INSTRUCTION MANUAL

CONVENTIONAL SIMULCAST SYSTEM OVERVIEW

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ERICSSON

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FIGURES

NOTICE!

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user’s authority to operate the equipment in addition to the manufacturer’s warranty.

NOTICE!

CONVENTIONAL SIMULCAST SYSTEM OVERVIEW

The Conventional Simulcast System enhances communications in areas where the size of the coverage area is too large and/or the communications paths are blocked or hindered by irregular terrain or other obstacles to be reliably serviced by a single site system. When these conditions exist and the talk out coverage is inadequate, the need for a simulcast system is indicated. It is also advantageous in areas where available frequencies are limited since it utilizes the same set of frequencies at each site. All transmissions are system wide; i.e., messages are transmitted simultaneously from all sites on the same RF frequency.

A typical simulcast system includes a Control Point and two or more Transmit Sites. The Transmit Sites are located so that two way communications are possible anywhere in a specified area. The Control Point exercises control over all Transmit Sites. All outbound call transmissions are initiated from the Control Point and all inbound calls from mobiles or portables are received at one or more of the Transmit Sites and routed to the Control Point for processing. These signals from all the Transmit sites are compared and the signal with the best audio quality is voted as the one to be equalized and delayed before being sent to all sites to be repeated outbound to the mobiles and portables.

CAPTURE/NON-CAPTURE ZONES

Since all transmitters for a channel operate on the same frequency at all sites, one may question the quality of communications received in the coverage area due to the arrival, at different times, of two or more signals from the transmitter sites. When the receivers, mobile or portable, are near a transmitter, the receiver is captured by the strong local signal while signals from all other transmitters are blocked out. In other areas where two or more signals are received, neither one may be strong enough to capture the receiver. These identifiable areas are known as "non-capture" or "overlap" zones.

The "capture" zone is defined as the area in which the carrier level of one transmitter exceeds the second by approximately 8 dB. In this area, the mobile receiver will lock onto the stronger signal to the complete or nearly complete exclusion of the weaker signal. This area is known as the "capture" zone and provides the best audio quality in the system. See Figure 1.

In the "non-capture" or "overlap" zone, the mobile receiver accepts two or more signals. These signals mix randomly producing stronger or weaker signals. If the power level difference between the received carrier signals is less than 6 dB with voice modulation, audio intermodulation and

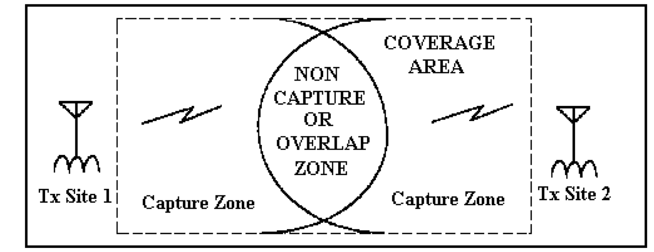


Figure 1. Radio Coverage Area

distortion may occur. This distortion is evident by a crackling and popping sound heard over the speaker. Audio distortion increases to a maximum when the received carrier signals are equal. Good communication in these areas is maintained by precision system equalization.

System equalization assures that the received carrier signals do not detract from one another in the overlap zone but instead reinforce one another. The transmitter audio from each carrier signal must be delay equalized to minimize the crackle and pop heard in the receiving radio.

LONG TERM SYSTEM STABILITY

The RF carrier frequency for each channel is typically maintained within 1 Hz of the frequency of all other transmitters in the simulcast system to minimize distortion due to heterodyning frequencies. To achieve this ultra high level of performance, the reference oscillator at each transmitter is locked onto a 60 kHz reference signal transmitted by WWVB. To ensure reliability, redundant WWVB receivers with individual ferrite loop antennas are connected to a distribution amplifier.

The accuracy of the 10 MHz oscillator, when locked to WWVB, is typically held within 0.01 Hz. During periods of short fades, the oscillator is held on the last frequency setting with a typical aging of plus or minus 3×10^{-10} per day.

NOTE

The frequency at each transmitter site drifts in the same direction and typically at the same rate and same time. Thus the important frequency drift differential remains very small, even with the loss of the 60 kHz reference signal.

SYSTEM EQUALIZATION

The Conventional Simulcast System provides equalization of the audio amplitude and phase of the transmitted message in order to achieve high quality communications. The audio amplitude and phase responses are matched. By precisely matching the analog voice from each site, the receiving mobile unit in the overlap zone will consistently hear good quality clear audio.

SYSTEM INTERFACE REQUIREMENTS

In addition to the simulcast and related peripheral equipment provided, audio lines must be installed to complete the voice paths to/from the multiplex equipment, the voter/simulcast equipment, and the console. The number of 4-wire E & M voice channels required between the Transmit Site and the Control Point is equal to the total number of channels plus an additional one per site when Channel Guard is required. To assure a high quality simulcast system the audio lines must meet the Bell System Specification for 3002 grade levels and be routed over a phase stable network.

A digital multiplex/microwave system is strongly recommended. If an analog multiplex system is employed, it must incorporate a "phase stable"/simulcast phase locked system.

Telephone lines are generally not acceptable for routing signals between the Transmitter Site and the Control Point.

Simulcast Support Equipment

- Multiplex/microwave - Digital or Analog Multiplex System. Digital is preferred. Channel requirements as indicated above.
- Antenna System for WWVB receivers, if used. RG-58 feed may be used.

STANDARD SYSTEM CONFIGURATIONS

The Conventional Simulcast System is available in three standard configurations that can be tailored to meet specific customer requirements. All systems are built to one of the following configurations with sites and/or channels omitted when design requirements fall between configuration intervals. The current Control Point standard configurations are:

1 Channel - up to 10 Sites - Requires 1 Cabinet/Rack plus Test Equipment

2 Channel - up to 10 Sites - Requires 2 Cabinet/Rack plus Test Equipment

4 Channel - up to 10 Sites - Requires 3 Cabinet/Rack plus Test Equipment

Figure 2 shows a typical rack-up of the Control Point equipment for a 2 Channel System with up to 10 Sites. Equipment rack ups, block diagrams and interconnect diagrams are shown at the end of this manual.

All of the voting equipment, analog processing equipment, analog delay equipment and console interface circuits are located at the Control Point. The dispatch console may be located at another site or it may be co-located at the Control Point. Figure 2 does not show any Console equipment other than the Interface board. When Channel Guard (CG) is required, the master and standby oscillators are located at the Control Point as shown in the Figure.

Transmit Site equipment configurations are based on the number of RF channels. The Transmit Site configuration is the same as for multiracking of MASTR III conventional stations except for the addition of the WWVB reference oscillator (one per site), an EDACS Interface Panel and audio bridge shelf for distribution of CG (one of each for each cabinet/rack), and a CG Demodulator circuit card for each MASTR III. The demodulator card is a plug in card that is installed on the MASTR III control shelf. The Tx Combiner and Rx Multicoupler are housed in a separate cabinet or rack.

Transmit site equipment is housed in either 69” or 83” cabinets. The Control Point equipment is housed in either 83” deep cabinets or 86-inch deep open relay racks (19-inch). Each rack is configured to meet customer system requirements with capability for cabinet to cabinet electrical interconnection by overhead cabling.

SYSTEM DESCRIPTION

A typical simulcast system includes equipment that is divided into two main functional areas: Control Point and Transmit Site. The Control Point is linked to each of the remote Transmit Sites by microwave or fiber optic cable through multiplex equipment located at the Control Point and the Transmit Sites. A typical functional diagram of a two site simulcast system is shown in Figure 3 (Multiplex and the transmission equipment not shown). Figure 3 shows typical routing of signals for a single conventional simulcast channel with two remote sites and a Dispatch Console.

Receive signals from the remote sites are routed to the Analog Voting equipment which selects a signal that is based on the best audio quality. The selected signal or voted audio is processed (amplitude equalized & delayed) before being routed to all the remote Transmitters.

Voted audio and CG for each Transmit Site is individually time delayed by audio delay circuits at the Control Point to compensate for the differences in distance from the Control Point to the specific Transmit Site. The delayed signals are fed to the multiplexer for transmission to all simulcast transmitters.

CONTROL POINT

The functions provided by equipment located at the Control Point include system interface, audio processing, Channel Guard processing, transmit keying for the remote sites, system alignment and system test . The Control Point equipment interfaces with the dispatch console by accepting the standard control sequence (2175 Hz + function tone) via a 4 wire connection. When the 2175 Hz tone is received by the simulcast equipment from the console, the voted audio is blocked and console audio is transmitted on the selected channel.

Analog Voting Equipment

Receive Audio signals from each of the MASTR III repeaters are compared in the voting selector where the signal with the best audio quality is selected as the “voted” signal. The voting selector provides continuous voting to ensure that the best available signal is being provided to the system for the repeat operation. Voted audio is routed from the voter to the Audio Signal Processing equipment.

Remote Keying Panel

The Remote Keying Panel (RKP) which is part of the voting equipment generates a Transmit PTT signal when the voted signal is first detected and remains until the signal ceases. The PTT signal is routed to the Transmit Site via the E & M Keying of the multiplex channel card. Additionally, a Transmit PTT signal is generated by the RKP when an input is received from a dispatch console. When a 2175 Hz transmit tone is detected by the Console Interface Board, the RKP generates a Transmit PTT signal as long as the 2175 Hz hold tone is present.

When both voted audio and console audio are present at the same time, only the console audio is passed on to the remote sites and voted audio is inhibited. When the console transmission ends, the voted audio transmission resumes. This is the console override function that allows a dispatch console operator to have priority over one of the field units.

Analog Processing Equipment

Voice channel inputs are received from the Transmit Sites via the analog voter or from the Dispatch Console and passed to the compressor located in the analog processing shelf.

The signal (either voted audio or console audio) is first processed by the compressor and amplitude/phase equalizer. The Compressor, Audio Bridge and Equalizer boards are located in the Processing Shelf. The absolute delay is then provided by a digitally controlled analog delay unit which is accomplished by circuit cards in the Delay Shelf. The relative phase between audio signals transmitted from different transmitter sites (on the same channel) is maintained within 25 degrees between 600 and 2600 Hz. The typical targeted adjustment values will be the same as the resolution of the phase measuring instruments; i.e., approximately 10 degrees in the same audio range. The relative audio amplitude response will be within 0.25 dB from 400 to 3000 Hz.

Compressor (Audio Processing Shelf)

The compressor combines continuously adjustable linear gain with linear level limiting to provide a low distortion compressed voice frequency signal. The gain is adjustable within the range of 0 to 20 dB, with a maximum output level of +17 dBm.

A front panel adjustment allows the output signal to be set to any level between -30 and +17 dBm, with up to 30 dB gain. Compression is linear, resulting in less than 2% total distortion at 30 dB compression.

Audio Bridge (Audio Processing Shelf)

The audio bridge serves as a signal splitter to provide a separate buffered audio source for each site on a given channel. Its gain has been chosen so that the per site equalizer which follows operates well within the level adjustment range. A single audio bridge provides audio bridging of up to 10 single ended outputs. The output of the audio bridge is passed to the audio equalizer.

Audio Equalizer (Audio Processing Shelf)

The audio equalizer, also located in the analog processing shelf, provides precisely controlled amplitude and phase equalization for one voice circuit. The amplitude equalization circuitry is switch-optioned for flat response.

Phase equalization is provided by 13 individual delay sections, providing up to 1500 microseconds of continuously adjustable delay at equally spaced frequencies across the voice band. Delay may be adjusted at 200 Hz intervals from 600 to 3000 Hz. To eliminate frequency response fluctuations, up to 6 dB of inband amplitude ripple equalization is available at each of the 13 delay sections.

The equalizer also provides flat adjustable insertion gain from -15 to +15 dB to coordinate the module output level with a variety of input levels. The maximum output level of the module is +5 dBm. The terminating impedance at the module input and output ports is 600 ohms balanced. The equalized voice/analog output is then passed to the audio delay board.

Analog Delay (Delay Shelf)

The analog delay board delays all analog signals received for transmission to the Transmit Site by an amount corresponding to its distance from the Control Point. Each analog delay board delays the audio signals for one specific transmitter. This ensures simultaneous arrival of the audio signals in the simulcast "overlap" region.

The amount of audio delay provided to the analog signals is determined by the setting of two pairs of dip switches on the audio board; one pair (S1 & S2) sets the delay for the primary audio path and the other pair (S3 & S4) sets the delay for the secondary path. The primary path is normally used while the secondary path is used in loop microwave system configurations. The delay is provided in increments of 1 microsecond with a maximum delay of 32 milliseconds. Delay is provided for up to 13 audio inputs. Analog delay boards are used only at the Control Point.

Channel Guard Modulator

When the system requires CTCSS, an optional Channel Guard (CG) modulator is included as part of the control point equipment. In order to adjust for different signal paths through out the Conventional Simulcast System a single CG oscillator generates the CG tone for the entire system which is then distributed to each remote site. The CG tone is distributed through out the system as modulation on an 1800 Hz carrier. At each remote site the CG modulation is stripped from the 1800 Hz carrier and applied to the MASTR III repeater. At the control point the CG signal is routed through the same absolute delay as the voted audio signals.

The Channel Guard Modulator consists of a Master Tone Board, a Hot Standby Tone Board and a Control Board that detects any failure in the Master Board and switches to the Standby Board. The three boards are mounted in a 2 rack unit shelf.

The test equipment rack provides the means to test, troubleshoot and align a simulcast system. It contains the control panels, digital storage scope, signal analyzer, equalizer test panel, alignment/test radio, balun panel, variable delay panels, transmission test set, and power supply.

Test Equipment

The test equipment rack provides the means to test, troubleshoot and align a simulcast system. It contains the control panels, digital storage scope, signal analyzer, equalizer test panel, alignment/test radio, balun panel, variable delay panels, transmission test set, and power supply. System alignment and test functions may be completed from the control point using equipment in the Test Equipment rack and the PTT Control Panel. A control panel, consisting of (75) 3-position switches, controls the PTT function for ten sites for each channel. These switches allow individual transmitters to be operated in order to adjust delay and gain for each path. Other test equipment is used to view the operation of each channel at each site and adjust the amplitude and delay for best system operation. Jackfield access is also provided to the transmit and receive audio circuits for alignment, test and routine troubleshooting.

Tone Decoder Shelf

A RPTR ON/OFF function allows the dispatch console operator to inhibit repeating of the voted audio so that the only open communication path is to/from the dispatch console. The RPTR ON/OFF function is provided by an optional 1 RU Tone Decoder shelf at the Control Point that receives a standard Tone Control Sequence from the dispatch console and provides a latched output to the repeater ON/OFF control of the RKP. A Tone Control Sequence, which includes a function tone of either 1950 Hz and 1850 Hz, may be used to latch the Repeat function ON or OFF.

TRANSMIT SITE

The Transmit Site completes the radio communications path between the Control Point and the radio operator. The MASTR III Repeaters operate as remote repeaters in which the voted audio signal is repeated at all sites. The MASTR III repeater at each Transmit site accepts the voice and CG signals from the Control Point and transmits them on to the mobiles and portables. Signals received by the repeater from mobiles and portables are routed back to the control point to provide an input to the voting selector.

Equipment located at the Transmit Site includes the MASTR III repeater cabinet, Hi Stability reference oscillator and the RF equipment. The communications link between the Control Point and the Transmit Site may be completed by microwave or fiber optics.

MASTR III Repeater Cabinet

The MASTR III Repeater Cabinet includes the Conventional MASTR III repeater/s, an EDACS Interface Panel (which is routinely installed with EDACS MASTR III repeaters but not usually installed with conventional MASTR III repeaters) and an Audio Bridge Panel used for distribution of Channel Guard. Voted audio and Channel Guard signals from the control point are routed to the transmit site along with the PTT control where they are applied as inputs to the EDACS Interface Panel. Transmit and Receive Audio are connected from the EDACS Interface Panel to the MASTR III Repeater standard connection point TB101. Transmit PTT is connected separately from the EDACS Interface Panel to the Remote PTT input of the MASTR III Repeater.

The Channel Guard (CG) input is connected from the EDACS Interface Panel either directly to the J5 connector on the MASTR III Repeater backplane (single channel site) or to a second EDACS Interface Module on the EDACS Interface Panel (multichannel site). The second EDACS Interface Module provides a connection point to route a single CG input to an Audio Bridge and from the Audio Bridge output to each MASTR III Repeater. Interconnection of the EDACS Interface Panel, MASTR III Repeaters and the Audio Bridge Panel are shown in the Transmit Site Repeater Interconnection Diagram of Figure 4. Figure 5 is the wiring diagram of the Audio Bridge which shows how the CG signal is routed through the bridge.

A plug in CG Demodulator board (part of CG option) for the MASTR III shelf provides the CG demodulation. The CG Demodulator Board provides the functions of receiving the 1800 Hz signal at the remote site, removing the CG Modulation from the 1800 Hz carrier and providing an alarm in the event that the 1800 Hz carrier is lost. Internal programming of the MASTR III Repeaters allows the MASTR III Repeater to accept the CG provided by the Control Point as long as the 1800 Hz carrier is detected by the CG Demodulator Board. When the 1800 Hz carrier is lost (and CG from the Control Point), the MASTR III is programmed to transmit with internally generated CG. Mobiles and portables in all the coverage area will still have CG Encode although the CG signals are not phase locked and operation will be degraded in overlap areas.

Hi Stability Reference Oscillator

One critical parameter in the operation of the simulcast system is the frequency stability of the transmitted RF carrier frequency. The stable reference oscillator used with the simulcast station determines the transmitter frequency stability. To achieve maximum frequency stability, the simulcast transmitter uses a Phase Locked Loop oscillator locked to WWVB. The WWVB receiver receives and locks onto the 60 kHz reference signal transmitted by the National Institute of Science and Technology, NIST, in Fort Collins, Co.

To ensure reliable reception, each WWVB receiver is connected to a tower mounted ferrite loop antenna, oriented toward station WWVB. Locking the reference oscillator to WWVB is accomplished by a closed loop servo system. This assures that given a four hour stabilization period and the absence of alarms, the EDACS simulcast transmitter average carrier frequency will be stable within 1 Hz at 800 MHz.

A second WWVB receiver/oscillator may be supplied as an option to provide complete redundancy in the event of receiver or oscillator failure. A signal selector automatically switches to the backup WWVB receiver/oscillator when the selected signal is removed, when an alarm input occurs or when the manual selection switch is pressed.

There is no periodic maintenance required to a closed loop system of this kind. The only maintenance required is failure maintenance in response to an alarm or user reported condition.

RF Equipment (Tx Combiner & Rx Multicoupler).

Standard EDACS antenna systems for transmit sites are directly applicable for Conventional Simulcast Systems. The number of RF channels and the frequency band are the determining parameters for the antenna system.

SIMULCAST MAINTENANCE MANUALS

An “Index of Conventional Simulcast Maintenance Manuals” is listed later in this LBI to provide the information relevant to understanding and troubleshooting the conventional simulcast system. These manuals contain circuit analysis, assembly diagrams, outline diagrams, schematic diagrams, parts lists, etc., where available.

SIGNAL FLOW DIAGRAMS

Simulcast system interconnection can be best understood by following the signal flow through the system. The basic blocks are the cross connect panels and the shelves that house the modules. Signal flow diagrams are provide for both the Control Point Site and the Transmit Site. These diagrams show the origin of and interface to the multiplex equipment for the audio and control signals used in the Conventional Simulcast System. Transmit audio, Receive audio, PTT and CG signal are shown in the diagrams.

