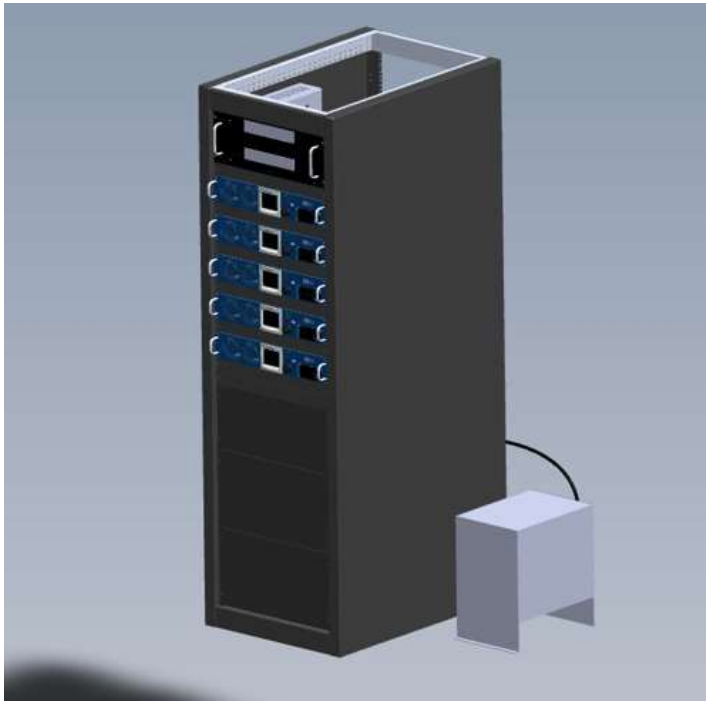

Post NAB 2024

Nautel N+1 Solutions



N+1 System



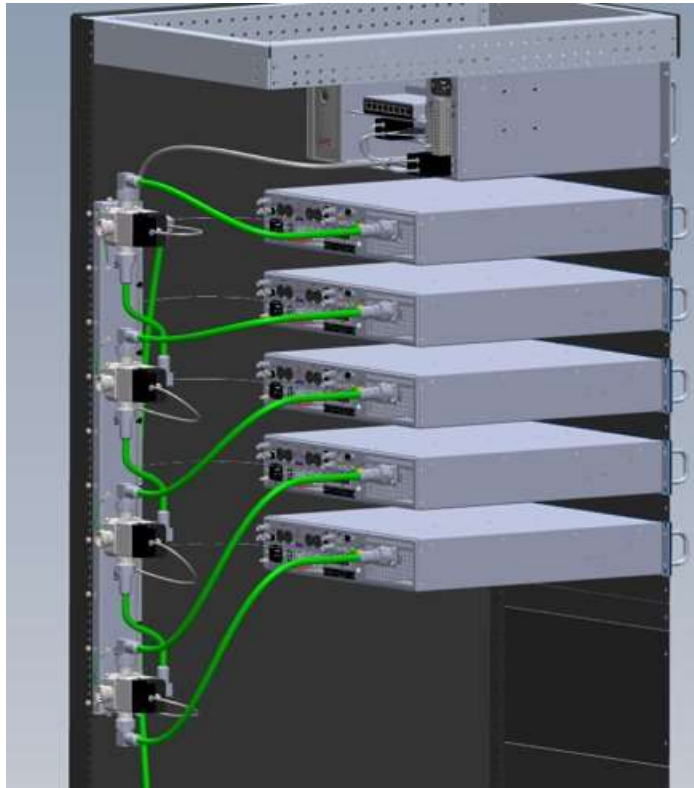
- Used by FM broadcasters to allow a single transmitter to back up multiple (N) main transmitters.
- Comprises:
 - N main transmitters
 - Standby transmitter
 - N+1 coaxial switch matrix
 - Test Load
 - Program Router
 - N+1 Controller

Transmitters

- Main transmitters should be of the same product family (eg Nautel Vx, GV, NVLT)
 - Main transmitters need not all be the same nameplate power, but often are.
- Standby transmitter should be of same product family as main transmitters
 - Standby transmitter nameplate power sufficient to allow adequate back up of any main transmitter
- Required transmitter interfaces:
 - interlock connection
 - ethernet (SNMP)



