Video Summing Combiner

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ATTENTION

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PESA Switching Systems

Video Summing Combiner

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1.1 Manual Overview

This manual provides detailed instructions for installing and operating the PESA Video Summing Combiner. This manual is divided into seven sections as shown.

Section 1, **INTRODUCTION**, summarizes the manual, describes the Video Summing Combiner, presents a list of terms, and provides the panel specifications.

Section 2, **INSTALLATION**, provides installation and setup instructions.

Section 3, **OPERATION**, describes system operation procedures.

Section 4, **FUNCTIONAL DESCRIPTIONS**, presents an in-depth description of each Video Summing Combiner component.

Section 5, **MAINTENANCE**, explains procedures for maintenance.

Section 6, **SCHEMATICS**, gives a complete package of technical documents such as schematics, and assembly drawings.

Section 7, **PARTS LIST**, provides a detailed list of system parts and components.

1.2 General Description

The Video Summing Combiner is a support device used in conjunction with video matrix switchers. It provides a convenient way to increase routing switcher *inputs* by linking together common matrix *outputs.* The combiner can link up to three switchers (eg. 48X96) for a maximum of 144 inputs to one output.

The Video Summing Combiner consists of a chassis, compact backplane with power and video connectors, and up to 12 Video Combiner modules. Each combiner module contains 4 channels, a full frame will contain 48, 3x1 combiner channels. The module assembly contains a green LED visible from the front of the unit. It will be illuminated when the module is plugged into a frame that is powered up. Each module also contains test points for +V, -V, and outputs for all four signal channels.

Because the Video Summing Combiner uses a summing configuration rather than a switch, it can only be used on systems that contain an "off crosspoint" feature. Only one of the three inputs can contain a signal at any given time. The 3X1 summing combiner can be used to combine signals from any matrix frame (or other 75ý source). The signals from all three inputs are resistively added. Normally there will only be a signal on one input at a time. Because these inputs are not buffered before they are mixed, all three inputs must be terminated by a 75ý device. If the third input is not connected to any device, it must be terminated with a 75ý terminator.

The resulting signal goes to an equalizer stage, which is user adjusted by a pot accessible from the front of the unit. Then the signal enters an adjustable gain device and on to the output stage which drives two 75ý BNC's. The output stage contains adjustments for setting the frequency response.

Power is supplied to the Video Summing Combiner by an external power supply which attaches to the rear of the switchers. A second supply may be used for redundancy.

Key features of the Video Summing Combiner are:

- 150' of cable equalization
- dual outputs
- wide bandwidth
- low power consumption

1.2 General Description Continued:

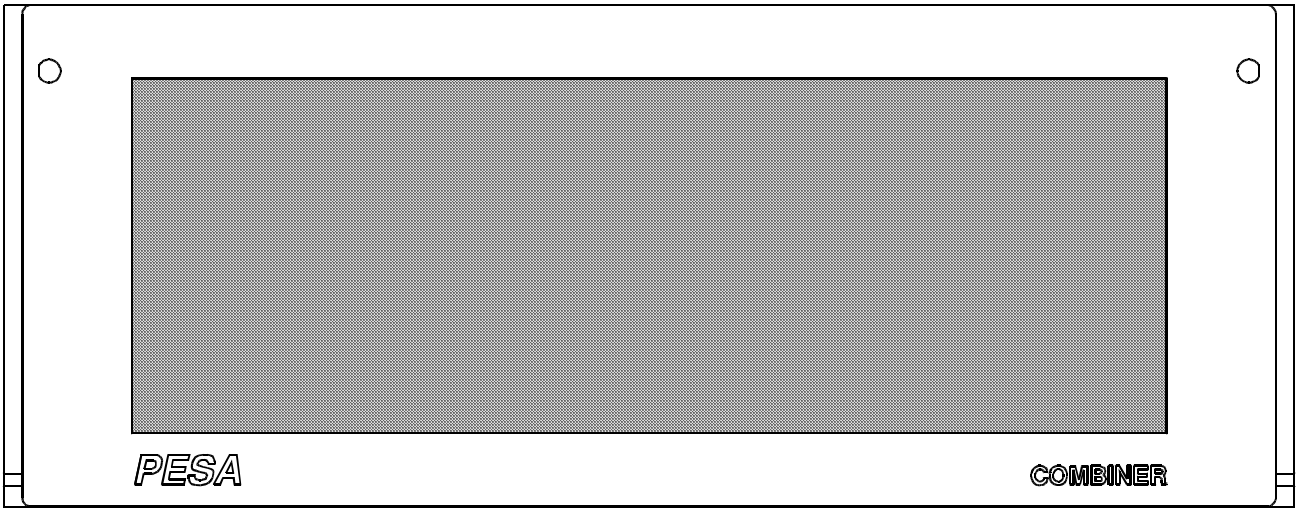


Figure 1–1 Front View of the Video Summing Combiner

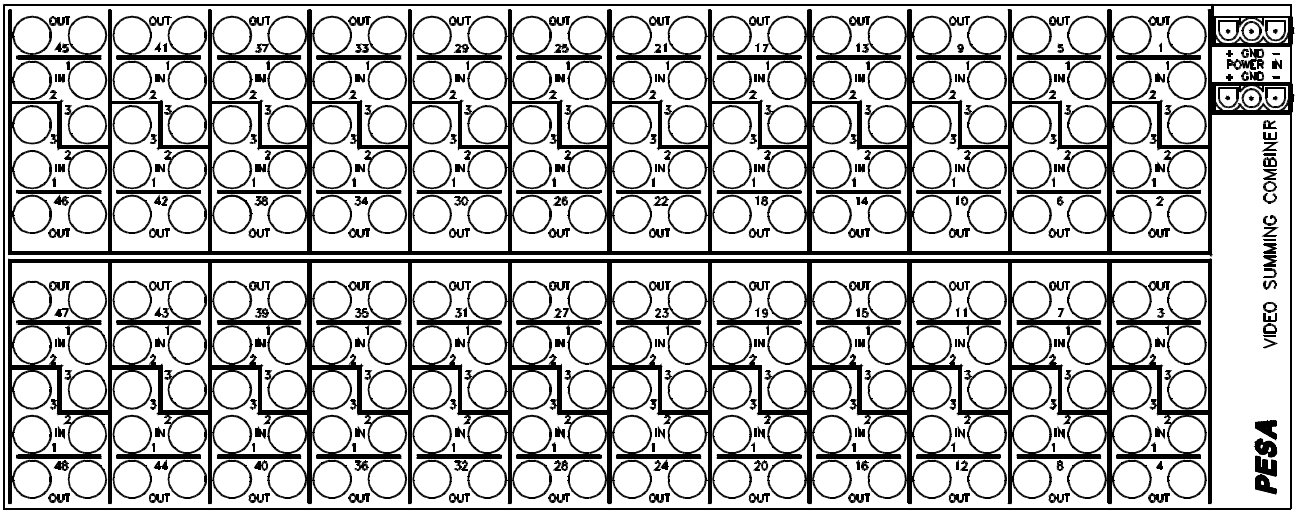


Figure 1–2 Rear View of the Video Summing Combiner

1.3 Specifications

INPUT	
Input Number	3 per channel, terminated in 75ý
Level	1V p-p nominal, 2V p-p w/o gross distortion
Impedance	75Ohm
Coupling	DC
Connector	BNC
OUTPUT	
Output Number	2 per channel
Level	1V p-p, 2V p-p w/o gross distortion
Impedance	75Ohm
Coupling	DC
Connector	BNC
DC Offset	±20 Mv
Return Loss	40dB to 5MHz
GAIN	
Gain (nominal)	Unity
Adjustment	±0.5dB
Stability	±.05dB
FREQUENCY RESPONSE	
0-5 MHz	±.05dB
5-100 MHz	±.5dB
100-200 MHz	+0.5dB - 1.5dB
CROSSTALK	
0-10 MHz	<-68dB
10-100 MHz	<-40 dB
DIFFERENTIAL GAIN	
10-90% APL	<.05° to 5MHz
DIFFERENTIAL PHASE	
10-90% APL	<.05° to 5MHz
SIGNAL TO NOISE	
Luminance Weighted	<-81 dB

1.3 Specifications Continued:

OTHER	
Electrial Path Length	5 nS (nominal)
Slew Rate	>250V/µS
POWER	
Per Module	±8-12 VDC @ 200mA
Full Frame (12 modules)	±8-12 VDC @ 2.5A
MECHANICAL	
Channels per Module	4
Modules per Frame	1 to 12
Channels per Full Frame	48
Dimensions	19"w x 7"h x 10" d (482.6mm x 177.8mm x 254mm)
Rack Units	4RU
ENVIRONMENTAL	
Temperature	0°C to 40°C
Humidity	20% to 90% Non-Condensing

2.1 Introduction

This section details Video Summing Combiner installation procedures. The following topics are discussed:

- Receipt Inspection
- Location and Mounting
- Power Connections
- Cabling
- Inserting Video Combiner Modules
- Power-Up Sequence

2.2 Receipt Inspection

The Video Summing Combiner was inspected and tested prior to leaving the PESA factory. Upon receipt, please inspect the unit for shipping damage. If damage is detected, notify the carrier immediately and hold all packing material for inspection. If assistance is required, please contact PESA Customer Service at the telephone number listed in the front of this manual.

After unpacking, compare all parts received against the packing list. If the unit is undamaged and all components have been received, proceed with installation.

2.3 Location and Mounting

The Video Summing Combiner has been designed to fit in a standard E.I.A. 19" equipment rack and uses 4 rack units of space (7"). An area should be selected where temperature does not exceed 40°C inside the equipment rack, and where air can circulate freely. The unit should be mounted in an area convenient to video and power connections. Sufficient space must be provided behind the rack to allow for the coaxial and power cables. When the Video Summing Combiner is supplied as part of a system including interconnecting cables, a rack layout drawing is usually provided. While adherence to this drawing is not required, it will ensure that the cables are of proper length. Support the frame from the bottom when installing in the rack. All mounting holes should be utilized and hardware tightened securely. As with all equipment installed in a rack, the bottom screw on each side should be installed before proceeding with the remainder of the screws. Insure that no side-to-side pressure is applied, as warpage may occur. Even though the unit's weight is low, considerable weight may be added to the unit's rear panel by the various video cables.