Control Point

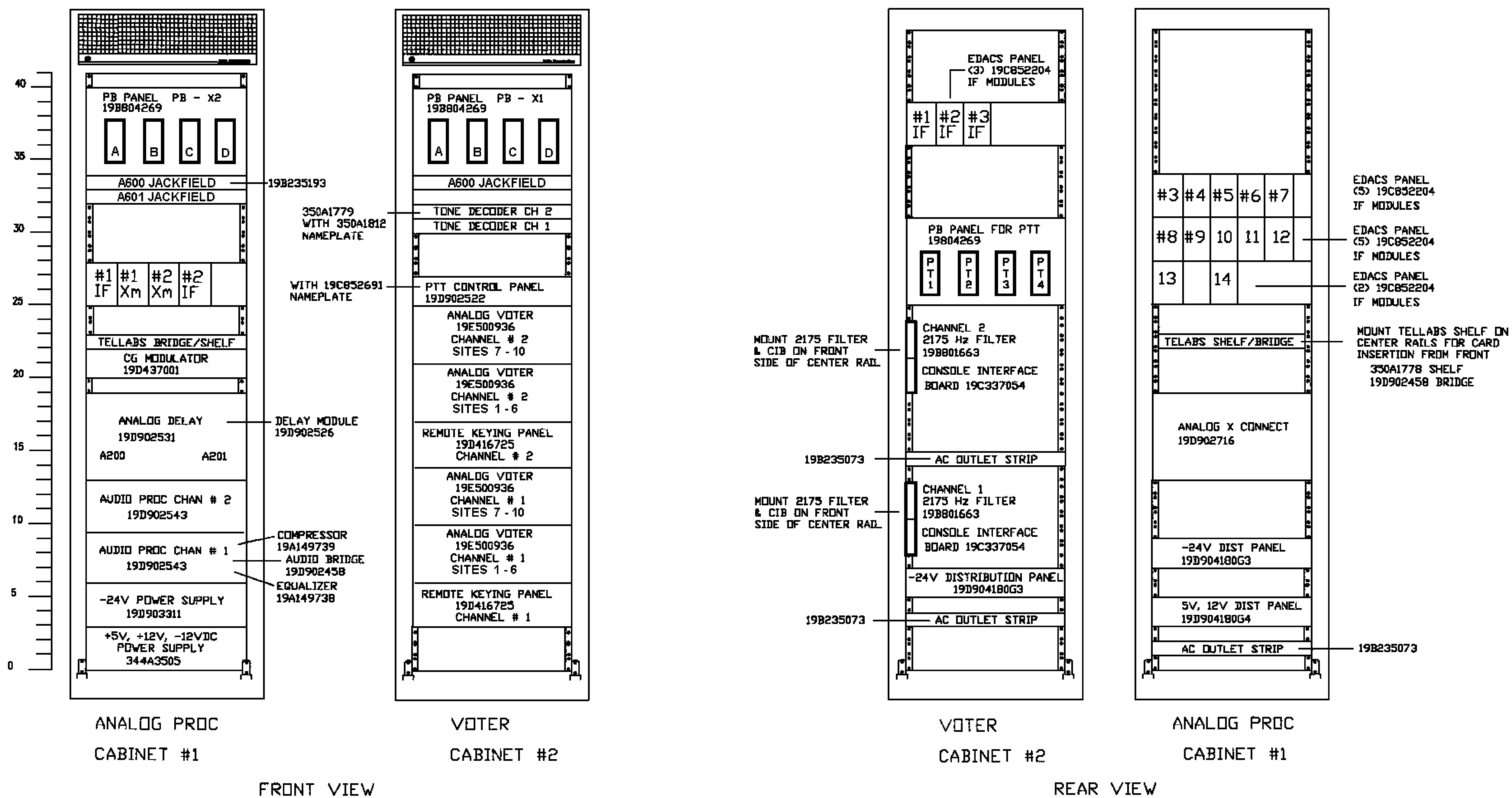
For each standard configuration (1,2 & 4 channel system) the rack layout, system block diagram, voter interconnect, PTT interconnect and power distribution diagrams are shown. The rack layout shows the location of each piece of equipment in the cabinet/rack for both the front rails and the rear rails. Interconnection of all of the pieces of equipment is shown in the system block diagram providing a means to follow the signal flow through the entire control point equipment. The voter interconnect, the PTT interconnect and the power distribution diagrams show detail wiring connections for those particular parts of the system.

Transmit Site

Transmit Site Repeater Interconnect Diagrams show interconnections among the MASTR III, the EDACS IF Panel, the Audio Bridge Shelf and the reference oscillator. Internal wiring of the MASTR III and the EDACS IF Panel is provided in Instruction Books listed in the Index of Manuals.

INDEX OF CONVENTIONAL SIMULCAST MAINTENANCE MANUALS

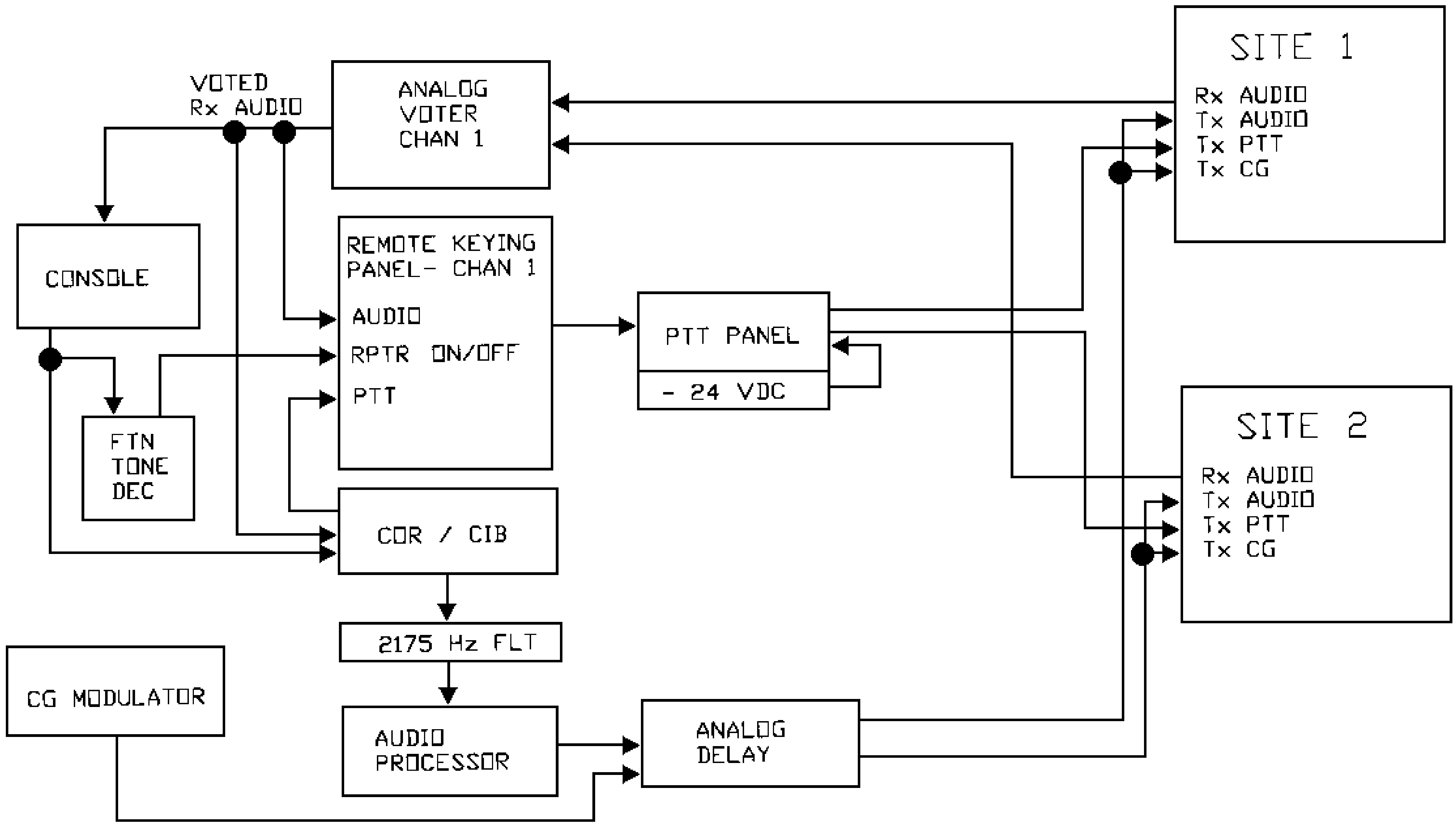
Figure 2 - Two Channels/10 Sites Conventional Simulcast Rack Layout



2 channel, 10 Sites
Rack Layout

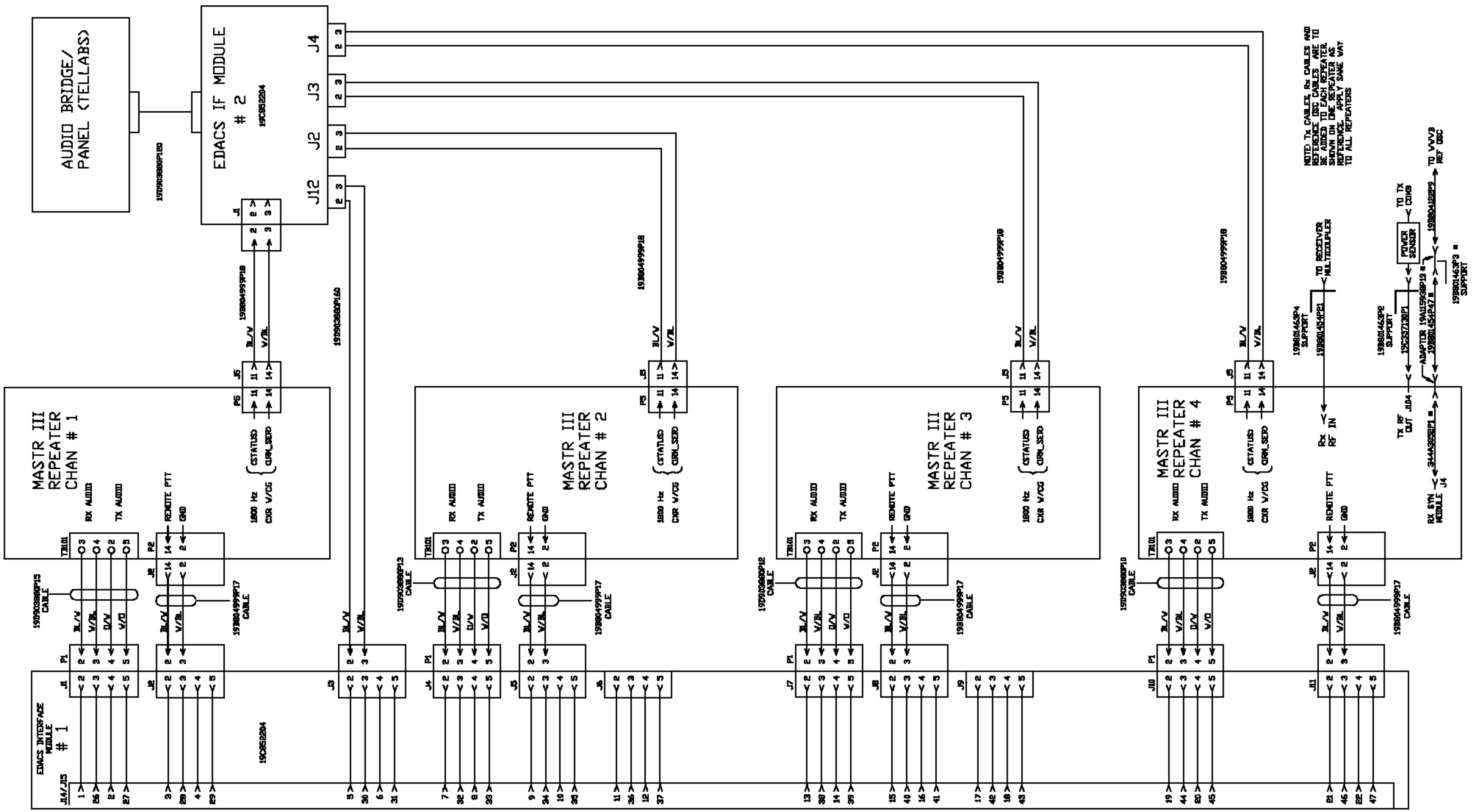
(193D1338, Sh. 1, Rev. 0)

Figure 3 - Typical Functional Diagram of a Single Channel Conventional Simulcast System with 2 Sites



Functional Block Diagram
Conventional Simulcast
(19B804488, Sh. 1, Rev. 1)

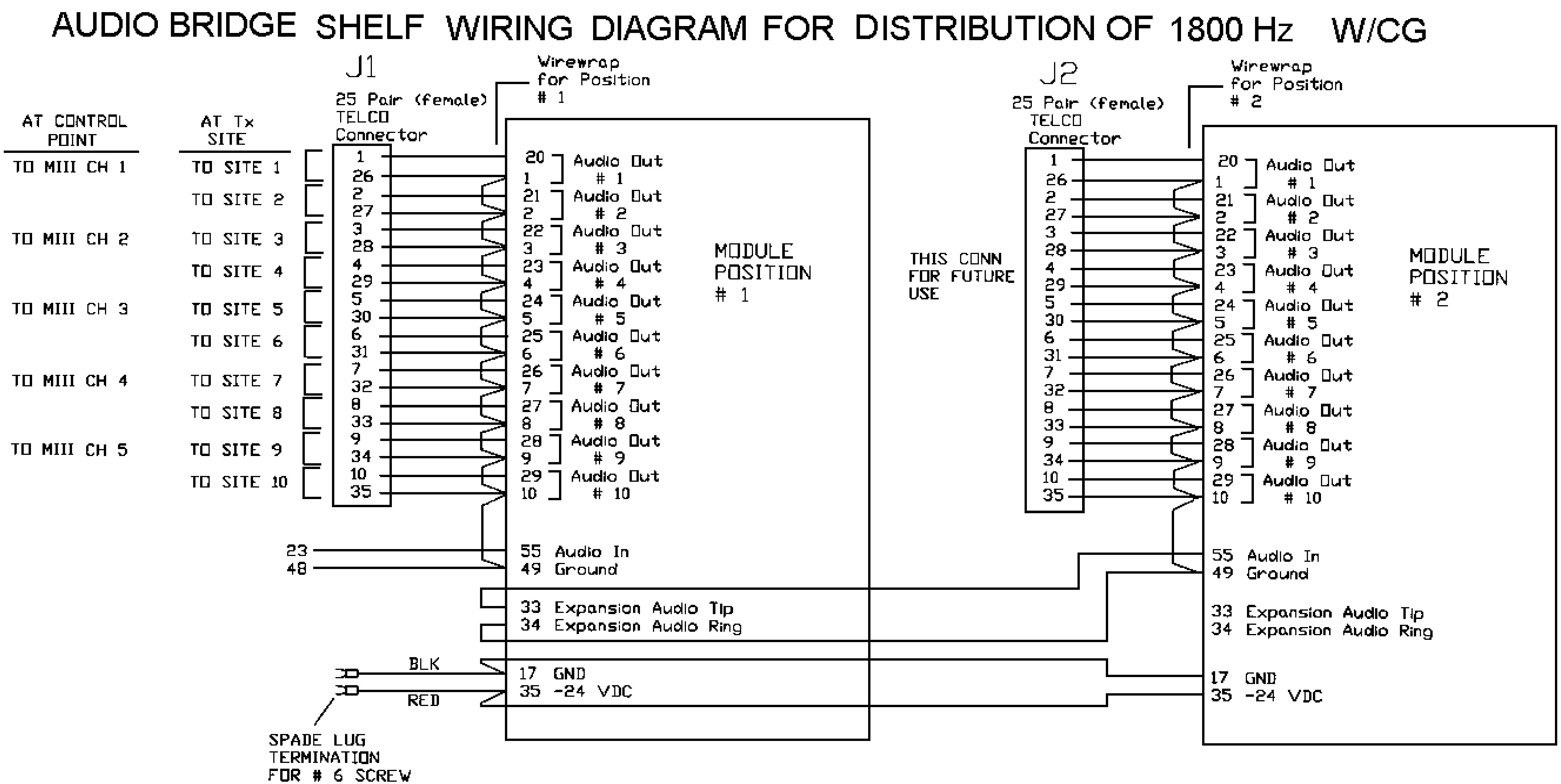
Figure 4 - Transmit Site Repeater Interconnect Diagram



**TX Site Repeater
Interconnect Diagram**

(193D1024, Sh. 1, Rev. 2)

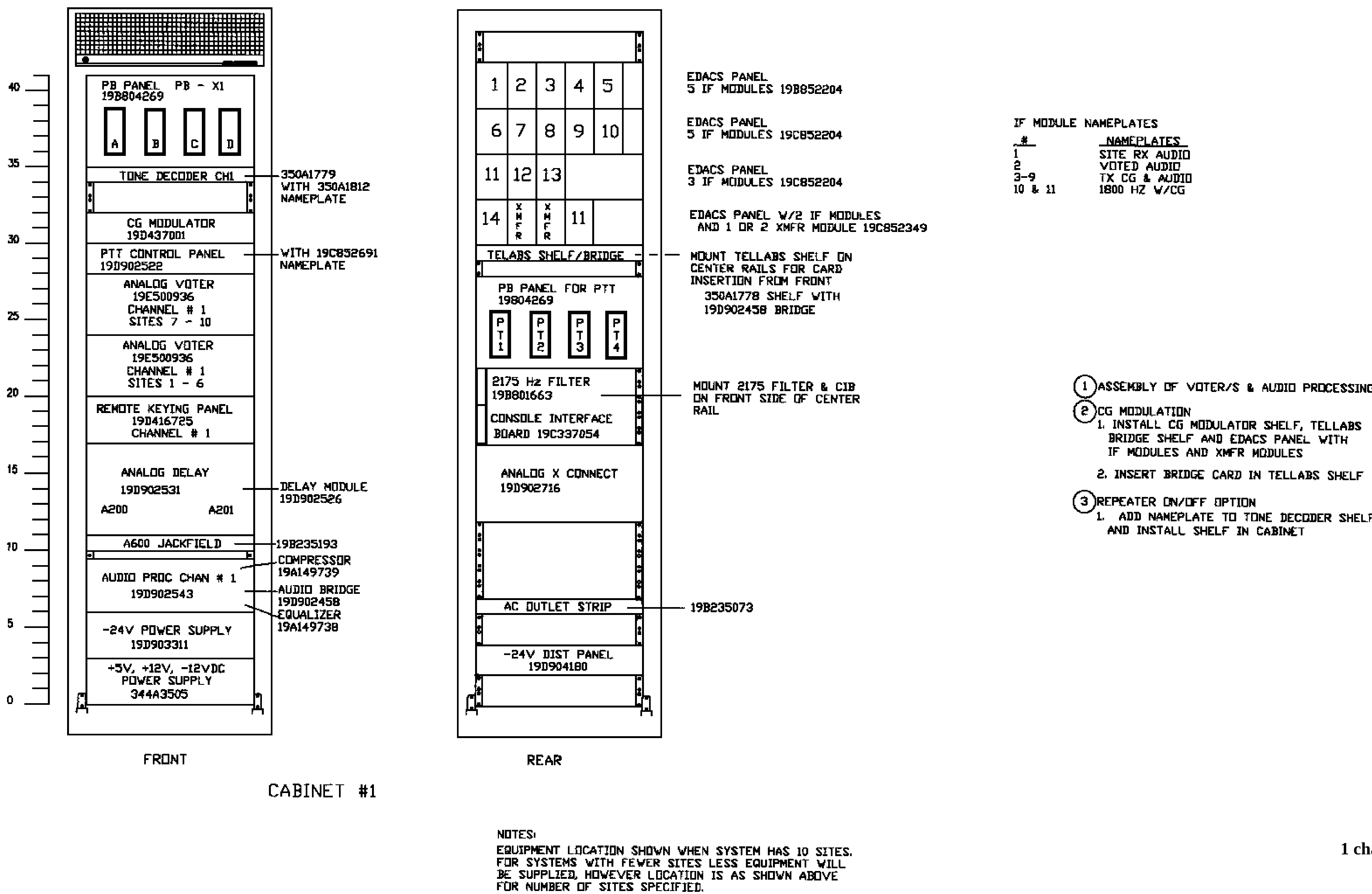
Figure 5 - Audio Bridge Shelf Wiring Diagram



