3240 VIDEO PROCESSING AMPLIFIER

NTSC

User's Guide

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MANUAL ORGANIZATION

This manual is bound into two subject-oriented volumes. Sections 1 through 3 (Instructions for Installation and Use) and sections 4 through 8 (Service Manual). Sections 1 through 3 contain general installation and operational information. Sections 4 through 7 contain functional and maintenance information for the video processor, as well as system-level parts lists and drawings. Section 8 contains a technical data package for each plug-in module.

INTRODUCTION

Overview

The 3240 NTSC Video Processing Amplifier is designed to improve or condition a video signal. The video processing amplifier regenerates the sync, blanking, and burst components of a video signal. The 3240 also provides cable equalization, hum rejection, hard and soft clipping, control of video and chroma gain, setup (pedestal) adjustment, and fade-to-black capability. Remote warning indicators and camera tally functions are provided.

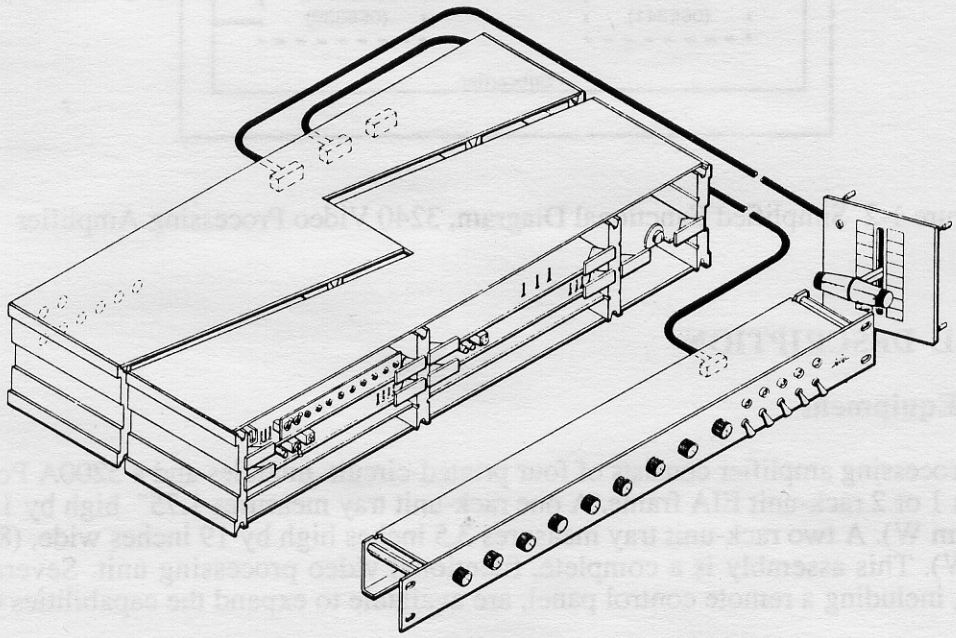

Figure 1-1 Basic 3240 System with Remote Controls

Module Functions Refer to Figure 1-2.

The basic Video Processing Amplifier (less options) consists of an Input Module (066337), a Color Lock Module (066339) a Sync Generator Module (066341), and an Output Module (066338). Figure 1-2 shows a simplified functional diagram of the processor. A functional description of the 3240 system is contained in Section 4.