Coaxial Switch Matrix



- N coaxial switches are required with interconnecting coaxial cables.
- When the system is running normally, all coaxial switches are in position 1.
 - each main transmitter is routed to its antenna port.
 - standby transmitter is routed thru each switch to the test load port
- When a transfer occurs, the switch associated with the main transmitter is set to position 2.
 - The main transmitter is routed to the test load port
 - The standby transmitter is routed to the antenna port associated with the transferred main transmitter
 - The standby transmitter preset is set to duplicate the power, frequency and program of the failed main transmitter
 - The program router applies the program of the failed main transmitter to the standby transmitter

Test Load

- A suitably rated test load is required by the system
- The test load is used for off-air testing of either the standby transmitter or the transferred main transmitter
- The N+1 controller requires a closed contact (test load interlock) when it is safe to apply RF power to the test load, in order to enable the off-air transmitter



Program Router

- A passive program router is provided as part of the system to route the correct program to the standby transmitter when it is operating as a backup to a transferred main transmitter.
 - The position of the router is controlled by the N+1 controller and monitored to insure it is in the correct position
 - A single router requires that all the main transmitters use the same program format (eg AES, Analog L/R, MPX)
- For systems where the main transmitters do not all use the same program format (or if multiple formats are used on the same transmitter (eg AES, RDS)), a separate router is required for each unique format.
 - The N+1 controller router position control relays will drive all routers
 - Position monitoring of all routers is not available.



N+1 Controller

- The SC4 (Nautel badged Davicom Cortex 320) forms the heart of the N+1 Controller.
 - Integral web server, SNMP manager, and configuration and workspace development environment
 - Remote user interface via web page
 - Control and monitoring of multiple SNMP devices (Nautel transmitters, other devices)
 - Multiple password protected user accounts with customizable access rights
 - Events logging
 - Physical I/O
 - 16 Metering inputs
 - 4 digital status inputs
 - 6 control relays
 - USB (modbus) interface allows expansion of physical I/O
 - Expandable N-value:
 - Baseline systems up to 4+1
 - Up to 8+1 (with expansion I/O modules)
 - UPS backup for up to 30 minutes of operation



4+1 Web Dashboard

The dashboard displays the following transmitter and standby preset information:

Transmitter/Preset	Power	RF Frequency	Status	Alarms
TRANSMITTER A	0 W	101.10 MHz	RF ON, ONLINE, REMOTE	FORWARD POWER, SWR FOLDBACK, INTERLOCK
TRANSMITTER B	230 W	102.10 MHz	RF ON, ONLINE, REMOTE	FORWARD POWER, SWR FOLDBACK, INTERLOCK
TRANSMITTER C	240 W	103.10 MHz	RF ON, ONLINE, REMOTE	FORWARD POWER, SWR FOLDBACK, INTERLOCK
TRANSMITTER D	140 W	104.10 MHz	RF ON, ONLINE, REMOTE	FORWARD POWER, SWR FOLDBACK, INTERLOCK
STANDBY PRESET: 1	220 W	101.10 MHz	RF ON, ONLINE, REMOTE	TRANSFER INHIBIT, SWR FOLDBACK, INTERLOCK

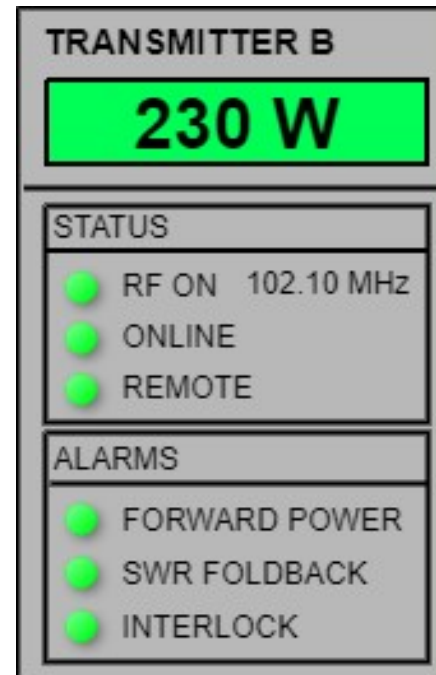
Control and System Status panels:

