



# How IP Transmitter Monitoring Can Save Time and Money

**This changes everything!**

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## Your Broadcast Challenge:

### Planning for the next 10-20 years

- Competing in an IP broadcast world
- Staying flexible: What about Digital Radio?
- Engineering resources: Doing more with less?
- Putting the web and IP technology to work
- Managing costs, complexity, maintenance
- Staying on top of your remote sites



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## Typical FM or AM Transmitter

- Analog FM Exciter (in many cases)
- Minimal to no IP functionality?
- Digital Upgradeability?
- Basic Remote Control/Monitoring?
- Variable Serviceability/Robustness?
- Parts obsolescence?
- Parts cost?
- Time consumed in servicing?



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**“Not an adequate solution for the next 10-20 years”**

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## What's important?

# Staying on the air!!

- Knowing really what's going on in your transmitter
- PA Efficiency changes, heat sink & PS temps
- Fan RPM
- Logging and alarms + early notification
- More than voice remote control
- Staying on top of your remote sites from anywhere
- What if the audio feed fails?
- In general, doing more with less

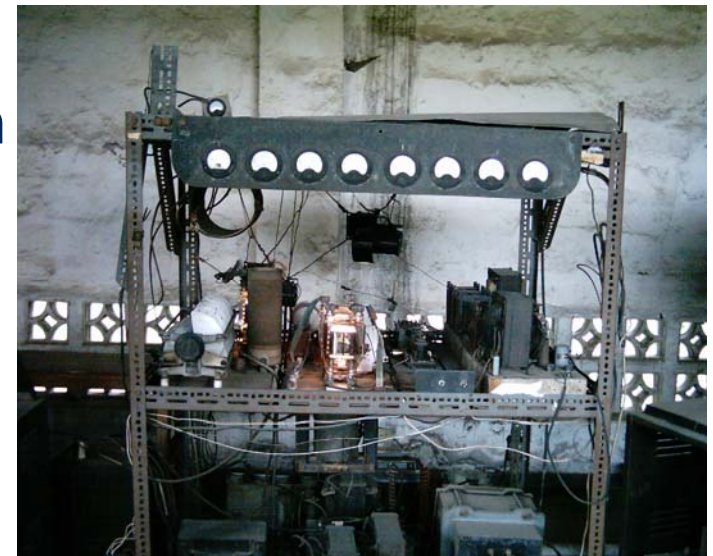


Photo courtesy John Schneider



# Is this you in winter?



Photo courtesy George Pletea - Romania

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# How it was

- FCC Requirements

- Live operators at transmitter facilities
- Meter readings on a regular schedule
- Ensure compliance with FCC rules



- Equipment Checks

- Monitor the equipment visually
- Equipment was less reliable and required more maintenance than the solid state boxes of today

- Engineers were responsible for fewer transmitters

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# How it was

- As transmitters became more reliable
  - Remote control was permitted
  - At first wired to the studio
  - Typically via a dedicated telephone line
  - Later dial-up telephone remotes were allowed



- Cell phones allowed for even more freedom
  - An engineer could monitor and control with limited functionality



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# Tone operated remote control