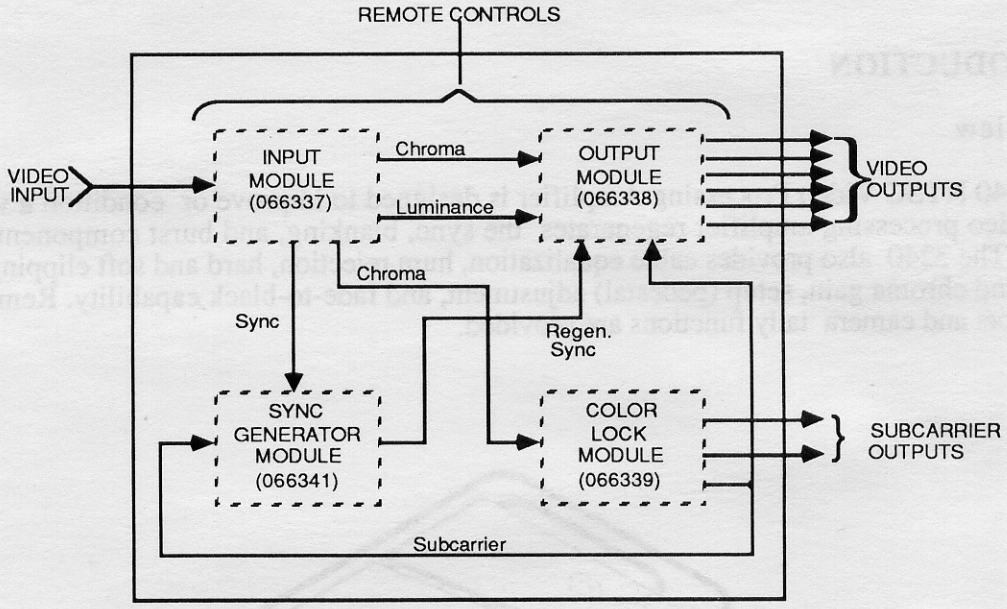

Figure 1-2 Simplified Functional Diagram, 3240 Video Processing Amplifier

PHYSICAL DESCRIPTION

Standard Equipment

The basic processing amplifier consists of four printed-circuit modules and a 3200A Power Supply Module in a 1 or 2 rack-unit EIA frame. A one rack-unit tray measures 1.75" high by 19" (4.45 cm H x 48.26 cm W). A two rack-unit tray measures 3.5 inches high by 19 inches wide, (8.89 cm H x 48.26 cm W). This assembly is a complete, functional video processing unit. Several optional accessories, including a remote control panel, are available to expand the capabilities of the basic processor.

Optional Equipment

Some of the accessories are: External Reference (for external sync and subcarrier timing), Automatic Gain Control (AGC), Pulse Distribution Amplifier, Linearity Corrector (3220), Relay Bypass Module, and a second 3200A Power Supply Module for redundancy. Blank circuit modules are also available to accommodate custom design requirements.

SPECIFICATIONS

Input (Loop Through)

Level	1 V p-p nominal, +/-6 dB
Return loss	40 dB to 5 MHz
Maximum DC on input	±4 V
Maximum differential mode hum	8 V p-p
Differential mode hum rejection	60 dB at 60 Hz
Maximum common mode signal	60 V p-p
Common mode rejection	100 dB at 50/60 Hz, 30 dB at 15 MHz and 20 dB at 250 MHz

Outputs (Six)

Level	1 V p-p nominal
Impedance	75 ohm nominal
Return loss	40 dB to 5 MHz
Output to output isolation	43 dB to 5 MHz
DC on output (DC or AC coupled)	0 V ± 50 mV

Pulse Regeneration

Sync time-base error	<10 ns
Burst phase jitter	<0.5 degrees
H phase range	±150 ns continuous; up to 2.8 microseconds phase range available using internal jumpers
H blanking range	Nominal RS170A, each edge adjustable ± 200 ns
Vertical interval line deletion	Any or all lines 10 through 21, selectable with an 8- position DIP switch
Burst width	Nominal RS170A, ±270 ns
Burst envelope rise time	300 ns ± 100 ns
Sync rise time	140 ns ± 10 ns
Blanking and setup rise time	140 ns ± 20 ns
Subcarrier lock range	± 200 Hz from free-run frequency
Free-run frequency	3.579545 MHz ± 5 Hz
Vertical phase	0, or 1 line advance

Performance

Frequency response	± 0.2 dB to 6 MHz, 0 to -1dB at 8 MHz No equalization
Differential phase	0.25 degrees, 10-90% APL
Differential gain	0.5%, 10-90% APL
Noise	70 dB RMS below 1 V p-p,5 MHz bandwidth
K Factor, T-Pulse	1%
Group delay	± 10 ns to 5 MHz

Control Adjustment Ranges

Video gain	± 6 dB
Chroma gain	± 6 dB
Burst phase	± 13 degrees
Burst level	-6 to +3 dB
Sync level	-6 to +3 dB
Setup	± 15 IRE

Power Requirements (Model 3200A Power Supply)

Input voltage (Selectable)	100-125 VAC 50/60 Hz, or 200-250 VAC 50/60 Hz
Power consumption	28 W maximum

Environmental

For specification	0 to 50 degrees C
Relative Humidity	95% maximum (non-condensing)

CABLE EQUALIZATION

General

The 3240 is capable of compensating for losses incurred by incoming cable, if an equalizer submodule is installed. Three plug-in sockets on the Input Module circuit board accomodate the equalizer submodule. The Input Module is normally configured at the factory for variable equalization.

To configure the Input Module for variable or fixed equalization, locate solder terminals E, F, and G in the Equalizer Amplifier section of the circuit board.

For fixed equalization, connect terminals E & G together. For variable equalization, connect terminals E & F together.

Standard Equalizers

Standard equalizer types are listed in Table 1, which also indicates the range of compensation for each equalizer as the EQ potentiometer is turned throughout its range. Maximum equalization is effected when the control is in the full clockwise position.

NOTE

In table 1 the equalizer type is defined by the equalizer number and the cable type.

Non-Standard Equalizers

Table 2 lists recommended maximum lengths of standard cables which may be equalized by the 3240. When ordering non-standard equalizers specify amplifier model, cable type, and cable length.