Wiring Diagram

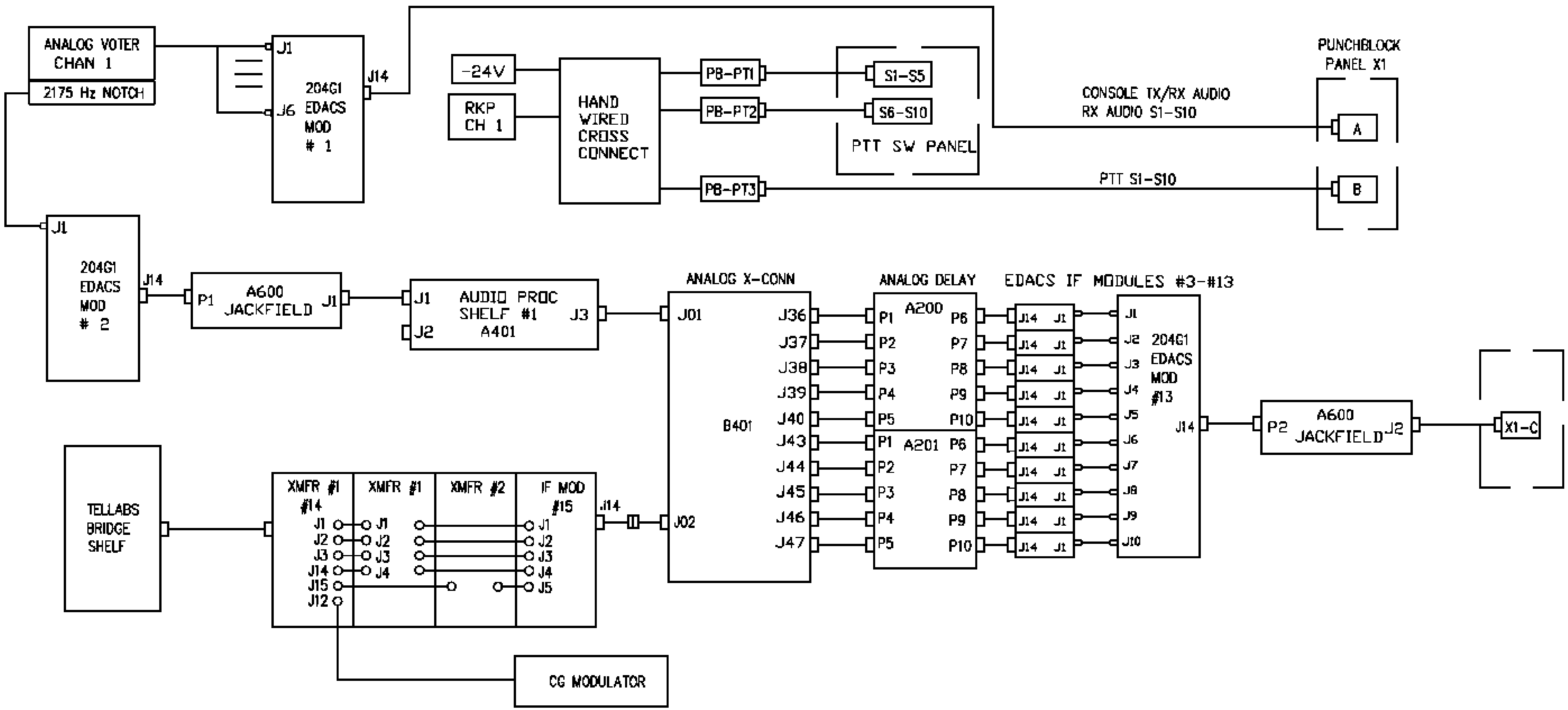
(330B5029, Sh. 1, Rev. 0)

Figure 6 - Conventional Simulcast Rack Layout



1 channel, 10 Sites
Rack Layout
(193D1367, Sh. 1, Rev. 0)

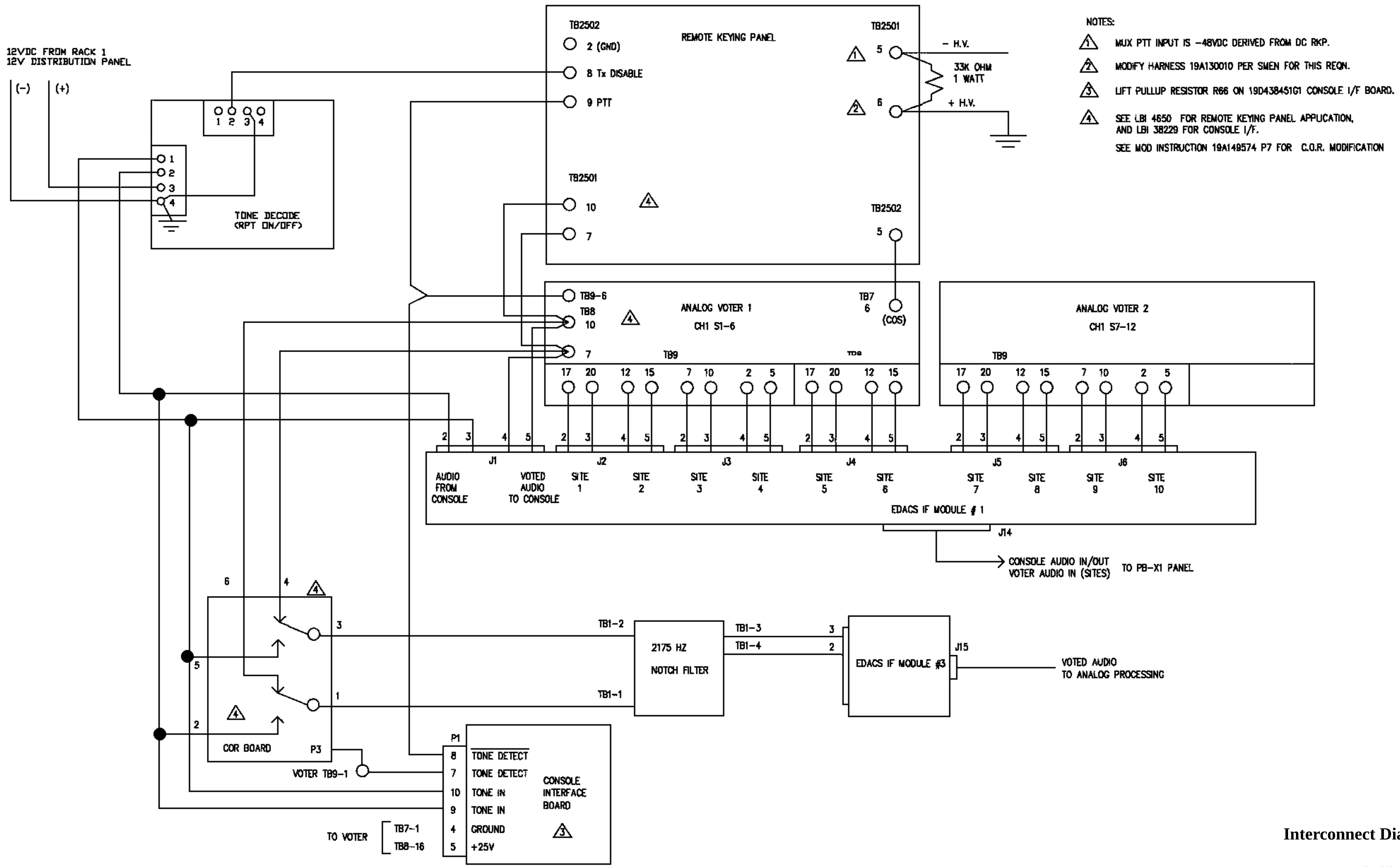
Figure 7 - Single Channel Conventional Simulcast Block Diagram



1 channel, 10 Sites

(330B5045, Sh. 1, Rev. 0)

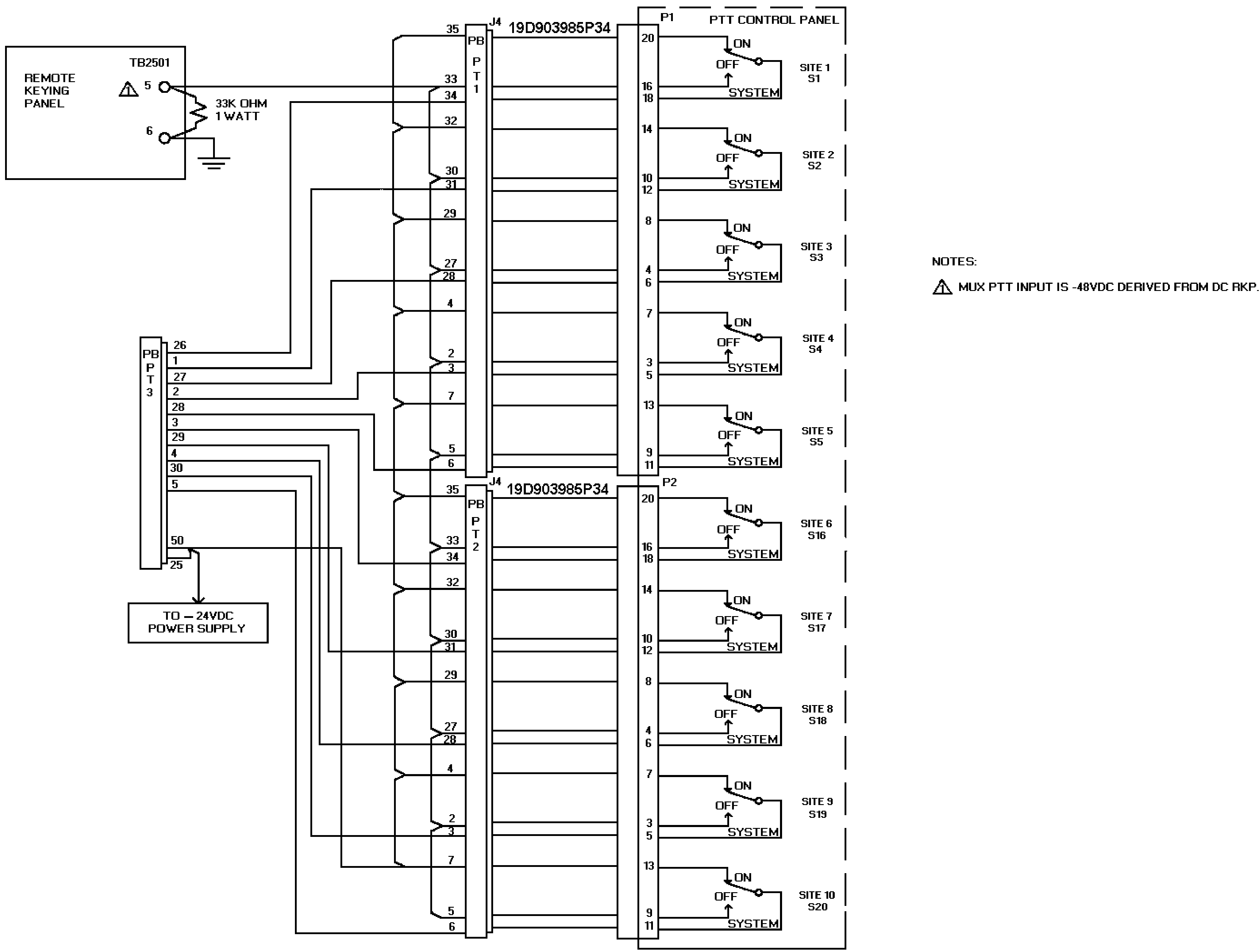
Figure 8 - Conventional Simulcast Voter - Channel 1 Interconnect



Interconnect Diagram

(193D1368, Sh. 1, Rev. 0)

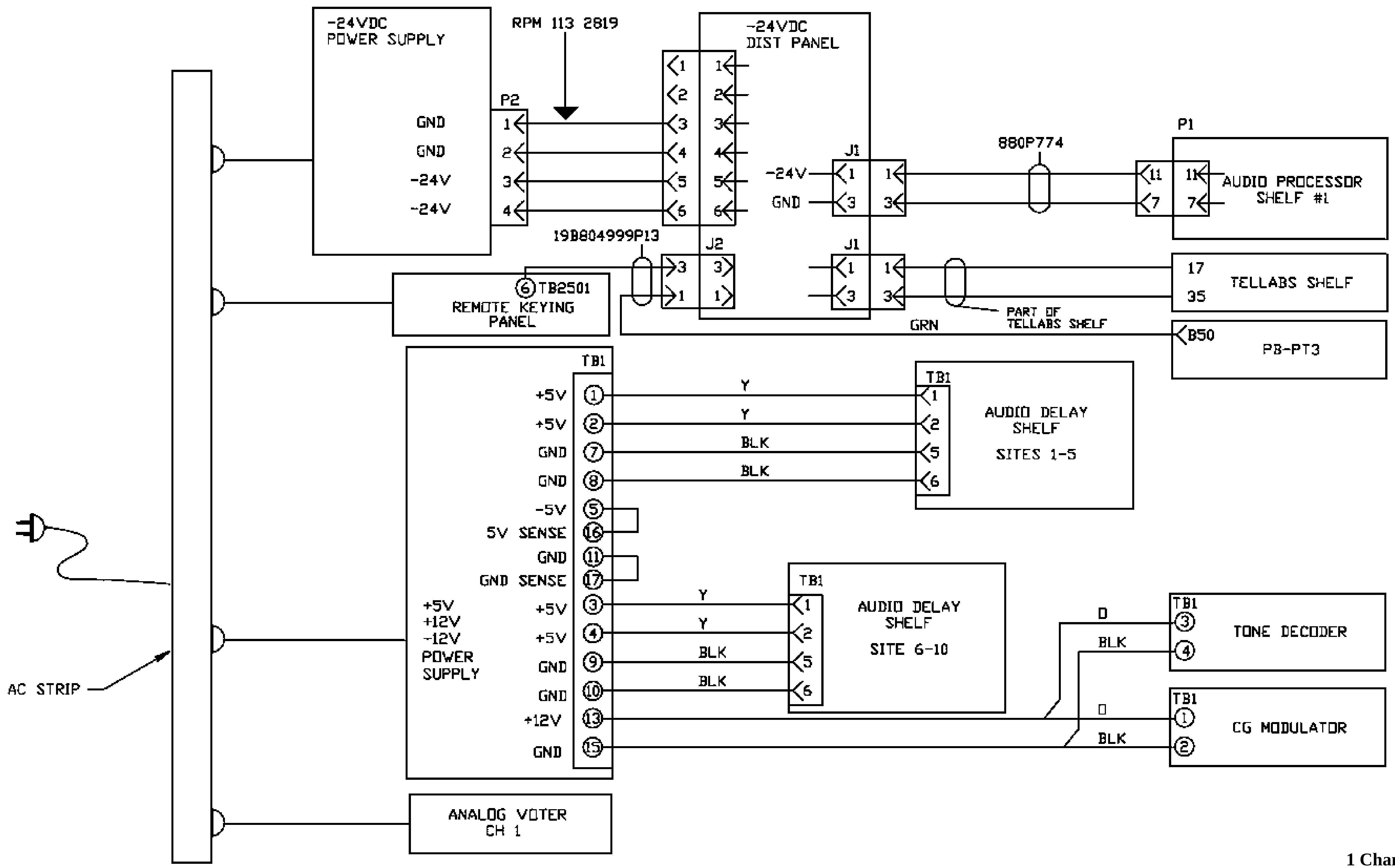
Figure 9 - PTT Control Wiring Conventional Simulcast



Single channel, 10 Sites

(193D1369, Sh. 1, Rev. 0)

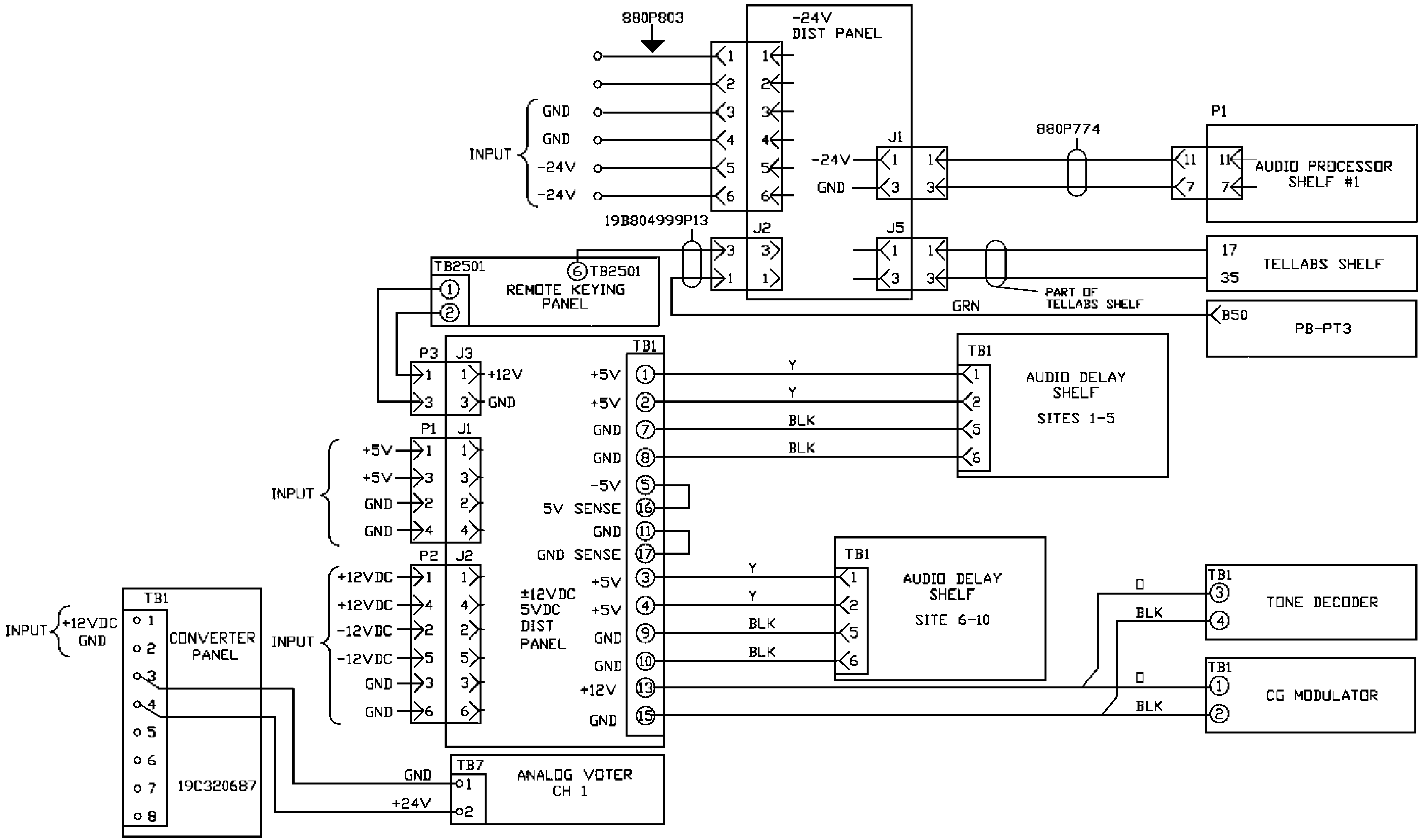
Figure 10 - AC & DC Power Distribution Conventional Simulcast



1 Channel, 10 Channel

(330B5094, Sh. 1, Rev. 1)

