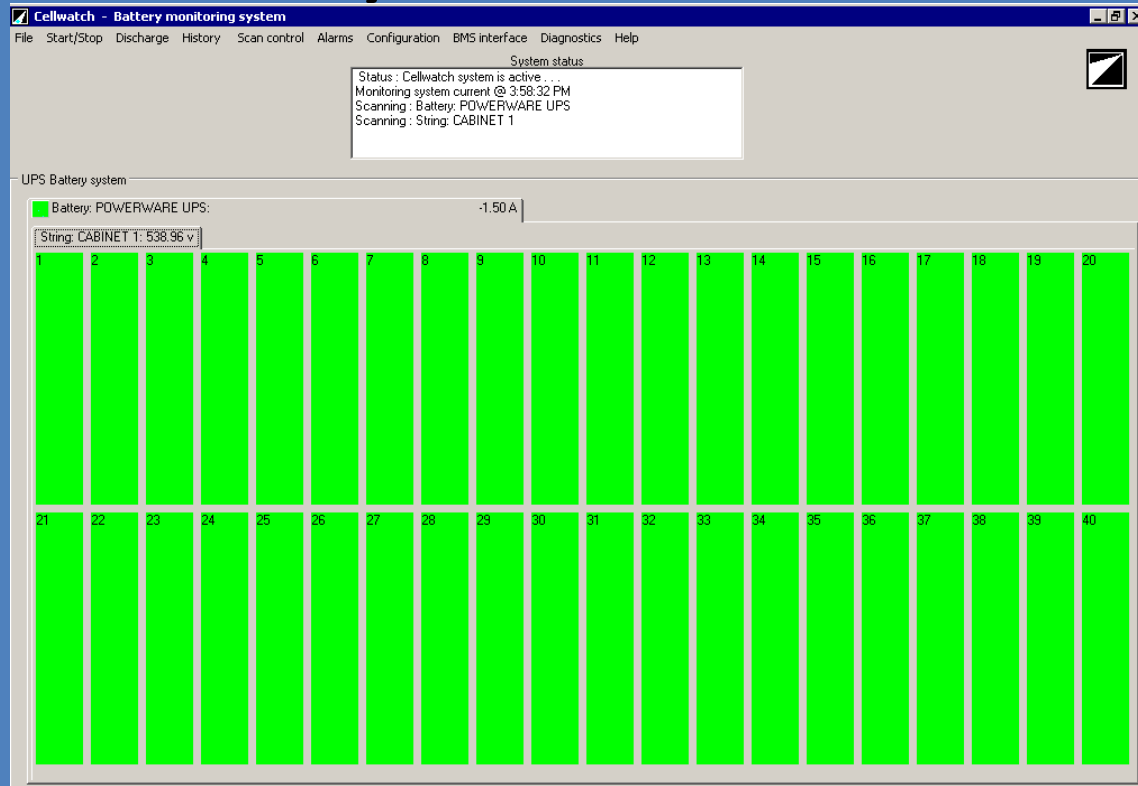
PRUDENTIAL WEATHER STATION

CURRENT TIME IS: 15:41:40 E=000

Outside Temperature	48.52°F
Wind Chill	44.7 °F
Wind Speed/Direction	07 Mph N
5 Min Wind Peak	11 Mph N
Barometric Pressure	30.00 inhg
Barometer 3 Hr Delta	+00.05 inhg
Rainfall Today/Total	00.04" 36.24"
Dew Point	44.1 °F
Humidity	86 %
Today's High Temp	57.51°F 08:34
Today's Low Temp	48.13°F 13:34
Day High Wind Speed	58 Mph 01:31