TABLE 1. STANDARD EQUALIZERS FOR 3240

Equalizer Number	Cable Type	Equalization Range
EQ100	A*	25 ft. - 100 ft. (7.5m - 30.4m)
	B	25 ft. - 100 ft. (7.5m - 30.4m)
	C	25 ft. - 100 ft. (7.5m - 30.4m)
	D	25 ft. - 100 ft. (7.5m - 30.4m)
	E	25 ft. - 100 ft. (7.5m - 30.4m)
EQ250	A	100 ft. - 250 ft. (30.4m - 76.2m)
	B	100 ft. - 250 ft. (30.4m - 76.2m)
	C	100 ft. - 250 ft. (30.4m - 76.2m)
	D	100 ft. - 250 ft. (30.4m - 76.2m)
	E	100 ft. - 250 ft. (30.4m - 76.2m)
EQ500	A	250 ft. - 350 ft. (76.2m - 106m)
	B	250 ft. - 400 ft. (76.2m - 122m)
	C	250 ft. - 500 ft. (76.2m - 152m)
	D	250 ft. - 600 ft. (76.2m - 183m)
	E	250 ft. - 900 ft. (76.2m - 274m)
EQ1000	A	350 ft. - 700 ft. (106m - 213m)
	B	400 ft. - 800 ft. (122m - 244m)
	C	500 ft. - 1000 ft. (152m - 304m)
	D	600 ft. - 1300 ft. (183m - 396m)
	E	900 ft. - 1700 ft. (274m - 518m)

* A = RG59 B/u
  B = F&G .6/3.7
  C = Belden 8281, 9231, WE724, F&G .8/4.9
  D = RG11/u, 11A/u, F&F 1.0/6.6
  E = Belden 8213

TABLE 2. MAXIMUM RECOMMENDED CABLE LENGTHS FOR 3240

Cable Type	Maximum Cable Length
RG59 B/u F&G .6/3.7	700 ft. (213m) 800 ft. (244m)
Belden 8281, 9231; WE724; F&G .8/4.9	100 ft. (304m)
FG11/u, RG11A/u; F&G 1.0/6.6	1300 ft. (396m)
Belden 8213	1700 ft. (518m)

INTRODUCTION

After carefully unpacking this unit and checking the box for power cord and other hardware, examine the box and unit for damage. Any damage should be promptly reported to the carrier.

RACK MOUNTING

Refer to Figure 2-1.

There are two mounting trays for the 3240 Video Processing Amplifier: a one rack-unit (1RU) tray or a two rack-unit (2RU) tray. The mounting trays install in a standard 19-inch (48.26 centimeters) equipment rack. A vertical space of 1RU (1-3/4 inches/4.45 centimeters) in the case of a 1RU tray, or 2RU (3-1/2 inches/8.9 centimeters) for a 2RU tray, and a depth of approximately 18 inches (45.7 centimeters) is required for installing a tray. Install the unit where it can be kept cool. Use of the rear support hardware is strongly recommended.

