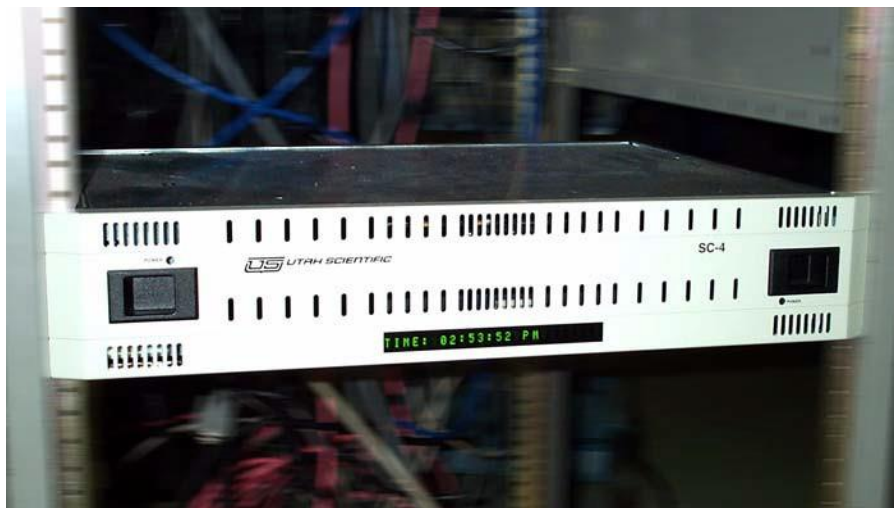**Utah Scientific**

SC-4 Routing and Control System

System Setup and Operations Guide

SC-4 Routing and Control Customizing Guide

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This equipment has been tested and found to comply with the limits for a Class A, digital device, pursuant to Part 15, Subpart B of the FCC Rules and the Canadian EMC Requirement (ICES-003). These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user will be required to correct the interference at their own expense. Shielded cables must be used to ensure compliance with the FCC Class A limits.

Declaration of Conformity

Utah Scientific, Inc.

4750 Wiley Post Way, Suite 150
Salt Lake City, Utah 84116-2878 U.S.A.

We declare our sole responsibility that the Utah-400 Digital Routing Switcher is in conformance with the following standards:

Emission

- EN55022:1994+A1&A2

Immunity

- EN55024:1998
- EN61000-3-2
- EN61000-3-3

Safety

- IEC 60950-1:2001 /EN 60950-1:2001

Following the provisions of the Directive(s) of the Council of the European Union:

- EMC Directive 89/336/EED
- Low Voltage Electrical Directive 72/23/EEC

Utah Scientific, Inc. hereby declares that the product specified above conforms to the above Directive(s) and Standard(s).

$$\mathsf{C}\mathsf{E}$$

Important Safeguards and Notices

This section provides important safety guidelines for the Operator and Service Personnel. Specific warnings and cautions are found throughout the guide where they apply, but may not appear here. Please read and follow the important safety information, specifically those instructions related to risk of fire, electric shock, or injury to persons.

Safety Symbols

- Hazardous Voltage symbol

- Caution symbol. The product is marked with this symbol when it is necessary to refer to the manual to prevent damage to the product.

Warnings

Please observe the following important warnings:

- Any instructions in this guide that require opening the chassis, changing a power supply, or removing a board, should be performed by qualified personnel only. To reduce the risk of electric shock, do not perform any service unless you are qualified to do so.

- Heed all warnings on the unit and in the operating instructions.

- Do not use this product in or near water. Disconnect AC power before installing any options or servicing the unit unless instructed to do so by this manual.

- This product is grounded through the power cord ground conductor. To avoid electric shock, plug the power cord into a properly wired receptacle before connecting the product inputs or outputs.

- Route power cords and other cables so they won't be damaged.

- The AC receptacle (socket) should be located near the equipment and be easily accessible.

- Disconnect power before cleaning. Do not use any liquid or aerosol cleaner - use only a damp cloth.

- Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed conductors and components while power is on. Do not insert anything into either of the systems two-power supply cavities with power connected.

- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as power supplies. During installation, do not use the door handles or front panels to lift the equipment as they may open abruptly and injure you.

- To avoid fire hazard when replacing fuses, use only the specified correct type, voltage and current rating as referenced in the appropriate parts list for this product. Always refer fuse replacement to qualified service personnel.

- Have qualified personnel perform safety checks after any service.

Cautions

Please observe the following important cautions:

- When installing this equipment do not install power cords to building surfaces. To prevent damage when replacing fuses, locate and correct the problem that caused the fuse to blow, before reconnecting power.

- Use only specified replacement parts

Notices

Please observe the following important notes:

- When the adjacent symbol is indicated on the chassis, please refer to the manual for additional information.

- For the HD-2020 Chassis and Master Control Panel, refer to "Connecting and Disconnecting Power" - Chapter 2 (Hardware Installation).

Company Information

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- World Wide Web: http://www.utahscientific.com
- **After Hours Emergency**: +1 (800) 447-7204. Follow the menu instructions for Emergency Service.

Warranty Policies

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> Utah Scientific, Inc. warrants to the original purchaser that the Utah Scientific hardware is free from defects in materials and workmanship and will perform substantially in accordance with the accompanying written materials under normal use and service for a period of ten (10) years from the date of shipment. Any implied warranties on hardware are limited to ten (10) years. Some states/jurisdictions do not allow limitations on duration of an implied warranty, so the above limitation may not apply to certain specific purchasers.

Software Warranty

> Utah Scientific warrants that the software will perform substantially in accordance with the accompanying written materials for a period of one (1) year from the date of shipment.

Customer Remedies

> For the first one (1) year after purchase of the software and the first ten (10) years after the date of purchase of the hardware, Utah Scientific's and its suppliers' entire liability and purchaser's exclusive remedy shall be, at Utah Scientific's option, either:
>
> •   Return of the price paid, or
>
> •   Repair or replacement of the software or hardware that does not meet the above warranties and is returned to Utah Scientific under the returned materials authorization (RMA) process with freight and forwarding charges paid.
>
> After the initial warranty periods, purchaser's exclusive remedy is the repair or replacement of the hardware upon payment of a fixed fee to cover handling and service costs based on Utah Scientific's then-current price schedule. The above warranties are void if failure of the software or hardware has resulted from an accident, abuse, or misapplication. Any replacement software or hardware will be warranted for the remainder of the original warranty period or thirty (30) days, whichever is longer.

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CHAPTER 1   *Introduction*

In this Guide

This guide provides information on installing, configuring, and operating the SC-4 Control System. The following chapters and appendices are included.

- Chapter 1: "**Introduction**" summarizes the guide and introduces the SC-4 Control System.

- Chapter 2: "**Hardware Installation**" provides installation instructions for the user. Includes some "do's" and "don'ts" regarding the installation.

- Chapter 3 "**System Configuration**" provides information the user needs to know when setting up or changing the SC-4 Control Boards.

- Chapter 4 "**Operations**" offers a detailed description of connections, software setup, and SC-4 system operations.

Chapter Contents

How to use this Guide

The chapters in this guide follow a logical sequence from the introduction through specifications.

- Read this chapter "**Introduction**" to familiarize yourself with the product and its components.

- Follow the instructions in "**Hardware Installation**" to install the SC-4 Control System and related components including control panels signal levels and inter-system communications.

- The chapter on "**System Configuration**" relates directly to the SC-4 Control Card(s) and what can be configured on them.

- "**Operations**" describes operational commands that can be sent to the SC-4 via Telnet or the system debug port. This section also describes various status messages available at the debug port.