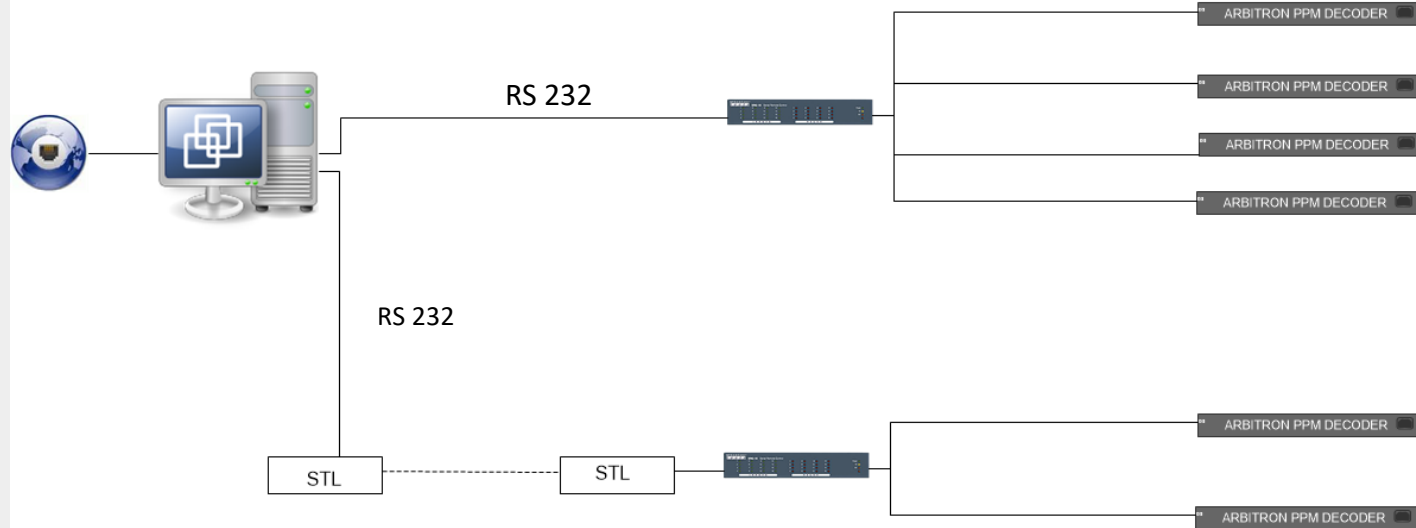


UPS Battery Health: "Cellwatch"



Portable People Meter (PPM) Confidence Monitoring Solution

105.7 WROR CLASSIC HITS	MAGIC 106.7 CLASSIC HITS	Country 102.5	radio 92.9	96.9 BOSTON TALKS
ANALOG	ANALOG	ANALOG	ANALOG	ANALOG
HD1	HD1	HD1	HD1	HD1
HD2	HD2	HD2	HD2	HD2
STREAM	STREAM	STREAM	STREAM	STREAM
HD-2 STREAM	HD-2 STREAM	HD-2 STREAM	HD-2 STREAM	HD-2 STREAM
This Source 2	This Source 2	This Source 2	This Source 2	This Source 2
NEWTON	NEWTON	NEWTON	NEWTON	NEWTON
OPXISON	OPXISON	OPXISON	OPXISON	OPXISON
HD2 Vault Primary	HD2 Vault Primary	HD2 Vault Primary	HD2 Vault Primary	HD2 Vault Primary
HD2 Vault Backup	HD2 Vault Backup	HD2 Vault Backup	HD2 Vault Backup	HD2 Vault Backup
ON Air Vault Backup	ON Air Vault Backup	ON Air Vault Backup	ON Air Vault Backup	ON Air Vault Backup