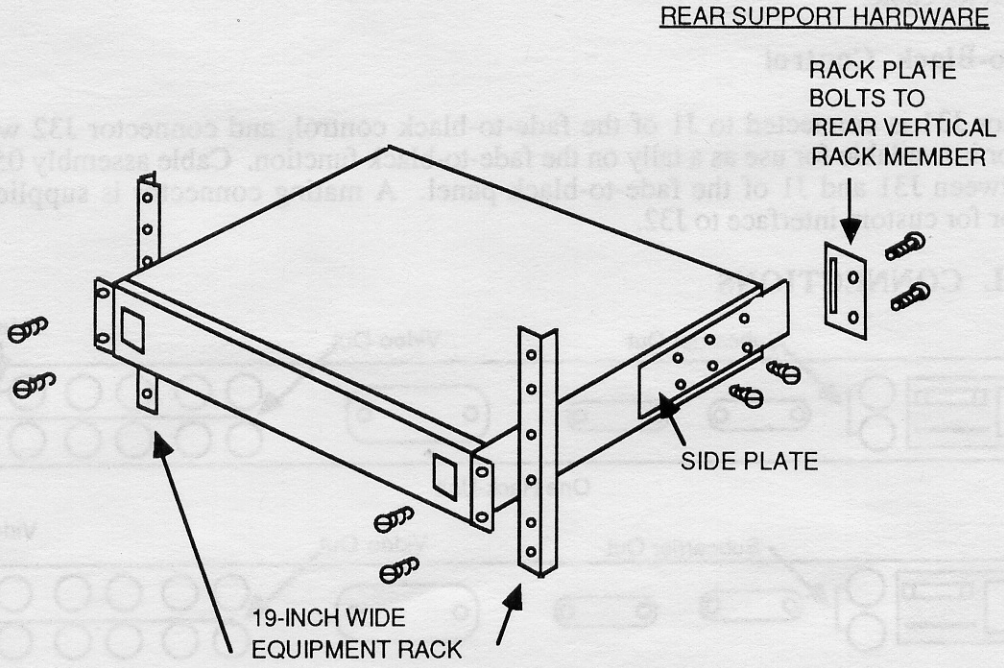

Figure 2-1 Rack Mounting

MODULE LOCATIONS

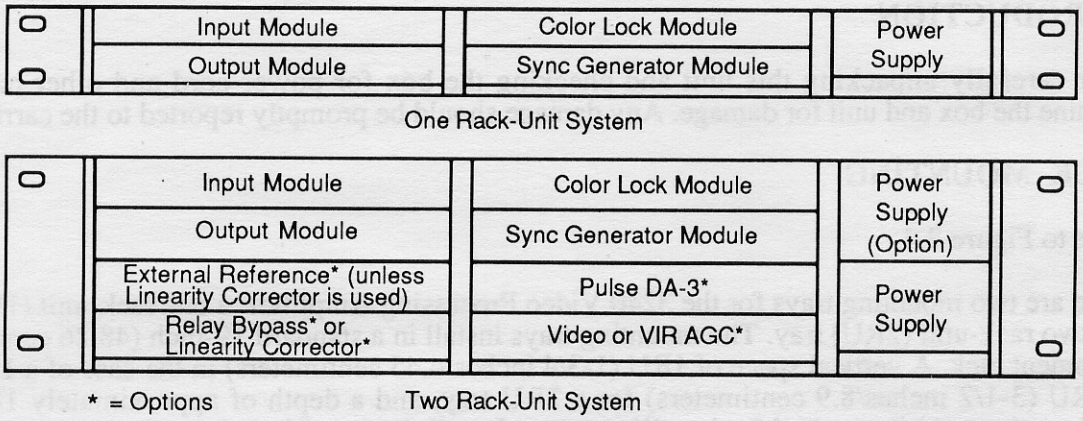

Figure 2-2 Module Locations

CONTROL PANEL CONNECTIONS

Remote Control Panel

Connector J1 on the remote control panel is connected to connector J30 on the 3240 frame with a 26-conductor cable.

Fade-To-Black Control

Connector J31 is connected to J1 of the fade-to-black control, and connector J32 with mating connector is available for use as a tally on the fade-to-black function. Cable assembly 053623-00 is used between J31 and J1 of the fade-to-black panel. A mating connector is supplied with the processor for custom interface to J32.

SIGNAL CONNECTIONS

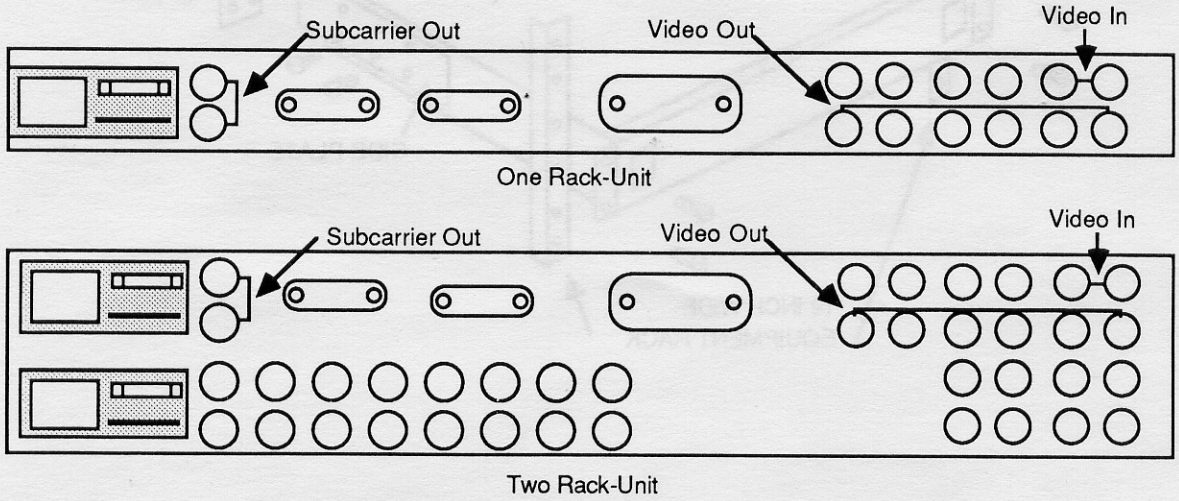

Figure 2-3 Signal Connections

POWER CONNECTIONS

CAUTION

Do not apply power until Line Voltage Selection has been performed.

For optimum redundancy when dual power supplies are used, supply power from outlets that are protected by different circuit breakers. Also ensure that proper line voltage has been selected.

LINE VOLTAGE SELECTION AND FUSE REPLACEMENT

Units come preset to the voltage ordered. The voltage can be changed (Fig. 2-4) as follows:

√ Pull FUSE PULL lever out and to the left and remove fuse.

√ Remove the VOLTAGE SELECT circuit board from below the FUSE PULL lever and reinsert it firmly in the slot with the **desired voltage up and readable on the left** (only the 120 and 240 positions are functional - they cover the entire specified line voltage range).

√ Push the FUSE PULL lever in and insert a **one ampere 3AGC fuse**.

