8. OPERATIONAL DESCRIPTION - MODEL ADC-835-3

8.1 General Description

The 835-3 is a complete 3000-watt UHF solid-state internally diplexed television transmitter. It operates at a nominal visual output power of 3000 watts peak sync and an average aural output power of 150 watts, at an A/V ratio of 13 dB, 5% sound.

8.2 Technical Specifications

Type of Emissions:
- Visual 5M75C3F
- Aural 250KF3E

Frequency Range .....470 MHz to 860 MHz (any 6-MHz channel)

Output Power
- Visual..... 1500 to 3000 watts peak sync (front panel adjustable)
- Aural .....≤150 watts average

Maximum Power Rating
- Visual.....3000 watts peak visual
- Aural ..... 150 watts average aural

Power Consumption .....10,000 watts (50% APL)

8.3 Performance Specifications

Visual Performance

Operating Frequency Range .....470 MHz to 860 MHz

RF output - Nominal:
- Power.....3000 watts peak sync
- Impedance..... 50 ohms
- Connector.....Type 1 5/8" EIA

Video Input:
- Level ..... 1 volt peak to peak
- Impedance.....75 ohms bridging

Visual Sideband Response:
- From -0.5 MHz to +3.58 MHz..... ±0.5 dB
- 3.58 MHz to 4.18 MHz..... +.5, -1.0 dB
- Below -1.25 MHz .....-20 dB
- Above +4.75 MHz .....-30 dB

Variation of Frequency Response with Brightness ..... +0.5 dB
Differential Phase..... ±3°
Incidental Phase Modulation ..... ±3°
Differential Gain.....5%
Low Frequency Linearity 5%
Intermodulation Distortion .....-52 dB

Amplitude Variation Over One Field.....2%
Regulation Of Output.....3%
Envelope Delay vs. Frequency.....Per FCC curves
2T Pulse.....2%
12.5T Pulse.....5%
Modulation Capability.....1%
AM Noise..... -55 dB
Harmonic Emission.....-60 dB
Spurious Emission.....-60 dB
Carrier Frequency Stability..... ±250 Hz

Aural Performance

RF Output – Nominal
Power.....≤150 watts
Impedance..... 50 ohms
Connector.....Type 1-5/8" EIA
Aural Input:
Impedance..... 600 ohms
Level..... +10 dBm
Amplitude vs. Frequency Response..75 microseconds pre-emphasis ±0.5 dB
Audio Harmonic Distortion.....0.5%
Noise:
AM.....-55 dB
FM.....-60 dB
Aural to Visual Carrier Separation.....4.5 MHz, ±100 Hz
Modulation Capability.....±100 kHz
Subcarrier Input.....+10 dBm for 25 kHz deviation

Electrical Requirements

Power Line Voltage.....208 volts to 240 volts, 50/60 Hz
Power Consumption.....15,000 watts, black picture

Environmental

Maximum Altitude.....8,500 feet
Ambient Temperature.....0°C to +50°C

8.4. System Overview

The 835-3 is a complete 3-kW UHF solid-state, internally diplexed television transmitter that operates at a nominal visual output power of 3000 watts peak of sync and average aural output power of 150 watts, at an A/V ratio of 13 dB.

8.4.1 System Overview

The 835-3 is made up of two cabinets: a UHF exciter cabinet (the left cabinet) and an amplifier array cabinet (the right cabinet).

This 835-3 (1176-1527) is comprised of (A1) a UHF exciter assembly (1227-1200), (A2) an amplifier array assembly (1245-1700), (A9) a bandpass filter (2005-1064),

(A10) an output trap filter assembly, and (A11) an output coupler assembly (1020-1002).

The left cabinet contains (A1) the UHF exciter assembly (1227-1200) for the 3-kW transmitter, mounted at the top of the cabinet.

The (A2) 3-kW amplifier array assembly (1176-1528) contains (A9-A1) an 8-way splitter (ZFSC-8-43), (A9-A2) an ALC splitter board (1181-1002), six (A1 through A6) 600-watt amplifier trays (1227-1300), (A7) a 6-way combiner, (A12) a reject load assembly (1278-1312), (A10) an AC distribution panel (1245-1300), and (A11) an interface panel.