System Hardware Requirements

Item	Minimum	Recommended
Processor	Intel Pentium II	Intel Pentium IV
Operating System	Windows 2000	Windoes XP
Memory	128 MB Ram	512 MB Ram
Hard Disk	384 MB Free Space Including Swap File	--
Monitor	17" 1024x768 Color Monitor	--
Video Card	1024x768 capable, 8 MB of RAM	==
CD-ROM	Any	Any
Ethernet Adapter	10 Base T	--
Serial Port	Any	Any

Hardware Features

The SC-4 Control System is normally shipped with the following components:

- One Front Cover
- One SC-4 Chassis
- Two Power supplies (Redundancy is supplied as standard)
- Two SC-4 Control Cards (Redundancy is supplied as standard)
- Two Power Cords
- Two (2) MX-Bus Terminator
- 8 UNET Terminators
- One PC to RJ-45 Adapter Plug (USI Part Number: 140100-2).
- One SC-4 Control System Users' Guide (USI PN 82101-0100).

Front Cover Features
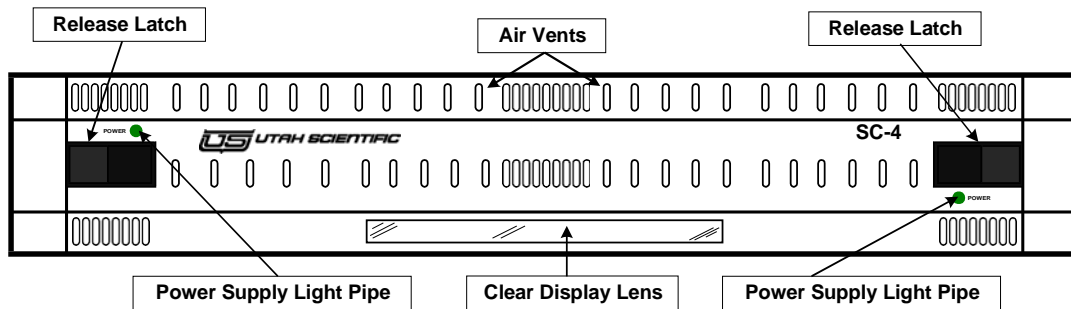
FIGURE 1-1. SC-4 Front Panel Components

Figure 1-1 shows the components of the SC-4 Front Panel. The function of each component is explained in the Table below.

TABLE 1-1. SC-4 Front Panel Functions

Component	Function
Air Vents	Allows airflow across the power supplies and control boards with the front cover installed
Release Latch(s)	Releases the front cover when each latch is moved toward the center of the chassis.
Power Supply Light Pipes	Will show "Green" when both supplies are operating properly, "Red" indicates a fault
Clear Display Lens	Allows the user to view the current display mode without removing the front cover.

SC-4 Chassis Front View with Front Cover Removed

With the front cover removed the following components are visible from the front:

- The SC-4 Control Boards (Normally shipped with two control boards).
- Two Power Supplies.
- One Chassis Monitoring (Display) Module.

Figure 2 shows the location of each of the components.
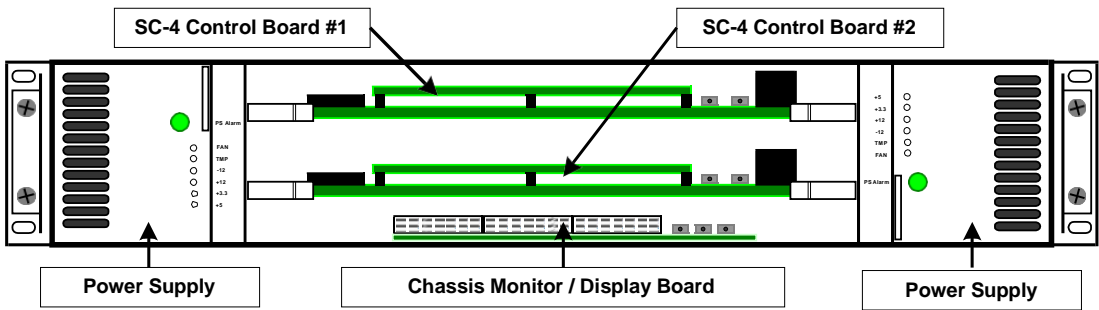
FIGURE 1-2. Chassis Front with Cover Removed

TABLE 1-2. SC-4 Chassis Internal Component Functions

Component	Function
Power Supplies	115 VAC – 230 VAC, auto sensing
Monitor / Display Board	Selects and displays SC-4 system parameters
Control Boards	Provides Control and Configuration

SC- 4 Control System Backplane

The SC-4 Backplane provides all of the connections necessary to control Utah Scientific equipment.

- The SC-4 backplane is arranged into the following groups of connectors:
- Eight RJ-45 UNET Connectors
- Four BNC Party Line Connectors
- Three looping sync inputs
- Two RJ-45 Ethernet Connectors
- Two MX-Bus Connectors (25 pin D Connector – Female)
- Six Control Connectors (9 pin D Connector – Female)

Figure 1-3 shows the complete backplane identifying all of the groups above.
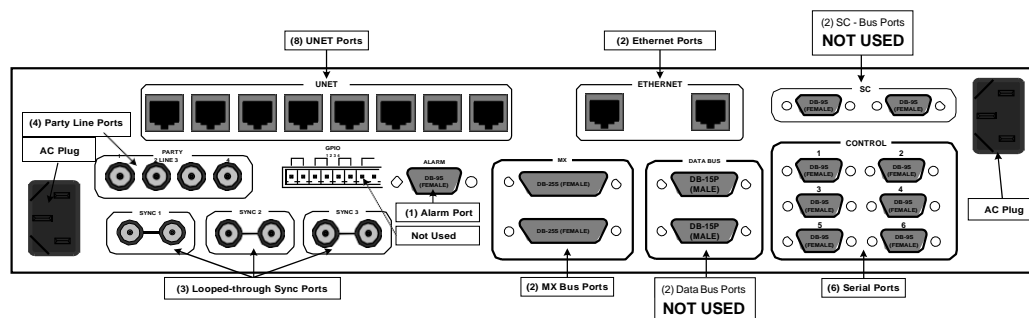
FIGURE 1-3. SC-4 Backplane with Callouts

TABLE 1-3. Backplane Connections and Functions

Port	Function
AC Plug	Connection for the AC Line Power Cord(s).
Party Line	Use with CSP Panels or Party Line controlled devices.
UNET	For use with UNET based control panels.
Ethernet	Standard Ethernet Ports.
GPIO	Nonfunctional
Alarm	SMPTE and Remote Alarm 0 – 3.
Serial	Hardware selectable as RS-232 / RS – 422.
Sync 1 - 3	NTSC Black Burst, PAL Black Burst, or TRI-Level Black Burst

CHAPTER 2   *Hardware Installation*

In this Chapter

Unpacking and Inspection

The SC-4 Control System, when shipped by itself, is packaged in a 25" x 25" x 13" carton and encased in Styrofoam. The SC-4 Chassis is in the bottom of the carton and all accessories are packed on top, packaged and wrapped in bubble wrap. **See Figure 1-1: SC-4 Basic Packaging and Contents.**

When the SC-4 Control System is shipped with control panels or other systems in the same carton it will be in a 25" x 25" x 29" carton and layered with the SC-4 on the bottom, other systems or control panels in the second layer and accessories on top. **See Figure 1-2: SC-4 Expanded Packaging and Contents.**

In either case, the SC-4 is wrapped in anti-static wrap and encased in Styrofoam.