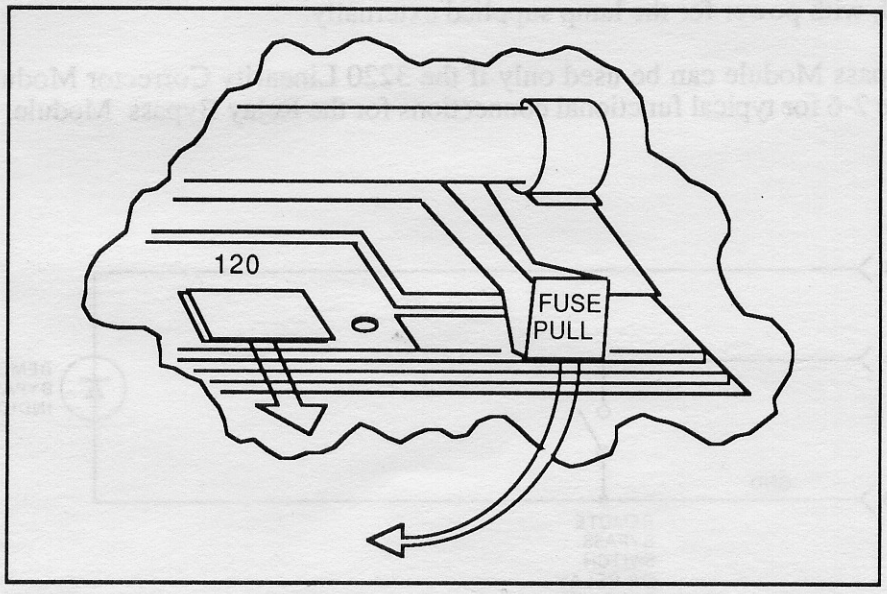

Figure 2-4 Line Voltage Selection

INSTALLATION OF ACCESSORIES (OPTIONAL MODULES)

Pulse DA-3 Module

Connectors J70 through J77 and J80 through J87 are outputs from the Pulse DA-3. There are two outputs per function and they are labeled by function.

3220 Linearity Corrector Module

When the 3220 is used in the 3240 frame, its operation is totally independent of the processor and shares only a common power supply. If the 3220 is used in a 3240 frame, neither the External Reference Module (066343) nor the Relay Bypass Module (066342) may be used in the processor.

When the 3220 is used in a 3240 frame, the cell divider shield above the lower left cell must be removed. This divider has a label affixed which reads, "External Reference 066343." The divider is held in place by a bind in the shield which provides a spring-like action. To remove, grasp the shield with a pair of pliers and pull straight out the front of the frame.

Insert the 3220 in the 3240 frame. Connector J60 then becomes the video input. The video input is terminated on the PC board. Connectors J62 and J63 are the two video outputs. No legend appears on the frame, since the function of J60 through J63 varies depending on options used.

Relay Bypass Module

Remote bypass control and indicators are available at J30, on the rear of the mounting tray (see Figure 2-5 and drawing D11-093682 or D11-093683). Both the local and remote bypass switches are referenced to ground. Nineteen milliamperes is available for an LED indicator. If more current is necessary (for instance, to power an incandescent lamp) an interface transistor or reed relay should be used, with power for the lamp supplied externally.

The Relay Bypass Module can be used only if the 3220 Linearity Corrector Module is <u>not</u> used. Refer to Figure 2-6 for typical functional connections for the Relay Bypass Module.

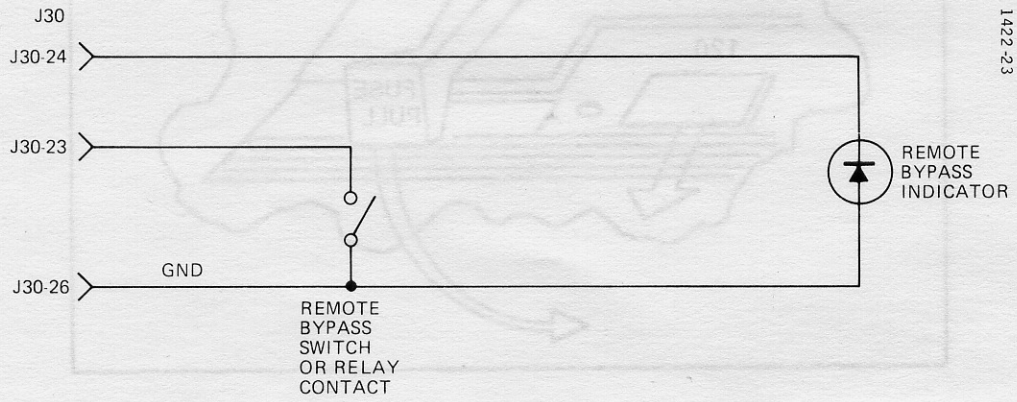

Figure 2-5 Suggested Remote Control and Indicator Connections for Relay Bypass Module.