TRANSFER CONTROL/STATUS		SYSTEM STATUS	
ACTIVE MODE	TRANSFER A	SYSTEM INTERLOCK	SWITCH 1
SET OPERATING MODE	Transfer A, Transfer B, Transfer C, Transfer D	SWITCH CONTROL DC POWER	SWITCH 2
AUTO TRANSFER	Enable, Disable	AC POWER	SWITCH 3
PRIORITY TRANSFER	Enable, Disable	STANDBY PRESET	SWITCH 4
OFF-AIR TEST	On, Off	PROGRAM ROUTER	AUTO TRANSFER



Main Transmitter

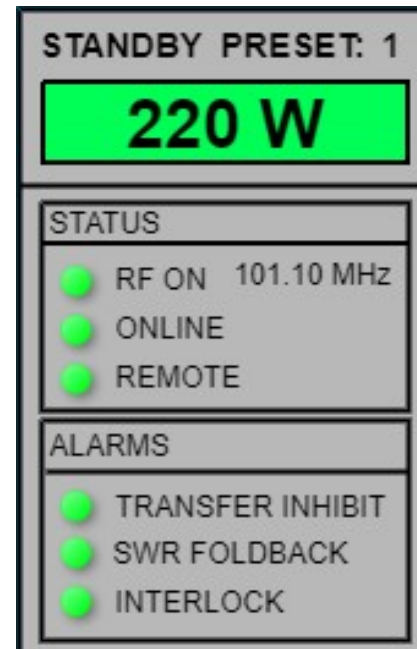
- Main Transmitter monitoring
 - SNMP Communication (online)
 - RF On
 - Remote
 - Fwd Power
 - SWR Foldback
 - Use of color coding to indicate normal/abnormal conditions



Standby Transmitter

- Standby Transmitter Monitoring

- SNMP Communication (online)
- RF On
- Remote
- Transfer Inhibit
- SWR Foldback
- Frequency (display only)
- Active Preset
 - Preset 1 duplicates transmitter A settings
 - Preset 2 duplicates transmitter B settings
 - etc
- Use of color coding to indicate normal/abnormal conditions



System Monitoring

- System Monitoring
 - System Interlock
 - Switch DC Supply
 - AC Power
 - Standby Preset
 - Program Router
 - Transfer switch status
 - Auto Transfer

SYSTEM STATUS	
● SYSTEM INTERLOCK	● SWITCH 1
● SWITCH CONTROL DC POWER	● SWITCH 2
● AC POWER	● SWITCH 3
● STANDBY PRESET	● SWITCH 4
● PROGRAM ROUTER	● AUTO TRANSFER



Transfer Triggers

	THRESHOLD (W)		DELAY (s)	
TRANSMITTER A	205	SET	8	SET
TRANSMITTER B	205	SET	10	SET
TRANSMITTER C	205	SET	12	SET
TRANSMITTER D	135	SET	14	SET

- Main Transmitter RF Power below threshold
 - Individually adjustable threshold
 - Individually adjustable delay
 - SNMP polling latency will add ~1sec to programmed delay
- Main Transmitter Offline
 - Detected by loss of SNMP communication
 - Detection speed ~10sec



Transfer Inhibits

- Main Transmitter RF Off
- Main Transmitter not in Remote
- Main Transmitter SWR Foldback
- Standby Transmitter RF Off
- Standby Transmitter not in Remote
- Standby Transmitter Offline
- System Interlock Open
- Transfer Switch Fault
- Transfer Switch DC Power Fault
- SC4 Boot flag (remains inhibited for 30 seconds after flag clears)
- AC Power Fail (remains inhibited for 2minutes following restoration of AC power)



Transfer Control/Status

TRANSFER CONTROL/STATUS					
ACTIVE MODE	NORMAL				
SET OPERATING MODE	Normal	Transfer A	Transfer B	Transfer C	Transfer D
AUTO TRANSFER	ENABLED	Enable	Disable		
PRIORITY TRANSFER	ENABLED	Enable	Disable		
OFF-AIR TEST	OFF	On	Off		

- System Controls

- Set Operating Mode (Normal, Transfer A, Transfer B...Transfer X)
- Enable/Disable Auto Transfer
 - When Normal operating mode is selected Auto Transfer will be enabled automatically
 - If Transfer X is selected manually, Auto Transfer is disabled
- Enable/Disable Priority Transfer
- Off-Air Test On/Off
 - Used to operate the standby or transferred main transmitter into a test load for troubleshooting/maintenance.
 - If the system has Auto Transfer enabled and an Auto Transfer is triggered while Off-Air test is on, the Off-Air test will be cancelled to allow the transfer to complete.



