

V. THEORY OF OPERATION

A. INTRODUCTION

The DTXPRO-1.2KU transmitter was designed to meet or exceed all FCC applicable specifications for TV broadcast equipment. Special attention was given to the selection of sub-assemblies and components to achieve maximum reliability and minimum down time. The construction of the DTXPRO-1.2KU is BASIC and MODULAR with most subassemblies field replaceable. Special emphasis was placed on "KEEPING IT SIMPLE" and returning to more traditional transmitter layouts and instrumentation. Refer to the DTXPRO-1.2KU block diagram for an overview of the transmitter architecture. This will give the technician basic information needed to understand the operation of the transmitter and the function of each subassembly.

B. ACDIS2 AC AND DC DISTRIBUTION

The ACDIS2 is the primary AC power inlet module. The DTXPRO-1.2KU transmitter was designed to accept 208 to 240 VAC Single Phase using a four (4) wire connection. The four wires are:

- 2 wires for 208 -240 VAC Single Phase
- 1 wire for neutral connection
- 1 wire for safety ground connection

CAUTION: Connection to the AC Primary source must be made using all four wires listed above. Follow the wiring instruction given in TRANSMITTER INSTALLATION Section III.3. If not followed, severe damage to the transmitter and, or, electrical shock could result.

The ACDIS2 performs the following functions:

1. Provides a primary AC power breaker point to shutdown the transmitter
2. Provides 208-240 VAC power to each of the 2 KWDC power supplies with individual breaker points for added safety.
3. Provides 110 VAC circuits for DXDPRO-10U, ADP500, ABS (as necessary) and AUX Power where needed.
4. Analog metering is provided to monitor the Power Supply voltage and current being applied to the RF Amplifier stages.
5. Power supply current sharing test points are provided for checking current sharing between power supply modules.

C. PS6KW 6 KW POWER SUPPLY ASSEMBLY FOR 50 VDC OPERATION

The DTXPRO-1.2KU transmitter is designed with over 6 KW of DC power. To achieve this level, the power supply in each transmitter rack is made up of three (3) AC2050 power modules mounted into one (1) main frame assembly, AC2009, which is capable of managing all three (3) 2 KW modules.

The power modules are "HOT PLUGGABLE" and can be removed or installed without turning off the transmitter. A third power supply module can be purchased for added redundancy.

Each power supply module has OVER VOLTAGE, OVER CURRENT AND OVER TEMPERATURE protection as well as a fault signal in the event of a failure.

REFER TO MANUFACTURER'S MANUAL FOR THE RRSI SERIES POWER SUPPLY PROVIDED WITH THIS DTXPRO-1.2KU USERS MANUAL.

D. ADP500 PERFORMANCE MONITOR AND PAS SELECTOR SWITCH

The ADP500 Performance Monitor provides the following functions:

1. Provides device current monitoring of all the pallets used in the three (3) PA1K-50 power amplifier assemblies. The current levels can be read directly from the multi-meter on the front panel. Individual PA's and pallets are selectable on the ADP500 and PAS. In normal operation, a PA FAULT is indicated when the LED goes from green to red. RED indicates that the current level is below 500 mA and a transistor device may have failed. To read the actual current, select the appropriate Power Amplifier (i.e.: PA1, PA2 or PA3) using the rotary switch on the PAS. Then, using the rotary switch on the ADP500, rotate through the 5 PA positions to measure the drain current on each transistor device for the selected power amplifier module. The multi-meter will read the actual current.
2. A PA INHIBIT switch is provided for failure diagnostic purposes. When activated, this switch allows the technician to monitor the bias currents for each pallet. These readings were recorded at the factory and are found on the Transmitter Test Report, DC Test Report Section. This is the best way to troubleshoot possible transistor problems. When in the PA INHIBIT mode, the RF PWR OFF LED will change from green to red indicating that the "SHUTDOWN LINE" is at TTL 0 state and the output power has been reduced to near zero.

D. ADP500 PERFORMANCE MONITOR AND PAS SELECTOR SWITCH (Continued)

3. An RF MONITOR port (BNC) is available to connect a spectrum analyzer for monitoring the output signal.
4. METER SELECTION SWITCHES – The rotary switches on the PAS are used to select the appropriate PA module (PA1K) for performance display on the ADP500. The PA designations on the ADP500 are PA5, the driver transistor device then PA1 and PA2, indicating the devices on the left side DX500U Pallet. PA3 and PA4 indicate the current through the devices on the right side DX500U Pallet.

The rotary switch on the ADP500 is the detail selector for the multi-meter. The various positions are defined as follows:

PA5	Reads PA Driver device currents as selected Typical reading in INHIBIT MODE 1.5 to 2.5 A. Typical reading in normal transmitter operation approximately 1 to 2 amps.
PA1 to 4	Reads the individual drain currents on each device located on the pallets located on the left and right side of the Power Amp selected. Typical reading in normal transmitter operation is approximately 7 to 14 amps.
PA6	Not used
PS VOLTS	Reads DC voltage applied to PA stages Typical reading for 50 VDC would be the center of the meter, in the green zone.
*P FWRD	Reads PA output power from the mask filter in RMS percentage of rating. Full power reading would be 100%.
*P RFLD	Reads PA output power being returned from the load and displayed as a percentage of forward power. Typical reading would be < 5% indicated.