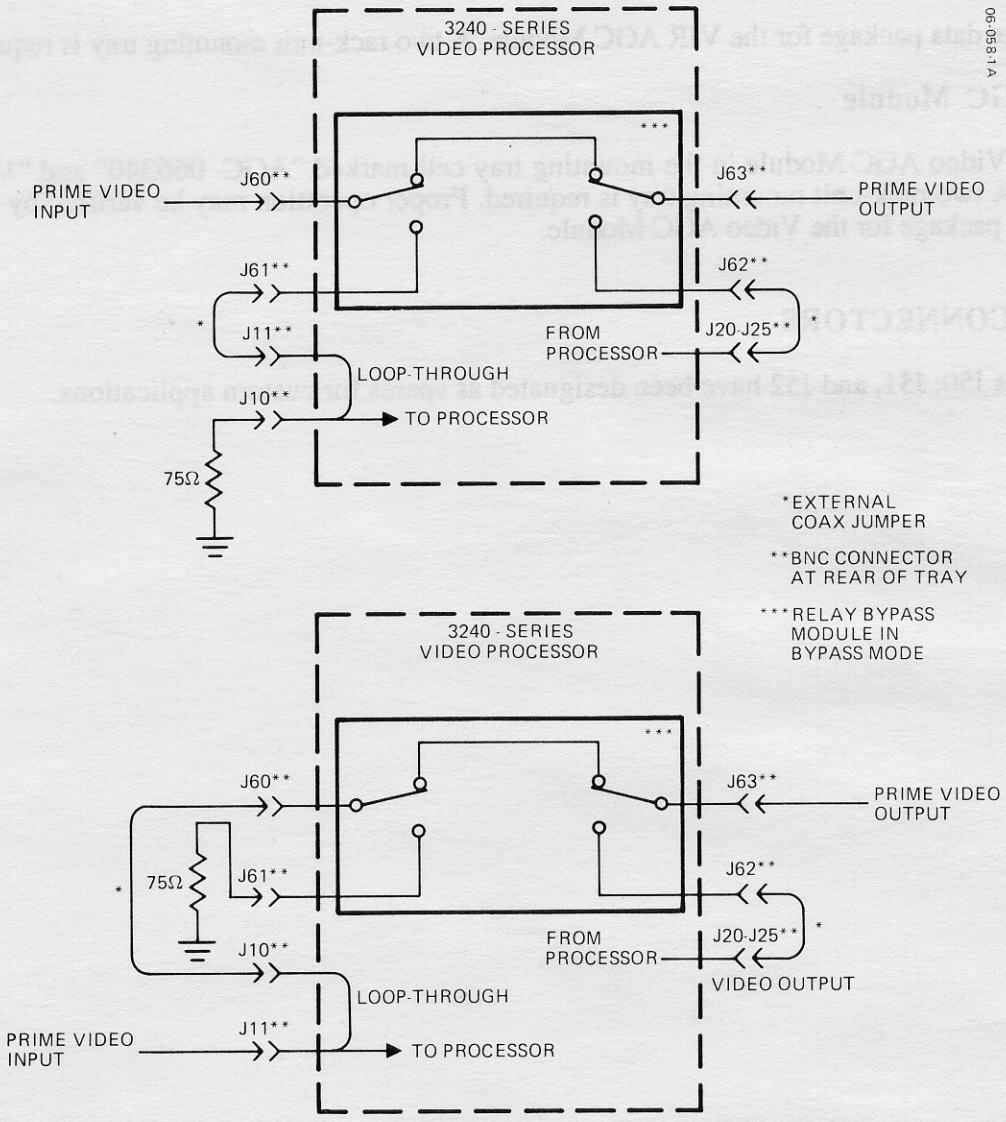

Figure 2-3 Typical Functional Connections For Relay Bypass Module

External Reference Module

Refer to the data package for the External Reference Module. A two rack-unit mounting tray is required.

VIR AGC Module

Refer to the data package for the VIR AGC Module. A two rack-unit mounting tray is required.

Video AGC Module

Insert the Video AGC Module in the mounting tray cell marked "AGC 066340" and "VIR AGC 066344". A two rack-unit mounting tray is required. Proper operation may be verified by referring to the data package for the Video AGC Module.

SPARE CONNECTORS

Connectors J50, J51, and J52 have been designated as spares for custom applications.