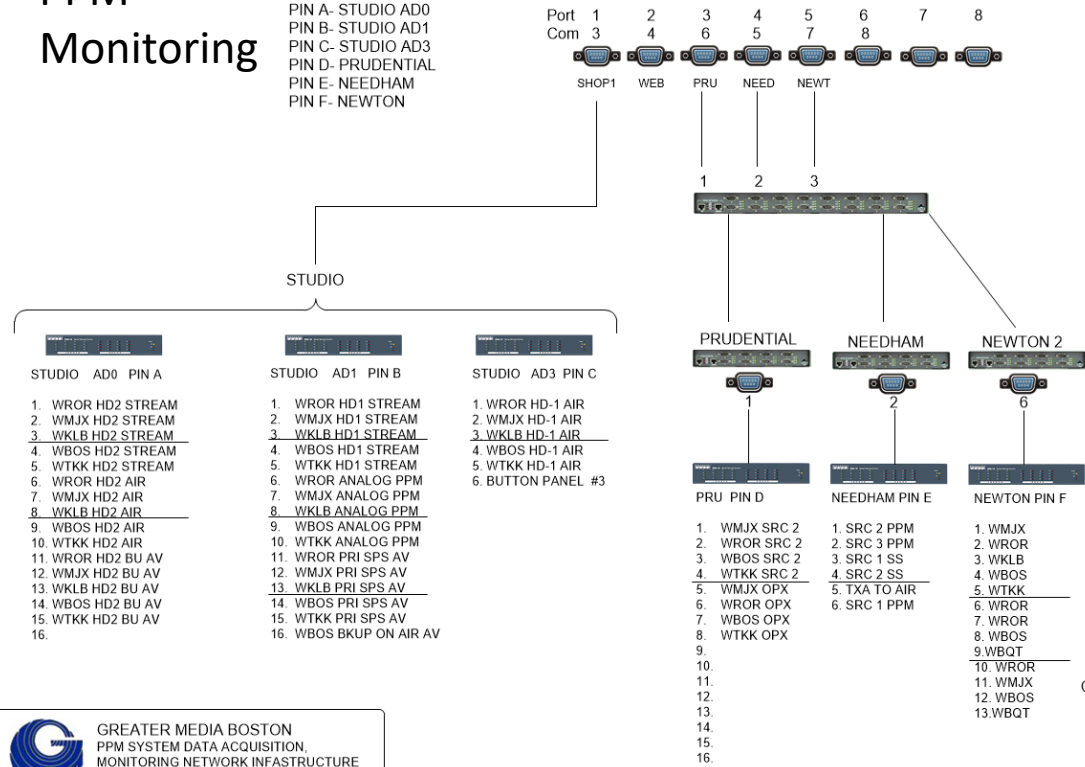
Detailed PPM Monitoring


PPM COMPUTER
10.110.40.108



106.7 WROR	MAGIC 106.7	Country 102.5	radio 92.9	96.9 INSTANTANS
ANALOG	ANALOG	ANALOG	ANALOG	ANALOG
HD1	HD1	HD1	HD1	HD1
HD2	HD2	HD2	HD2	HD2
STREAM	STREAM	STREAM	STREAM	STREAM
HD-2 STREAM	HD-2 STREAM	HD-2 STREAM	HD-2 STREAM	HD-2 STREAM
File Source 1	File Source 1	File Source 2	File Source 2	File Source 2
NEWTON	NEWTON	NEWTON	NEWTON	NEWTON
OPX/SS	OPX/SS	OPX/SS	OPX/SS	OPX/SS
HD2 Year Primary	HD2 Year Primary	HD2 Year Primary	HD2 Year Primary	HD2 Year Primary
HD2 Year Backup	HD2 Year Backup	HD2 Year Backup	HD2 Year Backup	HD2 Year Backup
ON Air Year Backup	ON Air Year Backup	ON Air Year Backup	ON Air Year Backup	ON Air Year Backup