Priority Transfer

- Priority Transfer

- When enabled the first main transmitter in the system has priority and then the next and so on.

- For a 4+1 system, Transmitter A has highest priority then Transmitter B, then C and then D
- Priority Transfer Example

- System operating in Normal mode with Priority Transfer Enabled

- » Transmitter D fails. The N+1 controller will transfer D to the test load and route the standby transmitter to the D antenna, and configure the standby transmitter for the D frequency, power and program
- » Next transmitter C fails. The N+1 controller will transfer C to the test load and route the standby transmitter to the C antenna, and configure the standby transmitter for the C frequency, power and program. Transmitter D will be placed back on air.
- » Next transmitter B fails. The N+1 controller will transfer B to the test load and route the standby transmitter to the B antenna, and configure the standby transmitter for the B frequency, power and program. Transmitter C will be placed back on air.
- » Next transmitter A fails. The N+1 controller will transfer A to the test load and route the standby transmitter to the A antenna, and configure the standby transmitter for the A frequency, power and program. Transmitter B will be placed back on air.
- » No further automatic transfers will occur, until the system is re-armed (set to Normal).

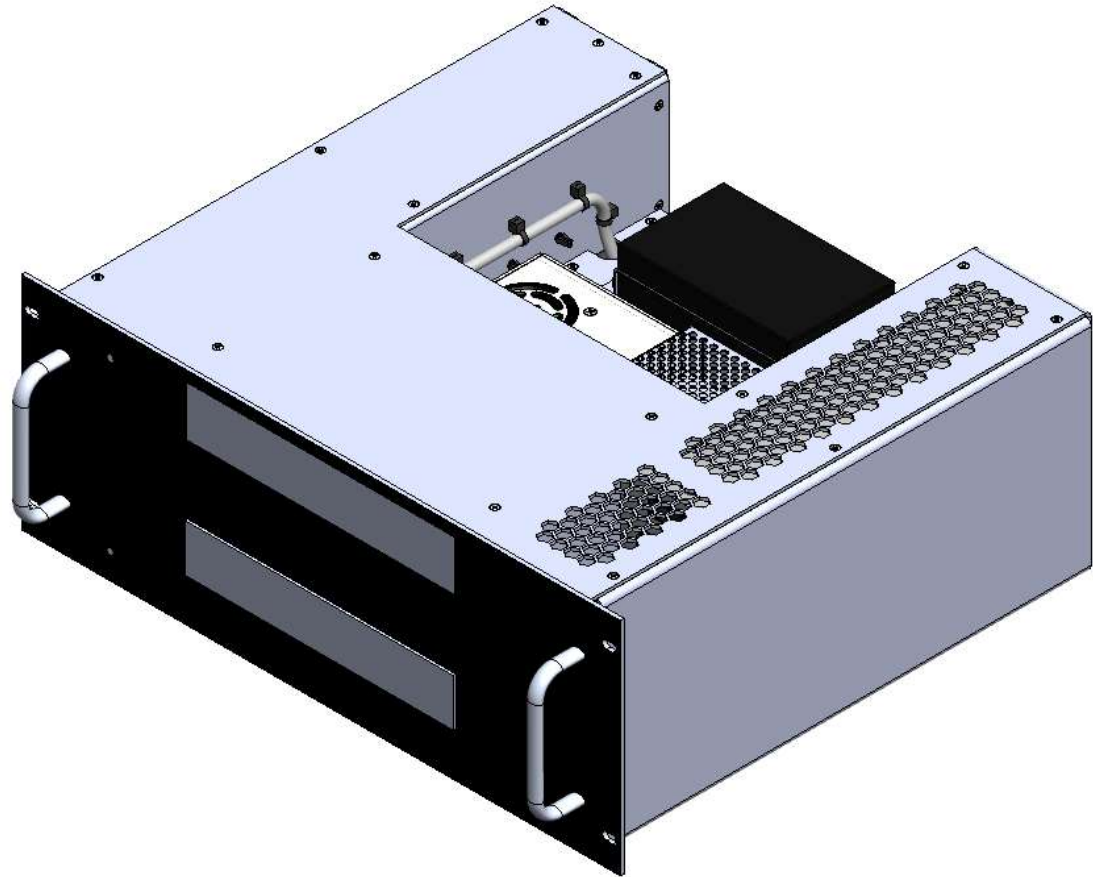
- When disabled the first failed transmitter is backed up (first come, first served)

- No further automatic transfers will occur, until the system is re-armed (set to Normal).