The easiest method of removing the SC-4 Chassis from the package is to:

1. Open the top of the box and remove all the accessories.
2. Cut the sides of the box and break the Styrofoam away from the back of the SC-4 Chassis.
3. Gently pull the SC-4 from the Styrofoam packing.

Inspect the accessories package and inventory it for the following items:

1. Two (2) AC Power Cords.
2. Two (2) MX-Bus Terminators.
3. Two (2) SC-Bus Terminators. (USI Part # 70797-1)
4. Eight (8) UNET Terminators. (USI Part # 65324-04)
5. One (1) PC to RJ-45 adapter Plug; DB-9S to RJ-45 USI PN 140100-2.
6. One (1) SC-4 Control System Users' Guide; USI PN 82101-0100.

If anything is missing from the above list, contact: **Utah Scientific Technical Services at 1.800.447.7204** or your Utah Scientific Sales Representative.
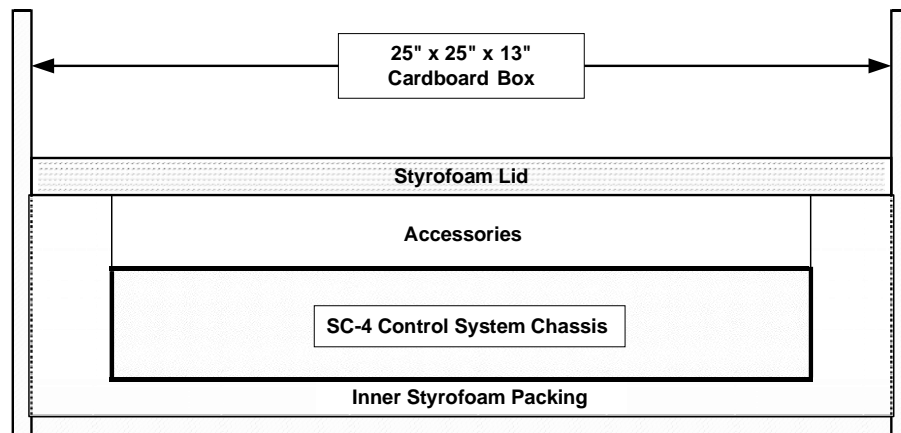
FIGURE 2-1. **SC-4 Basic Packaging and Contents**
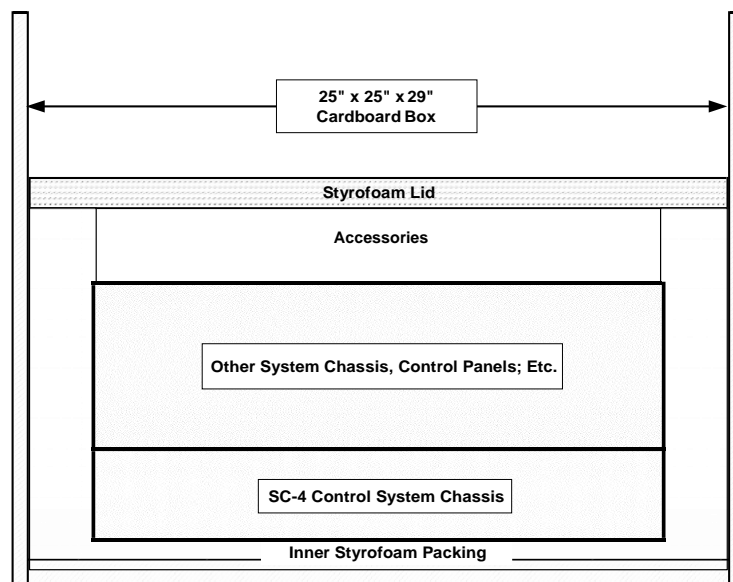
FIGURE 2-2. **SC-4 Expanded Packaging and Contents**

Warnings and Cautions

Warning

The SC-4 Control System is designed to be continuously powered up. The power socket should be located near the equipment and easily accessible in case of an emergency.

Potentially lethal AC voltages are present when the SC-4 AC System is powered up. This equipment should be operated and maintained by technically qualified personnel.

Caution

Your warranty does not cover damage resulting from improper handling of, repairs to or unauthorized modifications of your equipment. Refer to the warranty page for further information.

This equipment contains components that are susceptible to damage from electro-static discharges. A static safe environment, including work-stations, tools and containers, is recommended when handling or shipping circuit cards or equipment.

Claims Against the Carrier

Visually inspect the container your equipment was shipped in. You should receive cartons in good condition with no visible physical damage such as tearing, crushing puncture or water damage.

Make a note of any physical damage to the shipping containers before unpacking them. If possible, note any damage on the shipping invoice from the carrier before you sign for it. In some cases it may be useful to take pictures of the damage to present to the carrier if a claim must be made.

As the SC-4 is unpacked for installation, carefully check for any internal damage. Examine the frame and contents carefully as rough handling may dislodge cards and/or power supplies and cause internal damages not readily noticeable until the equipment is powered up.

File all damage claims with the carrier and contact Utah Scientific for further instructions.

Note: Utah Scientific assumes no responsibility for loss or damage to equipment in shipment. You must direct all claims related to such damage to the insurer and / or carrier. Do not return damaged items to Utah Scientific until your claim is authorized and Utah Scientific provides you with a Returned Materials Authorization (RMA).

Installing Hardware

The SC-4 Control System installation requires the following steps:

1. Installing the Physical Equipment.
2. Connecting Control Cables.
3. Connecting the Serial Ports.
4. Connecting the Sync Ports.
5. Connecting Power

Installing Physical Equipment

Install the SC-4 Control System in a standard 19 inch rack mount frame.

• The SC-4 Chassis is 3-1/2" high and occupies 2 rack units.

Locate the chassis where it is convenient and accessible with room for cabling and easily accessible.

Connecting Control Cables

Since each site varies considerably, some general rule of thumb should be adhered to when connecting control cables.

• When connecting the MX-Bus Cables they must be terminated at each end of the daisy chain.

• The MX-Bus is a router control bus driven by the SC-4. All equipment with MX-Bus connections contain two female 25-pin ports. The MX bus daisy chains from one piece of equipment to the next, with the unused connector on each end of the MX-Bus receiving a terminator. The cable type used to interconnect multiple chassis is USI part number 80229-XX, where 'XX' details the length of the cable. The terminator used at each end of the bus is USI part number 70797-1.

• The U-NET is a panel control bus that interfaces UCP or SCP series control panels to the SC-4. Each U-NET port can support up to 32 panels at 1000 feet of cable. Panels can be placed on any one of the U-NET ports without regard to station number, although **every panel must have a unique station number**. The U-NET daisy chains through the panels (and every unused port). Termination must take place, whether at the back of the SC-4 or at the end of a panel chain, with the USI terminator. part number 65324-04.

- Party Line coax cables do not need termination. If any party line connection does have termination it will cause erratic responses to control signals.

- Unused UNET Ports on the back of the SC-4 must be terminated. Those ports, which are daisy chained to SCP or UCP panels, must be terminated at the end of the daisy chain.

- Ethernet Ports require no termination.

- The Serial Ports do not require termination.

Connecting the Serial Port

Note: For additional serial port information, See "Serial Port Pinouts" on page 3-22.

(Default Serial Port Setup)

The Serial Ports are configured as:

- Serial Ports 1, 3 and 5 – 38400 Baud, 8 Data Bits, 1 Stop Bit and No Parity, Indexed.
- Serial Ports 2, 4 and 6 – 19200 Baud, 7 Data Bits, 2 Stop Bits and Even Parity, Numeric.