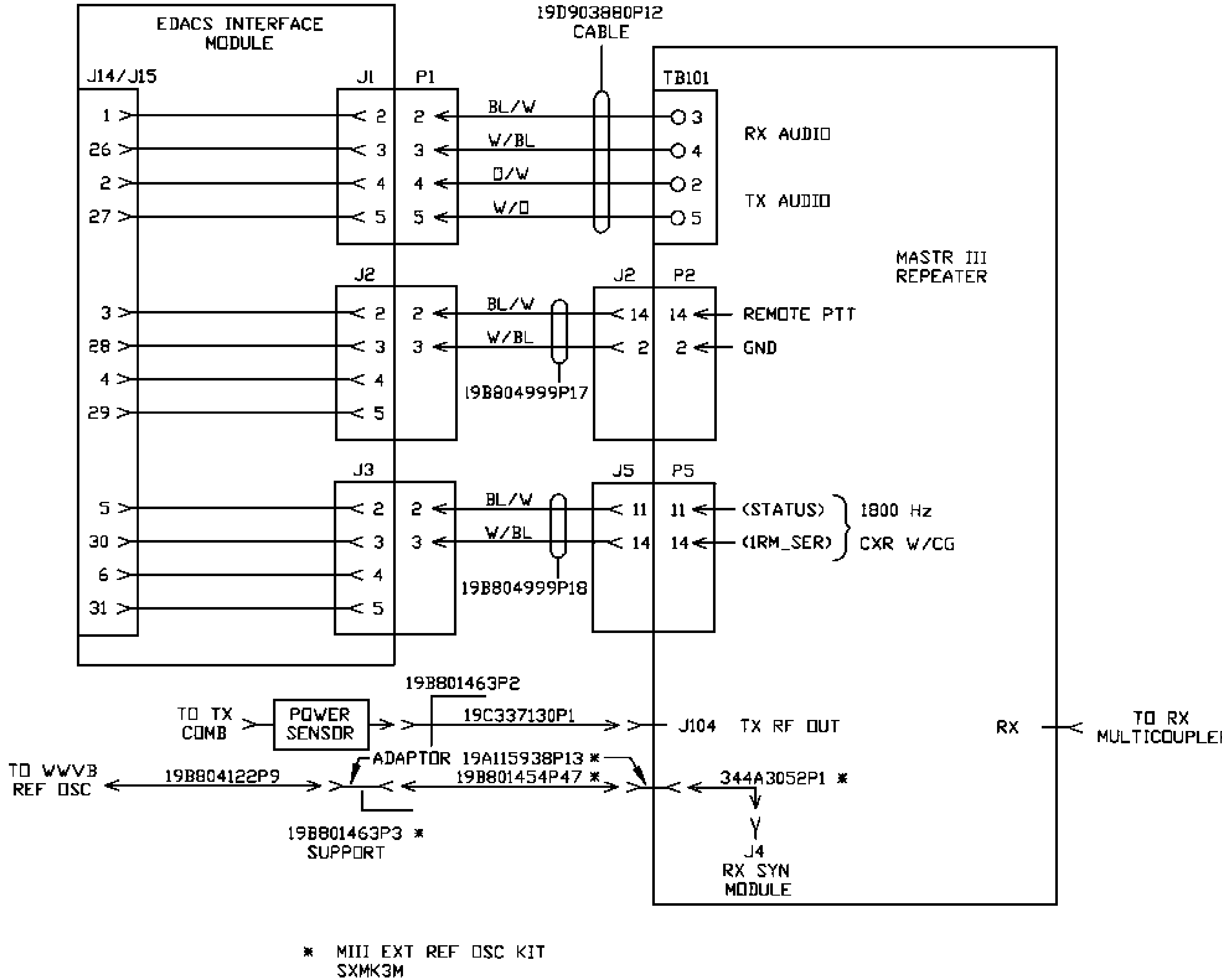
Figure 11 - Power Distribution for DC Operation



Single channel

(330B5095, Sh. 1, Rev. 0)

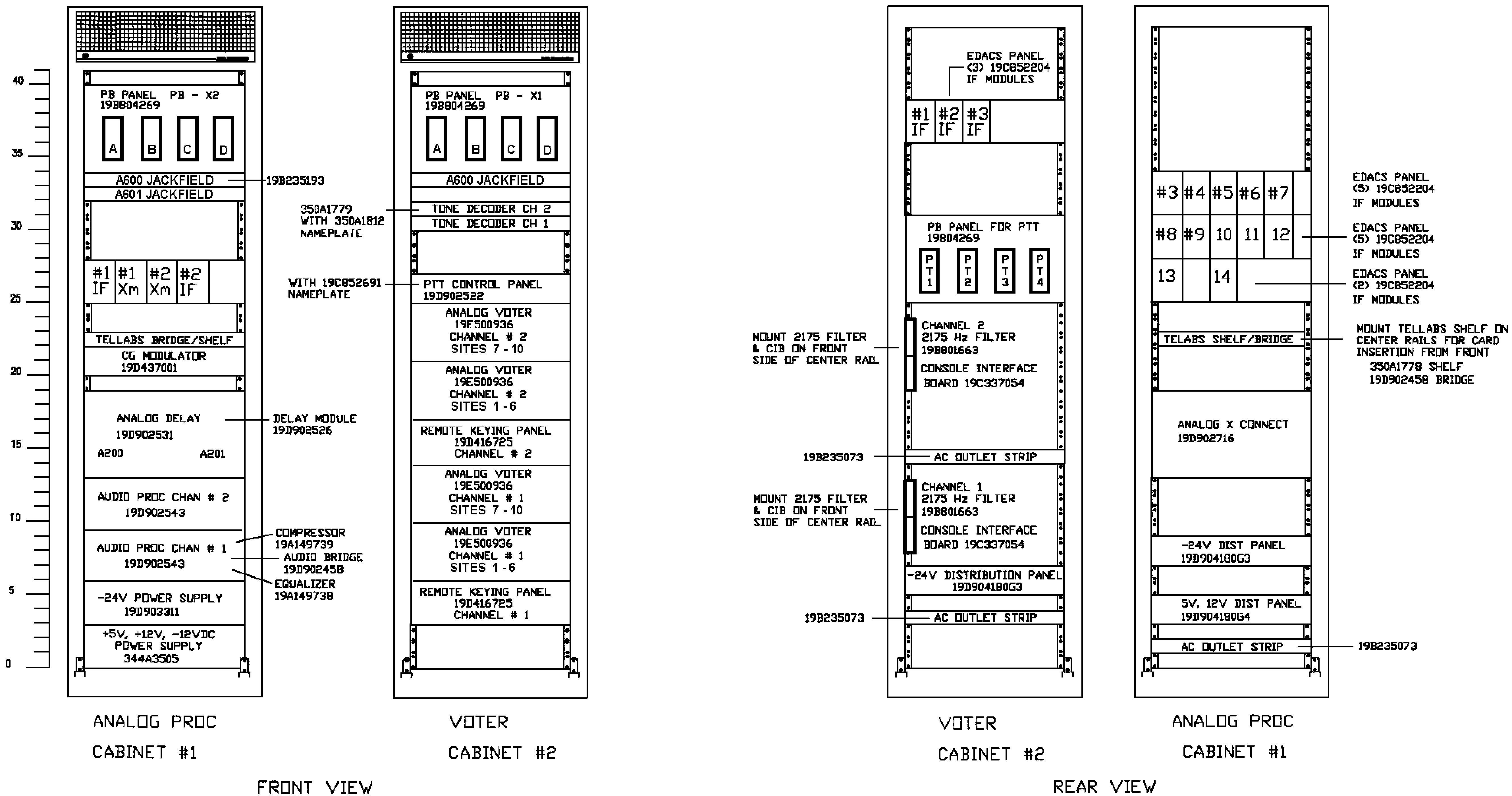
Figure 12 - Transmit Site Repeater Interconnect Diagram



Single Channel

(19B804621, Sh. 1, Rev. 2)

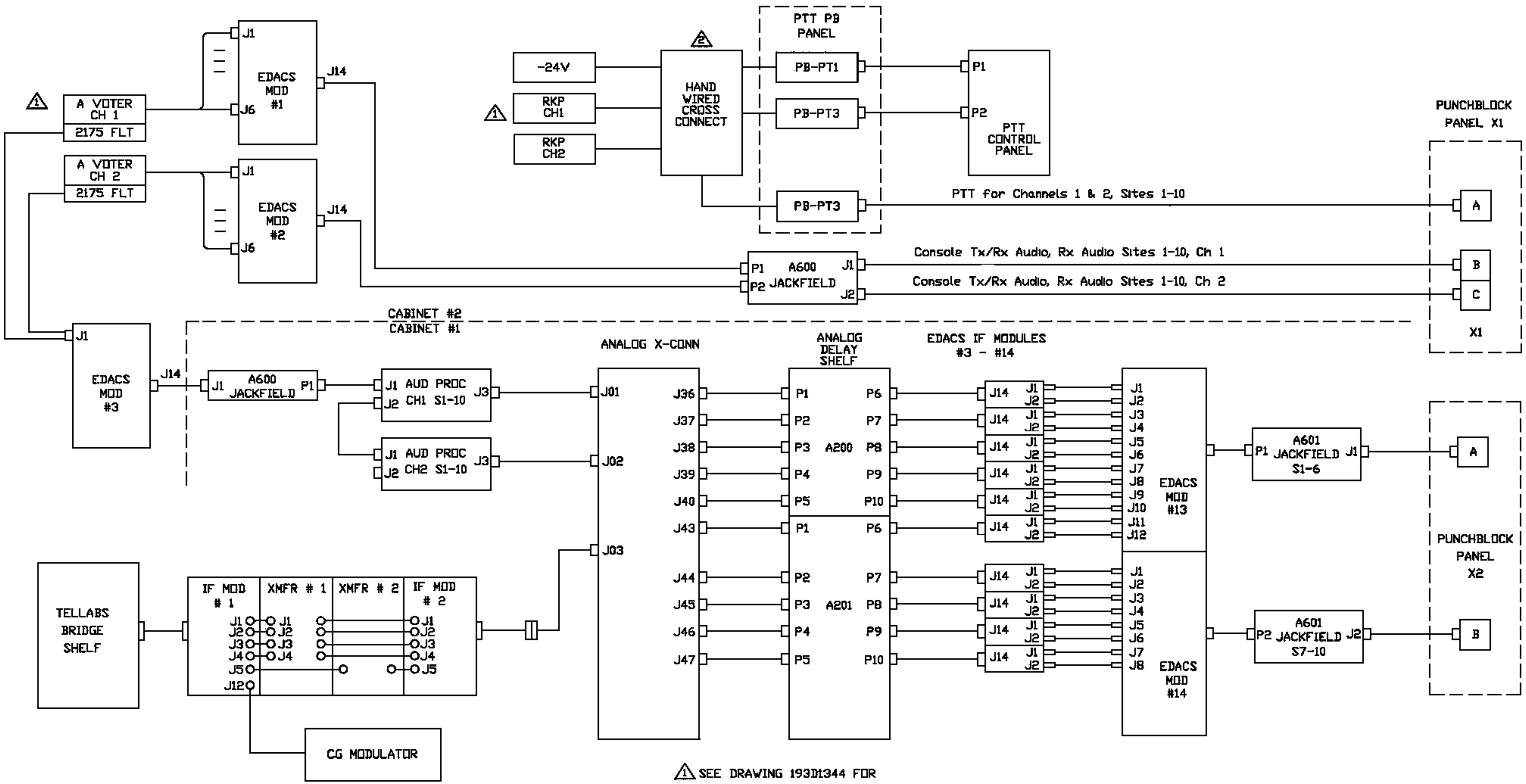
Figure 13 - Two Channels Conventional Simulcast Rack Layout



2 channel Rack Layout

(193D1338, Sh. 1, Rev. 0)

Figure 14 - Two Channels Conventional Simulcast Block Diagram



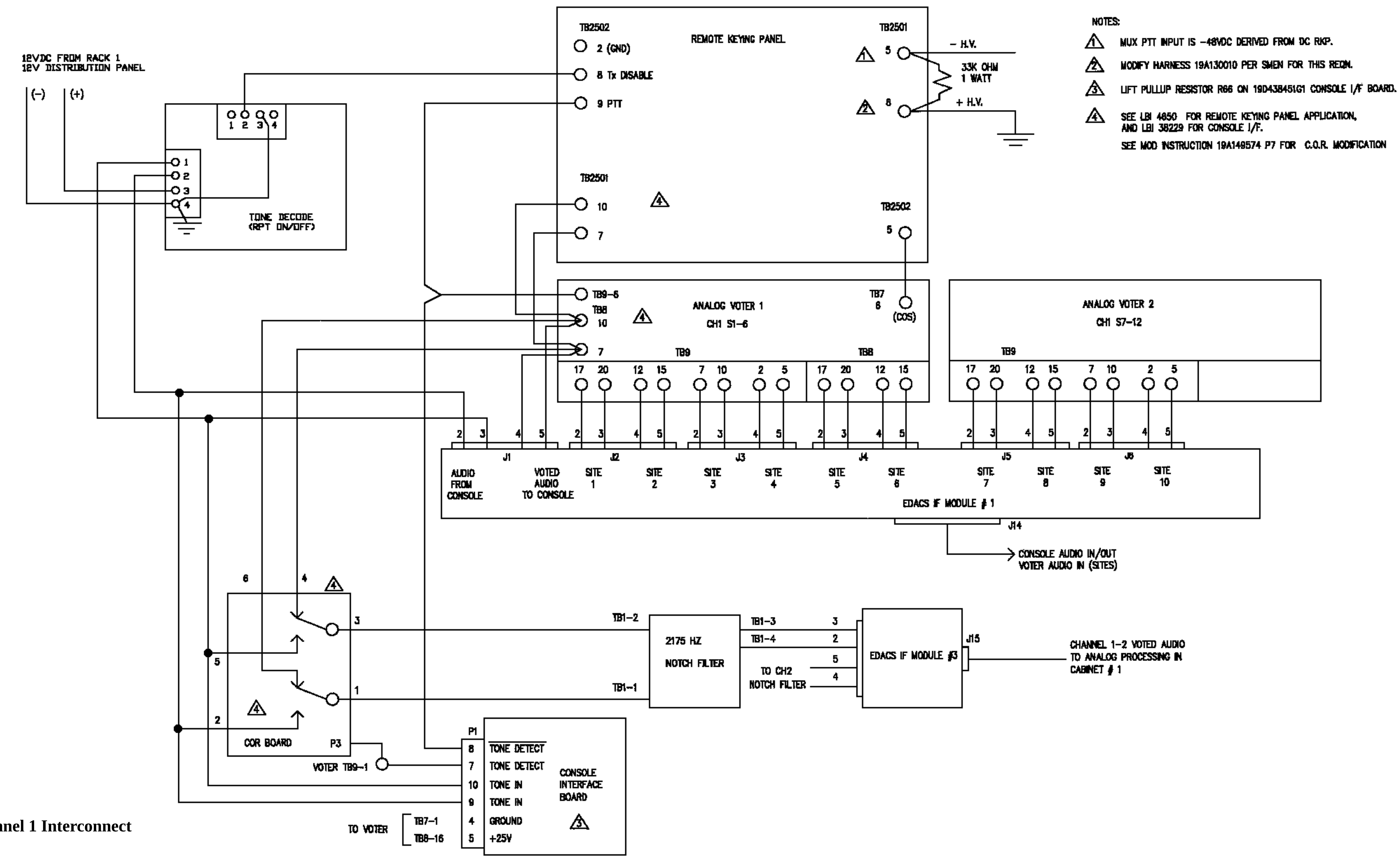
1. SEE DRAWING 193D1344 FOR VOTER TO RKP INTERCONNECT

2. SEE DRAWING 193D1345 FOR PTT CROSS CONNECT

2 channel, 10 Sites

(193D1342, Sh. 1, Rev. 0)

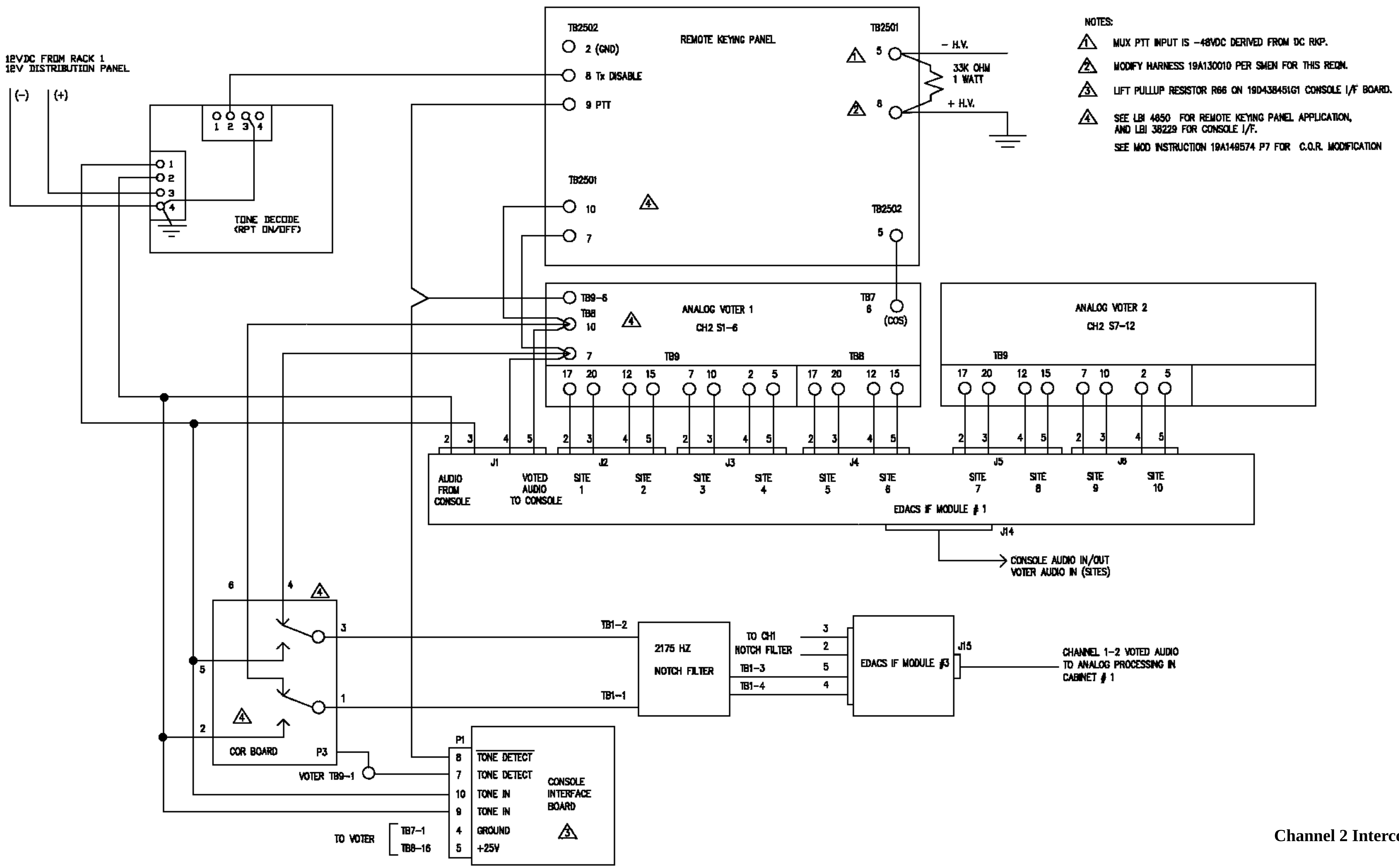
Figure 15A - Conventional Simulcast Voter Interconnect



Channel 1 Interconnect

(193D1344, Sh. 1, Rev. 0)