PPM BASIC CODE
PIN A- STUDIO AD0
PIN B- STUDIO AD1
PIN C- STUDIO AD3
PIN D- PRUDENTIAL
PIN E- NEEDHAM
PIN F- NEWTON



 GREATER MEDIA BOSTON
PPM SYSTEM DATA ACQUISITION,
MONITORING NETWORK INFRASTRUCTURE
DRAWN BY: JEFF HANSEN

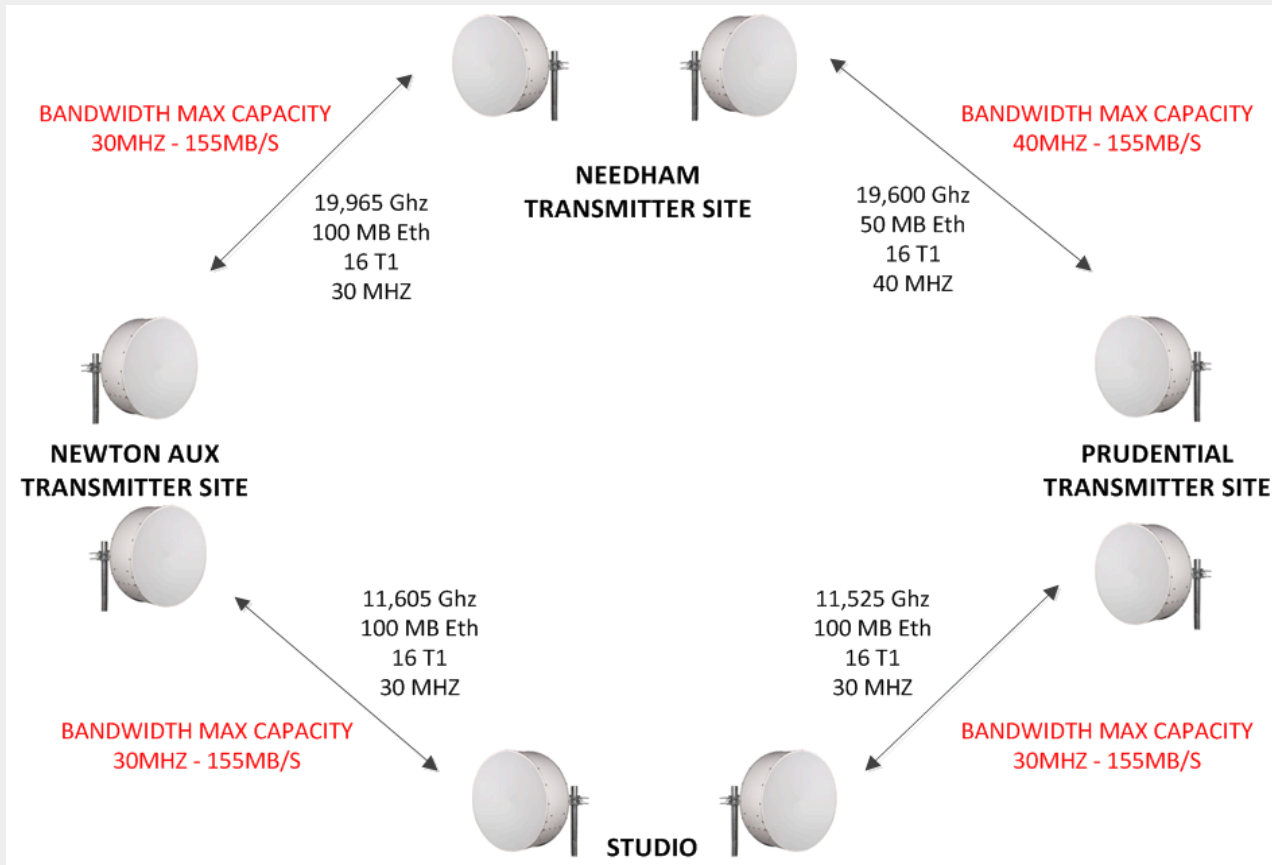
PPM



ANALOG	ANALOG	ANALOG	ANALOG	ANALOG
HD1	HD1	HD1	HD1	HD1
HD2	HD2	HD2	HD2	HD2
STREAM	STREAM	STREAM	STREAM	STREAM
HD-2 STREAM	HD-2 STREAM	HD-2 STREAM	HD-2 STREAM	HD-2 STREAM
Titus Source 2	Titus Source 2	Titus Source 2	Titus Source 2	Titus Source 2
NEWTON	NEWTON	NEWTON	NEWTON	NEWTON
OPX/ISDN	OPX/ISDN	OPX/ISDN	OPX/ISDN	OPX/ISDN
HD2 Vault Primary	HD2 Vault Primary	HD2 Vault Primary	HD2 Vault Primary	HD2 Vault Primary
HD2 Vault Backup	HD2 Vault Backup	HD2 Vault Backup	HD2 Vault Backup	HD2 Vault Backup
ON Air Vault Backup	ON Air Vault Backup	ON Air Vault Backup	ON Air Vault Backup	ON Air Vault Backup

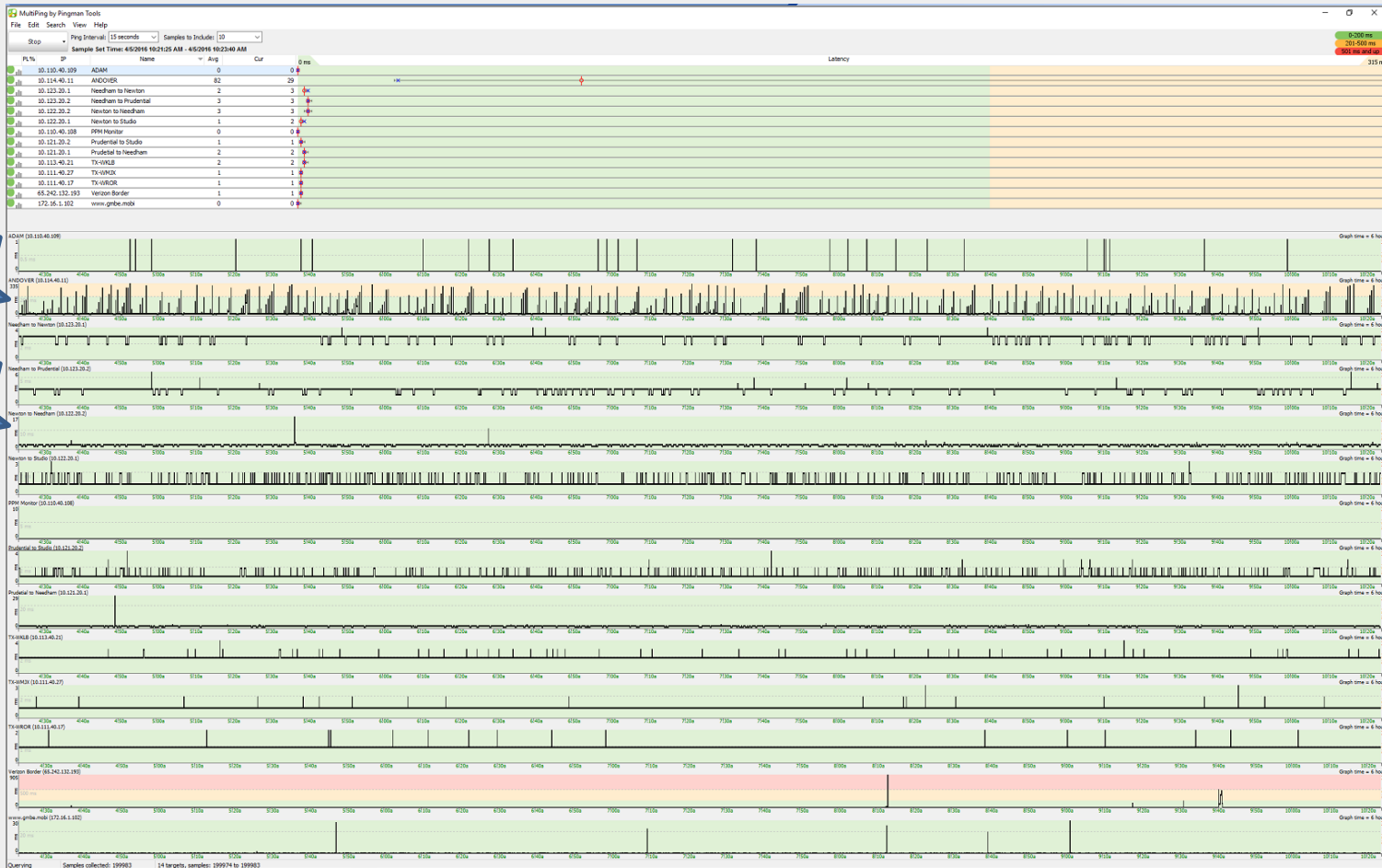
Connecting your sites together

- Part 101 approved radios vs spread Spectrum
- Sonnet Ring topology
- Landline T1
- Leased internet bandwidth