To select between RS-232 and RS-422:

- Extract the SC-4 Control Board from the chassis.
- The hardware selectable gang-jumpers are located on the Left Edge of the SC-4 Control Board.
- **To select RS-232 (default position)** – viewed from the front, the gang-jumper should be moved to the Right for the desired port.
- **To select RS-422** - viewed from the front, move the gang-jumper to the Left for the desired port.

For more specific information, refer to the Hardware Specifics section of this manual, which also shows the serial port pin-outs.

Connecting the Sync Ports

As a default, the SC-4 uses sync 1 for vertical interval switching.

The sync ports should be fed with analog black burst signals, either NTSC, PAL, or Tri-Level. **Do not connect composite sync or digital SDI or HD-SDI signals to these ports**.

Each Sync must be terminated in the daisy chain with a BNC 75Ohm / 1% terminator (Furnished by Utah Scientific).

Connecting Power - AC Systems

There are two six foot IEC / 18 Gauge power cords furnished with the SC-4 Control System. The power cords connect into the two IEC plugs located on each side of the chassis' backplane (Refer to Figure 2-3). **The SC-4 is capable of full operation with only one power supply operating.**

*Important: The AC Power Cord is the only method to connect and disconnect power from the SC-4 Control System. The chassis does not have a power switch and is intended to be left **ON** indefinitely. **In case of emergency, the AC power cord should be readily accessible for a quick disconnect.***

To connect to system power:

1. On the SC-4 Backplane locate the Left and Right power connector.
2. Using the AC Power Cord, connect each power cord to a stable AC Power Source.

3. Repeat steps 1 and 2 for any additional control systems.
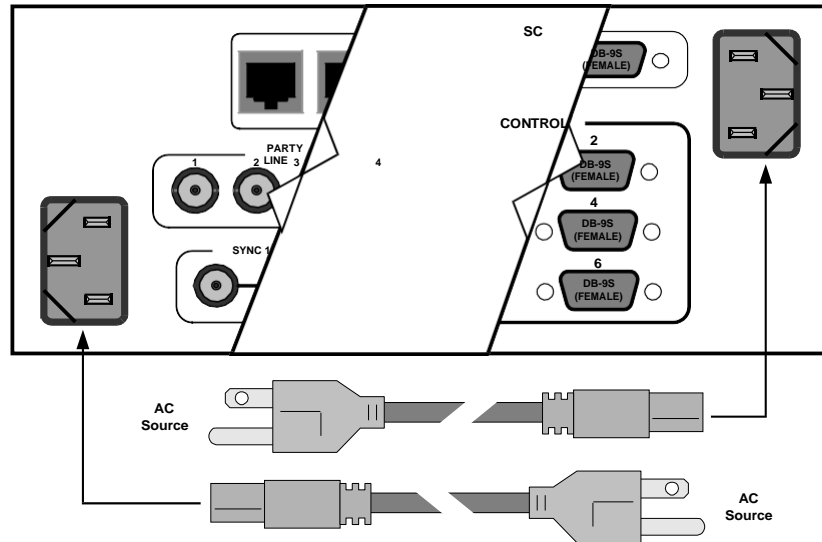
FIGURE 2-3. SC-4 Control System AC Power Connections

DC Power Connectivity

The DC input at the rear of the chassis is noticeably different than its AC counterpart. The connection consists of three separate terminals:

- Ground - Frame or chassis grounding point
- 0V - Most positive leg of -48V DC connection.
- -48V - Most negative leg of -48V DC connection.
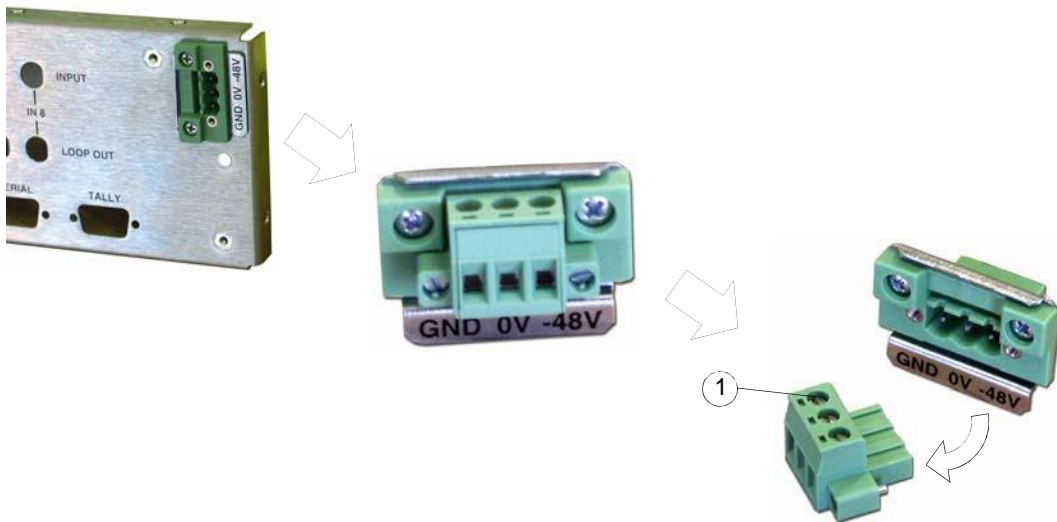
Note that this configuration is a DC-I or DC isolated connection.

The terminal strip is a small bracket containing three screws (see 1). Loosen the screws to remove the terminal from the back. This will expose the strip of wire (aprox. 1/4 of an inch).

Proper wire insertion into the removable terminal block

- Turn the screws counter clockwise to allow wire insertion (3 screws on block top).
- Strip 1/4" of the insulation from the new wires.
- Insert wire, then turn screw clockwise to tighten

Use 12 AWG wire (maximum)

The maximum branch circuit protection rating for the circuit feeding the SC-4 is 2 Amps

Cable Considerations

Utah Scientific provides some pre-assembled cables for some of the SC-4 connections. You must assemble cables associated with the Serial Ports, Alarm Ports and coaxial cables. This section provides some guidelines regarding those cables.

Cables that may be ordered from Utah Scientific

The SC-4 Control System is not normally shipped with any control cables; these are usually shipped with the Utah Scientific routing systems.

The cables provided by Utah Scientific include:

• The MX-Bus Cable - Part Number 80229-10; this cable may be special ordered in lengths up to 50 foot.

Cables that need to be fabricated

• **Sync1 and Sync 3 Ports** – use any good grade of 75-Ohm coaxial cable.
• **Party Line Ports** – Utah Scientific recommends using Belden 8281:   RG-59, 75-Ohm for lengths greater than 300 Meters (1000').
• **UNET and Ethernet Ports** – use Ethernet Category 5, UTP with RJ-45 Connectors. Grounded and shielded cables are recommended.
• **Serial Ports** – use any 22 Gauge to 24 Gauge twisted pair with DB-9P (male) connectors for the SC-4 backplane.
• **Alarms Port** – use any 22 or 24 Gauge twisted pair with DB-9P (male) connector.
• **GPIO Ports** – nonfunctional

SC-4 Setup and Operations

Overview

This section will assist you with configuration and setup for any SC-4 within your facility. Inventory instructions and visual sequences are provided throughout the following steps where necessary.

Please contact Utah Scientific Customer Service if you have additional questions.

Unpacking and Installation Instructions

1. Inspect the SC4 equipment making sure that the SC4 cards and power supplies are still inserted firmly in their proper slots. A fully populated (redundant) chassis will have two cards installed horizontally in the upper two slots with one power supply on each side. A non-redundant system will have one SC4 only installed in the upper slot but still requires the use of two power supplies. There should also be a time display module on the lower portion of the chassis.