circa late 1950s

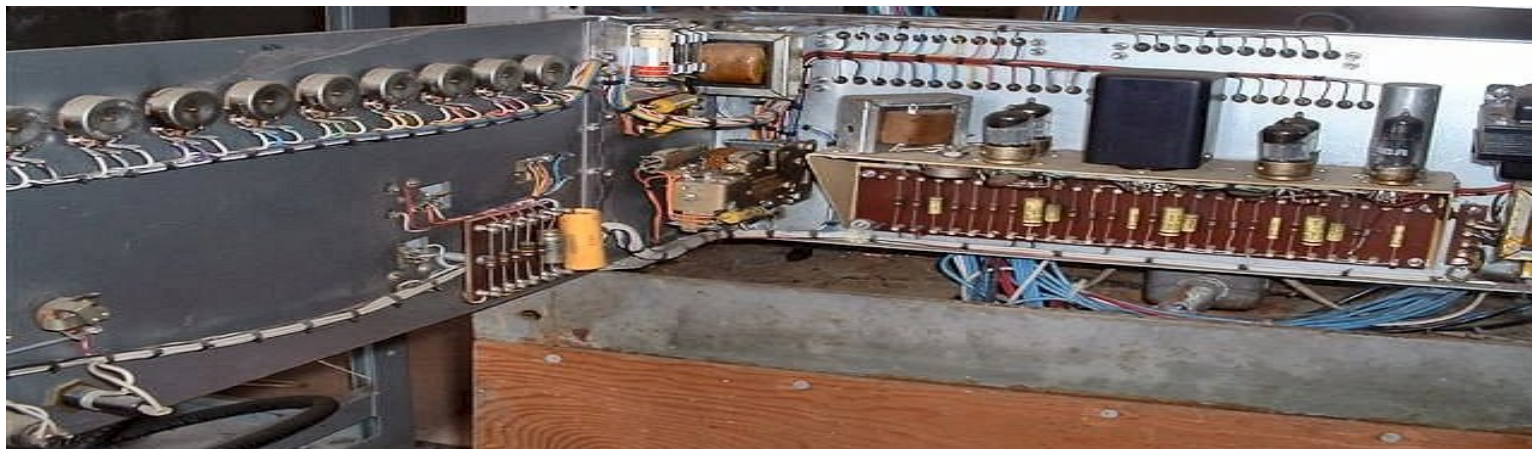


Photo courtesy Barry Mishkind – Oldradio.com  
And Broadcasters Desktop Resource [www.thebdr.net/](http://www.thebdr.net/)

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# How it was

- Did not address the need for
  - Remote maintenance
- Had limited remote diagnostics
  - Told us if the power had moved outside limits or if the building is too hot, etc.
  - But would not provide any significant detail
  - What has failed or what may soon fail?



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# How it was

- Trip to the site (empty handed)
  - Sometimes extremely inconvenient
    - Very long drive
    - Perhaps a helicopter or snow cat is required
  - Discover that a module has failed
  - Or a component needs to be replaced
  - Costly and time consuming “process of elimination” was often used as diagnostic approach
  - Or something else requires our attention that we are not prepared for (lacking the right tool, test equipment, etc.)





# How it was

- After leaving site on initial visit
  - Order the required parts / assembly
  - Or gather the additional tools or test gear
- Travel back to the site to deal with the actual repair

This has been the conventional methodology  
since sites became unmanned

Until the transmitter of today.



# In comes the new

- Internet protocol (IP)
  - Becoming widely available at our transmitter sites
  - Allowing for much more information
- FCC
  - No longer requires that we constantly measure our critical parameters as long as we remain in compliance and have a way to terminate operation.



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# In comes the new

- Smart transmitters
  - The amount of information available on the control panel (remote or local) of a modern transmitter was inconceivable a few years ago.
  - Learn much more about what is occurring inside the transmitter with the in-depth monitoring .
    - We now know the exact power level of the transmitter
    - Not only the output air temperature of the transmitter
    - but the heatsink temperature of critical components
    - Fan speed of every fan
    - More voltages and currents, more parameters monitored.
  - We don't need to interrogate – the system does it
  - Even emergency audio play-out if STL fails



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# Advanced User Interface (AUI) in today's transmitter

- Sophisticated tool available via TCP/IP
- Alarm via email
- Full SNMP capability
- Ability to diagnose problems
- Reset alarms
- Can determine what module, power supply, fan or what part of the transmitter is having an issue or may be starting to have one (elevated heat sink temperature for instance).
- USB Stick (rear panel) configures as FTP for upload of emergency audio and playlist management
- Direct IP feed from SHOUTcast™ stream



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# Advanced user interface (AUI)

- Can go to the site prepared to actually deal with the problem – on the first visit!
- Provides test equipment stations may not own and allows remote interrogation including mask compliance (spectrum analyzer, network analyzer, modulation monitor, etc.)
- Figure how much this test gear would cost if purchase separately – and would it actually be available “on line” remotely?

The screenshot shows a 'Transmitter Log' window with a table of log entries. The table has columns for Device, Alarm, Alarm State, Severity, and Time of Event. The 'Alarm State' column contains icons: a red triangle for warnings and green checkmarks for successful events. The 'Severity' column contains icons: a red exclamation mark for errors and a yellow exclamation mark for warnings. The 'Time of Event' column shows timestamps like '13:40:13 01/21/2009'. Below the table are buttons for 'RF On', 'RF Off', 'Menu', 'Status', 'Logs', 'Erase', 'Reset', and 'Change User'.

Device	Alarm	Alarm State	Severity	Time of Event
Exciter A	Composite Input Low	Warning	Error	13:40:13 01/21/2009
Exciter A	Engine Not Started	Success	Warning	13:40:04 01/21/2009
Exciter A	Failed Exciter	Success	Error	13:40:02 01/21/2009
Exciter A	SWR Outback	Success	Error	13:39:57 01/21/2009
Exciter A	Failed Exciter	Success	Error	13:39:57 01/21/2009
Exciter A	Engine Not Started	Warning	Warning	13:39:57 01/21/2009
Exciter A	SWR Outback	Warning	Error	13:39:57 01/21/2009

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# A real world example

- July 4<sup>th</sup> Holiday, 2009

Nautel CS were performing a maintenance check using the AUI on the tx at KCBC, a Crawford Broadcasting station and noticed a PA alarm.