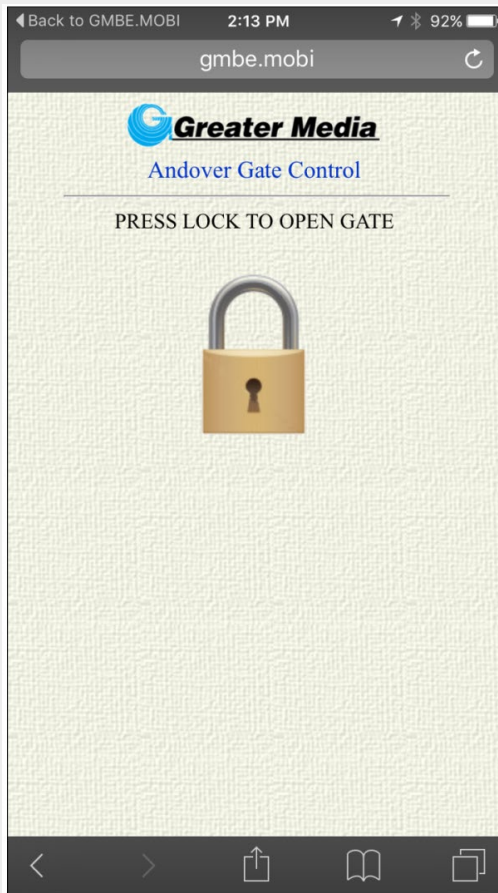
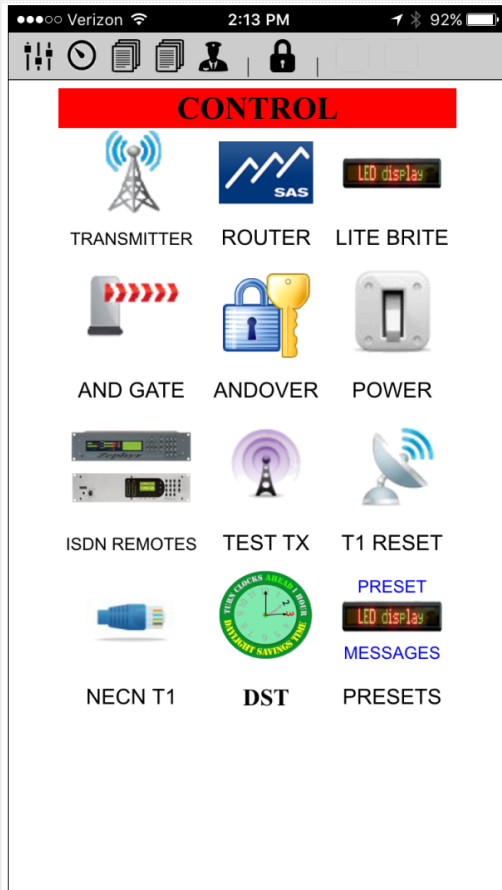
Network Health Monitoring

- Large Screen showing network Connectivity
- Ping times from location to location
- At a glance indications of site continuity
- Historical information displayed



Mobile Friendly Web Pages

- Near Real Time
- Dynamically Updated
- Password Protected



Station	TX	Pwr%	Temp	HD TX	HR PWR
105.7	A	97.2	68.2	A	232.1
106.7	A	100.4	71.3	A	199.2
102.5	A	97.2	74.3	A	657.7
92.9	A	99.9	69.8	A	220.7
96.9	A	100.8	70.1	A	264.3

Most Recent Events

- Engineer Leaving Prudential 13:53:52 on 04-01-2016
- Engineer Arriving at Prudential 11:14:07 on 04-01-2016
- Newton Generator Off 10:10:53 on 04-01-2016
- Newton Generator On! 10:05:00 on 04-01-2016
- Prudential 18Ghz Minor Alarm Cleared 07:33:59 on 04-01-2016
- Prudential 18Ghz Minor Alarm 07:33:50 on 04-01-2016
- Andover Tower Lights in Day Mode 06:47:41 on 04-01-2016
- Prudential Tower Lights Off 06:43:34 on 04-01-2016

greatermediaboston.net













PPM REALTIME STATUS

Updated: 14:14:23 ON 04-01

	WROR	WMJX	WKLB	WBOS	WBQT
ANAL					
HD-1					
HD-2					
STRM 1					
STRM 2					
SRC 2					
SRC 3					
NEWTON					

Verizon 2:13 PM 92%

SECURITY LOGS

		
LAST 2000	55 GATE	GARAGE DOOR
		
LOBBY	NIGHT DOOR	DBL DOOR
		
SHOP	SERVER ROOM	CONTRACTOR
		
ANDOVER	VEHICLE	VIDEO SUITE

Local Transmitter Touch Screen

- Manages Main/Alternate Analog and HD Transmitters
- Auto Swap upon loss of RF
- Analog Transmitter failure causes digital to swap as well
- Ability to control geographically diverse auxiliary transmitter sites
- Monitors audio sources for silence or PPM encoding loss
- Email/Text Alerts
- Generates heartbeat for confidence