CONTROL FUNCTIONS

Input Module Controls

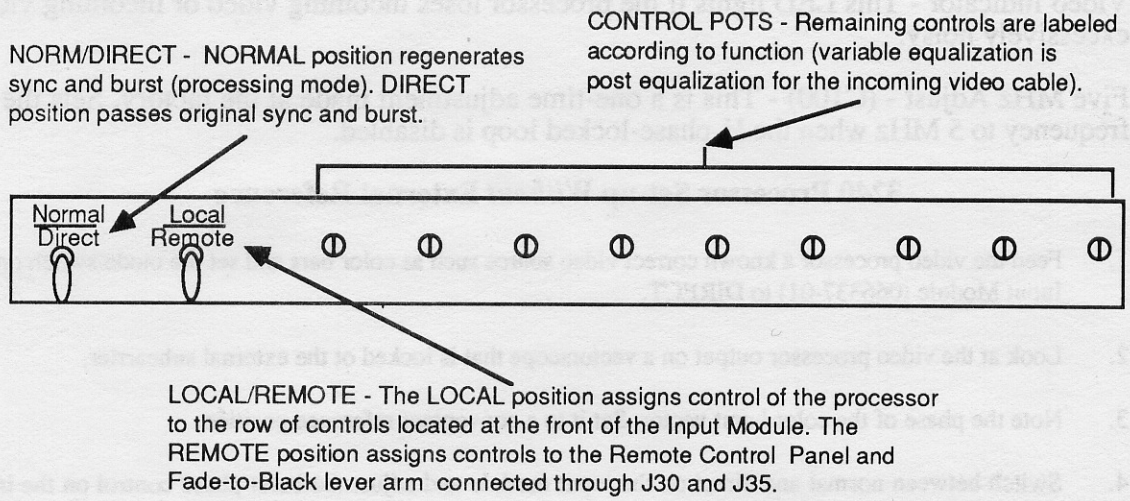

Figure 3-1 Input Module Controls

Output Module Controls

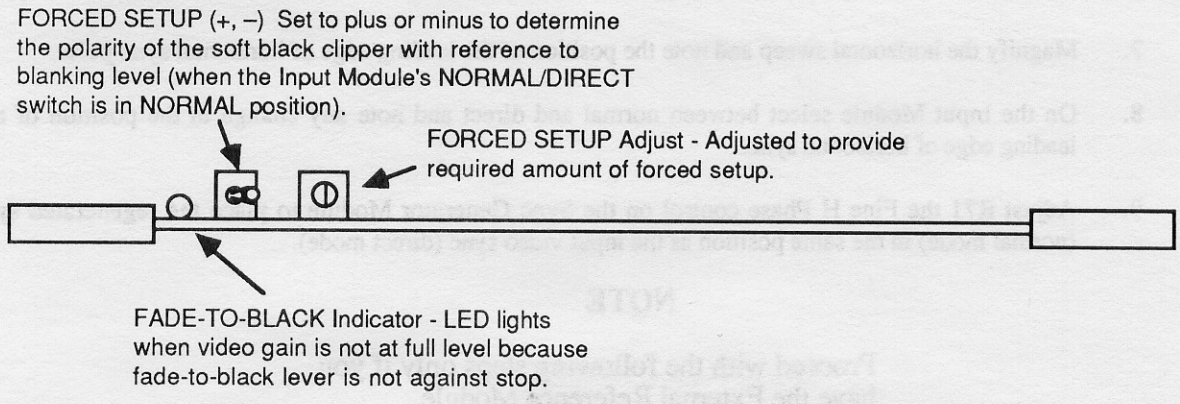

Figure 3-2 Output Module Controls

Color Lock Module Controls

a. Free Run Frequency - This control allows the user to trim the subcarrier frequency when it is in the free-run mode (no video input).

Sync Generator Module Controls

a. Fine H Phase - This control allows trimming of horizontal blanking and sync phase relative to incoming video.

b. Unlock Indicator - This LED lights if the time-base error on the incoming video signal is excessive. When the UNLOCK indicator lights, the processor switches to a fast time constant in the phase locked loop to follow variations in time-base error.

c. Video Indicator - This LED lights if the processor loses incoming video or incoming video is excessively noisy.

d. Five MHz Adjust - (C100) - This is a one-time adjustment made at the factory. Sets the VC0 frequency to 5 MHz when the H-phase-locked loop is disabled.

3240 Processor Set-up *Without* External Reference

1. Feed the video processor a known correct video source such as color bars and set the mode switch on the Input Module (066337-01) to DIRECT.

2. Look at the video processor output on a vectorscope that is locked ot the external subcarrier.

3. Note the phase of the color burst vector. Set it to a convenient reference position.

4. Switch between normal and direct on the input module and adjust the burst phase control on the input module to make the regenerated color burst (normal mode) the same as input video burst phase (direct mode).

5. Set input module mode switch to direct.

6. Look at the video output of the video processor on a waveform monitor that is locked to external sync.

7. Magnify the horizontal sweep and note the position of the leading edge of horizontal sync pulse.

8. On the Input Module select between normal and direct and note any change in the position of the leading edge of horizontal sync.

9. Adjust R71 the Fine H Phase control on the Sync Generator Module to place the regenerated sync (normal mode) in the same position as the input video sync (direct mode).

NOTE

Proceed with the following steps only if you have the External Reference Module.

3240 Processor Set-up *With* External Reference

10. Insure that the video processor is properly set-up as outlined in the section above. This can be done with the External Reference Module set to operate in the Internal mode.