(REDUNDANT AND NON-REDUNDANT SYSTEMS
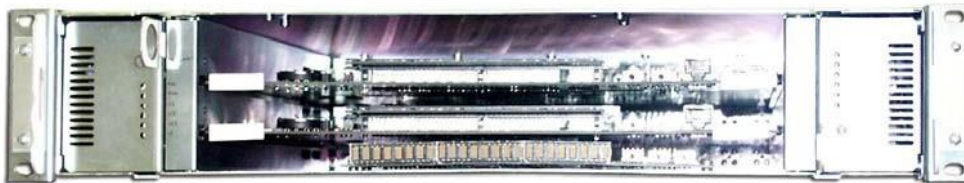
Redundant
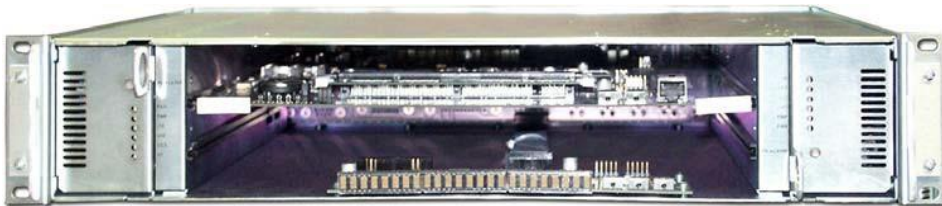
Non-Redundant

2. List of materials includes:

a. (1) SC4 2 RU chassis

b. (2) SC4 control cards (redundant system) and 1 SC4 card (non-redundant)

c. (2) power supplies

d. (2) AC power cords

e. (8) UNET terminators (RJ45)

f. (2) MX-Bus Terminators

g. (1) System CD (containing SC-4 manual and rMan software)

h. (1) RJ45 to 9 pin adapter labeled SC4/2020

3. Find the best location to install the chassis that will accommodate the various connections which include – MX-Bus to router chassis, UNET to UNET type control panels, Ethernet to PC and Ethernet type control panels, SYNC to analog house black source, Party Line ports to Party Line type control panels and serial ports to automation type equipment.

Description of SC4 Chassis, Cards and Power Supplies

1. MX-Bus ports – 2 total – located in lower right section on rear of chassis.

2. UNET ports – 8 total – located center top on rear of chassis.

3. Ethernet ports – 2 total – located just right of the UNET ports on rear of chassis.

4. SYNC ports – 3 total – located upper left on rear of chassis.

5. Party Line ports – 4 total – located upper left on rear of chassis.

Connecting All Pieces to SC4 Chassis

Note: Make all connections to rear of SC4 before applying power

1. MX-Bus cable connections

a. UTSCI provides one 10' MX-Bus cable for each chassis that uses the MX data bus. These include UT400, UT300, UT200, MXLator and MX-Hub equipment.

b. There are two possible options for connecting the various MX-Bus equipment. Option 1 is to connect one end of a cable to a single port on the SC4 chassis and the other end to either of

the dual ports on the MX-bus equipment. Then from that chassis 2nd port, another cable will run from there to the next piece of MX-Bus equipment.

Continue this looping topology until the final frame is attached. You must then attach one of the two MX-Bus terminators to the open port on the SC4 chassis and the other terminator to the open port on the final frame closing the MX-Bus loop. Option 1 View

Using option 2 you can essentially have the SC4 chassis in the middle of the different MX-Bus equipment. You will attach an MX-Bus cable to each of the two MX-Bus ports on the SC4 chassis and run them in two different directions to different MX-Bus equipment, looping through each chassis and putting an MX-Bus terminator on each final chassis open port.

c. The total overall length of MX-Bus cannot exceed 300 feet. To maximize the length of the bus, an MX-Bus hub (DA) may be used. This will allow up to 4 additional runs of 300 feet each to be used. The hub has 5 ports, which consist of 5 pairs of 25 pin MX-Bus connectors. The first pair of connectors is attached to the SC4 port using one cable. Then place one MX-Bus terminator on the open port on the SC4 and the other one on the open control port on the hub. The remaining 4 pairs of ports on the hub now act as 4 MX-Bus ports as if they were coming directly off the SC4. Each pair will use two terminators and can each go out to 300 feet. They can then be attached to any MX-Bus equipment using option 1 or 2.

2. UNET Connections

a. The UNET bus is the UTSCI proprietary protocol used to connect to the UCP/SCP models of control panels. There are 8 individual UNET ports on the back of the SC4 chassis. Each port is capable of looping up to a maximum of 32 control panels and a combined total over all length of 1000 feet. There are two options that can be used to connect multiple panels. Option 1 is a looping topology. Attach a standard, straight through CAT-5 cable to any of the 8 ports and run it to the back of the UCP/SCP control panel port labeled UNET. There are two ports on each panel. Connect to either port and use the other port to loop on to the next control panel. A UNET terminator must be placed on the end of the loop in the unused port of the last control panel. Also, place a UNET terminator in any unused UNET ports on the SC4 chassis.

Option 1 View
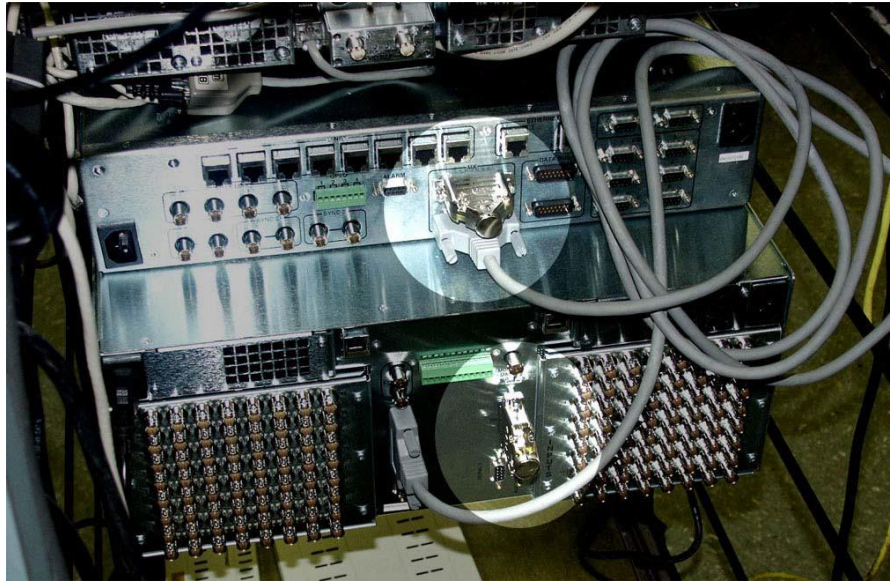
Option 2 is a star topology and requires the use of an optional UNET hub (DA). Attach one of the UNET ports on the SC4 to the 1st port on the hub and run the remaining ports of the hub to each control panel in that loop. Use the hub for connecting one panel to each port on the hub or loop through to additional panels. A 2nd UNET hub can be attached to the 1st hub for additional panels but no more than 2 hubs, 32 panels and 1000 feet per SC4 UNET port may be exceeded. A UNET terminator must be placed at the end of every loop and on any open ports on the rear of the SC4 chassis.

3. Ethernet connections

a. There are two Ethernet ports on the rear of the SC4 chassis. These are neither looping or dual ports but are two separate network connections with separate subnets and should be treated as individual networks. Port 1 is the only port enabled when delivered to your facility. It is set up using the default IP address of 192.168.5.230 unless specified prior to shipment. The address is stored in the chassis so when either SC4 card is active they will use the same number. The port is used for attaching Ethernet control panels as well as use of the UCON and RMAN editing and router management software.

b. Connect a standard straight through CAT5 cable to Ethernet port 1 if running to a local hub or a LAN and use a standard crossover cable if running directly to a PC. If another IP address is needed, refer to the end of this section for the proper procedure.