2.3 Location and Mounting Continued:

Therefore, all cable should be strained relieved and secured to racks or other supporting structures. Failure to provide adequate cable support can result in cables separating from connectors. If cable runs are to be stored under an elevated floor, they should be tied to the racks as a guide. If cables are run along the floor, do not allow them to lay in the work area behind the racks. Stepping or tripping on the cables may result in connections being pulled free or wire breakage inside the insulation.

Figure 2–1 illustrates chassis installation.

To install the Video Summing Combiner chassis follow these steps:

1. Align the chassis with the screw holes in the rack.
2. Install the bottom screws first.
3. Install the two top screws
4. Tighten all four screws securely.

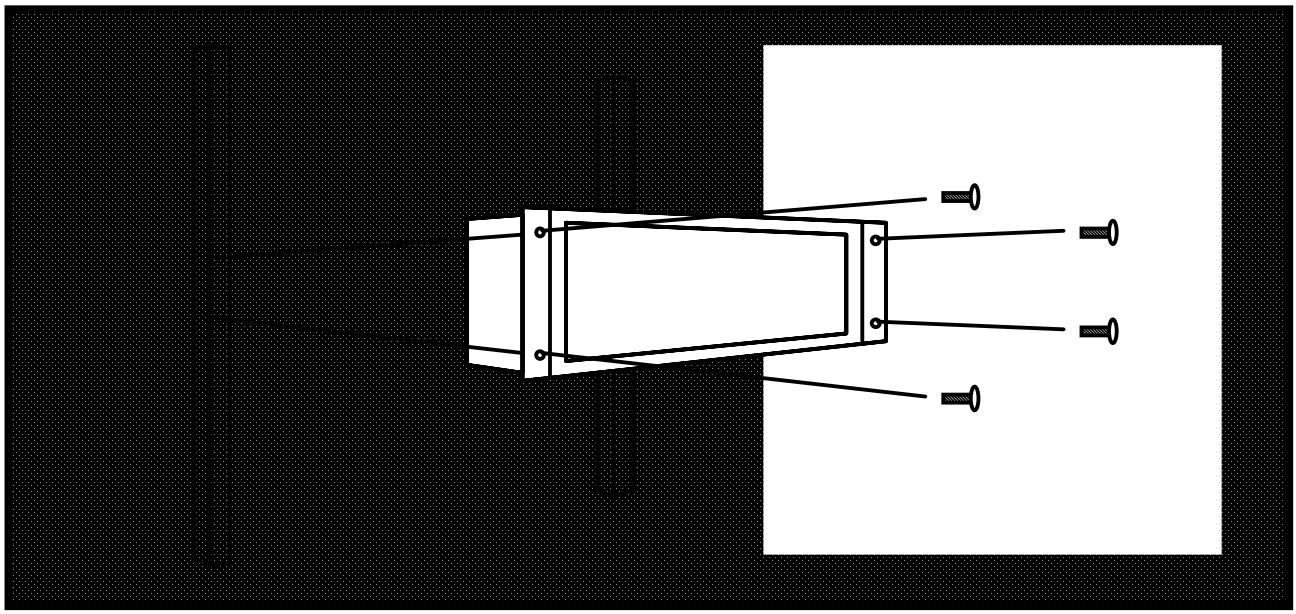


Figure 2–1 Video Summing Combiner Chassis Installation

2.4 Power

Each Video Summing Combiner frame is equipped with two mate-n-lock connectors which permit several types of power configuration. Power can be connected directly, or looped from one chassis to another.

Figure 2–2 shows the location of power connectors P13 and P14 on the rear Combiner chassis panel:

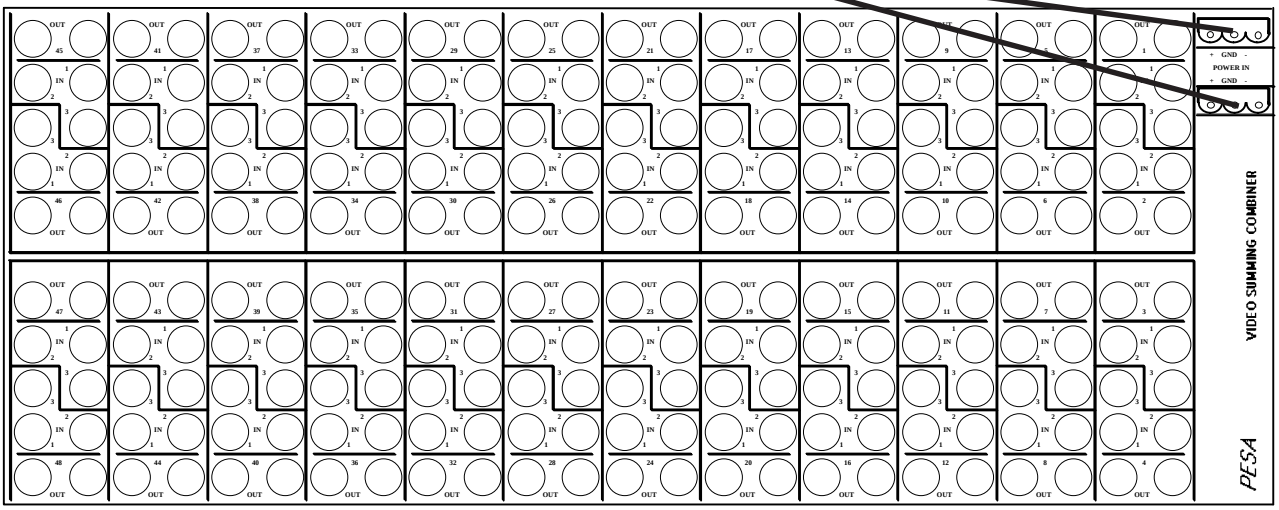


Figure 2–2 Video Summing Combiner Power Connectors

Power for the Video Summing Combiner chassis is supplied from the power supply which connects to the rear of the routing switcher units, or from an external “standalone” supply.

Dual power connectors on the Combiner provide the capability of “N+1” backup, *up to the limits of the power supplies* feeding the system.

2.4 Power Continued:

Video Summing Combiner power connection depends on your individual system configuration, however, three basic choices are available:

- **Direct Power**

Figure 2–3 illustrates the direct method, connecting the power supply output to the power connector on the Video Summing Combiner chassis:

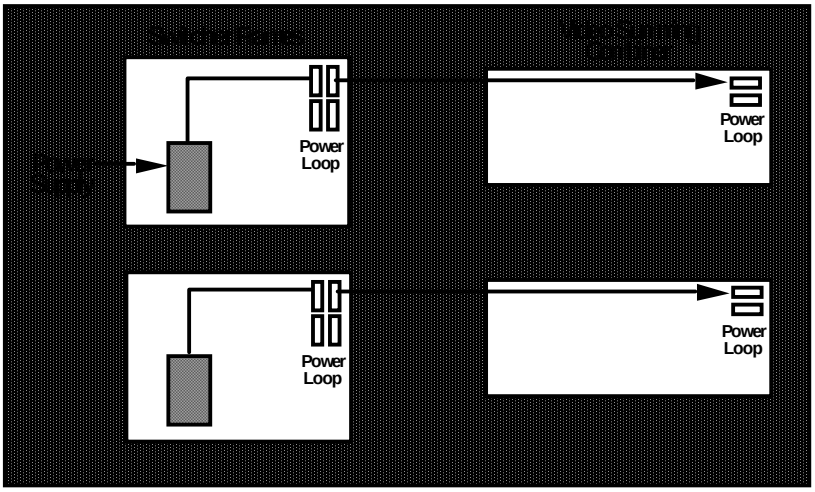


Figure 2–3 “Direct” Power Connection Method

- **Redundant Power**

Figure 2–4 illustrates the fully redundant power connection method:

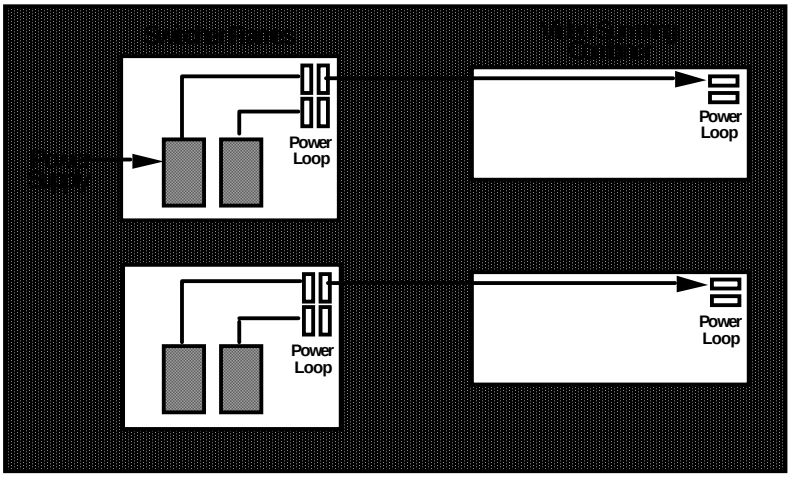


Figure 2–4 “Redundant” Power Connection Method

2.4 Power Continued:

Using the redundant method, both the primary and backup power supply outputs are connected to the power loop on the routing switcher, and one power connection is made to the Video Summing Combiner chassis. Should either power supply fail, the other supply takes over.

