8. OPERATIONAL DESCRIPTION - MODEL ADC-420A

8.1 General Description

The ADC-420A is a complete 100-watt highband VHF transmitter capable of operating as a television transmitter up to a nominal power of 100-watts peak sync and 10-watts average aural. Visual and aural signals within the system are internally diplexed.

The 420A is made up of an exciter/amplifier tray and a bandpass filter assembly. The exciter and power amplifiers are contained in a single tray that measures 19" x 22" x 14". An optional cabinet is available that can house single or multiple units.

8.2 Technical Specifications

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

Frequency Range..... 174 to 216 MHz (any 6 MHz channel)

Output Power
- Visual ..... 50 to 100 watts peak sync (front panel adjustable)
- Aural..... ≤10 watts average

Maximum Power Rating
- Visual ..... 100 watts peak visual
- Aural.....10 watts average aural

Power Consumption ..... 750 watts

8.3 Performance Specifications

<u>Visual Performance</u>

Operating Frequency Range.....174 to 216 MHz

RF output - Nominal:
- Power ..... 100 watts peak sync
- Impedance ..... 50 ohms
- Connector ..... Type N

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

Visual Sideband Response:
- From -0.5 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%
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 .....≤10 watts
Impedance ..... 50 ohms
Connector ..... Type N
Aural Input:
Impedance ..... 600 ohms
Level..... +10 dBm
Amplitude vs. Frequency Response.....75 usec preemphasis ±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 dev.

Electrical Requirements

Power Line Voltage ..... 117/230V, 50/60 Hz
Power Consumption ..... 750 watts, black picture

Environmental

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

Mechanical

Dimensions:
Width.....19 inches
Depth .....22 inches
Height.....14 inches
Weight .....65 lbs

8.4. Control and Status

Meters, switches, and LED indicators are mounted on (A17) the transmitter control board (1068933). The control board is attached to the back of the front panel to allow for the

switches and the LEDs to be operated or viewed from the front of the tray. The (S1) Operate/Standby switch controls the output of the transmitter by applying or removing the inhibit command to the switching power supply that provides the DC supply voltages to the amplifier section.

When the transmitter is in Operate, the green LED (DS2) is on and the Inhibit command is removed. When the transmitter is in Standby, the amber LED (DS1) is on and the Inhibit command is applied. 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 is lost, the transmitter automatically switches to Standby after a short delay. When the video input signal returns, the transmitter immediately switches 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 Auto position.

The front panel of the tray also has LEDs that indicate Video Fault (Loss; red LED [DS9]) and VSWR Cutback (amber LED [DS7]). The meters, switches, and LEDs found in the 420A are described in the following tables.

Table 8-1. Meters

METER	FUNCTION	
METER (A18) (mounted on the front panel)	Displays power in terms of a percentage of the calibrated output power level. A full-scale reading is 120%. A reading of 100% is equivalent to the full-rated peak of sync visual output power (100 watts). Also reads the % Exciter, % Reflected, and % Aural Power along with the ALC voltage, video, and audio levels.	
	With Switch S3 in Position	***Display***
	Switch (S3), Meter (mounted on the front panel)	Selects the desired % Power, ALC voltage, video, or audio level reading
	ALC (0 to 1 volts)	Displays the ALC voltage level (.85 VDC)
	% Exciter (0 to 120)	Displays the % Exciter Output power (level needed to attain 100% output power)
	% Reflected (0 to 120)	Displays the % Reflected Output power (<10%)
	% Visual Power (0 to 120)	Displays the % Visual Output power of the transmitter (100%=100 watts peak of sync)
	% Aural Power (0 to 120)	Displays the % Aural Output power of the transmitter (100%=10 watts at 10 dB A/V ratio)
	Video (0 to 1 volts)	Displays the video level (1V at white with .3V sync only, -40 IRE)
	Audio (0 to 100 kHz)	Displays the audio level (±25 kHz balanced or ±75 kHz composite); will not read if only the 4.5-MHz composite input kit is used

Table 8-2. Switches (mounted on the front panel)

SWITCH	FUNCTION
TRANSMITTER (S1)	The momentary contact switch (S1) applies a ground to K1, latching relay, on the transmitter control board.
OPERATE/STANDBY	K1 will switch either to Operate or to Standby depending on which direction S1 is pushed. When switched to Operate, the Inhibit command is removed from the switching power supply. This allows the switching power supply to apply 48 volts to the amplifier boards. When the transmitter is switched to Standby, the power supply is disabled.
MODE SELECT (S2)	The momentary contact switch (S2) applies a ground to latching relay K2 on the transmitter control board.
AUTO/MANUAL	K2 will switch the transmitter to the Automatic or Manual mode depending on which direction S2 is pushed. In Automatic, the video fault command from the ALC board will control the operation of the transmitter. The transmitter will switch to Standby after a slight delay, if the input video is lost, and will switch back to Operate when the video is restored. In Manual, the transmitter is controlled by the operator using the front panel Operate/Standby switch or by remote control.