Emailed Cris Alexander, Director of Engineering at Crawford advising we discovered the problem, diagnosed it as a PA module needed to be swapped out and that we were sending a replacement under warranty.



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# A real world example

*“It's amazing! I had a problem with the NX-50s VSWR protection system. I arranged for Nautel tech support to get VPN access to the transmitter while it was on the air and they found the problem quickly. Then they told me what to adjust and the problem went away. This is a paradigm shift if ever there was one!”*

*KRLD - Erik Disen*



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# AUI showing built-in test equipment



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# Prevention is the keystone

- Diagnosing a problem early can prevent more severe failures later.
- Knowing exactly what went wrong allows the engineer to go to the site fully prepared to affect the repairs.
- Can inform him by deduction, what tools, equipment or even if assistance will be required.





# Prevention is the keystone

- The AUI allows us to know that the transmitter is in compliance with regulatory rules.
- For HD Radio, a built-in spectrum analyzer instantly monitors and demonstrates mask compliance and HD Radio injection levels.
- Constellation views show the integrity of the HD Radio broadcast signal.



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# Prevention is the keystone

- We can monitor the adaptive pre-correction and see what equalization is taking place, graphically.
- We can monitor analog modulation.
- On an AM transmitter we have a real time “Smith Chart” and can know if our antenna load has shifted.



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# AUI – can save your station \$

- Eliminates the need for many thousands of dollars of test equipment.
- All available on the front of the transmitter or from any web browser, in real time, anywhere.
- Being able to check if you are in compliance can eliminate the possibility of costly fines for out-of-tolerance operation.



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# Factory Support

- With proper password authorization, factory support people can diagnose a problem, recommend a solution and if needed, ship parts or modules, or assist in complex configurations.
- Further, we can assist the customer with special configurations and optimization.



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# The reduction in operating costs comes from answering these questions

- How much money could be saved with contract engineers using this tool?
- How many staff hours can be saved?
- How many trips and dollars can be saved over the life of this equipment by cutting the number of trips to the site perhaps in half to solve problems when they do occur?





# AUI Logging

- Keeps track of hundreds of events
- Can be emailed automatically

**Transmitter Log** ✖

**Log Manager**

**104 Matches Sorted by "Time of Event"** Page 1/2

Device	Event	State	Severity	Time of Event	
Controller	Entered Firmware Upgrade		!!!	16:10:45 02/18/2010	
Controller	Rebooted Exciter		!!!	16:10:45 02/18/2010	
Controller	Entered Firmware Upgrade		!!!	16:10:45 02/18/2010	
Controller	TX_ACTIVE_PRESET_CHECKSUM_FAIL		!!!	16:10:45 02/18/2010	
Controller	TX_ACTIVE_PRESET_CHECKSUM_FAIL		!!!	16:02:27 02/18/2010	
Controller	+1.8V Supply Fail		!!!	15:59:05 02/18/2010	
Controller	+1.8V Supply Fail		!!!	15:58:06 02/18/2010	
Controller	Rebooted Exciter		!!!	15:37:34 02/18/2010	

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# AUI: Easy Troubleshooting

**Date & Time**  
Fri Mar 30 2012  
13:41:06

**Active Preset: Preset 1**

Power	<b>50.2 W</b>		
Analog			
Set Point	50.0 W	Mode	FM
Reflected	0.04 W	Frequency	95.3MHz

**Exciter**  
Active Exciter : Internal  
FM Modulation: 0% 100% +Pk:8 160%

**Controller** (Firmware Version: 1.0.0.62)

**Meters**

Local/Remote	Remote	PA 1 Current	4.20 A	+1.8V Supply	1.79 V	Total PA Current	4.19 A
RF On/Off	On	Heatsink Temperature	28.7 °C	+1.2V Supply	1.20 V	TX_DC_POWER_IN	71.2 W
Forward Power	50.2 W	+48V Supply	48.3 V	Backup Battery	3.08 V	DC-RF Efficiency	70.4 %
Reflected Power	0.04 W	+15V Supply	15.7 V	Fan 1 RPM	6572 rpm	TX_AVERAGE_PA_VOLTS	17.0 %
PA Volts A	17.2 V	-15V Supply	-15.3 V	VSWR	1.06	TX_PA_BIAS_1	0.00 V
Preamp Current	0.30 A	+5V Supply	5.02 V	IPA Power	0.00 W	TX_PREAMP_BIAS	2882 V
Total IPA Current	0.00 A	+3.3V Supply	3.27 V	TX_PS_CURRENT_A	4.19		

**Alarms**

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# Questions?

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**We're ready to help.**



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