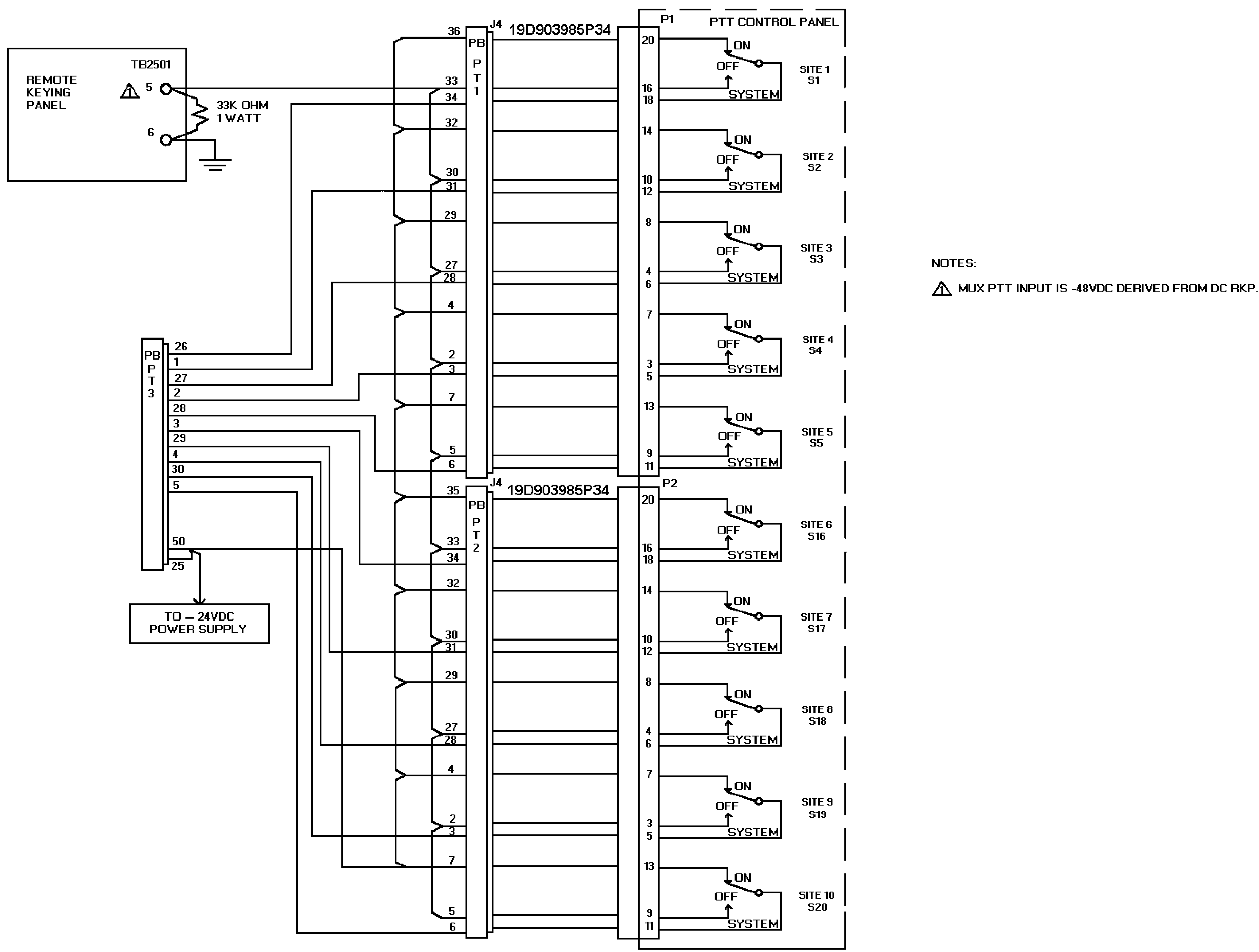
Figure 15B - Conventional Simulcast Voter Interconnect



Channel 2 Interconnect

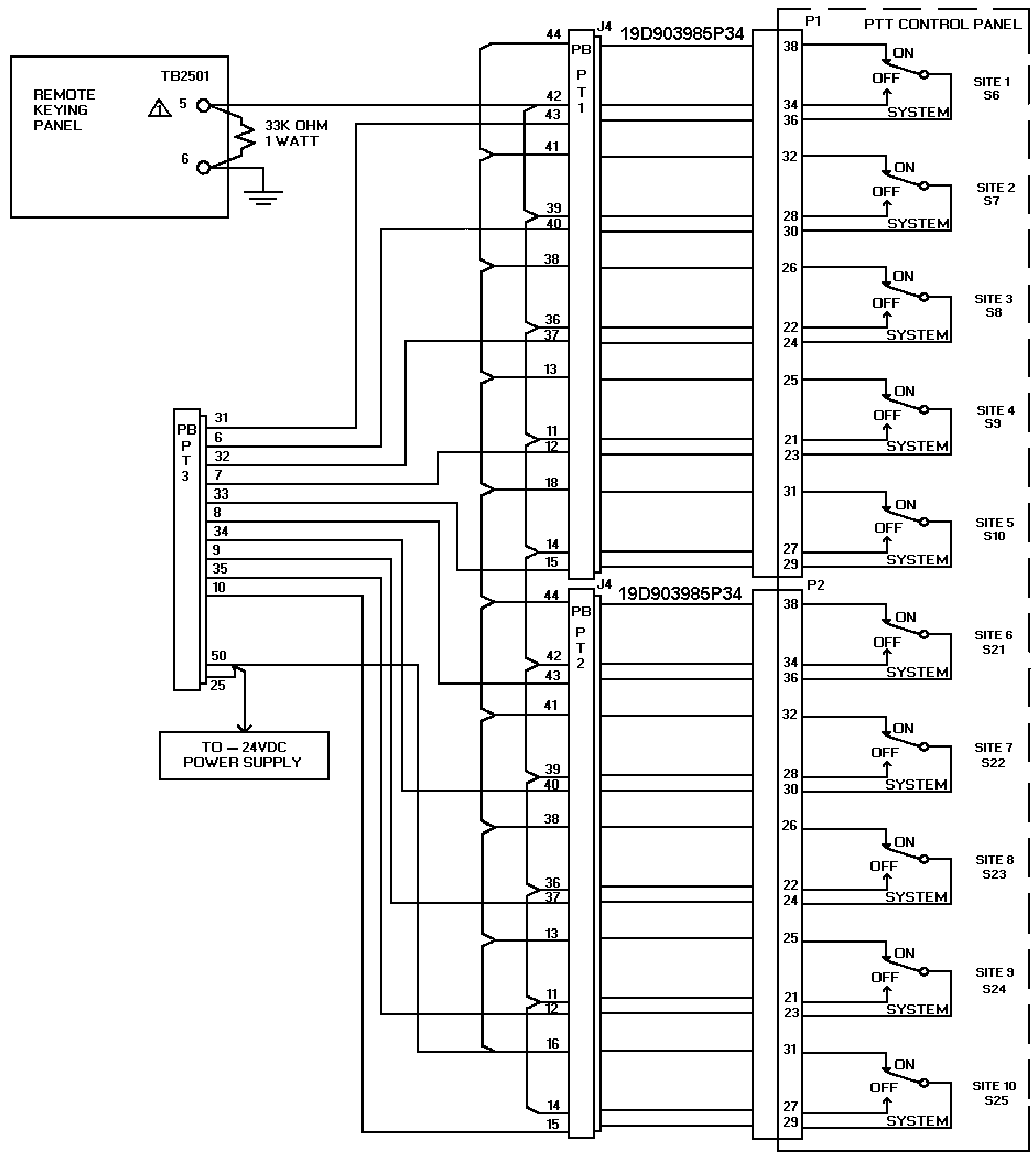
(193D1344, Sh. 2, Rev. 0)

Figure 16A - PTT Control Wiring Conventional Simulcast



Channel 1
1 Channel, 10 Sites
(193D1345, Sh. 1, Rev. 0)

Figure 16B - PTT Control Wiring Conventional Simulcast



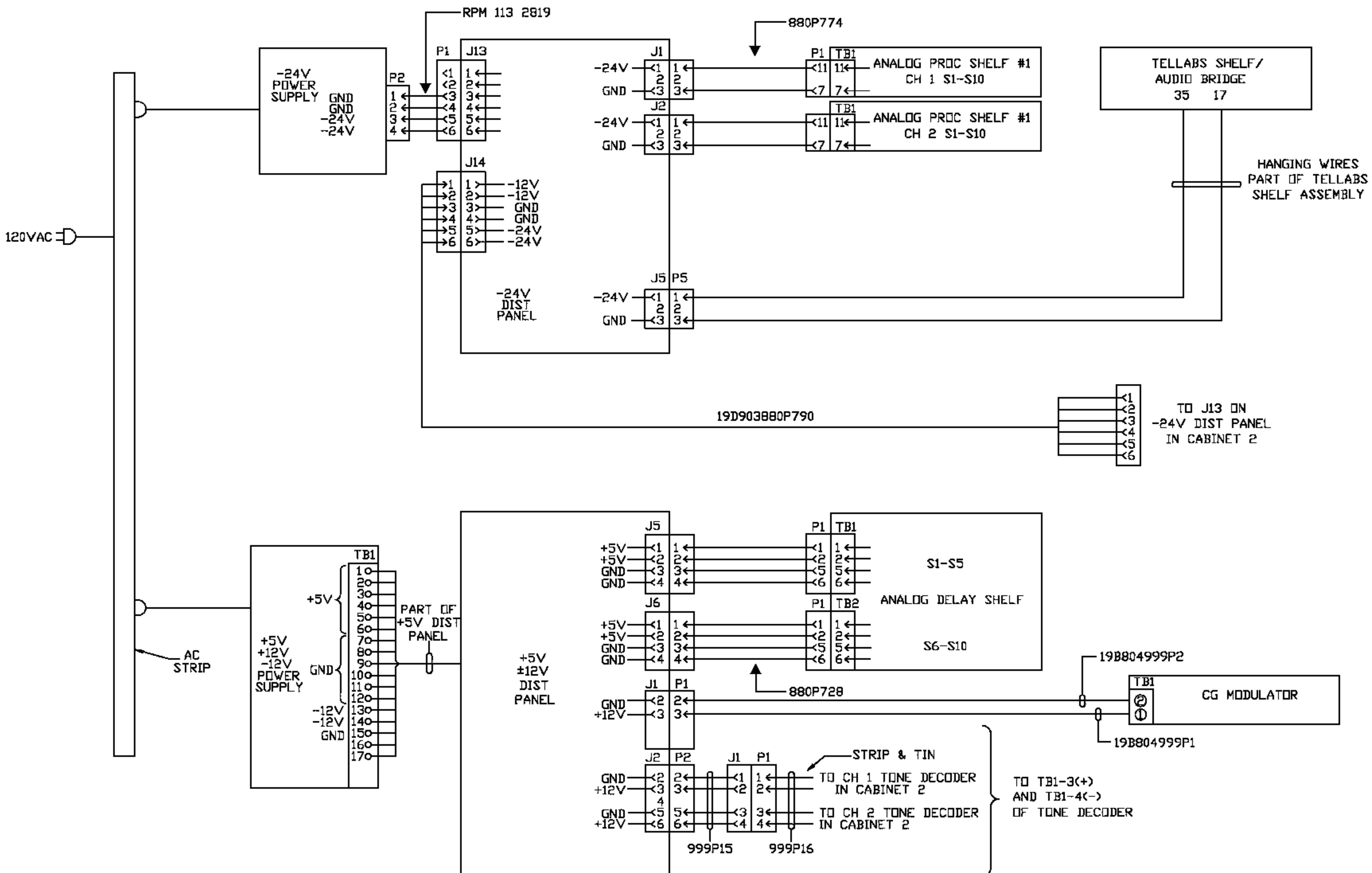
NOTES:

⚠ MUX PTT INPUT IS -48VDC DERIVED FROM DC RKP.

Channel 2
2 Channel, 10 Sites

(193D1345, Sh. 2, Rev. 0)

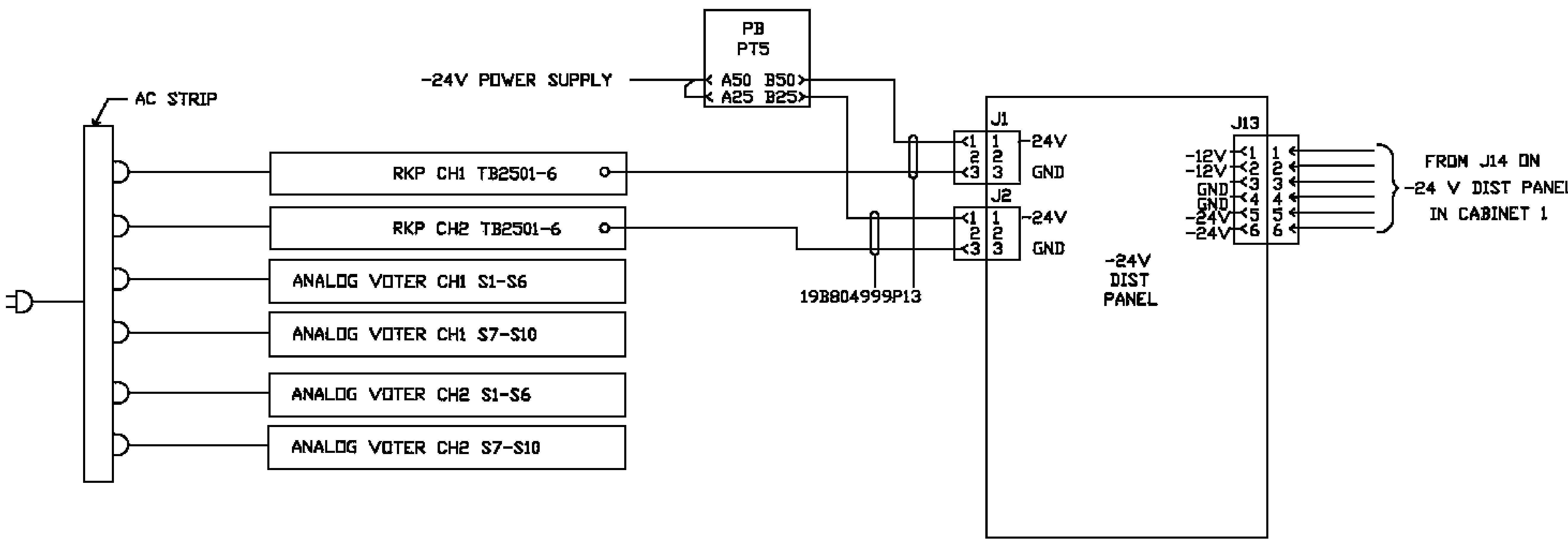
Figure 17A - AC & DC Power Distribution



Analog Processing Rack 1

(193D1343, Sh. 1, Rev. 1)

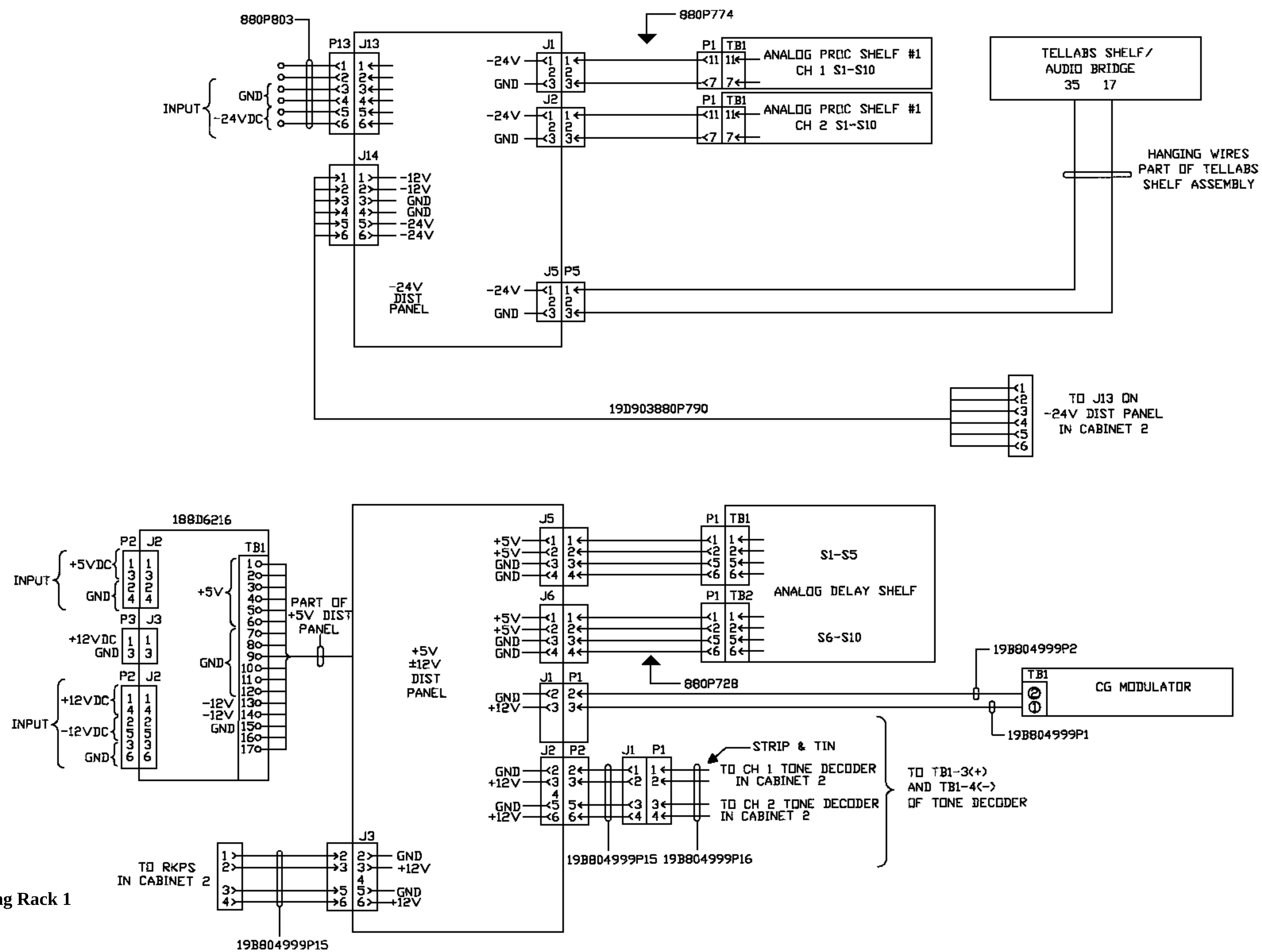
Figure 17B - AC & DC Power Distribution



Analog Voter

(193D1343, Sh. 2, Rev. 0)

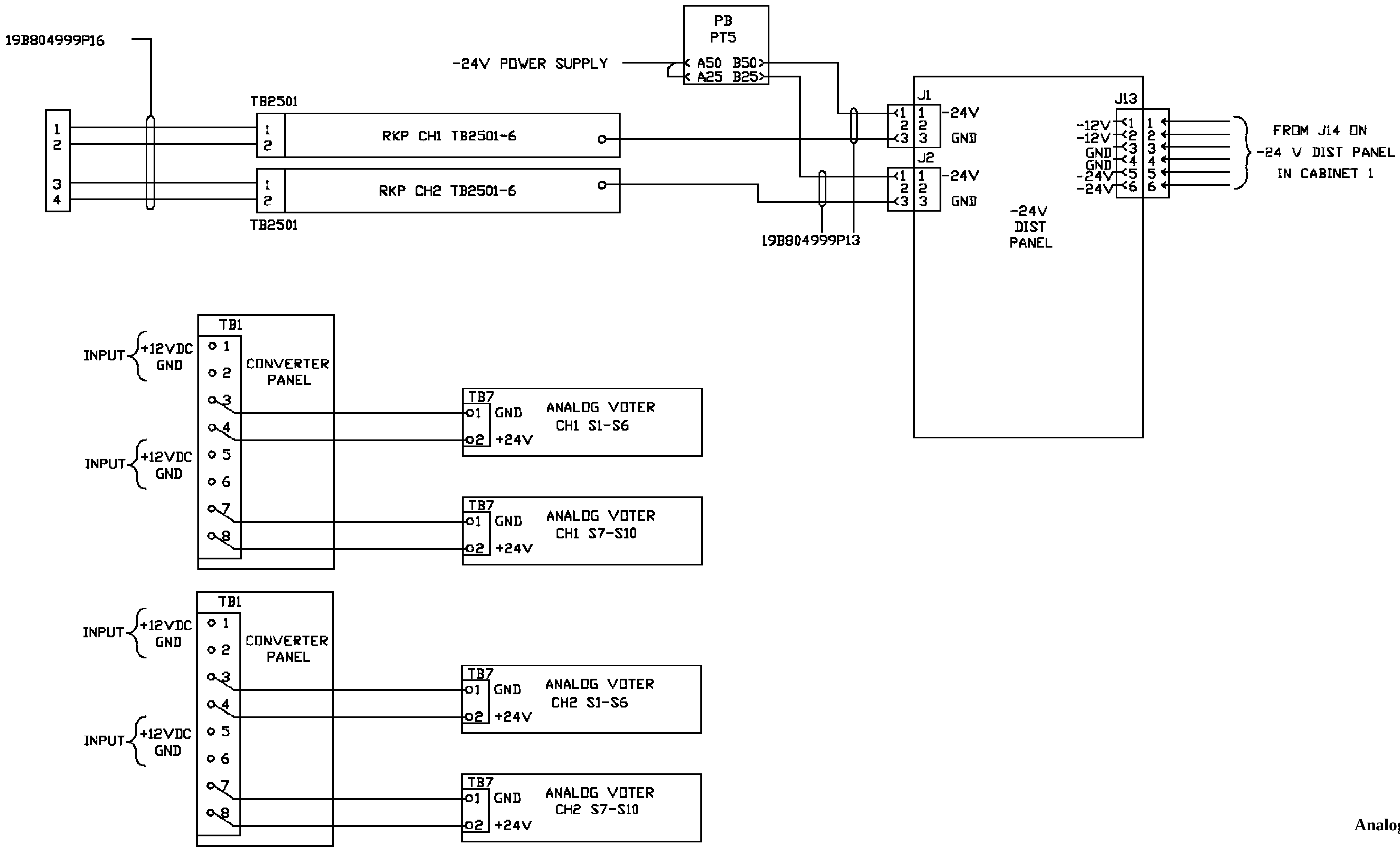
Figure 18A - Power Distribution for DC Operation