TX A FILAMENT	TX A PLATE	TX A COAX SW	TX A RF OK	HD TX A	HD TX A COAX	HD TX A RF OK
TX B FILAMENT	TX B PLATE	TX B COAX SW	TX B RF OK	HD TX B	HD TX B COAX	HD TX B RF OK
INHIBIT BOTH	INHIBIT ANALOG	INHIBIT DIGITAL	INHIBIT OPTIMOD	CLR ALL INHIBITS	8500 A DIGITAL	8500 B DIGITAL
SWAP BOTH	SWAP ANALOG	SWAP DIGITAL	NEWTON FILL	HYBRID FILL	DUMMY LOAD OFF	TRANSMITTER TST
GOTO NEWTON	BK FRM NTN	NTN FILAMENT	NTN PLATE	NTN HD TX	NTN ANALOG RF	NTN HD RF
ENABLE	FXI A IBOC	FXI B IBOC	FXI A OK	FXI B OK		NTN RS-232 OK



System A RF and Audio

Source 1

Source 2

Source 3

Analog A

Source 1

Source 2

Source 3

Auto

HD A

Tuesday September 06, 2011 11:45:10

Room Temperature:

00.0 (00.0)

Transmitter A

00.0 (00.0)

Dummy Load

00.0 (00.0)

Transmitter B

System B RF and Audio

Source 1

Source 2

Source 3

Analog B

Source 1

Source 2

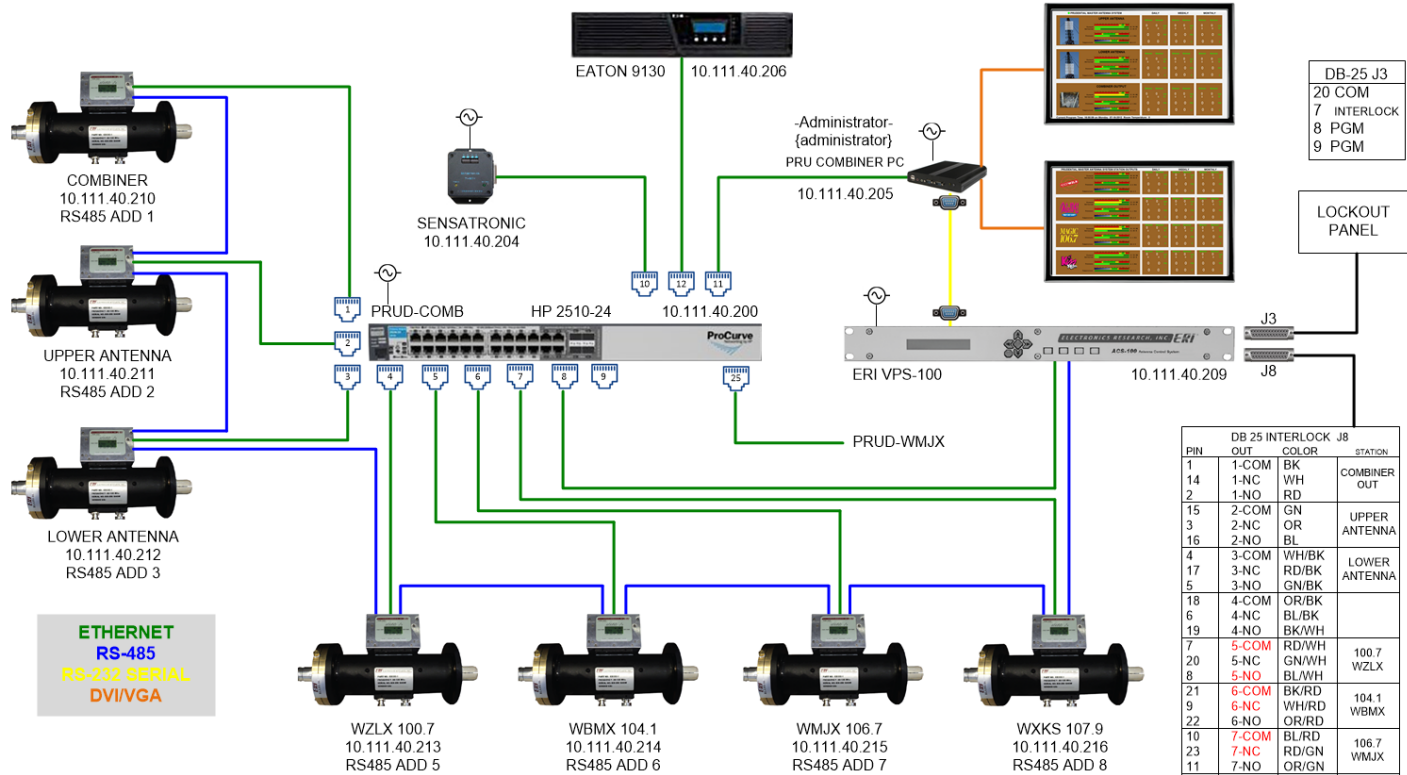
Source 3

Auto

HD B

Master Antenna Monitoring

- Multiple Inputs to Combiner
- Output to Antenna
- Max/Min Power Levels, VSWR, Line Pressure, Transmission Line Temperature
- Real Time Web Page Graphics
- Room Temperature
- Water Alarms
- HVAC Discharge Temperature and Air Flow