To enable Ethernet port 2, use IP2 instead of IP1 when setting up the IP address.

4. SYNC connections

a. There are three Sync ports on the rear of the SC4 chassis.
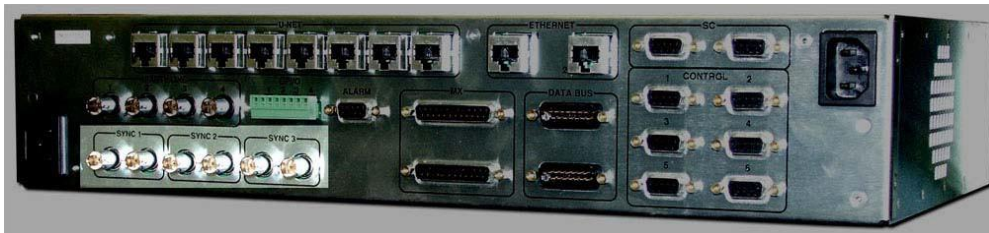
As a default, the SC-4 uses sync 1 for vertical interval switching.

The sync ports should be fed with analog black burst signals, either NTSC, PAL, or Tri-Level. **Do not connect composite sync or digital SDI or HD-SDI signals to these ports**.

Each Sync must be terminated in the daisy chain with a BNC 75Ohm / 1% terminator (Furnished by Utah Scientific).

5. Party Line Port connections

a. There are 4 individual Party Line ports. There can be up to 128 panels installed overall across the 4 ports.

b. Attach coax cable to any of the 4 ports and connect to desired panel using either of the two ports on the control panel. Then loop from the open port on the control panel to the next panel. The party line ports DO NOT require any termination.
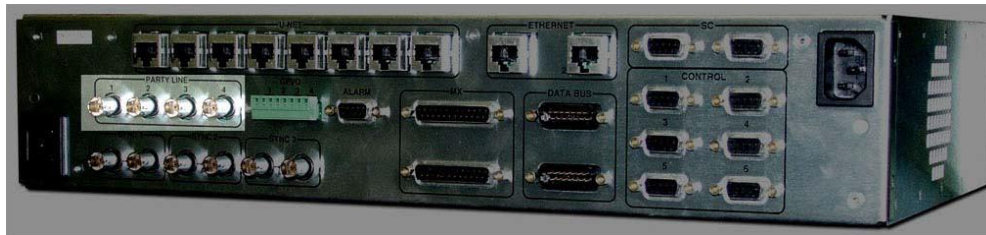
6. Serial Port connections

a. There are 6 nine pin serial port connectors on the rear of the SC4 chassis. These ports are currently enabled to use only the UDI-1B (RCP-1) protocol. These can be used as either RS232 (factory default) or RS422 ports and are selectable by moving the appropriate jumper blocks on the SC4 card. Remove both cards and located on the rear left of the SC4 card the jumpers are labeled port 1- port 6. Move the block to the desired position and re-insert the cards. If these jumper blocks must be moved after power has been applied, follow steps at the end of this chapter for proper removal of SC4 cards.

b. Baud rates are currently hard coded for 2 settings. Ports 1,3 and 5 are set to 38.4k for the baud rate with parity set to 8N1. Ports 2,4 and 6 are set to 19.2k for the baud rate with parity set to 7E2. If a different baud rate and parity are required, refer to the end of this chapter for procedure on how to change serial port settings.

c. Serial ports only use TX, RX and GND for RS232, which are pins 2(TX), 3(RX) and 5(GND). For RS422 the pins are 7(TX+), 8(RX-), 2(TX-) and 3(RX+) If Attaching to a standard 9 pin PC port simply use a straight through 9 pin cable for RS232.

Applying Power to SC4 Chassis

1. Plug both AC cords in and verify that the power supplies and SC4 cards power up correctly.

2. The power supplies should come on with only green LED's on.

3. One of the SC4 cards will come up as the active card and should have the power, SYNC and Ethernet 1 green LED's on. The amber Ethernet traffic LED will also flicker.

4. The backup card will only have the green power and SYNC LED's on.

5. The green ready LED will come on, on both cards after the information that is in the active card has been synced up with the backup card. This can take several minutes depending on how much information is stored in the active card.

Changing IP address for SC4 chassis

1. Currently, IP address changes must be done manually using the RJ45 diagnostic port located on the front of the SC4 card.

2. Connect a standard straight through CAT5 cable to the RJ45 connector on the front of the active SC4 card to the 9 pin - RJ45 adapter that was provided with the system.

3. Connect the adapter to the 9 pin serial port on the PC.

4. Using any terminal program such as HyperTerminal or TeraTerm (provided with system disc) set the baud rate to 19200k and the parity to 8N1 with no flow control and then hit the return key on the keyboard. You should then see the prompt \>. This visual sequence is available, by request, in Quicktime and Flash format.

5. To check current settings type chassis (space)-r and hit the return key. To change the IP address type chassis (space)-ip1 (space) (new IP address) and hit the return key. This will put the new IP, gateway and broadcast addresses into the SC4 chassis. This visual sequence is available, by request, in Quicktime and Flash format.

6. After doing this you must push the reset button on both SC4 cards at the same time. (refer to next section on proper resetting of SC4 cards) After the reset process completes on the terminal, type chassis (space)-r and then return to verify new settings.

Changing the Chassis ID

1. Currently, chassis ID changes must be done manually using the RJ45 diagnostic port located on the front of the SC4 card.

2. Connect a standard straight through CAT5 cable to the RJ45 connector on the front of the active SC4 card to the 9 pin - RJ45 adapter that was provided with the system.

3. Connect the adapter to the 9 pin serial port on the PC.

4. Using any terminal program such as HyperTerminal or TeraTerm (provided with system disc) set the baud rate to 19200k and the parity to 8N1 with no flow control and then hit the return key on the keyboard. You should then see the prompt \>. This visual sequence is available, by request, in Quicktime and Flash format.

5. To check the current chassis ID, type chassis (space)-r and hit the return key. (This chassis ID is the name that is found in U-CON for the SC-4 icon). To change the chassis ID, type chassis (space)-chid(space)new name. (This name can contain underscores and hyphens, as long as there are no spaces.)

6. After doing this you must push the reset button on both SC4 cards at the same time. (refer to next section on proper resetting of SC4 cards) After the reset process completes on the terminal, type chassis(space)-r and then return to verify new settings.

Setting the Correct Time and Date

Note: Any date and time set must be completed for both cards in a two card system. Follow this procedure - including 'Proper Reset' and 'Proper Changeover' whenever the time and date are set. Note also that this setting is independent of your house clock.

1. Currently, date and time changes must be done manually using the RJ45 diagnostic port located on the front of the SC4 card.

2. Connect a standard straight through CAT5 cable to the RJ45 connector on the front of the active SC4 card to the 9 pin - RJ45 adapter that was provided with the system.

3. Connect the adapter to the 9 pin serial port on the PC.

4. Using any terminal program such as HyperTerminal or TeraTerm (provided with system disc) set the baud rate to 19200k and the parity to 8N1 with no flow control and then hit the return key on the keyboard. You should then see the prompt \>. This visual sequence is available, by request, in Quicktime and Flash format.

5. At the prompt, type **settime**, then press ENTER. This will allow you to designate the current time in the format provided. HH:MM:SS - hours, minutes, and seconds separated by a colon. Press ENTER.