- "**N+1" Power**

Figure 2–5 illustrates the "N+1" connection method:

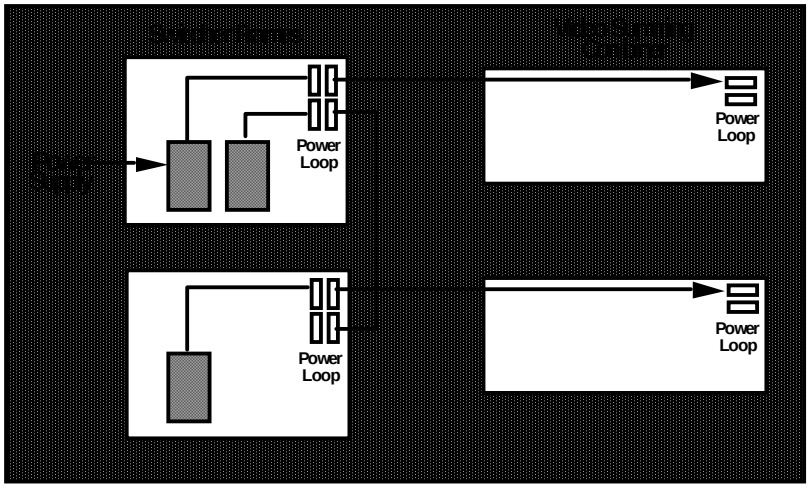


Figure 2–5 "N+1" Power Connection Method

The "N+1" method places an extra power supply in the loop at the routing switcher frame, and also loops the Video Summing Combiner frames together. Should any supply fail *throughout* the system, an extra supply is available.

NOTE:

Using the "N+1" method, should any power supply in the loop fail, be sure to restore "N+1" status immediately by replacing the failed supply.

When choosing one of the three power connection methods, note the following important points:

2.4 Power Continued:

- Avoid overloading any single power supply by distributing the load evenly.
- Ensure that the removal of a primary or redundant supply does not overload the remaining supplies.

Connect all Video Summing Combiner modules before making connections to the power supply. Refer to Paragraph 2.9 for the proper system power-up sequence.

2.5 Cabling

Ensure that the Video Summing Combiner chassis is installed in the equipment rack prior to attaching cables.

For all video cabling, it is recommended that you utilize a 75 ohm cable such as Belden 8281 or RG59 throughout.

NOTE:

Do not use 50 Ohm Cable, as this may produce standing waves and oscillations.

Use the following steps to cable the Video Summing Combiner chassis:

1. Lay all cables in their intended positions, separating video cables from power cables wherever possible.

2. Connect each cable to the Combiner chassis, and provide proper support for each cable during the connection process. The use of tie-wraps is recommended, as shown below in Figure 2–6:

2.5 Cabling Continued:

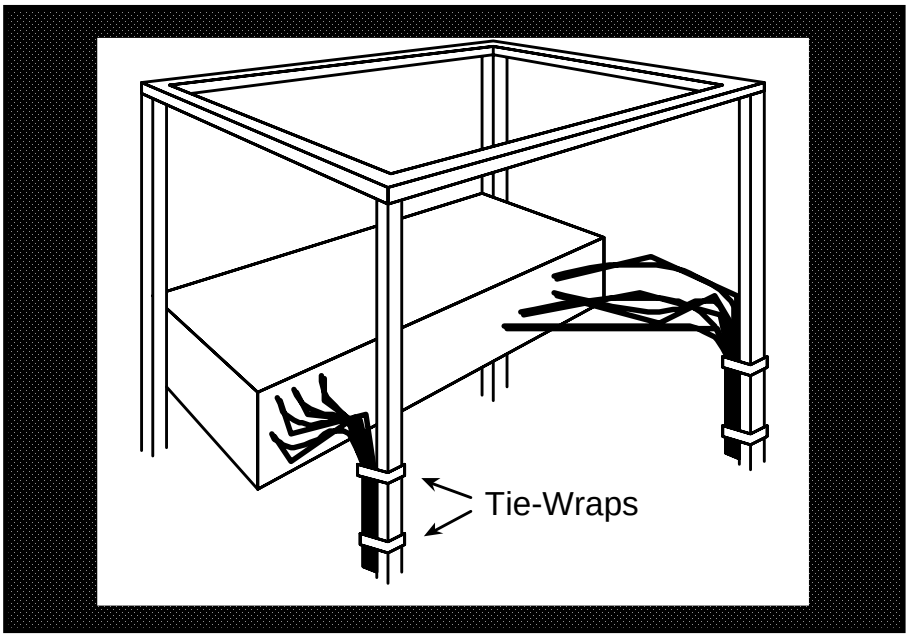


Figure 2–6 Cables Attached To Supports

Note that failure to provide cable support can result in cables separating from their connectors, or broken connectors on the Video Summing Combiner chassis.

The following connections should now be made:

1. **INPUT / OUTPUT**. Connect Routing Switcher outputs to the Video Summing Combiner's inputs as required.

2. Connect Video Summing Combiner outputs to their appropriate destinations, ensuring that all cables are secured with proper support to minimize strain, and cables are not placed in hazardous positions.

If cables are run under an elevated floor, ensure that they are tied to the racks as guides. If cables are run along the floor, ensure that they are clear of the main work area behind the racks. Stepping or tripping on cables can break wires inside the insulation and/or pull cables free from their connectors.

2.5 Cabling Continued:

NOTE:

Do not attach power cables from the Video Summing Combiner to the power supply until you have completed installation and run the power-up sequence. Refer to Paragraph 2.7 for details.

2.6 Inserting Video Combiner Modules

If required, insert Video Summing Combiner modules into the chassis at this time. Ensure that all module pins line up with the socket prior to applying insertion pressure. If the modules were shipped already installed in the chassis, ensure that all packing material is removed, and that each Combiner module is properly seated.

2.7 Power-Up Sequence

Use the following check list to perform the Video Summing Combiner's power-up sequence:

1. Ensure that each Video Summing Combiner module is properly seated.
2. Check all video and control cable connections. Each should be secure and without strain.
3. Apply power to the Video Matrix Switchers.
4. Connect power cables from the Combiner to the power supply per your specific power configuration requirements. Refer to Paragraph 2.4 for examples of power configurations.

NOTE:

The normal operating condition of the Video Summing Combiner is "ON." There is no ON / OFF switch in the unit.

When the above power-up sequence is complete, the green power LED on each Video Summing Combiner module's front edge will light. This LED is labelled "**PWR**."

3.1 Basic Operation and Adjustments

Operation of the Video Summing Combiner is completely transparent to the user once the unit is installed, cabled and powered.

Module Indicators

Figure 3–1 illustrates the front of each Video Summing Combiner Module.

Each Summing Combiner Module contains a green LED visible from the front of the unit. It will be illuminated when the module is plugged into a frame that is powered up.

Adjustments

All adjustments have been made at the factory. Cable equalization can be adjusted to compensate for cable on the output side of the system for up to 150' of Belden 8281.

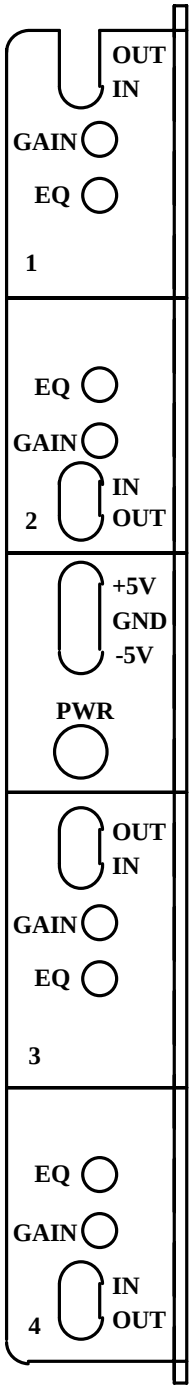


Figure 3–1 Front Edge, Video Summing Combiner Module

3.1 Basic Operation and Adjustments Continued:

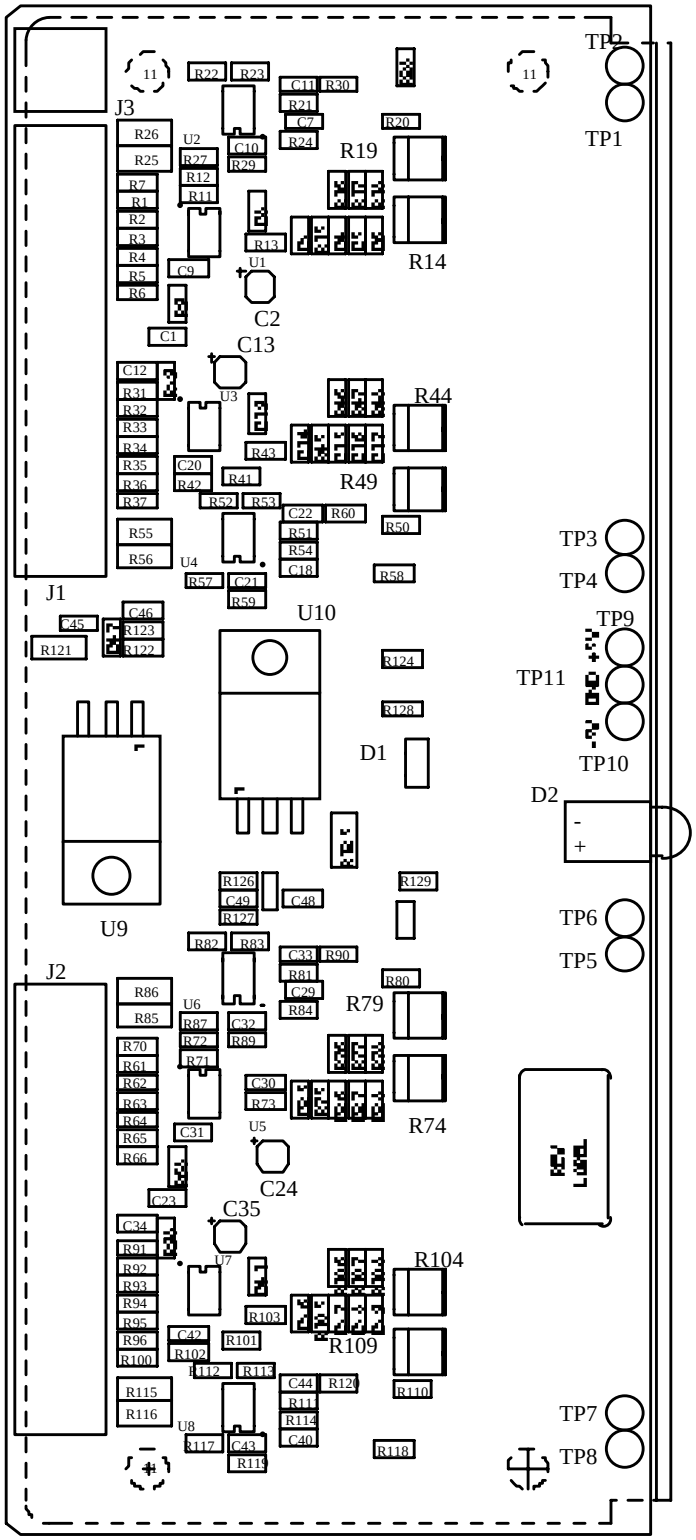


Figure 3–2 Video Summing Combiner Module Adjustments

3.1 Basic Operation and Adjustments Continued:

Gain Adjustment

Use the following procedure to adjust module gain. Verify that the combiner gain is in error before adjusting.