ETHERNET
RS-485
RS-232 SERIAL
DVI/VGA

DB-25 J3
20 COM
7 INTERLOCK
8 PGM
9 PGM

LOCKOUT PANEL

DB 25 INTERLOCK J8			
PIN	OUT	COLOR	STATION
1	1-COM	BK	COMBINER OUT
14	1-NC	WH	
2	1-NO	RD	UPPER ANTENNA
15	2-COM	GN	
3	2-NC	OR	LOWER ANTENNA
16	2-NO	BL	
4	3-COM	WH/BK	100.7 WZLX
17	3-NC	RD/BK	
5	3-NO	GN/BK	
18	4-COM	OR/BK	104.1 WBMX
6	4-NC	BL/BK	
19	4-NO	BK/WH	
7	5-COM	RD/WH	106.7 WMJX
20	5-NC	GN/WH	
8	5-NO	BL/WH	
21	6-COM	BK/RD	107.9 WXKS
9	6-NC	WH/RD	
22	6-NO	OR/RD	
10	7-COM	BL/RD	107.9 WXKS
23	7-NC	RD/GN	
11	7-NO	OR/GN	
14	8-COM	BK/WH/RD	107.9 WXKS
12	8-NC	WH/BK/RD	
25	8-NO	RD/BK/WH	
13	GND	GN/BK/WH	

GREATER MEDIA BOSTON
PRUDENTIAL FM BROADCASTERS
MASTER ANTENNA COMBINER SYSTEM
POWER MONITORING STATUS SYSTEM

Report Email Recipient List
C:\dropbox\Engineering\inertlock\emaild.txt – Daily Report Email List
C:\dropbox\Engineering\inertlock\emailw.txt – Weekly Report Email List
C:\dropbox\Engineering\inertlock\emailm.txt – Monthly Report Email list