6. Next you will designate the date by typing **setdate** at the prompt, then press ENTER. Month, day, year, and day of the week are entered, separated by forward slashes. In this case, Wednesday, July 9, 2008 would be entered as:

07/09/08/3 [ENTER]

Days of the week correspond to Monday - 1, to Sunday - 7.

Next you will need to perform a system reset to update the time and date (Proper Reset, next).

Proper Reset

1. If a reset is needed with only one card installed, simply push the reset button on that particular card (outside button).

2. A system reset needed within a two-card system can be accomplished with or without both ready lights on. Locate the active card, press and hold the reset buttons on both cards at the same time. Let go of the reset button on the active card first, followed by the reset button on the backup card. This will ensure that the active card comes up first and remains the active card. Important: An improper reset may cause serious loss of data. *(To do next, Proper Changeover.)*

Proper Changeover

To change over from the active card to the back up card, simply push the change over button on the active card (the inside button). The change over button does not function when pushed on the back-up card.

Proper Hot Swappable Removal of SC4 Cards

1. The SC4 cards are hot swappable so if only one card exists in your system, simply remove the card and re-insert it when ready. Make certain to plug the card in firmly.

2. If there are two cards in your system always make certain there is a ready light on both cards prior to removing the cards. If both cards are to be removed, first remove the backup card (this is the one without the Active LED on) and then remove the active card last.

3. If only the active card is to be removed, make sure the ready light is on both cards and then push the changeover button (inside button) on the active card to switch control to the backup card. Then remove the original active card.

Changing Serial Port Settings

There are two ways to modify serial port settings; using the U-CON software (*see the U-CON Operations Guide*), or manually through the config file within the SC4/SC-400.

Step 1 - Launch the NFS Server.

Step 2 - Navigate to C:/usi/"*call letters*"-sc401/encode

Step 3 - Run the batch file called getencode.bat, and follow the instructions from each call-out.

Step 4 - A new file called "call letters"-sc401.conf will appear in the encode folder. Open this with the text editor.

Step 5 - Scroll to the bottom of the file and make the desired changes to the serial ports.

Note: When editing this file it is imperative that all spaces and commas remain as they are seen. FAilure to do so will cause the SC-4 to not function properly.

Step 6 - Save changes and exit the file.

Step 7 - Run the batch file called burnenc-network-nr.bat.
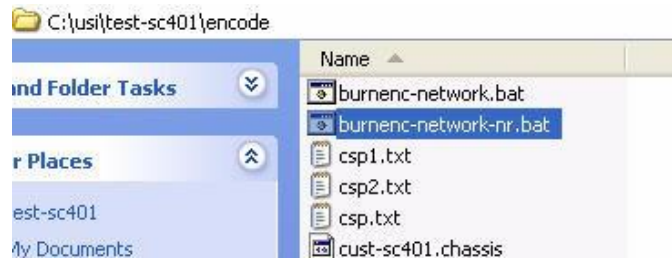
FIGURE 2-4. Burn Encode - screen 1
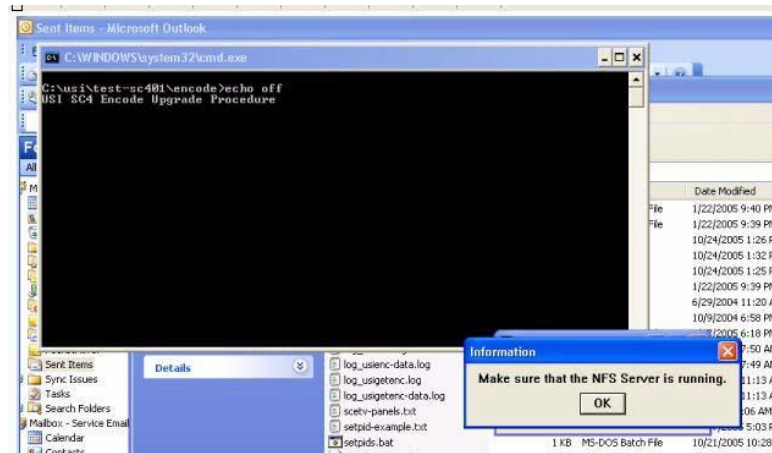
FIGURE 2-5. Burn Encode - screen 2
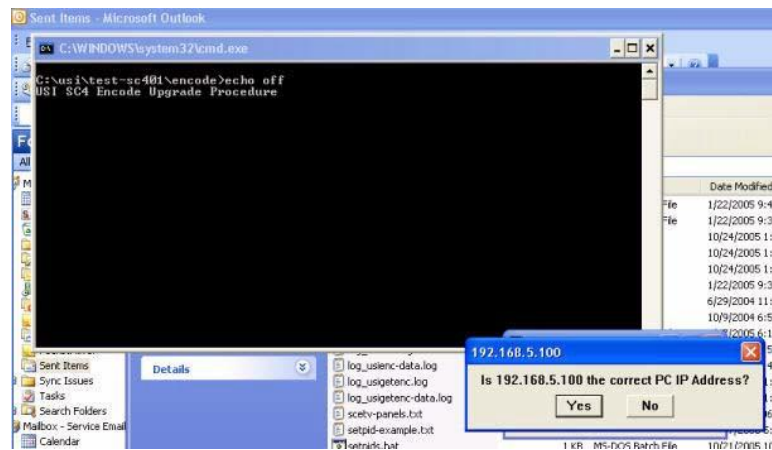
FIGURE 2-6. Burn Encode - screen 3
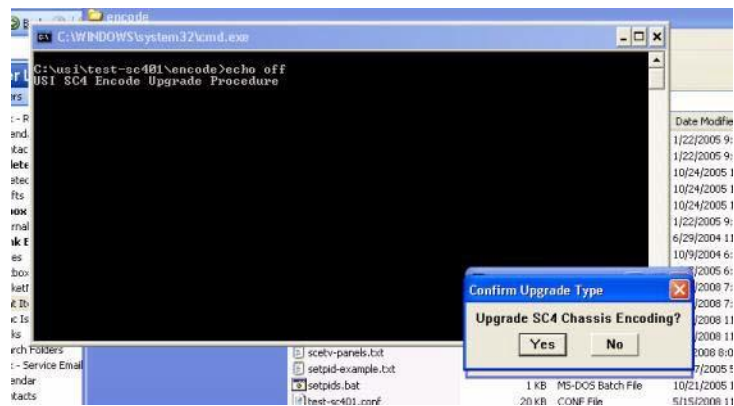
FIGURE 2-7. Burn Encode - screen 4
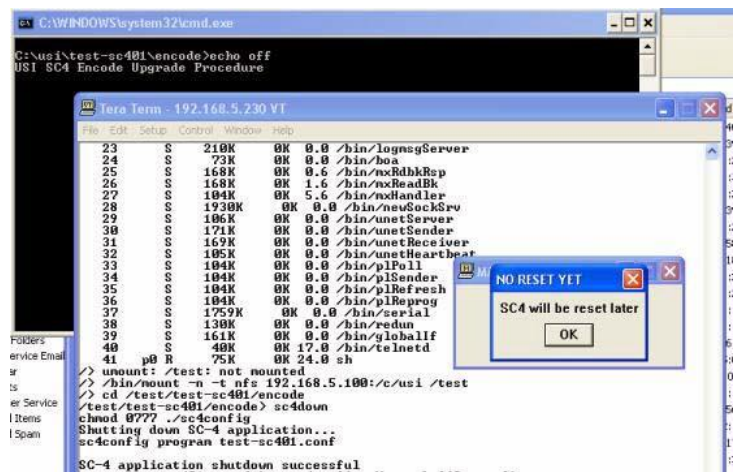
FIGURE 2-8. Burn Encode - screen 5

This will place the changes in the active SC-4 card. However, the changes will not be utilized until the SC-4 cards have been reset.