Analog Processing Rack 1

(193D1412, Sh. 1, Rev. 0)

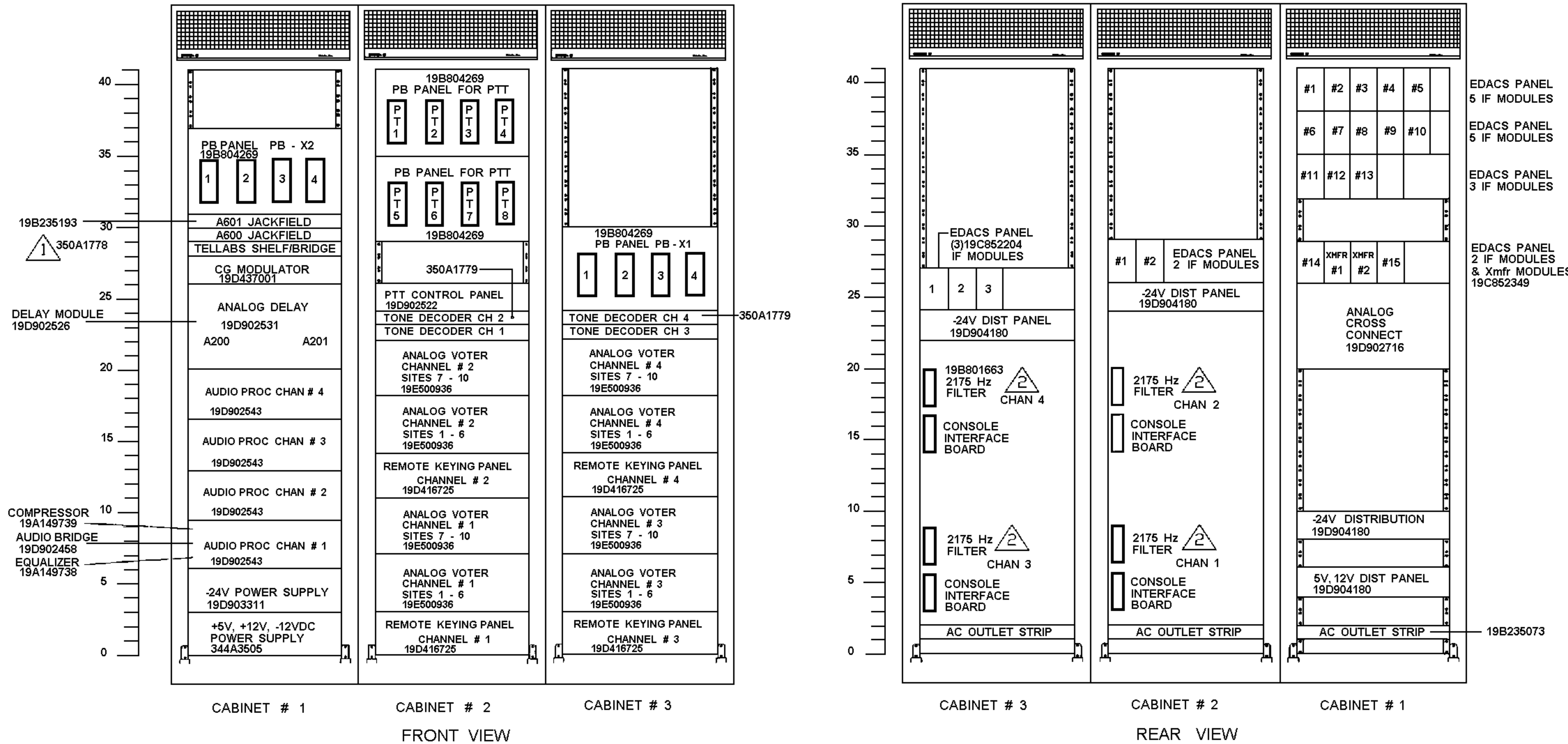
Figure 18B - Power Distribution for DC Operation



Analog Voter

(193D1412, Sh. 2, Rev. 0)

Figure 19 - Four Channels Conventional Simulcast Rack Layout



1. MOUNT TELLABS SHELF ON CENTER RAILS FOR PWB INSERT FROM FRONT OF RACK
2. MOUNT 2175 HZ FILTER & CIB ASM ON FRONT SIDE OF CENTER RAIL

(1) ASSEMBLY OF CABINET # 1

(2) CG MODULATION
1. INSTALL CG MODULATOR SHELF, TELLABS BRIDGE SHELF AND EDACS PANEL WITH IF MODULES AND XMFR MODULES
2. INSERT BRIDGE CARD IN TELLABS SHELF

(3) REPEATER ON/OFF OPTION
1. ADD NAMEPLATE TO TONE DECODER SHELF AND INSTALL SHELF IN CABINET

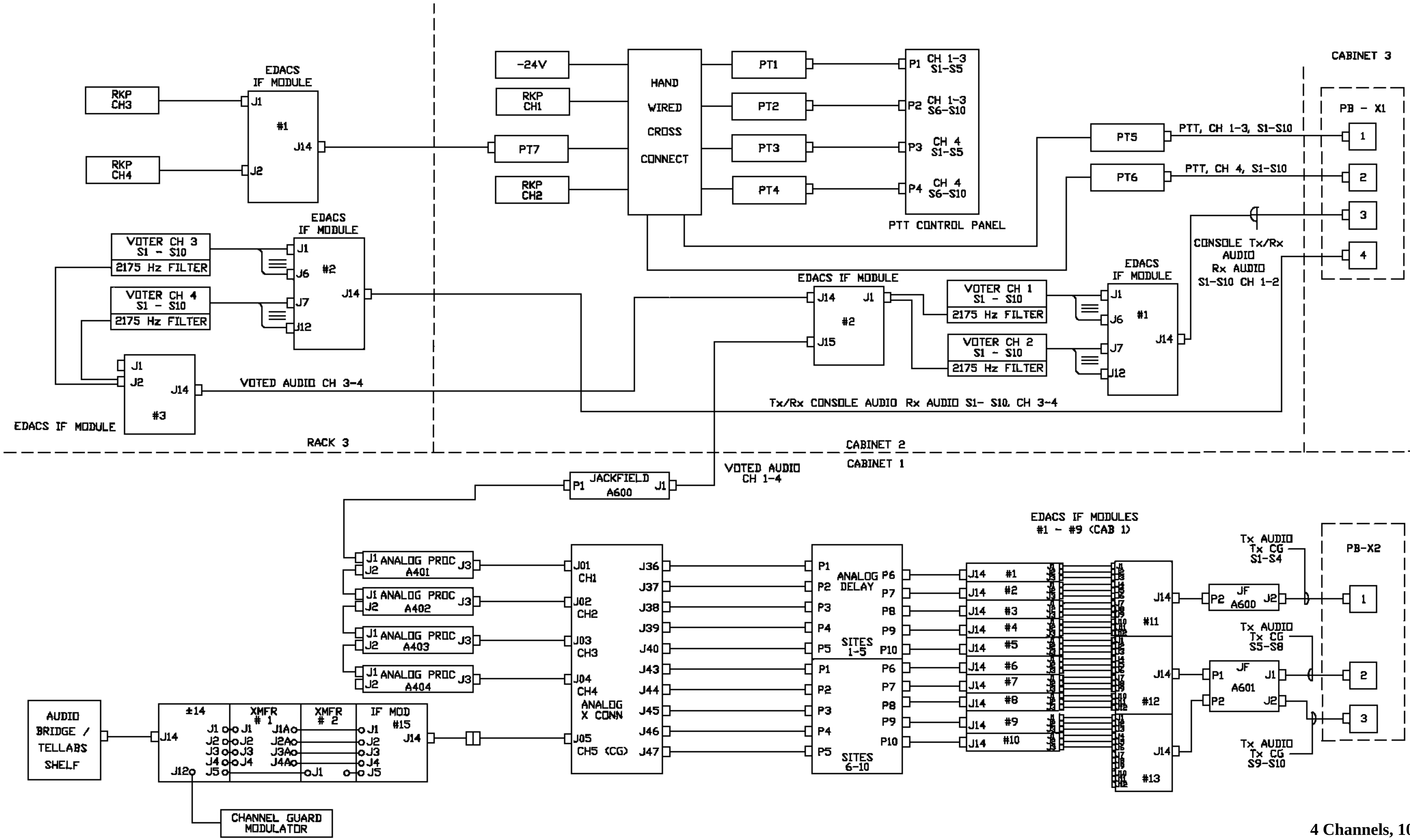
(4) ASSEMBLY OF CABINET # 2

(5) ASSEMBLY OF CABINET # 3

4 Channels, 10 Sites

(330B5070, Sh. 1, Rev. 0)

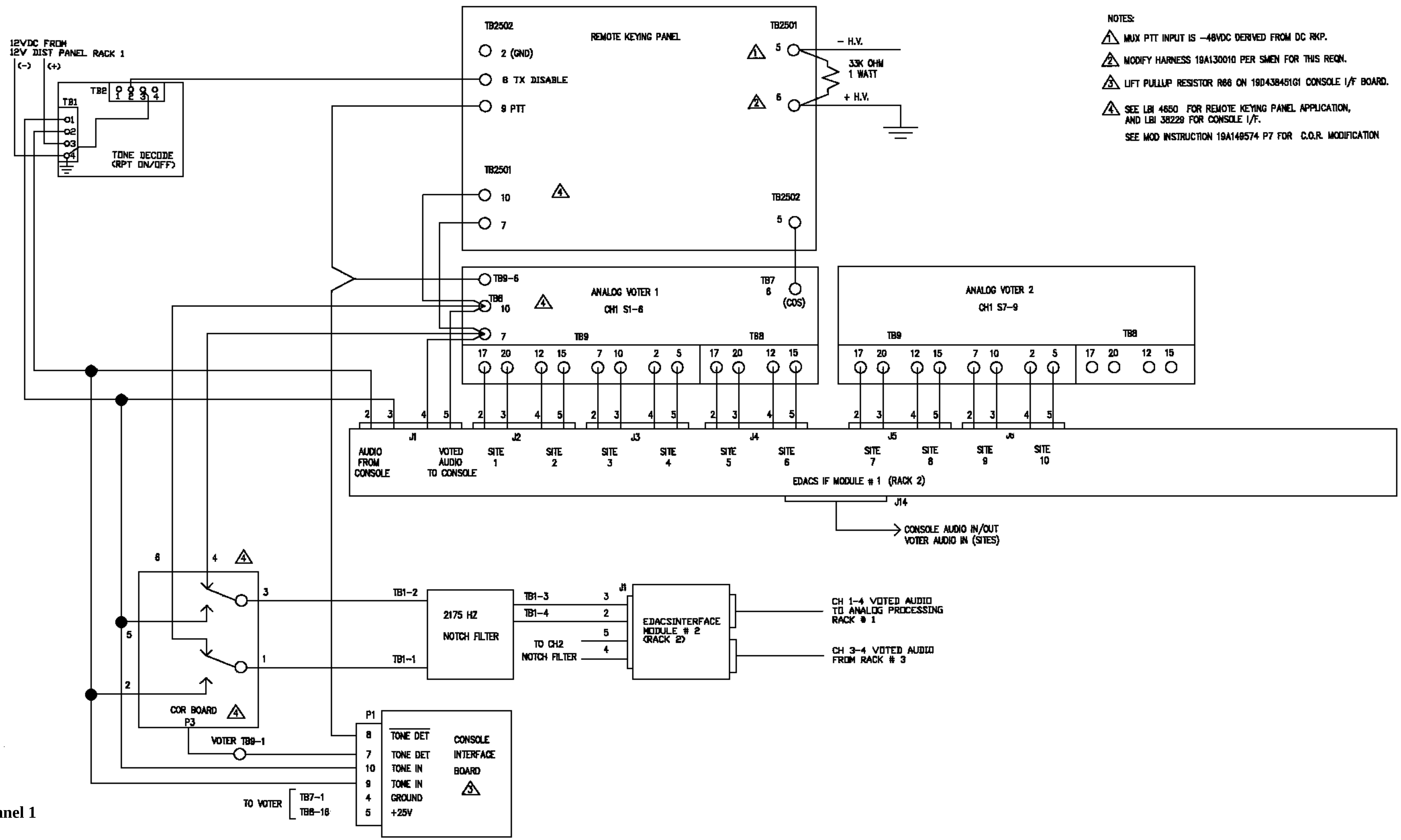
Figure 20 - Four Channels Conventional Simulcast Block Diagram



4 Channels, 10 Sites

(193D1400, Sh. 1, Rev. 0)

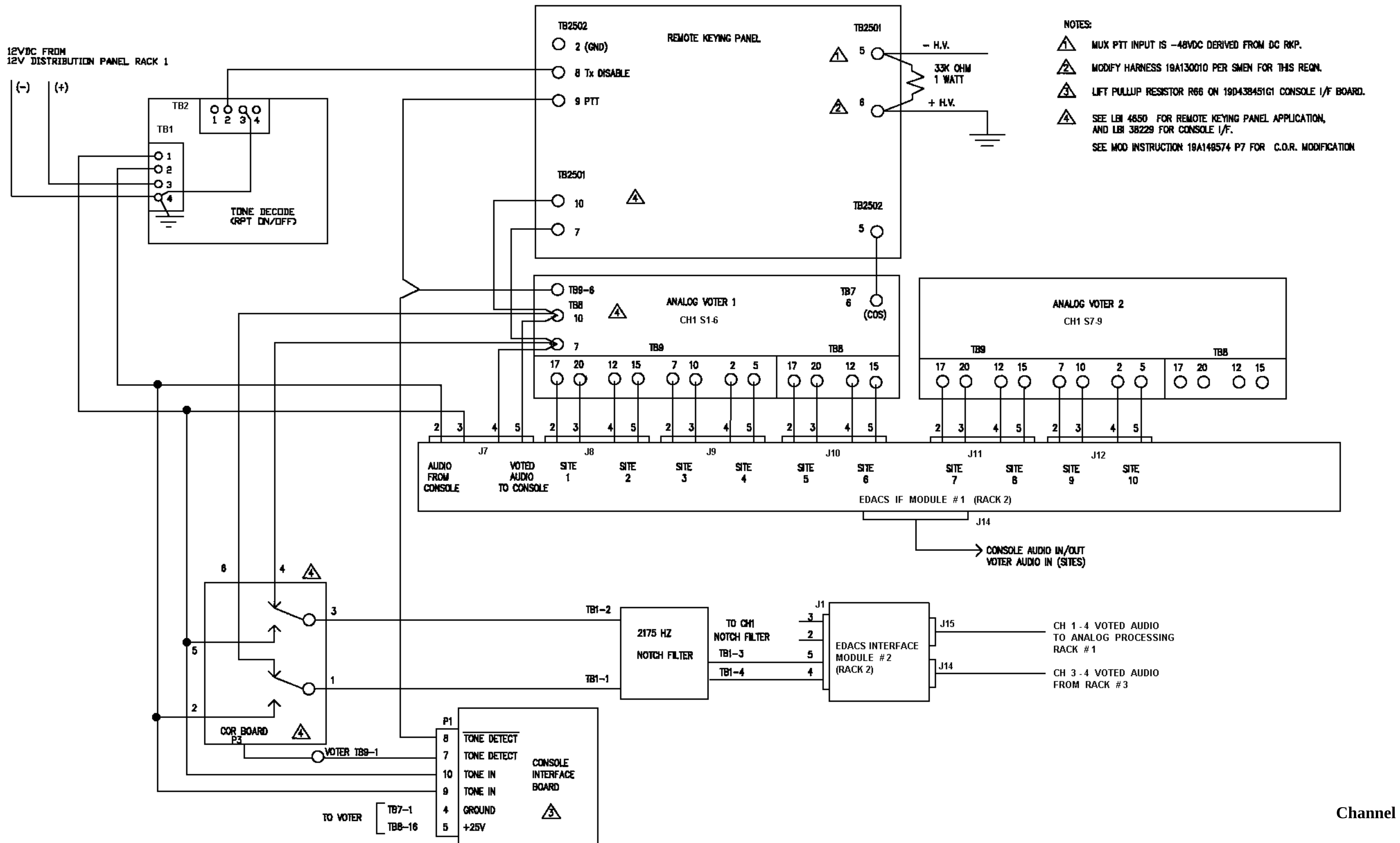
Figure 21A - Conventional Simulcast Voter Interconnect



Channel 1

(193D1044, Sh. 1, Rev. 3)

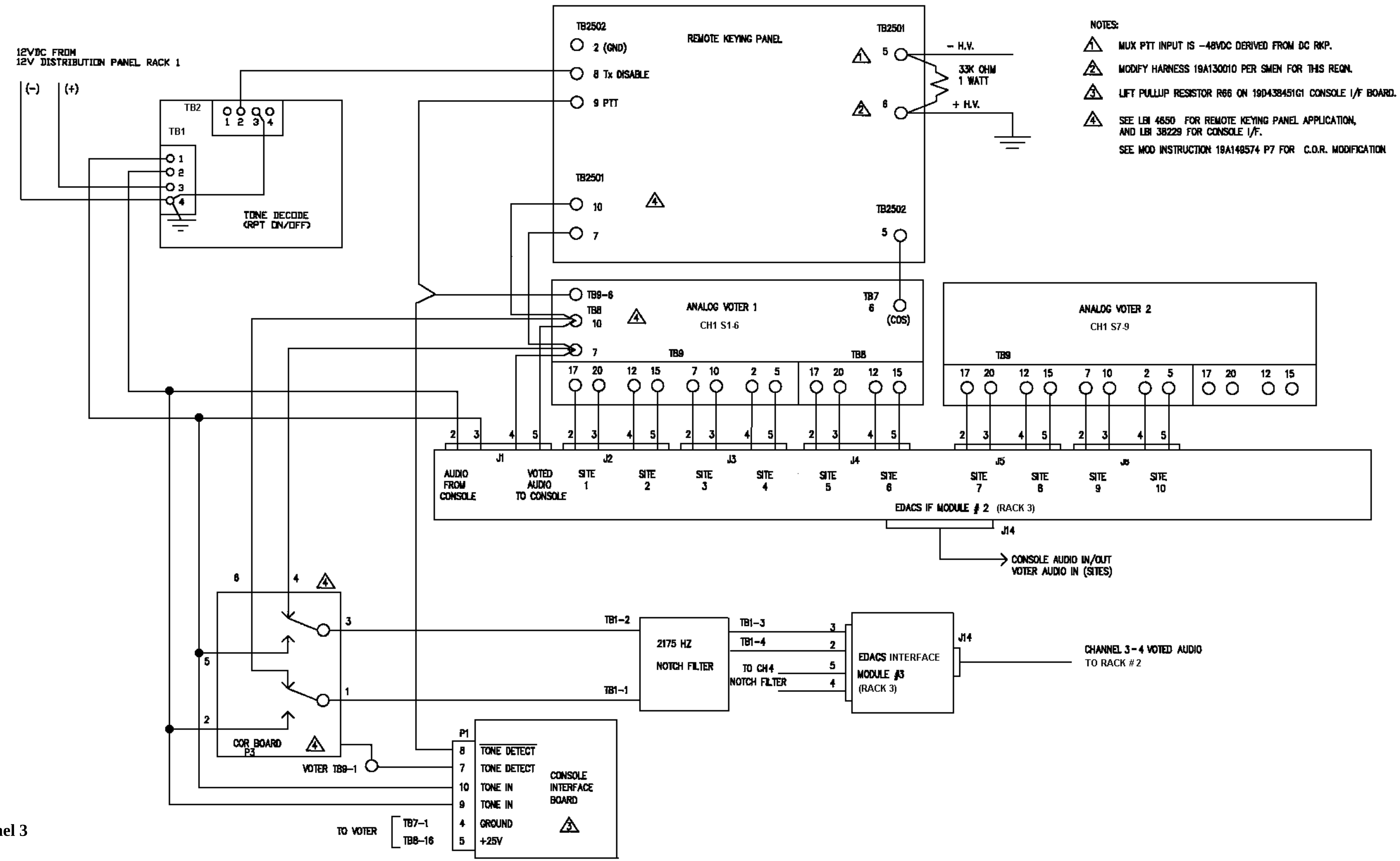
Figure 21B - Conventional Simulcast Voter Interconnect