Table 8-3. Adjustments

ADJUSTMENT	DESCRIPTION
GAIN (A20-R1)	Adjusts the gain of the RF output using the ALC board when the IF ALC circuit is enabled

Table 8-4. Control Indicators (LEDs mounted on the front panel)

INDICATOR	FUNCTION
OPERATE (DS2 GREEN)	Indicates that the transmitter is in Operate
STANDBY (DS1 AMBER)	Indicates that the transmitter is in Standby
AUTO (DS3 GREEN)	Indicates that the transmitter is in Automatic mode; switches to Standby if the input video signal is lost
MANUAL (DS4 AMBER)	Indicates that the transmitter is in Manual mode; the system will not automatically switch to Standby if the input video signal is lost

Table 8-5. Status Indicators (LEDs mounted on the front panel)

INDICATOR	FUNCTION
VIDEO LOSS (DS9 RED)	Indicates that the input video to the transmitter has been lost. The fault is generated on the ALC board.
VSWR CUTBACK (DS7 AMBER)	Indicates that the reflected power level of the transmitter has increased above 20%; this will automatically cut back the output power level to 20%. The fault is generated on the transmitter control board.

Table 8-6. Samples (BNC connectors mounted on the front panel)

SAMPLE	DESCRIPTION
f(s)	A sample of the channel oscillator output taken from the sample jack of the channel oscillator assembly. The (f_C) channel RF frequency equals four times the crystal frequency (f_S) minus the (f_{IF}) IF frequency.
f(IF)	A sample of the 45.75 MHz output from the IF carrier oven oscillator board
f(IC)	A sample of the 4.5-MHz intercarrier output from the aural IF synthesizer board
EXCITER O/P	An output power sample of the exciter taken from the VHF filter/amplifier board (high output)

8.5 Input and Remote Connections

The baseband video and audio inputs alone or, if the (optional) 4.5-MHz composite input kit (1273-1326) is purchased, the 4.5-MHz composite input or the baseband video input and audio input to the transmitter, connect to the rear of the tray. The baseband video input, or the 4.5-MHz composite input, connects to jack J1 or J2, which are loop-through connected. The baseband audio input connects to TB1 for balanced audio or to jack J3 or

J13, which are loop-through connected, for composite, stereo, audio. To use the 4.5-MHz composite input kit, the baseband audio can remain connected to the VHF exciter even if the 4.5-MHz composite input kit is used, but the baseband video must be disconnected from J1 or J2 and the 4.5-MHz composite input must be connected to J1 or J2. The Baseband Select command must also be removed from J18-6 and J18-7.

Remote monitoring and operation of the transmitter is provided through jacks J10 and J11 on the rear of the tray. Jack J11 should have a dummy plug connected to it, with a jumper connected between pins 23 and 24, that provides the interlock 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 in J11 or to J10 in the positions noted in Table 8-7.

Note: If the optional 4.5-MHz composite input kit is purchased, the baseband select connects to J18, pins 6 and 7, on the back of the tray.

The remote interface connections for the 420A transmitter are listed in Table 8-7. These connections are made to jack J11, the 37-position "D"-connector, or to jack J10, the 25-position "D"-connector, on the rear panel of the tray.

Note: Only the pins called out in Table 8-7 are utilized in this transmitter.

Table 8-7. Remote Interface Connections

FUNCTION	REMOTE JACK/PIN NUMBER	INTERFACE TYPE
Transmitter Enable Interlock	J11-24	J11-24 and 23 must be jumpered together for normal operation; (1176-1038) jumper jack should be used.
Transmitter Enable Interlock Rtn	J11-23	
Remote Control Commands		
Transmitter Standby (Disable)	J11-22	Contact closure
Transmitter Standby/Operate Rtn	J11-21	
Transmitter Operate (Enable)	J11-20	Contact closure
Transmitter Manual	J11-9	Contact closure
Transmitter Auto/Manual Rtn	J11-36	
Transmitter Auto	J11-8	Contact closure
Power Level Raise (optional)	J10-11	Contact closure
Pwr Lvl Raise/Lower Rtn (optional)	J10-13	
Power Level Lower (optional)	J10-12	Contact closure

FUNCTION	REMOTE JACK / PIN NUMBER	INTERFACE TYPE
Modulator Select (optional)	J11-10	Contact closure
Modulator Select Rtn (optional)	J11-30	
Remote Status Indications		
Transmitter Operate (Enable) Ind	J10-3	50 mA max current sink
Operate/Standby Ind Return	J10-16	
Transmitter Standby (Disable) Ind	J10-4	50 mA max current sink
Transmitter Auto Indicator	J11-7	50 mA max current sink
Auto/Manual Indicator Return	J11-32	
Transmitter Manual Indicator	J11-6	50 mA max current sink
VSWR Cutback Indicator	J11-37	50 mA max current sink
VSWR Cutback Indicator Return	J11-35	
Video Loss (Fault) Indicator	J11-25	50 mA max current sink
Video Loss (Fault) Ind. Rtn	J11-31	
Receiver Fault (optional)	J11-12	
Remote Metering		
Visual Output Power	J11-26	1V full scale At 1kΩ source resistance
Visual Output Power Rtn	J11-28	
Aural Output Power	J11-27	1V full scale At 1kΩ source resistance
Aural Output Power Rtn	J11-29	
Reflected Power	J10-5	1V full scale At 1kΩ source resistance
Power Rtn	J10-22	
Exciter Output Power	J10-10	1V full scale At 1kΩ source resistance
Power Rtn	J10-22	