1. Ensure that your scope is calibrated.
2. Attach a 1v p-p signal such as multi-burst or sweep to the scope's channel A input, and using a BNC "T" connector, bring the signal to the input of the desired combiner module.
3. Connect the combiner module output to the scope's channel B input, and terminate at the scope.
4. Terminate the other two inputs on the channel under adjustment.
5. Adjust the gain potentiometers (R19, R49, R79, R109) for a 1v p-p output.

Equalization

Use the following procedure to equalize the cable from the switching system:

1. Use an appropriate signal (i.e. sweep signal with markers).
2. Adjust the equalization pots (R14, R44, R74, R104) for flat response at the destination of each output. Up to 150' of Belden 8781 cable can be compensated.

4.1 Video Summing Combiner

The Video Summing Combiner can be used to combine signals from any matrix frame (or other 75 ohm source), provided the signal is only present on one channel at a time.

The signals from all three inputs are resistively added. Normally, there will only be a signal on one input at a time. Because these inputs are not buffered before they are mixed, all three inputs must be terminated by a 75ohm device. If the third input is not connected to any device, it must be terminated with a 75ohm terminator.

The resulting signal goes to an equalizer stage, which is user adjusted by a pot accessible from the front of the unit. Then the signal enters an adjustable gain device (also user adjustable by a pot accessible from the front of the unit). The signal then goes to the output stage, which drives the two 75 ohm output BNC's.

Each Video Summing Combiner module assembly contains a green LED visible from the front of the unit. It will be illuminated when the module is plugged into a frame that is powered up. Each module also contains test points for +V, -V, and outputs for all four signal channels.

Figure 4–1 illustrates the Video Summing Combiner functional operation.

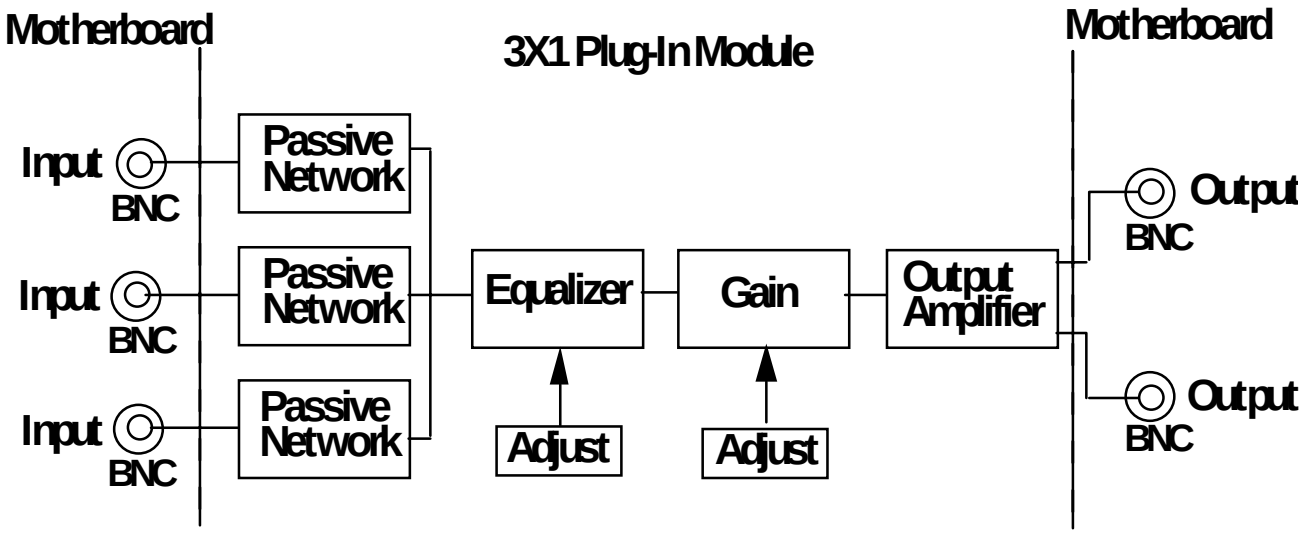


Figure 4–1 Video Summing Combiner Functional Diagram

4.2 Power Supplies

PS140V Functional Description

The PS140V is an unregulated power source that supplies ± voltages to the Video Summing Combiner.

Separate power supply units are available for the 115V and 230V versions. Voltage range selection is implemented in the same manner by changing the position of an AC Select Card inside the unit. There are three types of AC Select Cards: 100-130V range, 220-250V range, and 200-210V range. One AC Select Card is supplied for 115V units; two cards are supplied for the 230V. Voltage ranges can be selected in increments of 10V to comply with most US and International requirements.

PART NUMBER	NOMINAL VOLTAGE RANGES
81902406982	100 - 110 - 120 - 130
81902406990	220 - 230 - 240 - 250
81902407000	200 - 210

The edge of each card has different circuitry with matching labels that determine the voltage range. The appropriate AC Select Card is inserted into the connector so that the edge labeled with the desired voltage is towards the pins in the connector. The factory installed cards are 120V for 100V-130V systems, or 230V for 200V-250V systems. The input voltage may be adjusted up or down by repositioning the card. To change the AC Select Card voltage from the factory settings, disconnect AC power and remove the cover from the Power Supply Unit. Remove the AC Select Card and insert it into the connector so that the desired voltage matches up with the contacts in the connector. The connector has contacts only on one side. Replace the cover and reconnect AC power.

Note: To avoid electrical shock, insure that the filter capacitors are completely discharged. Refer to Figure 4–2.

4.2 Power Supplies Continued:

Circuit Description:

The AC Selector Card interconnects the transformer primaries in series and/or parallel combinations to provide the proper nominal input line voltage.

The secondaries drive full wave rectifiers with capacitor input filters providing positive and negative voltages with respect to ground.

Series diodes are used after the filters to allow supplies to be paralleled for redundancy. The diodes assure that one faulty supply cannot load the output of the other power supply.

A temperature sensing circuit controls the fan speed according to the air temperature. The fan usually runs at half speed at normal temperature (25°C).

A voltage monitoring circuit senses the output voltages. If the output voltages decrease by approximately 25% from normal, the green LED will extinguish; the red LED illuminates and the alarm closure activates at the same time. The green LED is an indicator of output voltage; it dims as the combined positive and negative voltages decrease.

Test points are provided for plus, minus, and ground. The test points are connected to unregulated voltages and follow input line changes and output load variations.

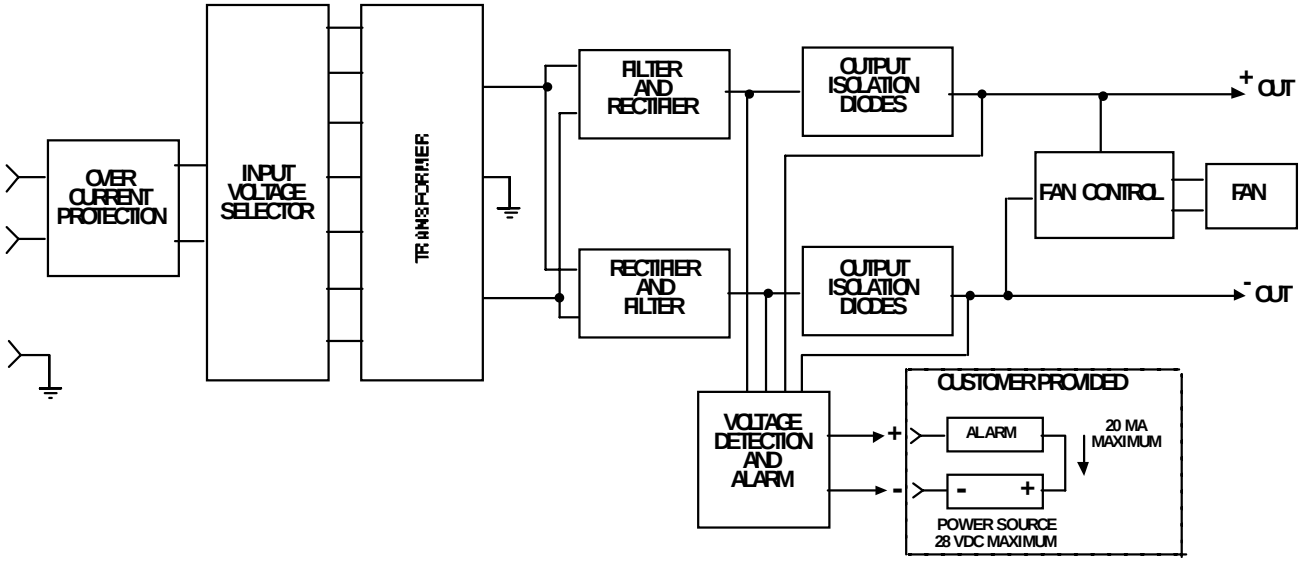


Figure 4–2 PS140V Functional Block Diagram

4.2 Power Supplies Continued:

PS270V Power Supply

The PS270V is an unregulated power source that supplies ± voltages to the Video Summing Combiner.