Switch S2 is an Automatic/Manual switch that controls the operation of the transmitter by the presence of the video input signal. When the switch is in Automatic, the green LED DS3 is lit and, if the video input signal to the transmitter is lost, the transmitter will automatically switch to Standby. When the video input signal returns, the transmitter will automatically switch back to Operate. In Manual, the amber LED DS4 is lit and the operation of the transmitter is controlled by the front panel switches. During normal operation of the transmitter, switch S2 should be in the Automatic position. The front panel of the UHF exciter also has LEDs that indicate an overtemperature fault, (red LED DS6), an ALC fault, (red LED DS8), a video fault (loss) (red LED DS9), and a VSWR cutback (amber LED DS7).

The (A1) UHF exciter (1227-1200) takes the baseband audio and video inputs and produces a diplexed, modulated, and on-channel frequency visual + aural RF output. The RF output of the UHF exciter at J15 is connected to (A2) the 3-kW amplifier assembly (1245-1700), where it is split six ways in (A9-A1) the 8-way power splitter assembly (ZFSC-8-43). The outputs of the splitter feed the six (A1, A2, A3, A4, A5, and A6) 600-watt amplifier trays (1227-1300) that amplify the RF signals to approximately 600 watts each.

A forward power sample from the 4-way combiner board inside the 600-watt amplifier tray is connected to the dual peak detector board. This board provides a peak-detected forward sample to the amplifier control board that supplies the sample to the front panel meter of the 600-watt amplifier tray. Before exiting each 600-watt amplifier tray, the RF is fed through a circulator for protection of the tray from high VSWR conditions. The reject port of the circulator provides a reject sample to the 4-way combiner board that supplies the reflected sample to the dual peak detector board. The peak-detected reflected sample connects to the amplifier control board that provides the sample to the front panel meter of the tray. The outputs of the six 600-watt amplifier trays are then combined in (A7) a 6-way combiner that provides approximately 3400 watts peak of sync output. The combined output of the amplifier assembly is connected to (A9) a bandpass filter, (A10) an output trap filter, and then to (A11) the output coupler assembly (1020-1002). The bandpass filter and trap filter are tuned to provide high out-of-band rejection of unwanted products. The output of the trap filter is cabled to (A11) an output coupler assembly that provides two forward and one reflected power samples to the visual/aural metering board in the UHF exciter. The two forward samples are processed to provide peak-detected Visual and aural power output samples to the transmitter control board. The reflected power sample is also peak detected and wired to the transmitter control board. The transmitter control board connects the visual, aural, and reflected power output samples to the front panel meter for monitoring.

8.4.2 Transmitter Operation

The 835-3 transmitter needs two AC inputs of 220 VAC: one to the exciter cabinet at 80 amps and one to the amplifier assembly cabinet at 100 amps. In the exciter cabinet, the 220-VAC input connects to the AC input assembly in the upper, right rear of the cabinet. The assembly contains terminal block TB1 that connects to the 220 VAC. The 220 VAC is wired from the AC input assembly to the TB1 in the AC distribution panel (1247-1100). The AC distribution panel contains six circuit breakers that supply the AC to the two UHF exciter trays, one for the 3-kW transmitter and one for the 1-kW transmitter. The input AC is connected to CB1, the main AC circuit breaker (80 amps) that distributes the 220 VAC to TB2. TB2 has three metal-oxide varistors (MOVs), mounted to the terminal block: one connected from each leg of the input AC to ground and one across the two legs.

The input AC is wired from TB2 through five circuit breakers (CB2, CB3, CB4, CB5, and CB6) to the exciters and the rest of the 1-kW transmitter. CB2 (10 amps) supplies the AC voltage to the IEC outlet strip (A2-A1) into which the UHF exciter for the 3-kW transmitter and the UHF exciter for the 1-kW transmitter are connected. A circuit breaker mounted on the rear of each UHF exciter tray can be switched on and off to control the AC to that individual UHF exciter Tray. CB3 (20 amps) supplies AC through J5 to (A6) the 600-watt amplifier tray. CB4 (20 amps) supplies AC through J6 to (A7) the 600-watt amplifier tray. When the UHF exciter circuit breaker is switched on, +12 VDC from the bottom UHF exciter tray is supplied to the two 600-watt amplifier trays in the 1-kW transmitter and +12 VDC from the top UHF exciter tray is supplied to the 3-kW amplifier array assembly for the operation of the LED status indicators in the tray.