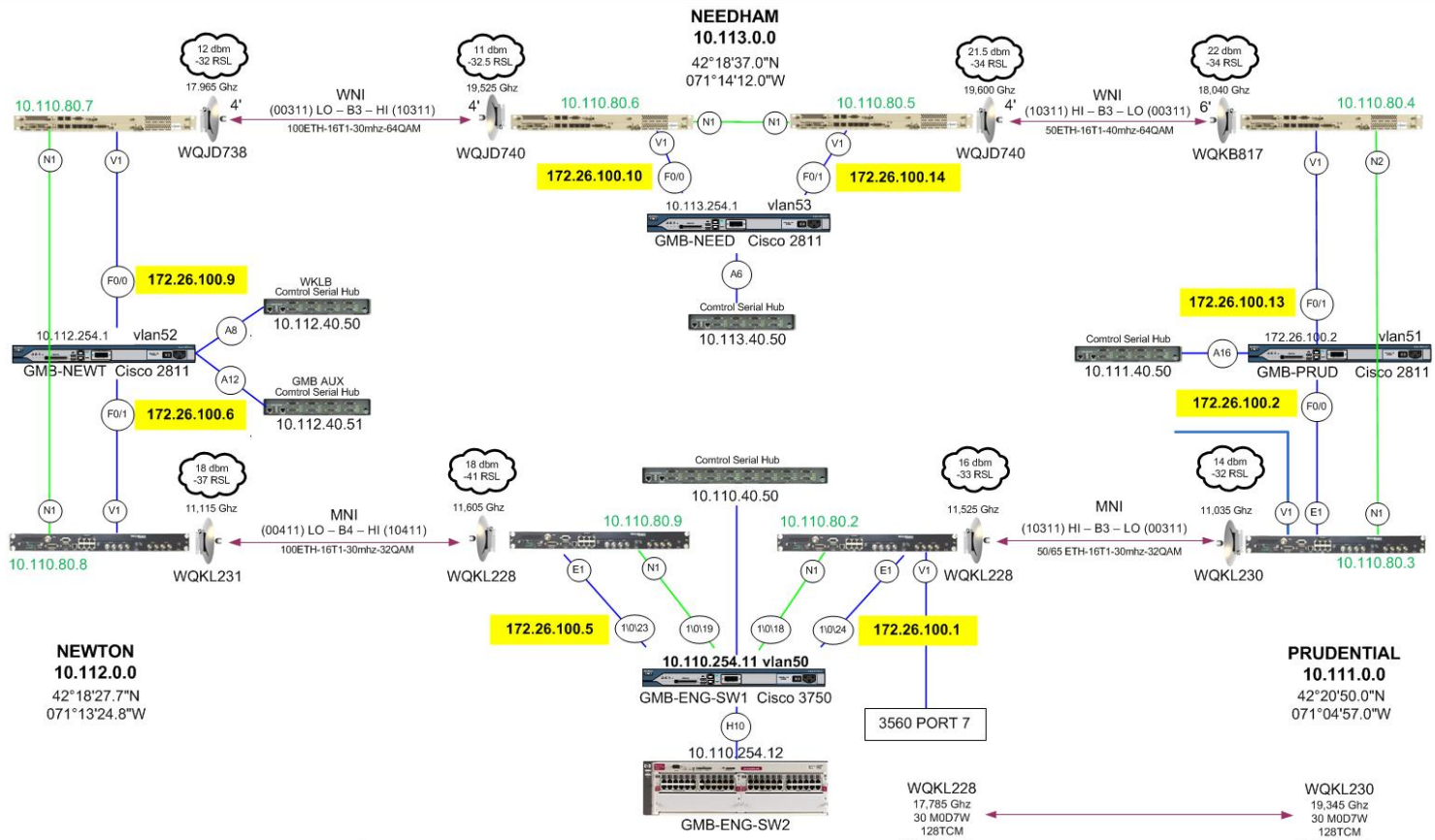
COMB


Light Bright Display Messages



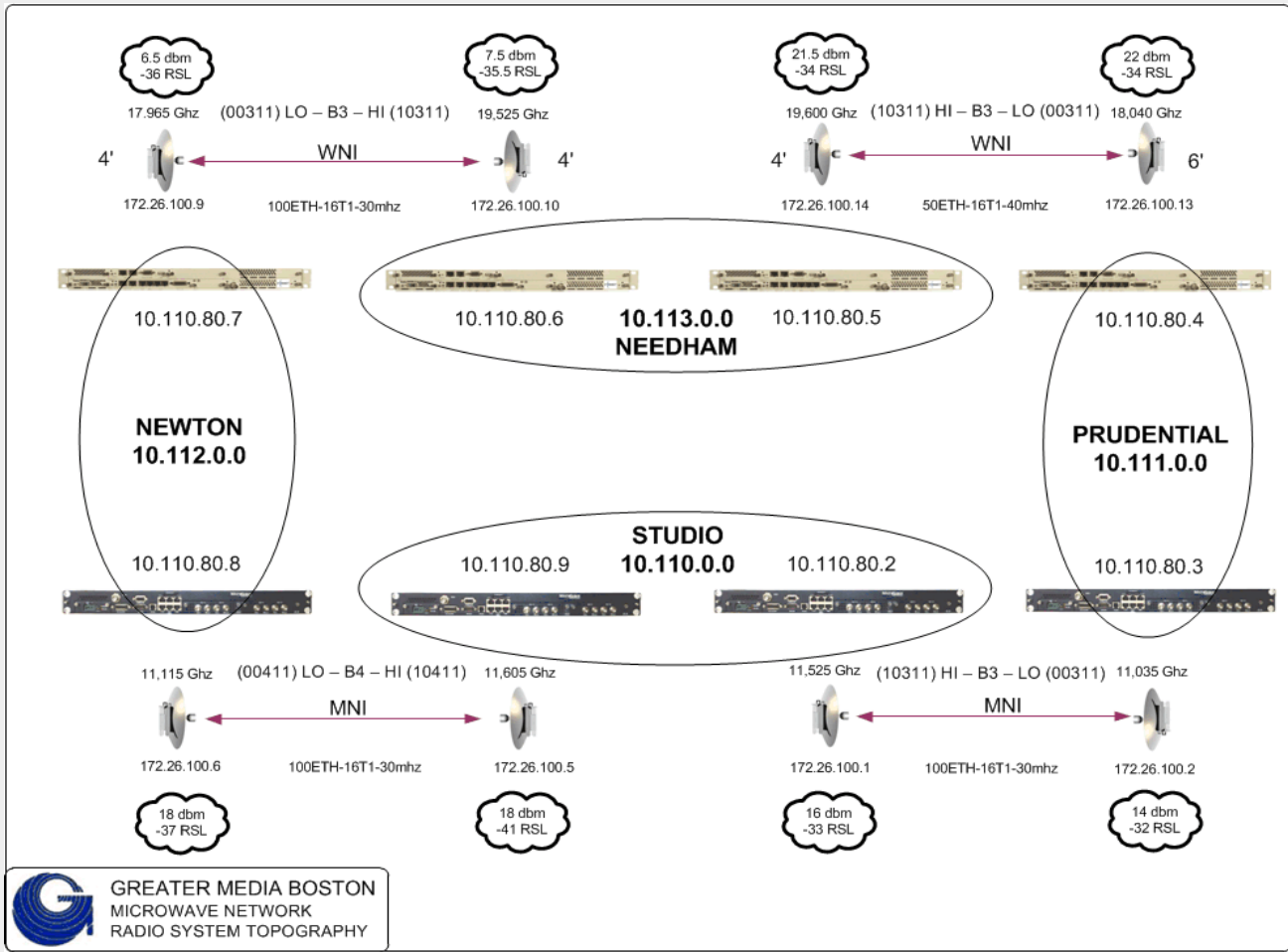
Thank You for your attention!


Questions?



 **GREATER MEDIA BOSTON**
 TRANSMITTER SITE MICROWAVE NETWORK
 DYNAMIC WAN ROUTING, L3 SWITCHING
 NMS NETWORK, SERIAL DATA NETWORK

— Ethernet
 — Microwave
 — NMS



 **GREATER MEDIA BOSTON**
 MICROWAVE NETWORK
 RADIO SYSTEM TOPOGRAPHY

Greater Media PRUDENTIAL TRANSMITTER AUDIO / RF SIGNAL FLOW