Although separate power supply units are available for the 115V and 230V versions, internally, voltage selection is obtained in the same manner for all units. Each power supply produced by Pesa has an adjustable AC Select Card inside the unit that allows the customer to select the required voltage range. There are three types of AC Select Cards: 100-130V range, 220-240V range, and 200-210V range. Pesa supplies one card for 115V units or two cards for the 230V units depending upon where the equipment is being shipped. Voltage ranges can be selected in increments of 10V to comply with most US and International requirements.

PART NUMBER	NOMINAL VOLTAGE RANGES
81902406982	100 - 110 - 120 - 130
81902406990	220 - 230 - 240 - 250
81902407000	200 - 210

How the card is inserted into the connector determines the voltage range - **note the labels on the cards**. The appropriate AC Select Card is inserted into the connector so that the edge labeled with the desired voltage is towards the pins in the connector. The factory installs a card such that the nominal voltages are 120V for 100V-130V systems, or 230V for 200V-250V systems. The voltage may be further adjusted by changing the position of the card.

To change the AC Select Card voltage from the factory settings, disconnect AC power and remove the cover from the Power Supply Unit. Insure that you have the proper AC Select Card and insert it into the connector so that the desired voltage matches up with the contacts in the connector. The connector has contacts only on one side. Replace the cover and check the output voltages to insure they are correct.

Note: To avoid electrical shock, insure that the filter capacitors are completely discharged.

Circuit Description:

An input fuse provides overcurrent protection from internal faults and output overloads. If the fuse opens, correct the overcurrent condition then replace the fuse.

4.2 Power Supplies Continued:

Circuit Description Continued:

The AC selector card interconnects the transformer primaries in series and/or parallel combinations to provide the proper ratio for the input line voltage.

The secondary drive full wave rectifiers with capacitor input filters providing positive and negative voltages with respect to ground.

After the filters, series diodes are used to allow supplies to be paralleled for redundancy. The diodes assure that one supply cannot load the output of the others in case of a shorted diode or capacitor.

In the PS270V, a temperature sensing circuit controls the fan speed according to the air temperature. The fan usually runs at half speed at normal temperature (25°C). The PS270A does not incorporate a fan.

A circuit senses the voltages across the filter capacitors. If the combined voltages decrease by approximately 25% from normal, the green LED extinguishes. The red LED illuminates and the alarm closure activates at the same time. The green LED serves as a rough indicator of output voltage; it dims as the combined positive and negative voltages decrease.

Test points are provided for plus, minus, and ground. These supplies are unregulated and follow input line changes and output load variations.

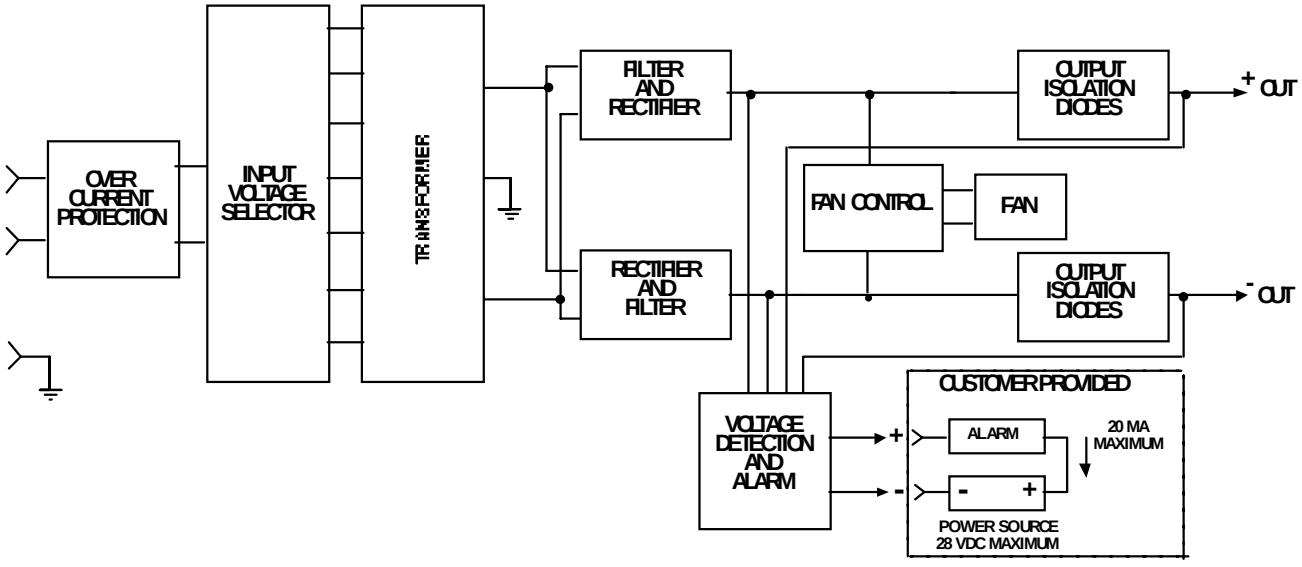


Figure 4–3 PS270V Functional Block Diagram

5.1 Maintenance

General

The Video Summing Combiner is designed to provide extended, trouble-free service with minimum maintenance requirements. Other than the normal care which should be given to any advanced solid-state electronic device, there are few additional maintenance requirements on the Video Summing Combiner unit.

If additional technical assistance is required, please refer to the "Ordering Assistance, Service, and Inquiries Sheet" in the front of this manual.

5.2 Preventive Maintenance

Use the following guidelines for general preventive maintenance:

- Keep the inside of the frame clean, especially if your facility is subject to dust or dirt in the atmosphere. Use compressed air, an anti-static cloth, or a gentle vacuum to clean the grille and internal components.

- Observe proper procedures for preventing electrostatic discharge when cleaning the unit, and when inserting and removing cards. Ensure that all tools and personnel handling individual components are properly grounded.

- Avoid covering the front grille for any extended period. The Video Summing Combiner system doen not include cooling fans, the grille is designed to provide all required system ventilation.

- The center conductors of each BNC connector are readily accessible inside the frame, if you wish to check system input and output levels. It is recommended that a scope with a 10:1 probe is used for minimum signal disturbance.

- If a problem is suspected with an individual Video Summing Combiner module, first swap out the module and recheck the system for the problem. If the problem can be isolated on the module itself, and your facility is equipped for module component repair, proceed with repairs using the schematics provided in Section 6 of this manual.

- For replacement components or replacement modules, contact PESA technical support. Refer to the "Ordering Assistance, Service & Inquires Sheet" in the front of this manual for details.

5.2 Preventive Maintenance Continued:

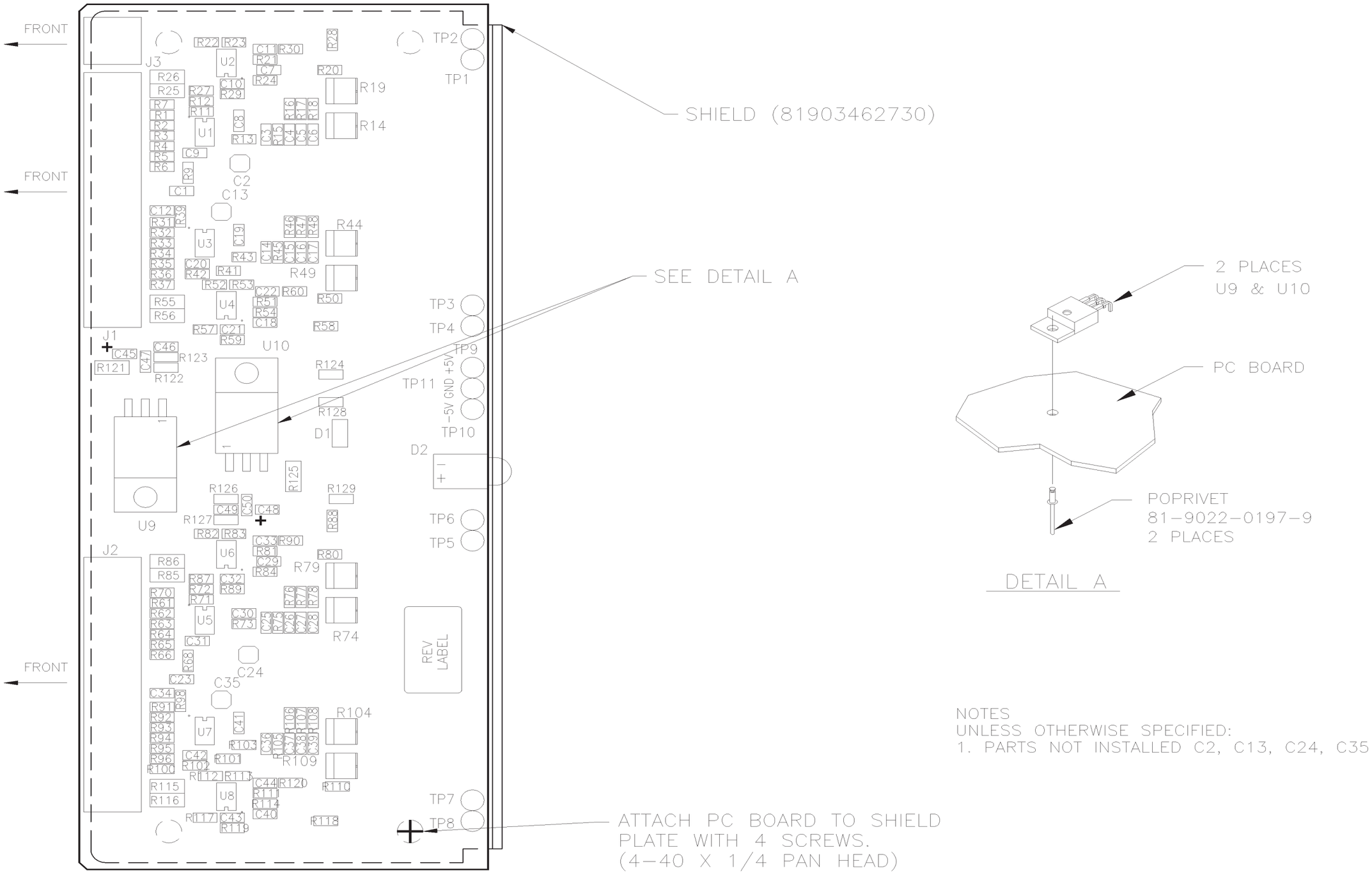
NOTE:
Do not repair equipment under warranty without first contacting PESA. Remember that PESA warrants the Video Summing Combiner equipment against defective workmanship or materials for a period of one year from the date of purchase. Refer to the "Equipment Warranty" sheet in the front of this manual for further information.

