THEORY OF OPERATION

A. INTRODUCTION

The DTXPRO-800VH 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-800VH is BASIC and MODULAR with most components field replaceable. Special emphasis was placed on "KEEPING IT SIMPLE" and returning to more traditional transmitter layouts and instrumentation. Refer to the DTXPRO-800VH 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. ACDIS1 AC & DC DISTRIBUTION

The ACDIS1 is the primary AC power inlet module. The DTXPRO-800VH 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 lll.3. If not followed, severe damage to the transmitter and, or, electrical shock could result.

The ACDIS1 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 Exciter, ADP1000, and AUX Power where needed.
4. Analog metering is provided to monitor the Power Supply voltage and current being applied to the RF Amplifier states.
5. Power supply current sharing test points are provided for checking current sharing between power supply modules.

V -- THEORY OF OPERATION (Continued)

C. PS4KW 4 KW POWER SUPPLY ASSEMBLY

The DTXPRO-800VH transmitter is designed with over 4 kW of DC power. To achieve this level, the power supply in each transmitter rack is made up of two (2) AC2050 power modules mounted into one (1) main frame assembly, AC2009, which is capable of managing both 2 kW modules.

The power modules are "HOT PLUGGABLE" and can be removed or installed without turning off the transmitter. Although the transmitter output power would need to be reduced below the level of power from one PS module. 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-800VH USER MANUAL.

D. ADP1000 PERFORMANCE MONITOR

The ADP1000 Performance Monitor provides the following functions:

1. Provides device current monitoring of all the pallets used in the two (2) PA1KVH-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 ADP1000. 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) using the push button switch. Then, using the rotary switch on the ADP1000, 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.

3. The PA designations on the ADP1000 are PA5 (inhibited in this transmitter) then PA1 and PA2, indicating the devices on the left side VHB600A-50 Pallet. PA3 and PA4 indicate the current through the devices on the right side VHB600A-50 Pallet.

V -- THEORY OF OPERATION (Continued)

The rotary switch on the ADP1000 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 to14 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	**Not Used** (See Exciter)
P RFLD	**Not Used** (See Exciter)
AUX 1 & AUX 2	**Not used** in this configuration.

E. DXDPRO-10VH EXCITER

The heart of any TV Transmitter is the Exciter. This equipment receives the ASI (or SMPTE) digital stream from the source, changes the format to ATSC 8VSB and up converts the IF signal to the specific “on-channel” RF broadcast frequency.

The DXDPRO-10VH provides adaptive linear and non-linear correction and consists of a ProTV core modulator assembly and a 15 VDC power supply. In addition, the DXDPRO-10VH Exciter has an internal 10W driver, Automatic Level Control, Power Detector and Logical Measurement and Control.

The DXDPRO-10VH has provision for accepting a pre mask filter RF monitoring sample and a post mask filter RF monitoring sample. These samples are used by the internal modulator assembly to make linear and non-linear corrections on-the-fly.

The DXDPRO-10VH has provision for accepting a transmitter forward output power sample and reflected output power sample. These values can be read on the exciter front panel as a percent of specified operating power levels.

V -- THEORY OF OPERATION (Continued)

The DXDPRO-10VH has a built-in ALC circuit. This circuit receives a sample of output transmitter power and automatically adjusts exciter output power to provide for consistent and constant power in the output.

Additional information on the functions and applications of the DXDPRO-10VH Exciter can be found in the transmitter User Manual.

F. VS200N 2-Way IN-PHASE SPLITTER

The VS200N 2-Way In-Phase Splitter receives the output from the DXDPRO-10VH Modulator/Driver and splits it into 2 parts. The VS200N is a frequency sensitive assembly and can only be used on the transmitter channel it was designed for.

G. MFA2PAH-50 POWER AMPLIFIER HOUSING MAINFRAME

The MFA2PAH-50 is the main RF Power Amplifier housing which accommodates up to two (2) PA1KVH-50 Amplifiers. The housing includes the following:

2 each 470 CFM cooling fans

2 each Air filter assemblies

2 each Front panel status PC boards

1 each Main chassis

2 each Mechanical slide assemblies

1 each 220 VAC Filtered inlet for operating the cooling fans

There is one (1) MFA2PAH-50ND mainframe assembly in the DTXPRO-800VH transmitter rack for two (2) each PA1KVH-50ND Power Amplifiers.

I. PA1KVH-50 POWER AMPLIFIER

The PA1KVH-50 is the main RF Power Amplifier Assembly used in the DTXPRO-800VH. Each amplifier assembly is made up of one (1) DX25VH-50 driver amp pallet and two (2) VHB600A-50 power pallets operating in parallel. These amplifiers are operated in Class A/AB or sometimes referred to as "HARD AB". This refers to the bias levels to achieve best linearity.

Each PA1KVH-50ND amplifier assembly includes the following:

1 each DX25VH-50 driver amp pallet

2 each VHB600A-50 power pallets

1 each Phase and gain matching circuit

V -- THEORY OF OPERATION (Continued)

1 each 2-Way in-phase splitter

1 each 2-Way in-phase combiner

1 each Circulator

1 each Power distribution module (1A0025)

3 each Thermal sensors

1 each Remote monitor port (DB9)

1 each Front panel status port (Molex)

1 each Filtered DC input port

1 each Type N Panel mounted RF Input port

1 each 7-16 DIN Panel mounted RF Output port

J. VHC1KW IN-PHASE COMBINER

The VHC1KW is a 2-Way In-Phase Combiner. This combiner accepts the output power from each of the two (2) PA1KVH-50ND 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 generally does not require servicing.

K. DC2KB-2 DIRECTIONAL COUPLER

There are two (2) DC2KB-2 Directional Coupler provided with this transmitter. One directional coupler (DC) is placed before (pre) the mask filter and one is placed after (post) the mask filter.

1. The **pre** directional coupler has four monitor probes of which two are used by the transmitter. One probe monitors the forward power which is sent by RG-223 cable to the back of the modulator and used for non-linear correction. The other DC probe monitors the reflected transmitter power and is also sent to the back of the modulator by RG-223 cable. This provides a HIGH ANTENNA VSWR MONITOR in the event of an antenna or antenna transmission line failure. Should the reflected power exceed 25% the transmitter will shut down.
2. The **post** directional coupler also has four monitor probes of which two are used by the transmitter. One probe monitors forward power and is sent by RG-223 cable to the back of the modulator and used for linear correction. The other DC probe monitors the transmitter forward output power and is also sent to the back of the modulator by RG-223 cable. Monitors FORWARD POWER to the antenna and presents it as a percentage of power rating. The transmitter comes set to 25% Forward Power and the customers engineer turns the power up to 100% for 800W RMS transmitter output power after the mask filter.

The remaining spare DC probe positions are available for customer use.

V -- THEORY OF OPERATION (Continued)

L. BPVD1KH VHF ATSC COMPLIANT MASK FILTER

This mask filter was designed to meet FCC Certification requirements with minimum loss of RF Power. The BPVD1KH 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.