The baseband video and audio inputs to the 3-kW transmitter connect to the rear of (A1) the UHF exciter tray, the top exciter. The baseband video input connects to jack J1 and the baseband audio input connects to jack J5, balanced audio, or to J3, for composite, stereo, audio. The back of the UHF exciter also provides connections for remote monitoring and operation of the transmitter at jack J11. Jack J11 should have a dummy plug connected to it which has a jumper between pins 23 and 24 that provides the interlock needed to operate the 3-kW transmitter. If remote connections are made to the transmitter, they should be made through the plug in J11.

8.4.2.1 (A2) 3-kW Amplifier Assembly (1245-1700)

The (A2) 3-kW amplifier assembly contains (A9-A1) an 8-way splitter (ZFSC-8-43), (A9-A2) an ALC splitter board (1181-1002), six (A1 through A6) 600-watt amplifier trays (1227-1300), (A7) a 6-way combiner, (A12) a reject load assembly (1278-1312), and (A10) an AC distribution assembly, amplifier array (1245-1300).

The RF input from the UHF exciter tray connects to J1 on (A11) the interface panel in the amplifier assembly. The RF is connected to the COM input of (A9-A1) the 8-way splitter which splits it eight ways; six of the outputs are connected to J1, the RF input on each of the 600-watt amplifier trays (1227-1300), and the other two outputs are terminated with 50-Ω loads. Each of the 600-watt amplifier trays amplify the RF signals to the power needed to produce a total of 3000 watts peak of sync, with a maximum of 600 watts.

In each 600-watt amplifier tray, a forward power sample and a reflected power sample from the 4-way combiner board are connected to the dual peak detector

board, single supply. This board provides peak-detected forward samples to the amplifier control board that supplies the samples to the front panel meter of the 600-watt amplifier tray. Before exiting each 600-watt amplifier tray, the RF is fed through a circulator for the protection of the tray from high VSWR conditions. The reject port of the circulator provides a reject sample to the 4-way combiner board. The 4-way combiner board supplies the reflected sample to the dual peak detector board, single supply, in the tray that connects to the front panel meter.

The outputs of the six 600-watt amplifier trays are combined in (A7) the 6-way combiner that provides the 3000 watts peak of sync output with a maximum of 3600 watts. The 6-way combiner has six reject outputs that connect to (A12) a reject load assembly (1278-1312). The reject load assembly provides loads for any reject power generated due to mismatch in the combing process. The assembly provides a heatsink, (A12-A3 and A12-A5), two fans, and (A12-A4) a thermal switch. The thermal switch is mounted on the heatsink for the reject load assembly and connects to the overtemperature fault circuit on the transmitter control board in the UHF exciter tray; this shuts down the transmitter if an overtemperature fault occurs. The combined RF output for the transmitter is at the 1-5/8" hardline connector from the 6-way combiner.

8.4.2.2 3-kW Transmitter Output Assemblies

The output of (A2) the amplifier assembly connects through a 1-5/8" to 3-1/8" adapter to (A9) a bandpass filter, (A10) an output trap filter assembly, and then to (A11) the output coupler assembly (1020-1002). The bandpass filter and trap filter are tuned to provide high out-of-band rejection of unwanted generated products. The filtered signal is connected to (A11) an output coupler assembly that provides two combined forward and a combined reflected power sample to the metering panel in the UHF exciter assembly.

8.4.3 Control and Status

The forward samples are processed to provide peak-detected visual and aural power output samples to the front panel meter of the metering panel. The reflected power sample is also peak detected and wired to the front panel meter.

The control and status of the 3-kW transmitter is provided by the meter indications on the UHF exciter tray. The switches and LED indicators, which are mounted so that the switches and LEDs are operated or viewed from the front panel of the UHF exciter, are part of the transmitter control board (1265-1311). On the UHF exciter tray, switch S1 is an Operate/Standby switch that provides the Operate command (enable), when in Operate, to the amplifier array at J4-15 and J4-16, where it is split six ways and connected to each 600-watt amplifier tray. The enable is needed to turn on the switching power supplies in the 600-watt amplifier trays. When the UHF exciter is in Operate, the green LED DS2 is on and, when in Standby, the amber LED DS1 is on.

Note: If the transmitter does not switch to Operate when S1 is switched to Operate, check that a dummy jumper plug, with a jumper between pins 23 and 24, is connected to jack J11 on the rear of the UHF exciter tray. This jumper provides the interlock needed for the operation of the transmitter. If the interlock is present, the green LED DS5 on the transmitter control board should be lit.