6.1 Schematics

General

This section contains the schematic diagrams and parts location diagrams for the Video Summing Combiner. Refer to this section when trouble-shooting the equipment or replacing defective parts.

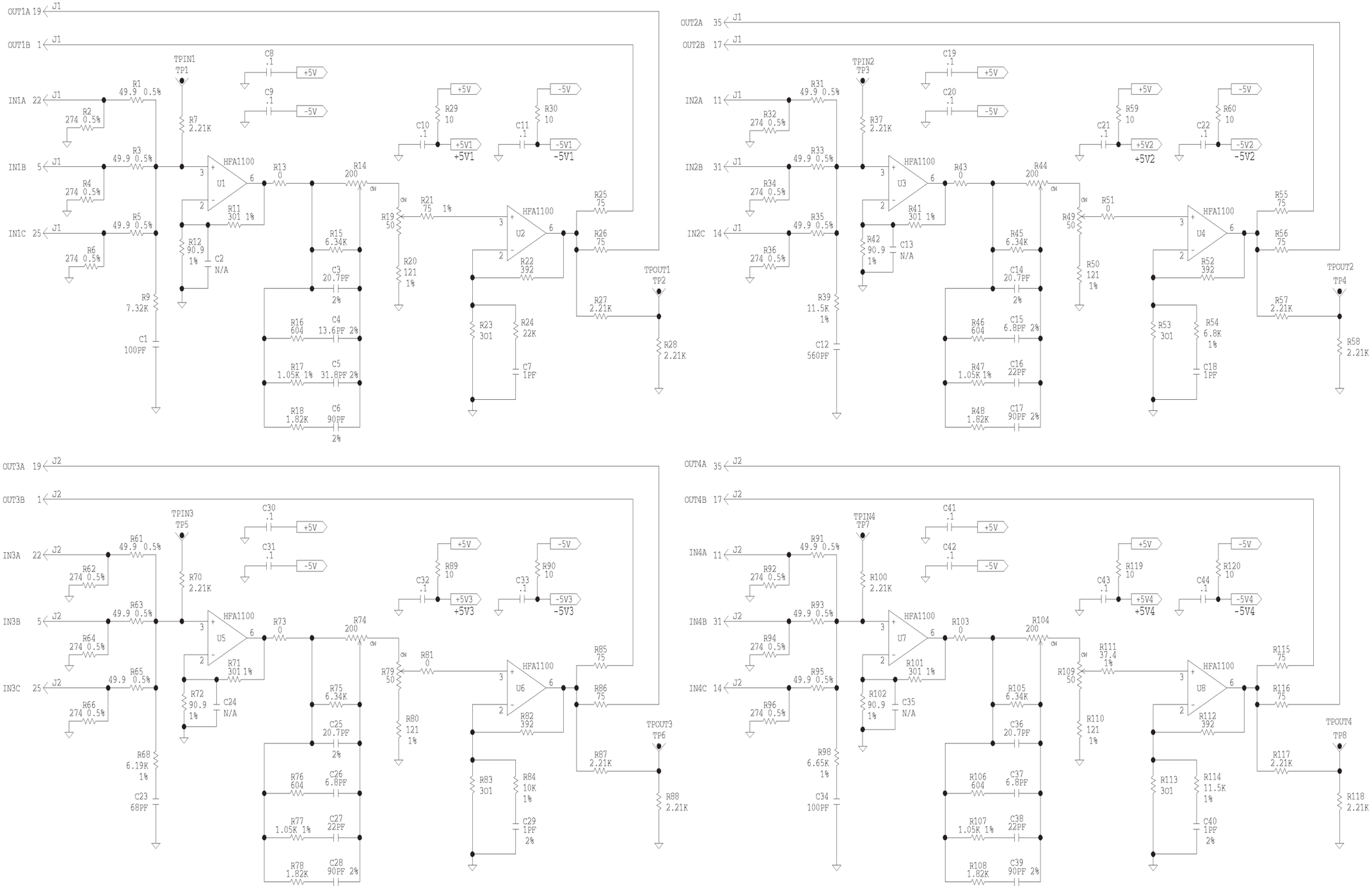
Not Available at Time of Printing



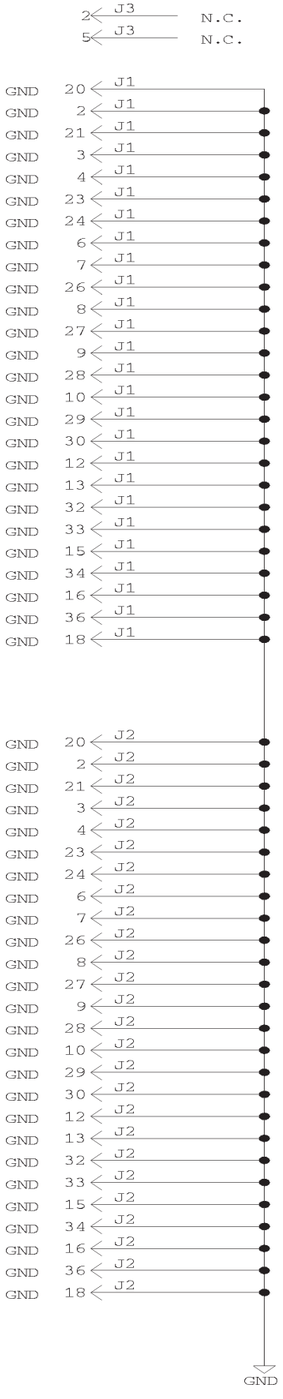
DETAIL A

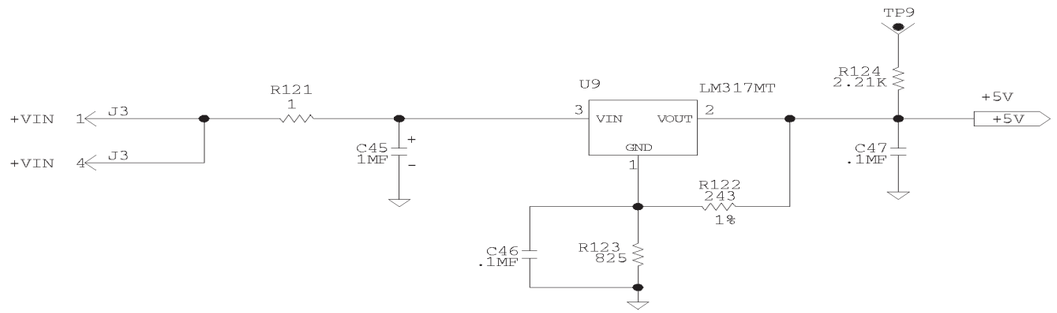
NOTES
UNLESS OTHERWISE SPECIFIED:
1. PARTS NOT INSTALLED C2, C13, C24, C35

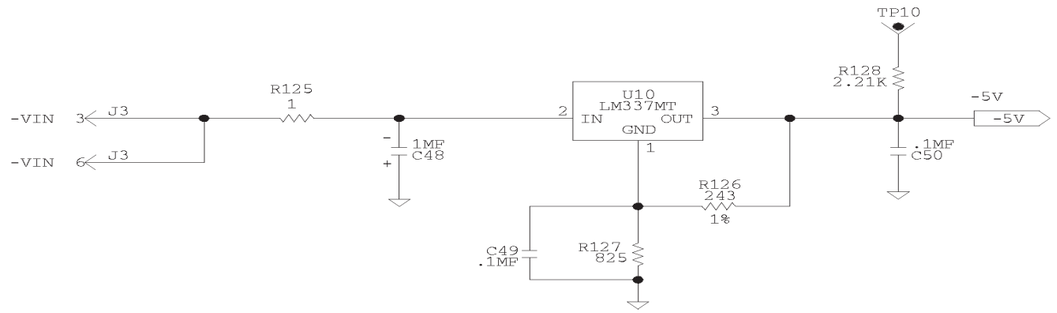
Component Assembly • Video Summing Combiner Card • CA25-1198