Channel 2

(193D1044, Sh. 2, Rev. 3)

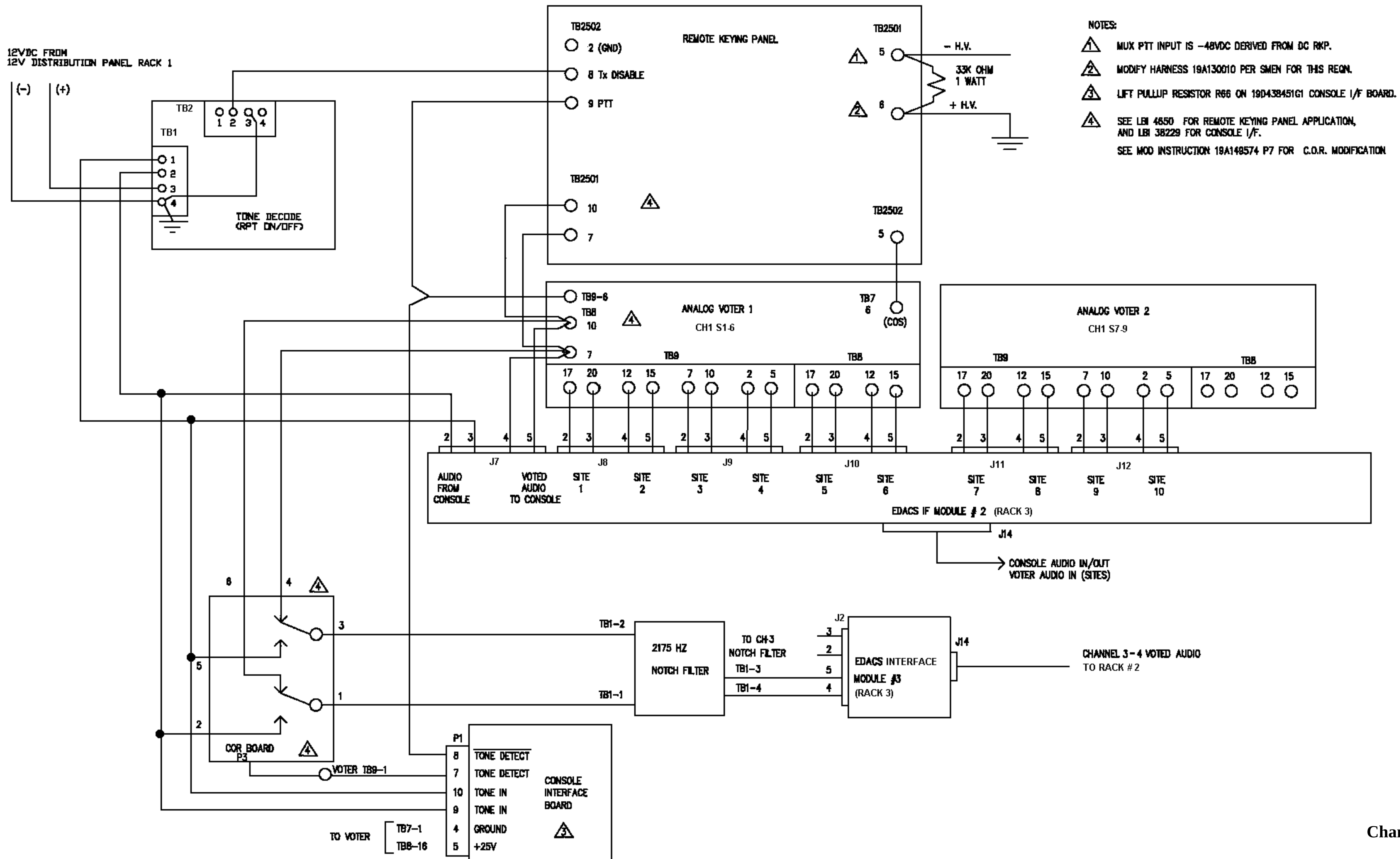
Figure 21C - Conventional Simulcast Voter Interconnect



Channel 3

(193D1044, Sh. 3, Rev. 3)

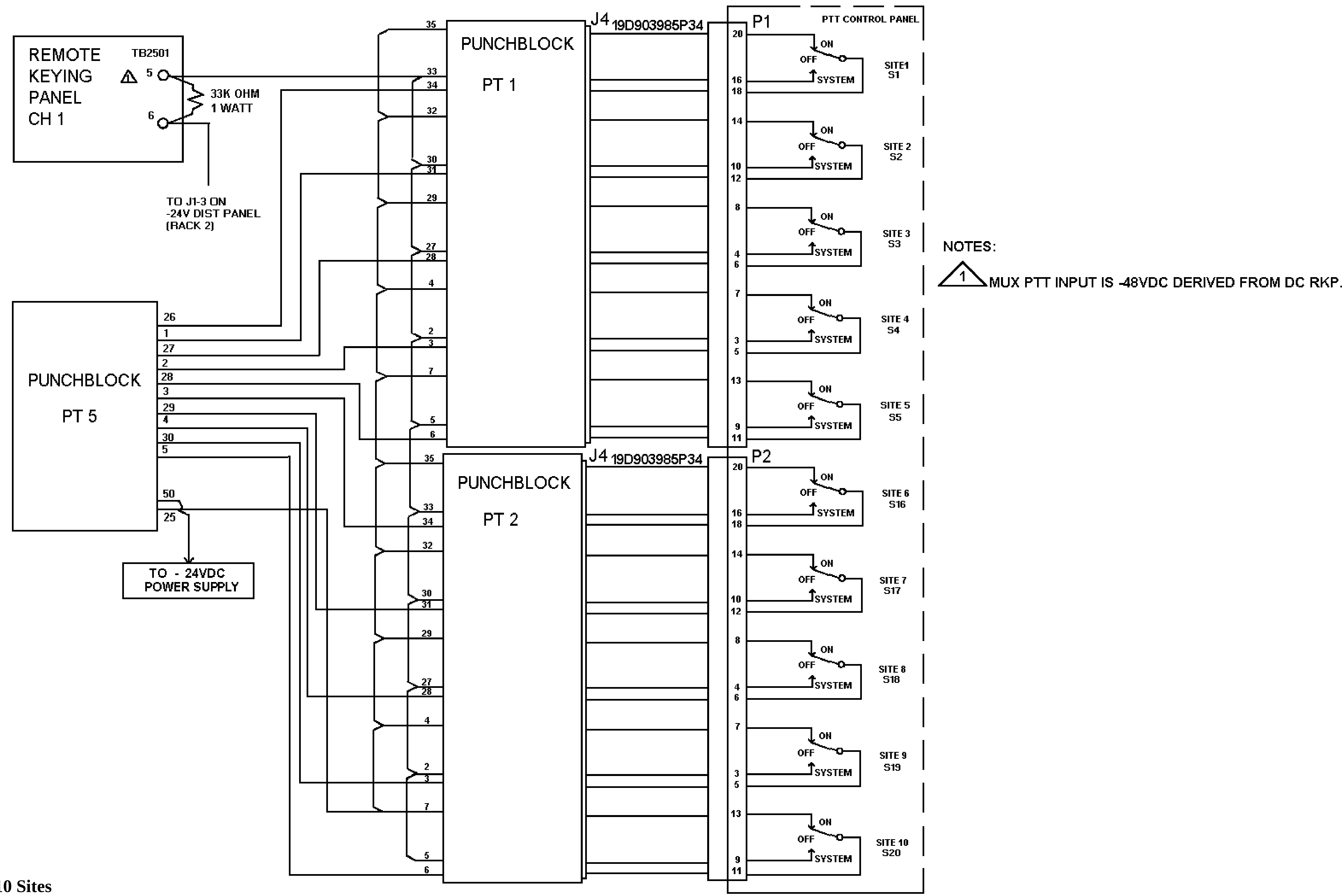
Figure 21D - Conventional Simulcast Voter Interconnect



Channel 4

(193D1044, Sh. 4, Rev. 3)

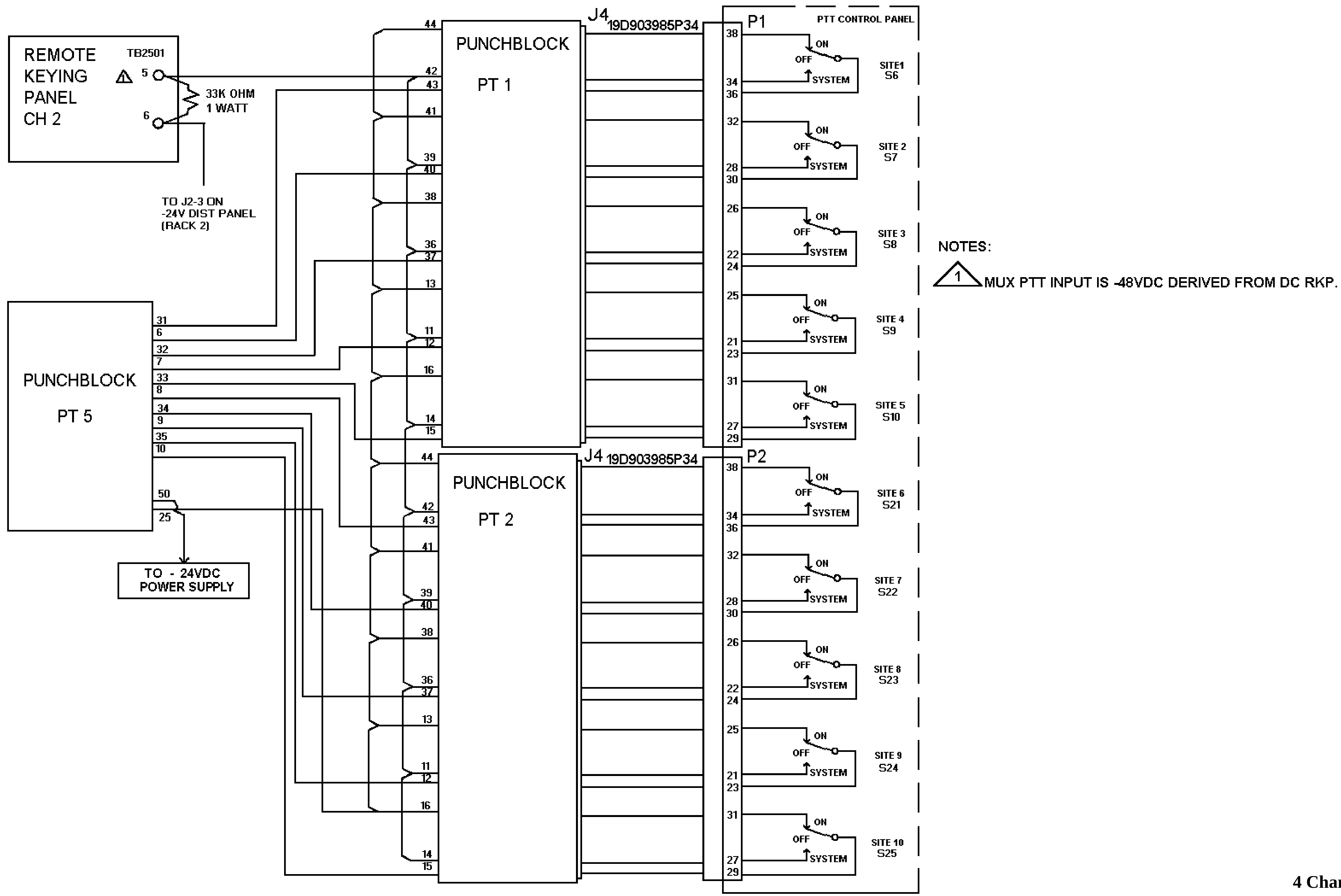
Figure 22A - PTT Control Wiring Conventional Simulcast



Channel 1
4 Channels, 10 Sites

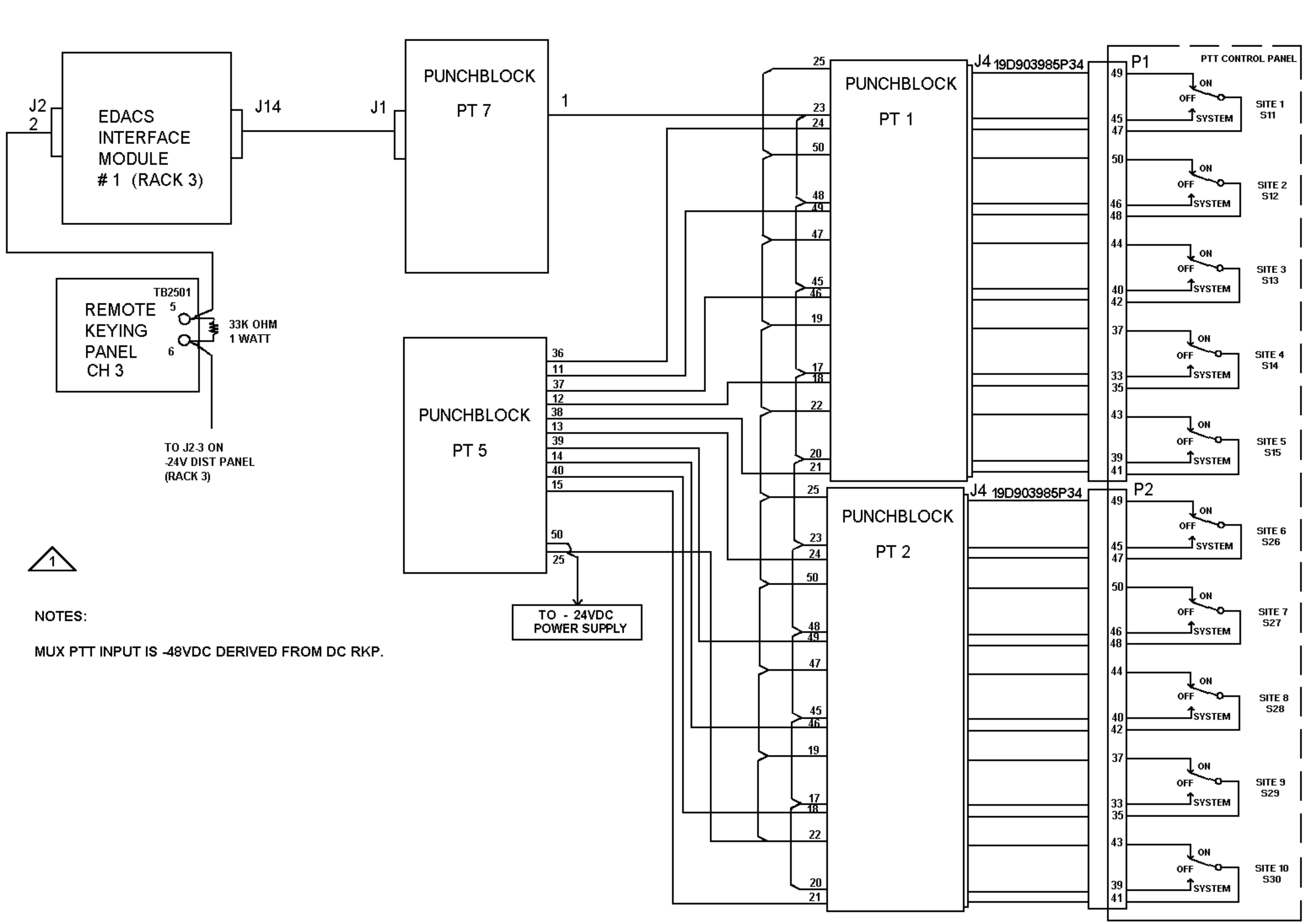
(193D1045, Sh. 1, Rev. 1)

Figure 22B - PTT Control Wiring Conventional Simulcast



Channel 2
4 Channels, 10 Sites
(193D1045, Sh. 2, Rev. 1)

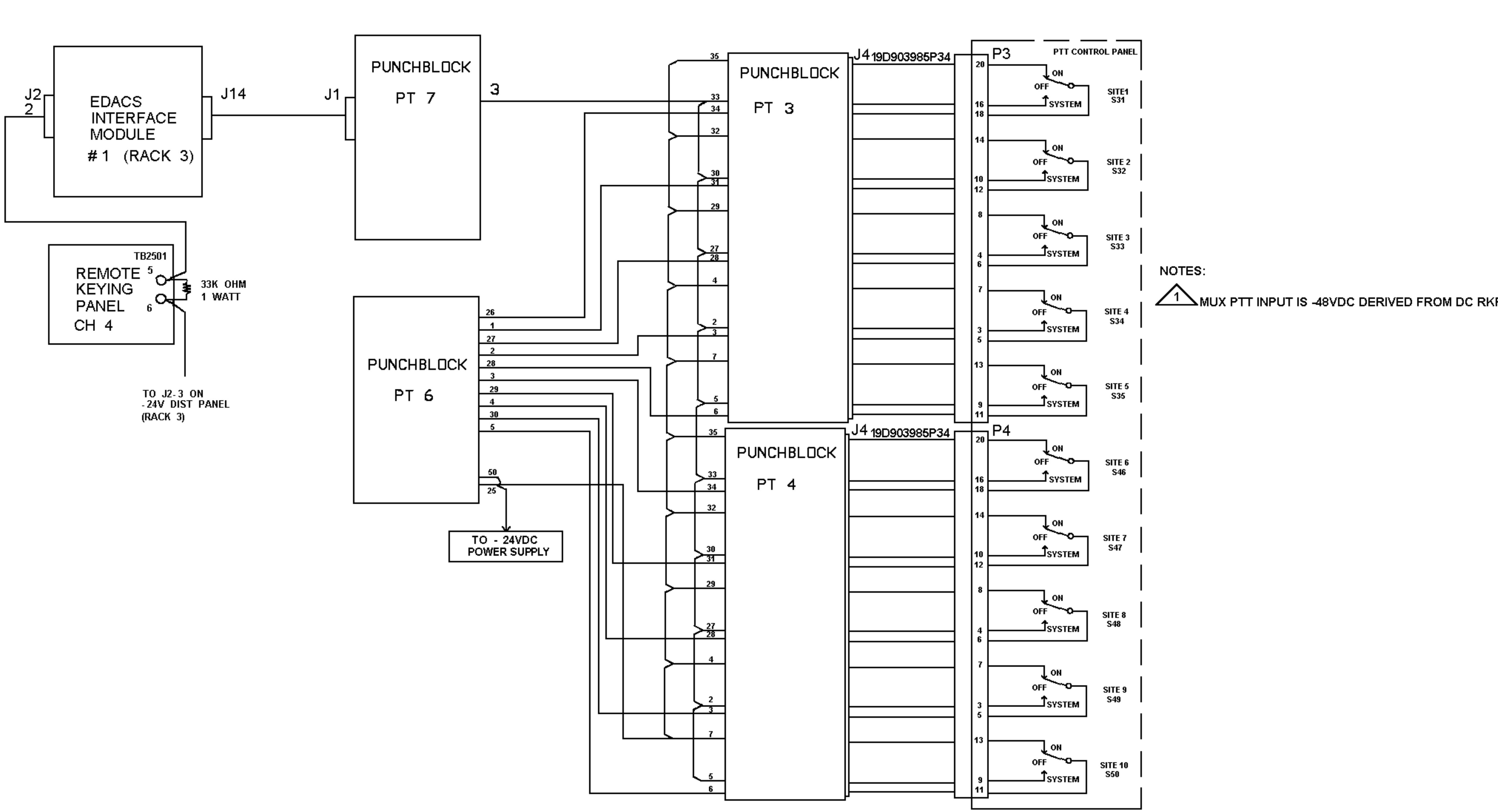
Figure 22C - PTT Control Wiring Conventional Simulcast