11. Set the switch on External Reference Module to the EXTernal mode and look at the output of the video processor on a vectorscope.

12. On the Input Module select between normal and direct and note the burst phase change.

13. Adjust S1 coarse subcarier phase switch and R4 fine phase controls to make the external reference color burst (normal mode) the same as the input video (direct mode) color burst.

14. Look at the video output of the video processor on a waveform monitor that is locked to external sync.

15. Magnify the horizontal sweep and note the position of the leading edge of horizontal sync pulse.

16. On the Input Module select between normal and direct and note any change in the position of the leading edge of horizontal sync.

17. Adjust the Fine H Phase control on the External Reference Module to place the externally referenced (normal mode) sync in the same position as the input video sync (direct mode). This control may be slightly offset to make the output SC/H phase of the video processor correct.

18. All LED indicators on the External Reference except EXT REF should be extinguished.

Optional Operating Modes

a. Input Module - LOCAL/REMOTE parallel transfer control method. Control of the 3240 may be transferred from local to remote, or operated in parallel with the local controls. Some control schemes such as the console remote panel require parallel operation since not all functions are controlled at the remote location.

   If turrets A, B, C, and D are not connected, the control method is "transfer". If A is strapped to B, and C is strapped to D, the control method is "parallel". The LOCAL/REMOTE control switch in either case demands only local control in the LOCAL position.

b. Input Module - Variable/fixed equalizer. Connect turrets E to F for variable cable equalizer. Connect E to G for fixed or no equalizer. Refer to Section 1 for specific application information.

c. Output Module - Setup on VIT/VIR lines. If variable setup is desired on vertical lines which are passed, turrets A and B should be connected. If no setup change is desired, connect A and C.

   Where VIR correctors are used, the variable setup should affect all passed lines so that the test signal is representative of program content.

d. Output Module - AC/DC coupled output (module is normally shipped DC coupled). If a DC coupled output is desired, C53 should be replaced with a wire jumper and R264, R265, and R266 should not be used. If AC coupling is desired, use C53, R264, R265, and R266. See schematic for component values (refer to data package in Section 8).

e. NTSC Sync Generator - Default to color black or direct mode. If the input video is not present or is too noisy for the sync generator to detect vertical sync, the output of the processor will be color black or input video (direct). The selection is made with S4, and is labeled on the Sync Generator circuit board.

f. NTSC Sync Generator - Fast/auto phase-locked loop. If the input signal is noisy, a slow PLL is desired to average out sync pickoff errors. If the input signal has considerable time-base error, a fast PLL is desired to follow rapid variations.

   If S1 is in the AUTO position the PLL will be slow, but will automatically switch to fast mode if time-base errors exceed (approximately) 1 microsecond. If S1 is in the FAST position, it will remain in the fast mode regardless of input signal conditions.

g. NTSC Sync Generator - Coarse H phase programming. The fine H phase control, R71, has a range of approximately ± 150 ns. If more range is necessary, coarse H phase programming jumpers are provided for adjusting the horizontal phase in increments of 200 ns. The jumpers program digital phase information into the horizontal counters. As the number programmed in is incremented or decremented, the horizontal phase will delay or advance respectively. The binary number which gives the nominal horizontal phase is 0111.

h. NTSC Sync Generator - Vertical phase. Vertical phase may be operated normally or advanced one line from input video sync by using S3.

i. NTSC Sync Generator - Subcarrier clocking. Subcarrier clocking causes the output sync to move in increments of 140 ns (1/2 subcarrier cycle) if the input sync phase drifts relative to subcarrier. This mode of operation will maintain the proper relationship of sync and subcarrier as established by the fine H phase control and the burst phase control. It is activated by S2.

j. NTSC Sync Generator - Vertical toothed blanking.

Vertical blanking width is 20 or 21 lines, depending on the position of the #1 rocker on dip switch S6. All other rockers on switches 5 and 6 are for unblanking whole lines on both fields from lines 10 through 20. These switches are used to pass or delete VIR or VIT lines.

k. NTSC Sync Generator - Noise window. The noise window serves two functions:

1. It increases noise immunity by rejecting all input pulses except those which occur approximately where sync is expected, and

2. It ignores the vertical component of sync. The width of the acceptance window is variable from 0.5 microseconds to 20 microseconds, depending on which of the WIDE WINDOW jumpers are connected.

The window will be wide when the horizontal phase-locked loop is acquiring lock, or if input time-base error is excessive. Under all other conditions, the window will be narrow. The narrow window may be defeated by jumping the NARROW WINDOW turrets (next to rear connector). This may be desirable where large time-base errors are expected.

Position	Wide Window Width
1	20.0 microseconds
2	4.0 microseconds
3	2.0 microseconds
4	0.5 microseconds

l. NTSC Sync Generator - Position of H blanking. Each edge of horizontal blanking is adjustable independently. The range of adjustment is 400 ns each edge. The leading edge adjustment is R91; the trailing edge is R93.