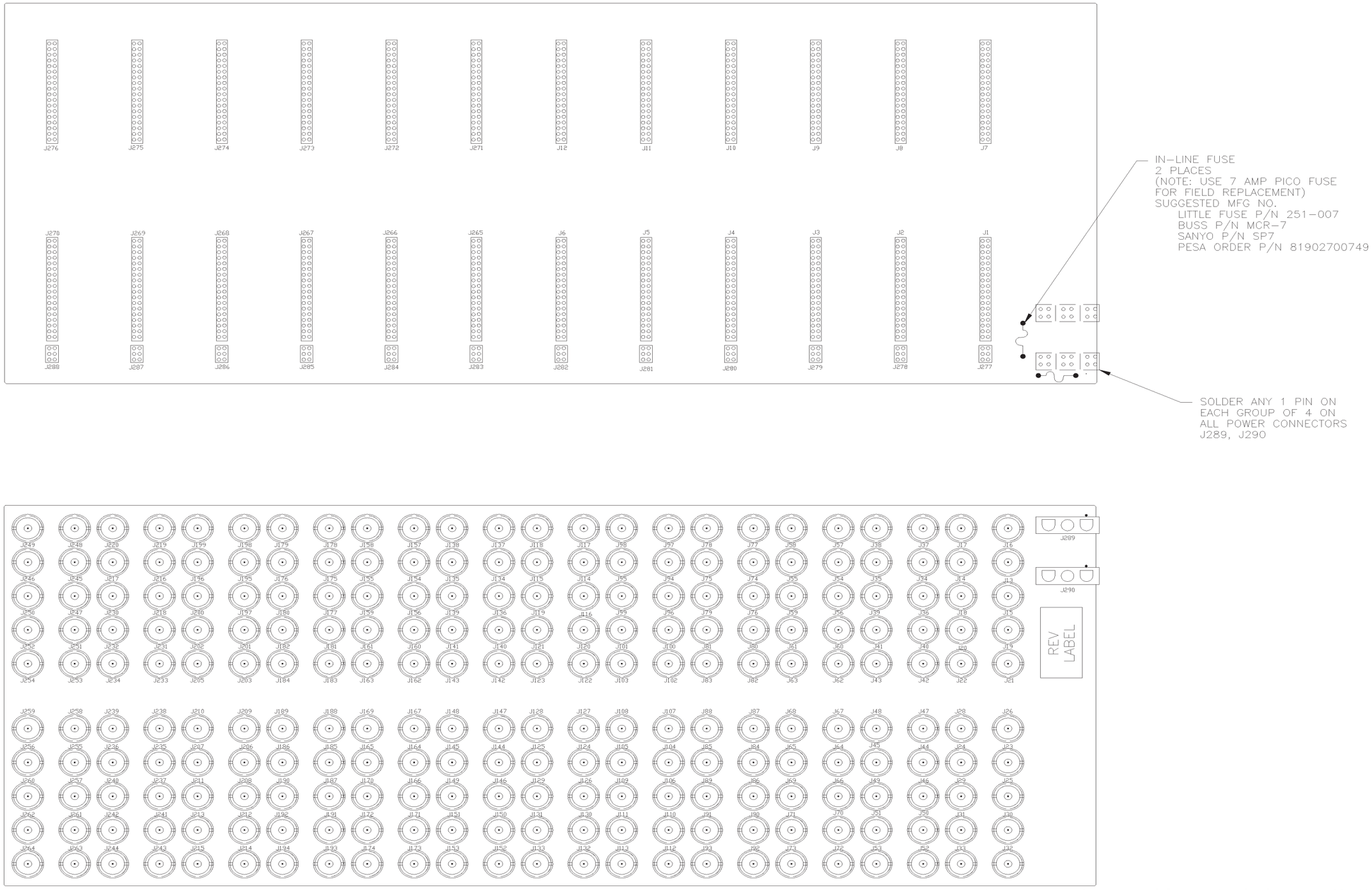
Schematic (Sheet 1 of 2) • Video Summing Combiner Card • SC33-1198



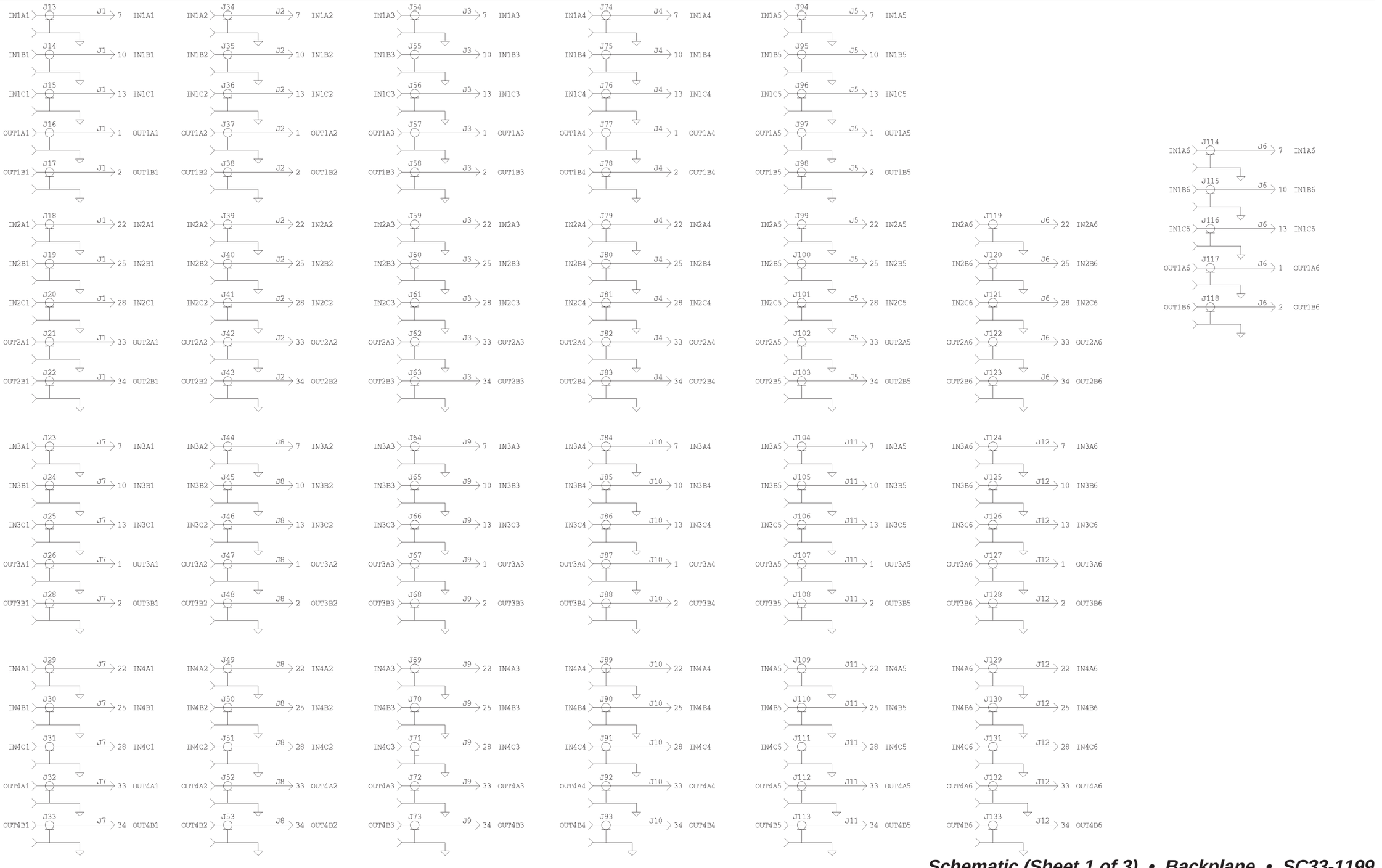




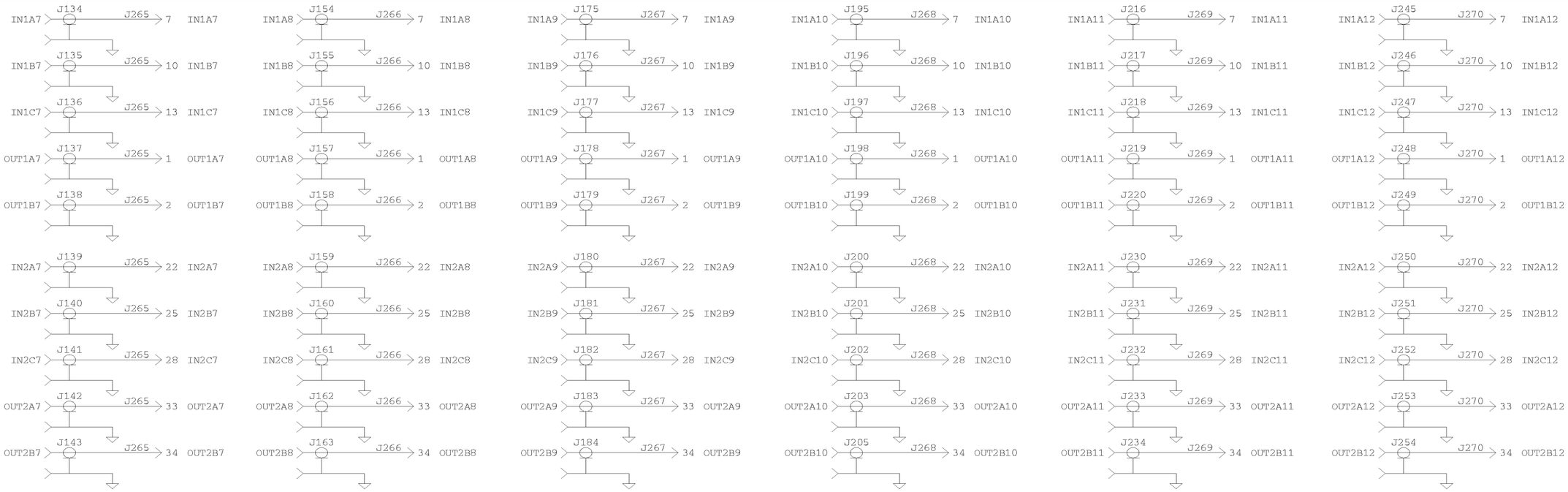
Schematic (Sheet 2 of 2) • Video Summing Combiner Card • SC33-1198