Channel 3
4 Channels, 10 Sites

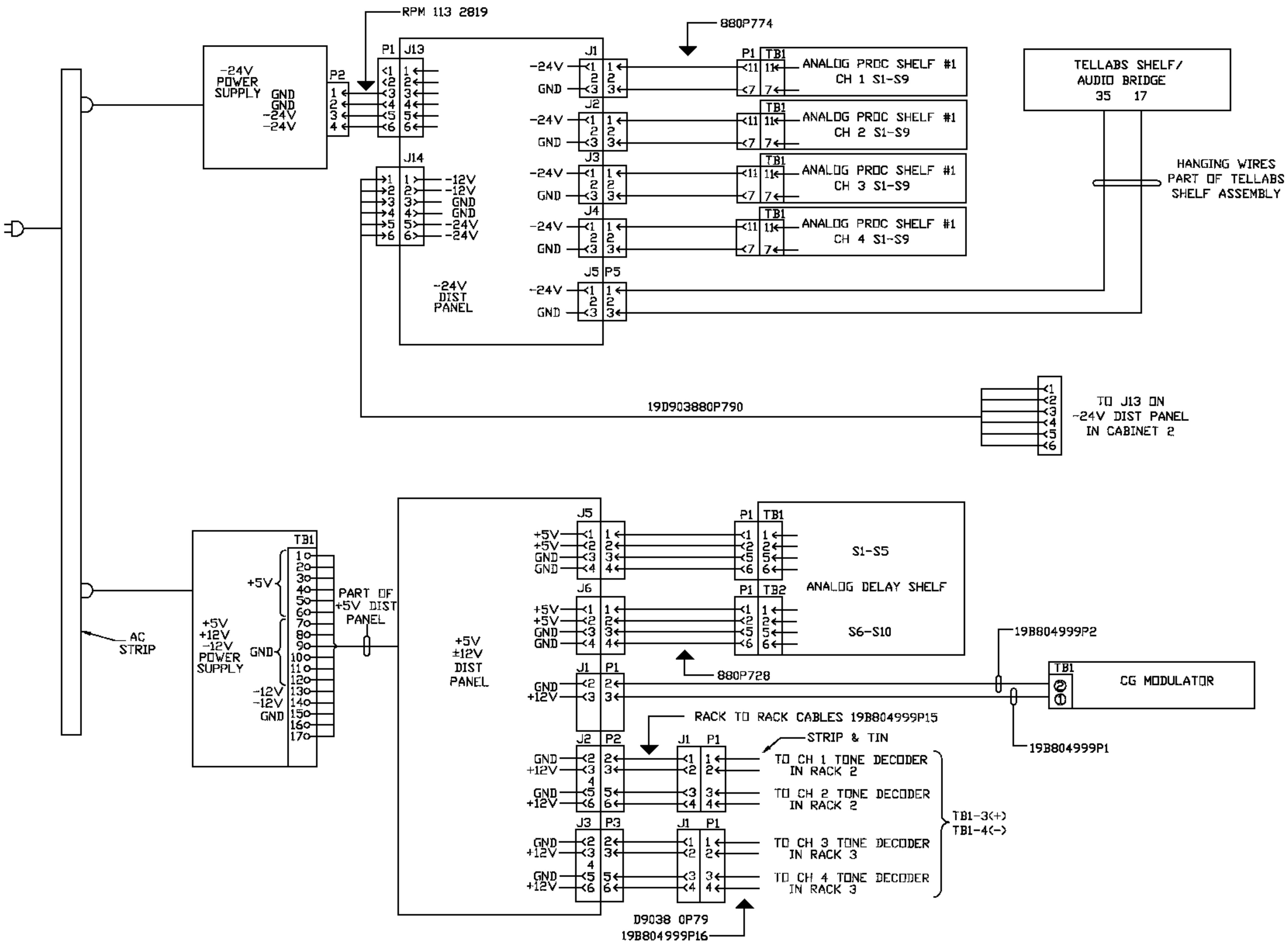
(193D1045, Sh. 3, Rev. 1)

Figure 22D - PTT Control Wiring Conventional Simulcast



Channel 4
4 Channels, 10 Sites
(193D1045, Sh. 4, Rev. 1)

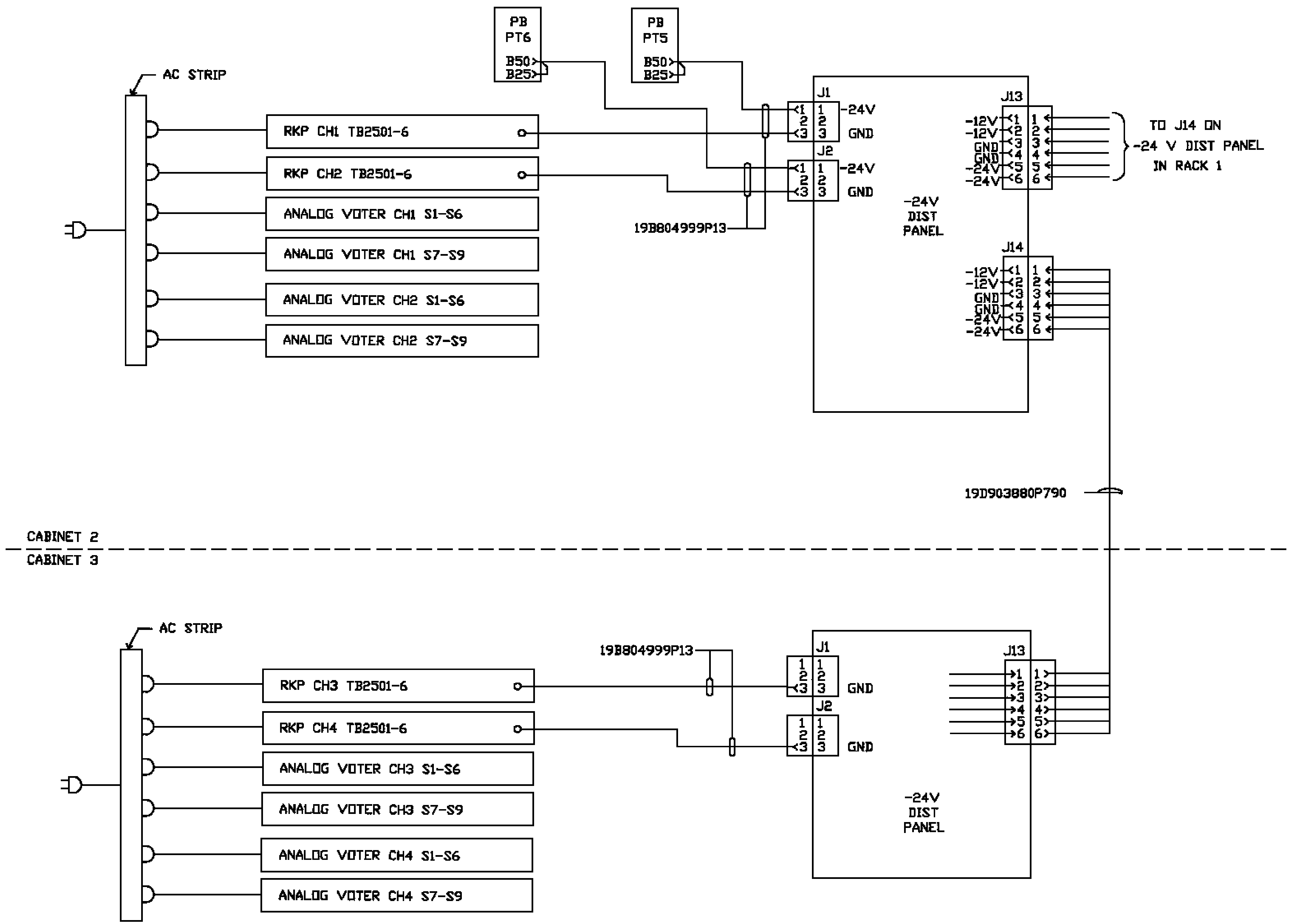
Figure 23A - AC & DC Power Distribution



Analog Processing Cab 1

(193D1046, Sh. 1, Rev. 4)

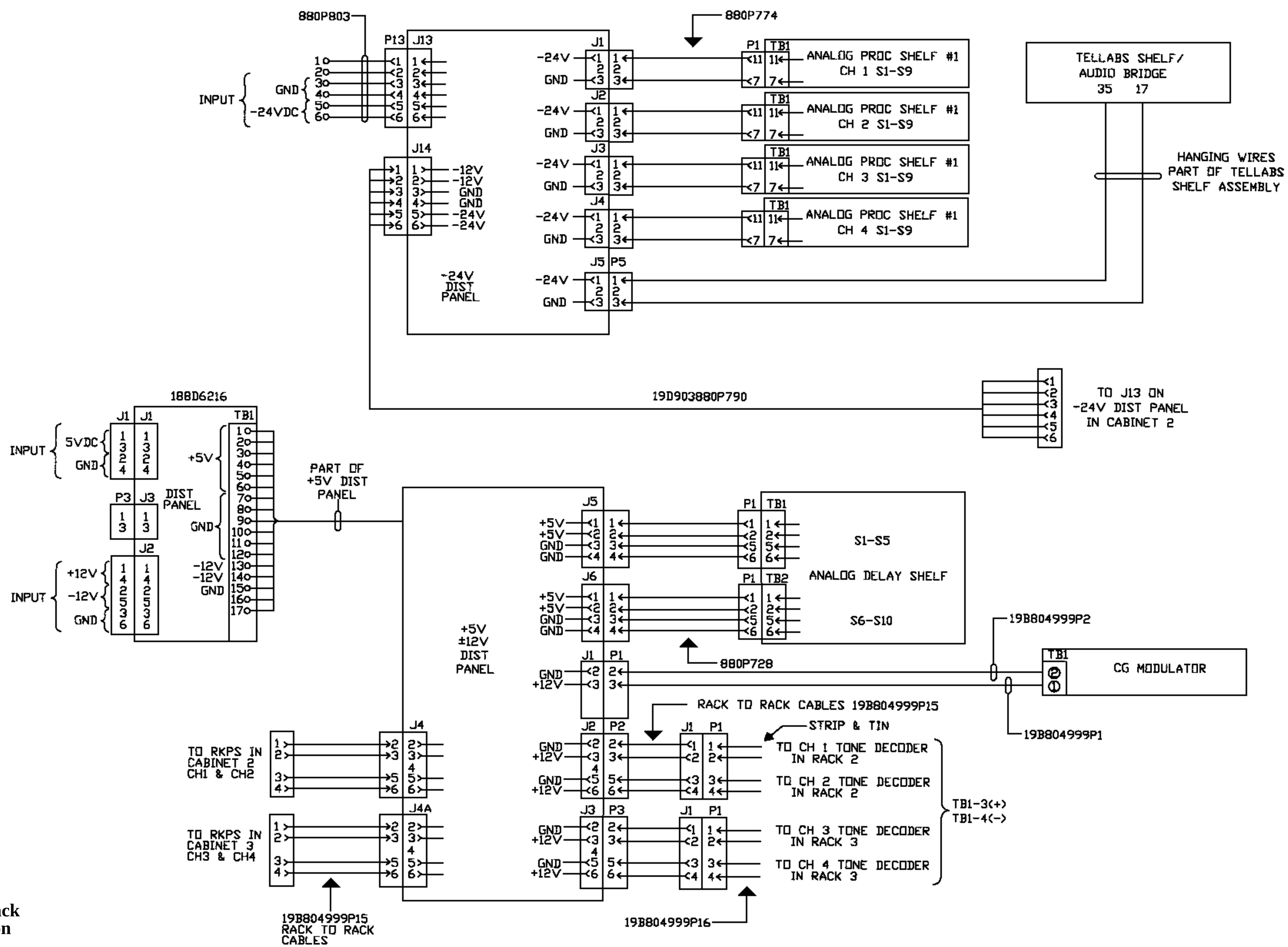
Figure 23B - AC & DC Power Distribution



Analog Voter Cab 2 & 3

(193D1046, Sh. 2, Rev. 1)

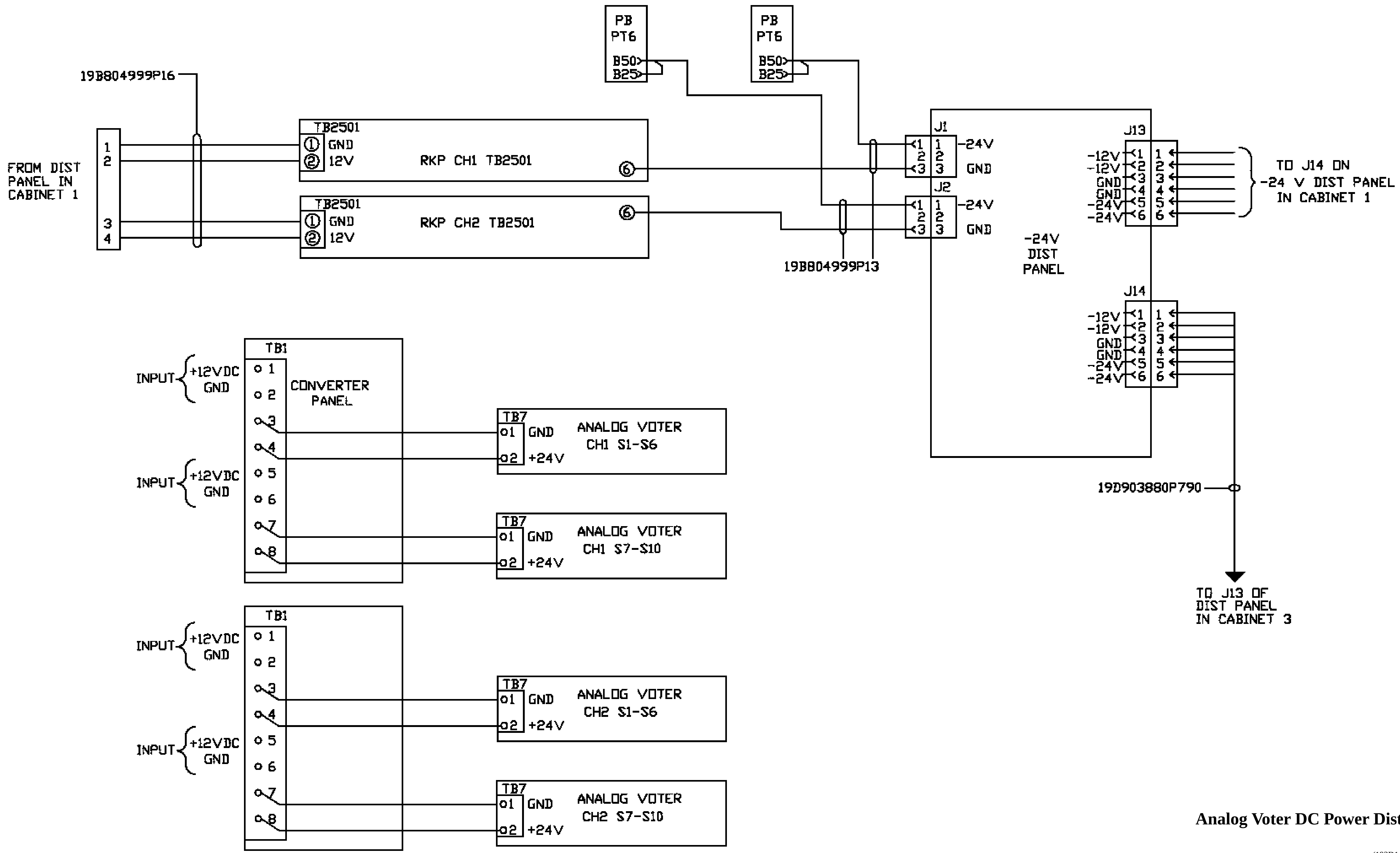
Figure 24A - Power Distribution for DC Operation



Analog Processing Rack
DC Power Distribution

(193D1413, Sh. 1, Rev. 0)

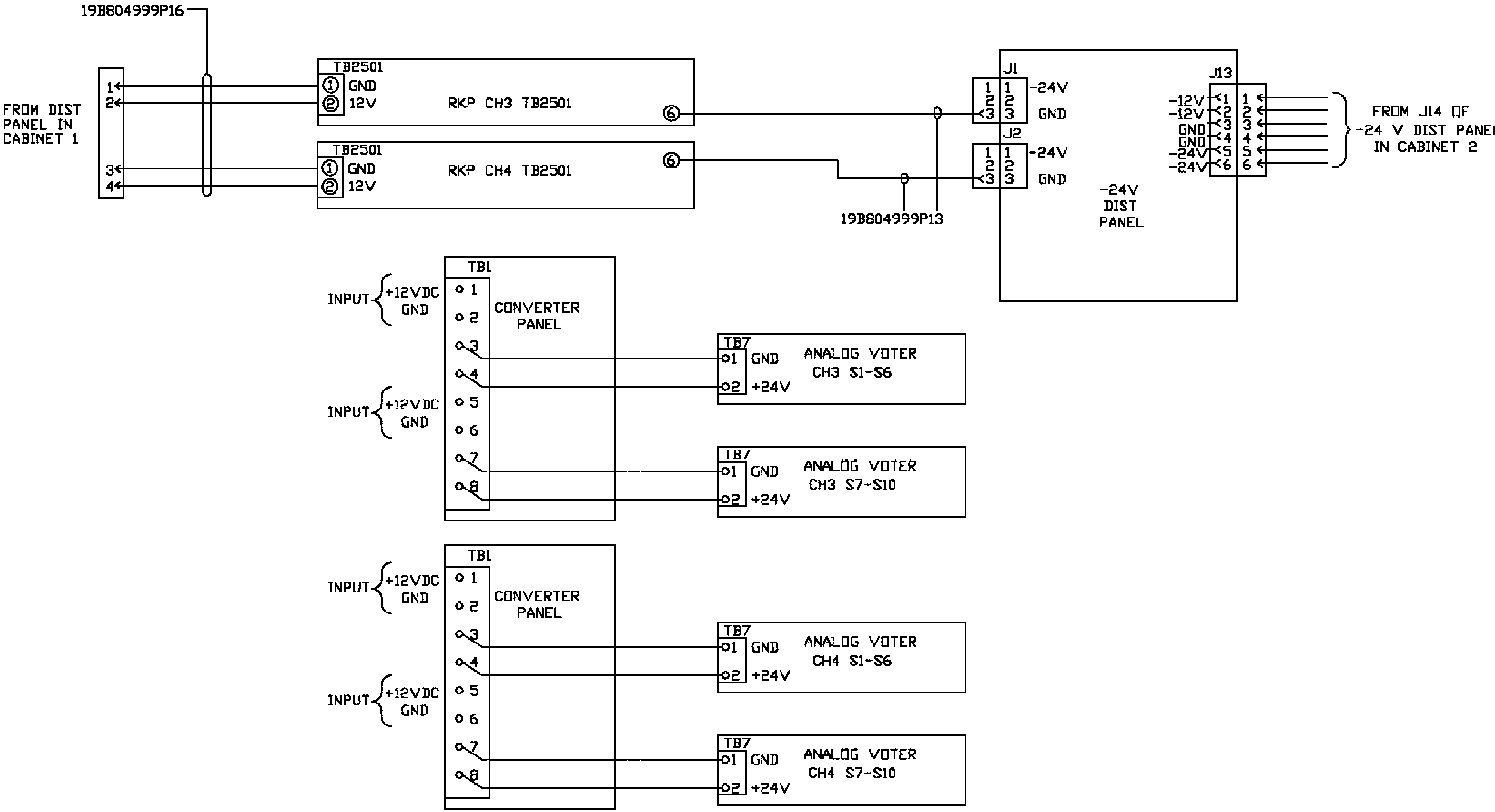
Figure 24B - Power Distribution for DC Operation



Analog Voter DC Power Distribution Cab 2

(193D1413, Sh. 2, Rev. 0)

Figure 24C - Power Distribution for DC Operation



Analog Voter AC/DC Power Distribution Cab 2 & 3

(193D1413, Sh. 3, Rev. 0)

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