The operation of the transmitter is controlled by the front panel switches on the UHF exciter tray. During the normal operation of the transmitter, switch S2 should be in the Auto position. The front panel of the UHF exciter also has LEDs that indicate a video fault (loss) (red LED DS9) and a VSWR cutback (amber LED DS7).

8.4.4 Baseband Input and Remote Connections

The baseband video and audio inputs to the transmitter connect to the rear of the UHF exciter assembly. The baseband video input connects to jack J1. The baseband audio input connects to J5 for balanced audio or to jack J3 for composite, stereo, audio.

Remote monitoring and operation of the transmitter is provided through jacks J10 and J11 on the rear of the UHF exciter tray. Jack J11 should have a dummy plug connected to it, with a jumper connected between pins 23 and 24, that provides the interlock to the exciter which is needed to operate the transmitter. If this jumper is missing, the transmitter will not switch to Operate. If remote connections are made to the transmitter, they should be made through the plug provided in the installation material to jack J11 or J10 on the rear of the UHF exciter tray as shown in the transmitter interconnect drawing.

8.4.5 Main AC Input

The transmitter needs an AC input of 220 VAC at 100 amps for the amplifier assembly and 80 amps for the UHF exciter and the 1-kW transmitter assembly.

The 220-VAC input to the amplifier assembly connects to (A10) the AC distribution assembly, amplifier array (1245-1300), on the right side, center rear of the cabinet. The assembly contains TB1, which is connected to the 220 VAC (line 1 to TB1-1, ground to TB1-2, and line 2 to TB1-3).

The AC distribution panel contains seven circuit breakers that supply the AC to the rest of the exciter assembly. The input AC from TB1 is connected to CB1, the main AC circuit breaker (100 amps), that distributes the 220 VAC to the other six circuit breakers. The output of CB1 has three MOVs (VR1, VR2, and VR3) mounted to it, one connected from each leg of the input AC to ground and one across the two legs. The switched input AC is wired through the six circuit breakers, CB2 to CB7, to the six 600-watt amplifier trays in the amplifier cabinets. CB2 is a 20-amp circuit breaker that supplies the AC voltage to (A1) the 600-watt amplifier tray. CB3 is a 20-amp circuit breaker that supplies the AC voltage to (A2) the 600-watt amplifier tray. CB4 is a 20-amp circuit breaker that supplies the AC voltage to (A3) the 600-watt amplifier tray. CB5 is a 20-amp circuit breaker that supplies the AC voltage to (A4) the 600-watt amplifier tray. CB6 is a 20-amp circuit breaker that supplies the AC voltage to (A5) the 600-watt amplifier tray. CB7 is a 20-amp circuit breaker that supplies the AC voltage to (A6) the 600-watt amplifier tray.

The 220 VAC input to the UHF exciter assembly and 1-kW transmitter connects to (A8) the AC distribution assembly (1247-1100) in the right, center rear of the cabinet. The assembly contains TB1, which connects to the 220 VAC (line 1 to TB1-1, line 2 to TB1-2, and ground to TB1-3). The AC distribution panel contains one circuit breaker that supplies the AC to the rest of the cabinet. The input AC is connected to CB1, the main AC circuit breaker (80 amps).

The output of CB1 has two neon glow tubes, connected in series, that will light when the circuit breaker is switched on. The AC connects to TB2, which has three MOVs (VR1, VR2, and VR3) connected to it, one connected from each leg of the input AC to ground and one across the two legs. The AC output of TB2 connects to five circuit breakers (CB2 through CB6). CB2 is a 10-amp circuit breaker that supplies the AC voltage to (A1) the IEC outlet strip. The (A1) UHF exciter tray and the UHF exciter tray for the 1-kW transmitter should connect to the IEC outlet strip. CB3 is a 20-amp circuit breaker that supplies the AC voltage to (A6) the 600-watt amplifier tray. CB4 is a 20-amp circuit breaker that supplies the AC voltage to (A7) the 600-watt amplifier tray. The CB5 and CB6 circuit breakers are not used in the 1-kW transmitter.

When the circuit breaker for the exciters on the exciter cabinet AC distribution panel is switched on, and the AC circuit breakers on the rear of the trays are on, +12 VDC from the UHF exciters is supplied to the amplifier array cabinet and the two amplifier trays in the 1-kW transmitter. The +12 VDC is split six ways in the amplifier array cabinet and then connected to each of the 600-watt amplifier trays for the operation of the LED status indicators in the tray.