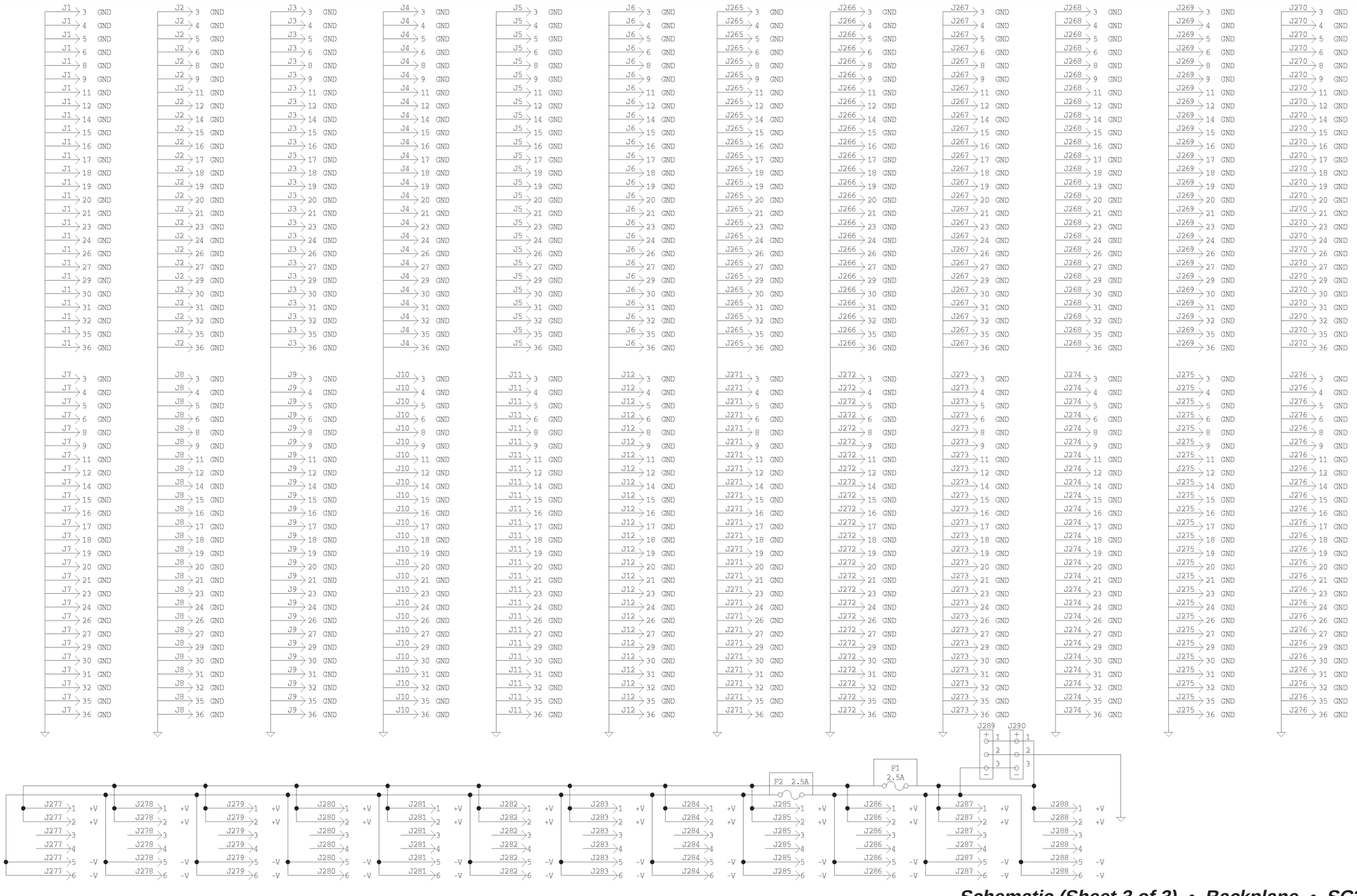
Component Assembly • Backplane • CA25-1199



Schematic (Sheet 1 of 3) • Backplane • SC33-1199



Schematic (Sheet 2 of 3) • Backplane • SC33-1199



Schematic (Sheet 3 of 3) • Backplane • SC33-1199

Not Available at Time of Printing

7.1 Parts List

General

The Parts List in this section have been grouped according to each assembly associated with the Video Summing Combiner. Refer to each list by name of card, board, or section of the equipment requiring replacement parts.

Mainframe Assembly - 81906515580

81903462720	REAR PANEL VIDEO SUMMING COM	1	EA
81906511837	CABLE MVDA/RM5000 6' POWER	1	EA
81906512256	CHASSIS COMBINER AUD/VID	1	EA
81906515600	BACKPLANE VID SUMM COMBINER	1	EA
PK65-1558	DOC MAINFRAME VID SUM COMB	REF	

Video Summing Combiner Card - 81906515590

81901606236	REG LM337MT NEG 0.5A TO-220	U10	1	EA
81901606244	REG LM317MT POS 0.5A TO-220	U9	1	EA
81902200120	SCREW 4-40 X ¼ PAN HEAD PHIL		4	EA
81902201979	RIVET 1/8 ALUM		2	EA
81902411980	PCB ASSY VID SUMMING COMB		1	EA
81902907096	CONN 2X3 RECEPT RT/A PCB MT	J3	1	EA
81902907530	CONN 36 POS FEM RT/A PC MT	J1 J2	2	EA
81902907600	CONN 2 POS HEADER 0.15” CENTER	TP1-TP8	4	EA
81902907630	CONN 3 POS HEADER 0.15” CENTER	TP9-TP11	1	EA
81903200541	LED GREEN RT/A HI-EFF PCB	D2	1	EA
81903462730	SHEILD VID SUMMING COMBINER		1	EA
81906600184	RESISTOR 10 OHM 5% 0805	R29 R30 R59 R60 R89 R90 R119 R120	8	EA
81906600866	RESISTOR 6.8K 5% 0805	R54	1	EA
81906600986	RESISTOR 22K 5% 0805	R24	1	EA
81906601521	RESISTOR 0.0 OHM 5% 0805	R13 R43 R51 R73 R81 R103	6	EA
81906602700	RESISTOR 1.05K 1% 0805	R17 R47 R77 R107	4	EA
81906610563	RESISTOR 37.4 OHM 1% 0805	R111	1	EA
81906610852	RESISTOR 75.0 OHM 1% 0805	R21	1	EA
81906610930	RESISTOR 90.9 OHM 1% 0805	R12 R42 R72 R102	4	EA
81906611058	RESISTOR 121 OHM 1% 0805	R20 R50 R80 R110	4	EA
81906611348	RESISTOR 243 OHM 1% 0805	R122 R126 R129	3	EA
81906611431	RESISTOR 301 OHM 1% 0805	R11 R23 R41 R53 R71 R83 R101 R1133	8	EA
81906611540	RESISTOR 392 OHM 1% 0805	R22 R52 R83 R112	4	EA
81906611720	RESISTOR 604 OHM 1% 0805	R16 R46 R76 R106	4	EA
81906611850	RESISTOR 825 OHM 1% 0805	R123 R127	2	EA
81906612180	RESISTOR 1.82K 1% 0805	R18 R48 R78 R108	4	EA
81906612264	RESISTOR 2.21K 1% 0805	R7 R27 R28 R37 R57 R58 R70 R87 R88 R100 R117 R118 R124 R128	14	EA
81906612680	RESISTOR 6.19K 1% 0805	R68	1	EA
81906612690	RESISTOR 6.34K 1% 0805	R15 R45 R75 R105	4	EA
81906612718	RESISTOR 6.65K 1% 0805	R98	1	EA
81906612759	RESISTOR 7.32K 1% 0805	R9	1	EA
81906612882	RESISTOR 10K 1% 0805	R84	1	EA
81906612940	RESISTOR 11.5K 1% 0805	R39 R114	2	EA
81906621513	RESISTOR 1 OHM 5% 1206	R121 R125	2	EA
81906640073	RESISTOR 75 OHM 0.5% 1206	R25 R26 R55 R56 R85 R86 R115 R116	8	EA
81906640140	POT 50 OHM RT/A 1-TURN 10%	R19 R49 R79 R109	4	EA
81906640160	RESISTOR 49.9 OHM 0.5% 0805	R1 R3 R5 R31 R33 R35 R61 R63 R65 R91 R93 R95	12	EA
81906640170	RESISTOR 274 OHM 0.5% 0805	R2 R4 R6 R32 R34 R36 R62 R64 R66 R92 R94 R96	12	EA

Video Summing Combiner Card - 81906515590 Continued:

81906650080	POT 200 OHM RT/A 1-TURN 10%	R14 R44 R74 R104	4	EA
81906700026	CAP 560PF 50V CERAMIC SMT	C12	1	EA
81906700059	CAP 6.8PF 50V CERAMIC 0805	C15 C26 C37	3	EA
81906700166	CAP 100PF 50V CERAMIC 0805	C1 C34	2	EA
81906700210	CAP 1PF CERAMIC 2% 0805	C7 C18 C29 C40	4	EA
81906700290	CAP 68PF NPO CERAMIC 0805	C23	1	EA
81906700350	CAP 22PF NPO CERAMIC 0805	C16 C27 C38	3	EA
81906700410	CAP 20.7PF NPO 50V CERAMIC 0805	C3 C14 C25 C36	4	EA
81906700420	CAP 90PF NPO 50V CERAMIC 0805	C6 C17 C28 C39	4	EA
81906700470	CAP 31.8PF NPO 50V 2% 0805	C5	1	EA
81906700480	CAP 13.6PF NPO 0805 2%	C4	1	EA
81906720010	CAP 0.1MF 25V X7R 0805	C8-C11 C19-C22 C30-C33 C41-C44 C46 C47 C49 C50	20	EA
81906770052	CAP 1MF 20V TANT SIZE A	C45 C48	2	EA
81906800065	TRANS MMBZ5234B SMT	D1	1	EA
81906810470	IC OPAMP 670MHZ 6V SO-8	U1-U8	8	EA
CA25-1198	DOC ASSY VIDEO SUMM COMBINER		REF	
SC33-1198	DOC ASSY VIDEO SUMM COMBINER		REF	

Backplane - 81906515600

81902411990	PCB BACKPLANE VID SUMM COMB	1	EA
81902905082	HEADER DOUBLE ROW 2X3 6 POS	12	EA
81902906320	CONN 3 PIN MALE PRESS-IN	2	EA
81902906486	CONN BNC PRESS-IN 75 OHM	240	EA
81902907520	CONN 36 POS 18X2 HEADER	24	EA
PK65-1560	DOC BACKPLANE VID SUM COMB	REF	

Chassis - 81906512256

81902002807	LATCH ADJ W/KNOB AND PAWL	2	EA
81902104470	WASHER 0.15 SHOULDER NYLON	2	EA
81902201896	SCREW #6 HEX/WASHER	8	EA
81902202837	RIVET 0.125” STAINLESS	8	EA
81903460442	SIDE COMBINER CHASSIS	2	EA
81903460459	CARD GUIDE HORZ COMB CHASSIS	2	EA
81903460467	FRONT DOOR COMBINER	1	EA
81903460947	SUPPORT BAR REAR COMB CHAS	2	EA
PK65-1225	DOC COMBINER CHASSIS	REF	