AUX 1 AND AUX 2 Not used in this configuration.

*This feature is disabled on units used in the DTXPRO-1.2KU. This feature is displayed on the DXDPRO-10U Modulator/Exciter front panel.

E. DXDPRO-10U DIGITAL MODULATOR AND EXCITTER

The heart of any TV Transmitter is the Modulator. This equipment receives the ASI or SMPTE digital stream from the program source. The modulator generates the ATSC/8VSB signal and up converts it to the desired Television Channel.

The modulator performs several additional important function as listed below;

1. Manages the linear and non linear correction of the output signal.
2. Provides a platform for all alarms and monitoring functions via Ethernet.
3. Manages TS inputs

REFER TO INSTRUCTION MANUAL PROVIDED WITH THIS PACKAGE FOR MORE DETAILS ON OPERATING AND USING THE DXDPRO-10U MODULATOR..

F. PA1KU-50 FINAL AMPLIFIER

The DTXPRO-1.2KU transmitter uses three (3) PA1KU-50 integrated power amplifiers. See section VI PA1KU-50 for block diagram and parts list. This integrated final amplifier assembly is built using 50 VDC power transistors and includes a full power isolator with an 800 watt dump load.

G. DRIVER AND ALC CIRCUITS ARE INCLUDED IN THE DXDPRO-10U MODULATOR/DRIVER.

1. The ALC and output power level adjustments are integrated into the DXDPRO-10U modulator. These controls perform the same as the previous driver with ALC (DR50U). Additional information is also available in the DTXPRO-10U MODULATOR MANUAL.

The ALC function when active is designed to keep the transmitter output power at a predetermined level, typically 100%. The output power is sampled with a directional coupler located after the digital mask filter. The power sampled is detected in the modulator and a DC voltage proportional to the power level is provided to the processor for display on the front panel and on the Ethernet Web Page.

2.0 VDC = 120% Output Power

1.8 VDC = 100% Output Power

1.3 VDC = 50% Output Power

Note: % FWD Power = $30V^2$

% RFLD Power = $12.5V^2$

The ALC is adjusted to maintain the output power you have selected at a constant level.

G. DRIVER AND ALC CIRCUITS ARE INCLUDED IN THE DXDPRO-10U Modulator/Driver (Continued)

2. Command Functions - The three front panel "NO" (momentary) push buttons – POWER UP, POWER DOWN, SET/RESET – can be remotely operated by a momentary relay closure to ground. Each operation is internally pulled up to 5 VDC through a 10K resistor. The SET/RESET push button toggles the DR50UD between manual and track modes. In manual mode the transmitter power may be raised or lowered by use of the POWER UP or POWER DOWN buttons until the desired transmitter output power is obtained. Momentarily pressing the SET/RESET push button toggles the DR50UD into TRACK mode where the ALC board maintains that power level.

H. USH3C 3-WAY SPLITTER

The USH3C 3-Way Phased Splitter receives the output from the DXDPRO-10U and splits it into 3 parts. Two outputs are at 0 degrees phase and the third output is shifted 90 degrees. This unit is an isolated phased splitter and will provide some isolation in the event one PA fails.

I. UCH2KU-3 MULTICOUPLER COMBINER

The UCH2KU-3 is a 3-Way Phased Multicoupler Combiner. This multicoupler accepts the phased output power from each of the three (3) PA1K-50 Power Amplifiers and combines them into an output power level slightly higher than the rated transmitter output power in order to compensate for the filter insertion loss. This is a closed unit and cannot be serviced.

J. DC5KC-1 DIRECTIONAL COUPLER

The DC5KC-1 Directional Coupler provides for insertion monitoring of forward (FWD) and reflected (RFLD) RF power after the mask. These monitor signals are sent to the ADP500 for display, operation of the ALC feature and adaptive pre-correction when the DXD100AU exciter is installed. These directional couplers also provide sample power to the modulator Adaptive correction circuits.

K. BPUD2.5K ATSC COMPLIANT MASK FILTER

This mask filter was designed to meet FCC Certification requirements with minimum loss of RF Power. The BPUD2.5k comes tuned and tested to the operating frequency of the transmitter and should not be adjusted without proper equipment and experience. It is recommended that, should adjustment become necessary, the filter be returned to the factory.

L. BPL5KU-KK HARMONIC FILTER

This harmonic (also sometimes called Low Pass) filter is inserted at the output of the ATSC mask filter and before the transmission line to the antenna to provide necessary filtering of channel harmonics to meet FCC Rules.