Physical Details

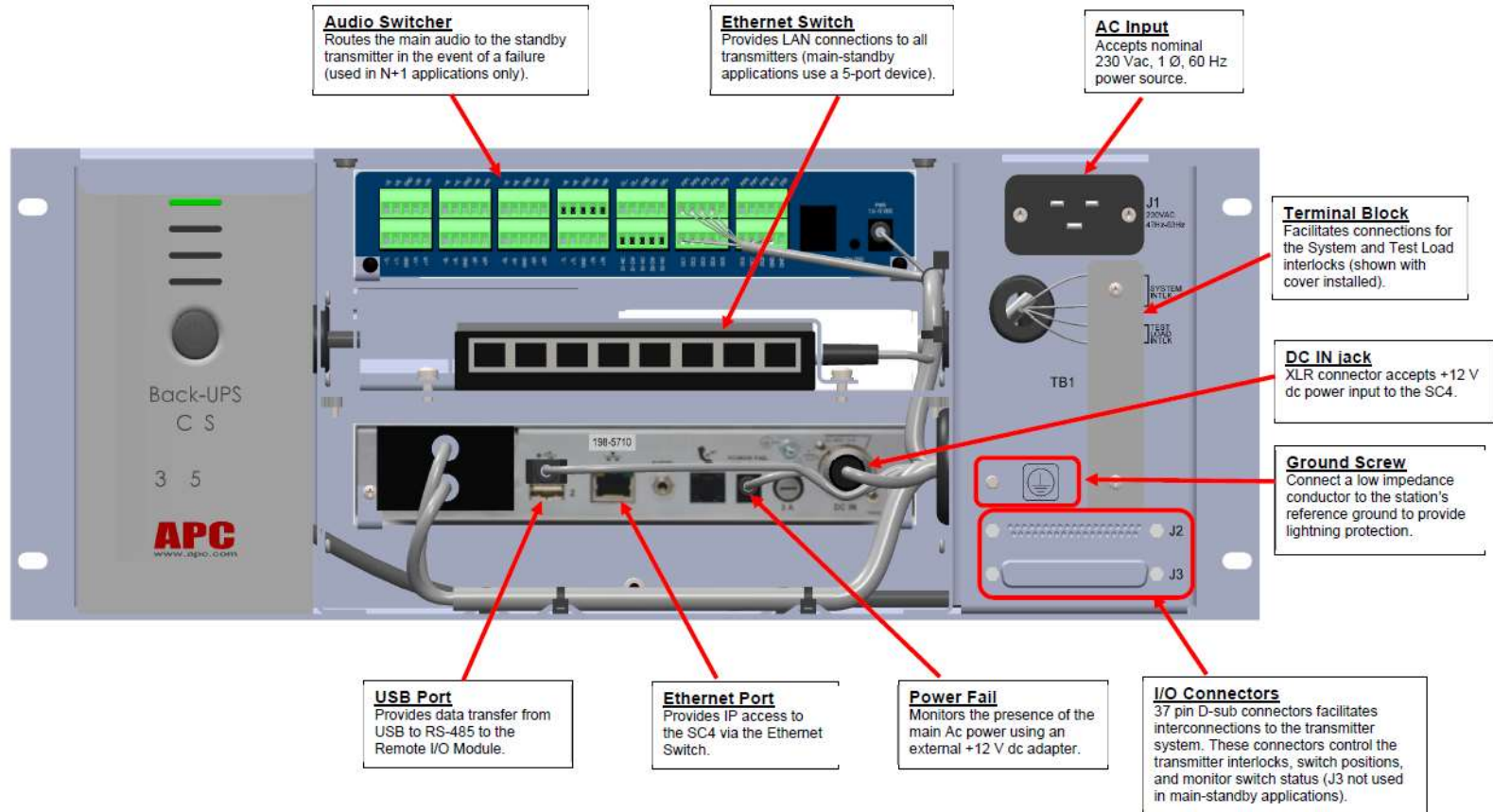
- 19" Rack Mount (4U)
- 16.9" deep



Front View



Rear View



Thank you