Step 8 - Press and hold the reset button on both SC-4 cards at the same time and release the reset button on the active card first, followed by the backup card. (The 'active' LED will be illuminated on the card that is in use.)

Ethernet LEDs

ENET #1 (Network Interface #1)

Link = should be green when attached to a network. Activity = should flicker amber with activity on the network.

ENET #2 (Network Interface #2)

Link = should be green when attached to a network. Activity = should flicker amber with activity on the network.

System LEDs

ACTIVE = This LED will be green along the active card used on the system, and off along the back-up card.

SMPTE = Not currently implemented.

PS1 FAIL = this will be red when the left power supply fails.

PS2 FAIL = This will be red when the right power supply fails.

READY = This will be green when there are two cards inserted. It will come on at the same time as the ready LED on the back-up card. It indicates that the back-up card reflects the same configuration as the active card.

Sync LEDs

SYNC A = This LED will turn green when a sync source is put into the Sync 1 port on the rear of the chassis. Usable Sync formats include NTSC, PAL, and Tri-Level.

SYNC B = This LED will turn green when a sync source is put into the Sync 2 port on the rear of the chassis. Usable Sync formats include NTSC, PAL, and Tri-Level.

SYNC C = This LED will turn green when a sync source is put into the Sync 3 port on the rear of the chassis. Usable sync formats include NTSC, PAL, and Tri-Level.

Power Supply LEDs

5v FAIL = If the 5 volt supply drops below 5 volts, this LED will turn red.

BAT FAIL = If the battery voltage drops below 3.3 volts, this LED will turn red.

1.8 v FAIL = If the 1.8 volt supply drops below 1.8 volts, this LED will turn red.

12v FAIL = If the 12 volt supply drops below 12 volts, this LED will turn red.

3.3v FAIL = If the 3.3 volt supply drops below 3.3 volts, this LED will turn red.

POWER OK = If all of the voltages are good, this LED will remain green.

CHAPTER 3 *System Configuration*

In this Chapter

SC-4 Control Board System Operation

The SC-4 Control System is designed so it may operate with one control board or in the redundant mode, with two control boards. Utah Scientific always recommends having the system configured as a redundant system in case of board failure during system operation.

Redundant Operation

When the SC-4 System is powered up the top control board typically comes up in the primary mode. This is not always the case and the user should be aware that either board (upper or lower) would function equally well as the primary controller after the power up sequence.

The Debug Port

The RJ-45 Debug Port is provided on each control board and is located on the front Right-hand side of each board. See Figure 1.

The Debug Port has two primary functions:

1. To aid the user in system diagnostics or when diagnosing problems with Technical Services.
2. When performing software upgrades as recommended by Utah Scientific.

The Debug Port can be connected to a PC using the adapter plug (Part # 140100-2, DB-9S to RJ-45) provided by Utah Scientific and a straight through CAT-5 cable (furnished by the user).

The debug port will communicate with any terminal program although Hyper-terminal and Tera-Term Pro are two of the programs that work well.

The set up for your terminal emulator should be:

1. 19200 Baud,
2. 8 Data Bits,
3. No Parity,
4. 1 Stop Bit,
5. No flow control.

The SC-4 Control Board

This section is devoted to describing only those components, which are user accessible or changeable, in the context of normal operation.
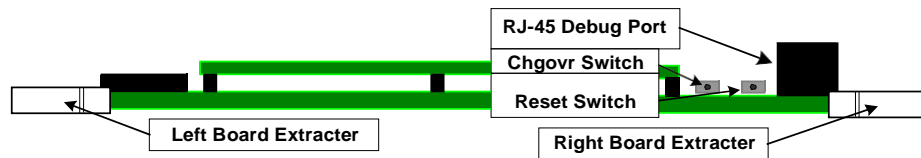
FIGURE 3-1. SC-4 Control Board Components – Front View

SC-4 Front View Components and Functions

The following table describes the components of the front view:

TABLE 3-1. SC-4 Control Board Front View Component Functions

Component	Function
L & R Board Extractors	Rotate outward to extract board from the chassis.
RJ-45 Debug Port	Female connector for RJ-45 Debug Cable.
Chgovr Switch	Push to change to inactive SC-4 board.
Reset Switch	Push to reset control board *– **Use with caution, setups may be lost.***

IMPORTANT: Before removing any SC-4 Control Board from the SC-4 Chassis verify and/or do the following:

Using the "CHGOVR" (changeover) switch to deactivate an "ACTIVE" control board:

> *1. Verify the "READY" LED's on "Both" control boards are "ON".*
>
> > *a. The "READY" LED on the inactive board indicates it is in sync with the active board and the configuration tables are current.*
>
> *Caution: Do not attempt to remove the currently active board until the "READY" LED is "ON" – on the redundant board. If the board is removed with the "READY" LED "OFF" configuration tables could be corrupted and / or destroyed.*
>
> *2. Verify the "ACTIVE" LED is currently "ON" for the board you wish to change.*
>
> > *a. Press the "CHGOVR" switch (on the Left) and hold it in momentarily until the "Active" LED goes "OFF", the "READY" LED should still be "ON".*
>
> *3. Verify the "READY" and "ACTIVE" LED's are now "ON" - on the redundant control board.*
>
> *4. Prepare to remove the control board.*

Using the "RESET" switch when removing an "INACTIVE" control board:

> *1. Press the reset button on the front of the board. This will force the control board to a known state and preserve its configuration integrity.*
>
> > *a. Observe the Power OK LED goes off for approximately one second.*
>
> *2. Quickly remove the SC-4 Control Board from the chassis.*

The SC-4 Control Board Hardware Settings

The following hardware changes must be made with the SC-4 Control Board removed from the chassis. If your system does not have redundant controllers these changes should be made during equipment maintenance downtime.

If your system does have redundant controllers, be sure to make the same changes to both of the controller boards.

Refer to Figure 3-2 to locate the area of the hardware functions you wish to change.

Hardware Changes on the SC-4 Control Board

Note: When making hardware changes on one SC-4 Control Board, be sure that the same changes are made on the other (redundant) SC-4 Control Board.

The changes that can be made on the SC-4 Control Board include the following:

1. **Serial Ports** – Each Serial Port gang-jumper must be physically moved from the RS-232 (factory default) position to the RS-422 position. It changes the pin-outs for each of the DB-9S connectors on the backplane; it does not affect protocols.

2. **VBAT: J-3** - This jumper should always be in the VBAT position so the controller will maintain its configuration data. Moving the VBAT jumper position to the GND position will default the SC-4 Controller. Do not change this jumper unless you are having a configuration problem or Utah Scientific Technical Services advises you to do so.

3. **Watchdog -** Change J-9 if you wish to enable or disable the watchdog timer.

4. **SW-3 -** When the SC-4 System is shipped from the factory; these switches are all moved to the "OFF" position. Do not change switch positions unless advised to do so by Utah Scientific Technical Services.

Note: RS-232 is the factory default setting

Serial Ports 1, 2 and 3
RS-232 / RS-422 Jumper Blocks

J-11

Serial Ports 4, 5 and 6
RS-232 / RS-422 Jumper Blocks

J-10

J-8

J-9

Wat hdog
1 - 2 = E able
2 - 3 = D isable

Moving Jumper to GND Defaults
Battery Backed up RAM

GND   J3   VBAT

SW-3
8 - Position Dipswitch
All Switches "OFF"

SDRAM Board

RJ - 45
Debug Port

ENET #1   ENET #2   System   Sync   Power Supply

3 Volt Lithium Battery

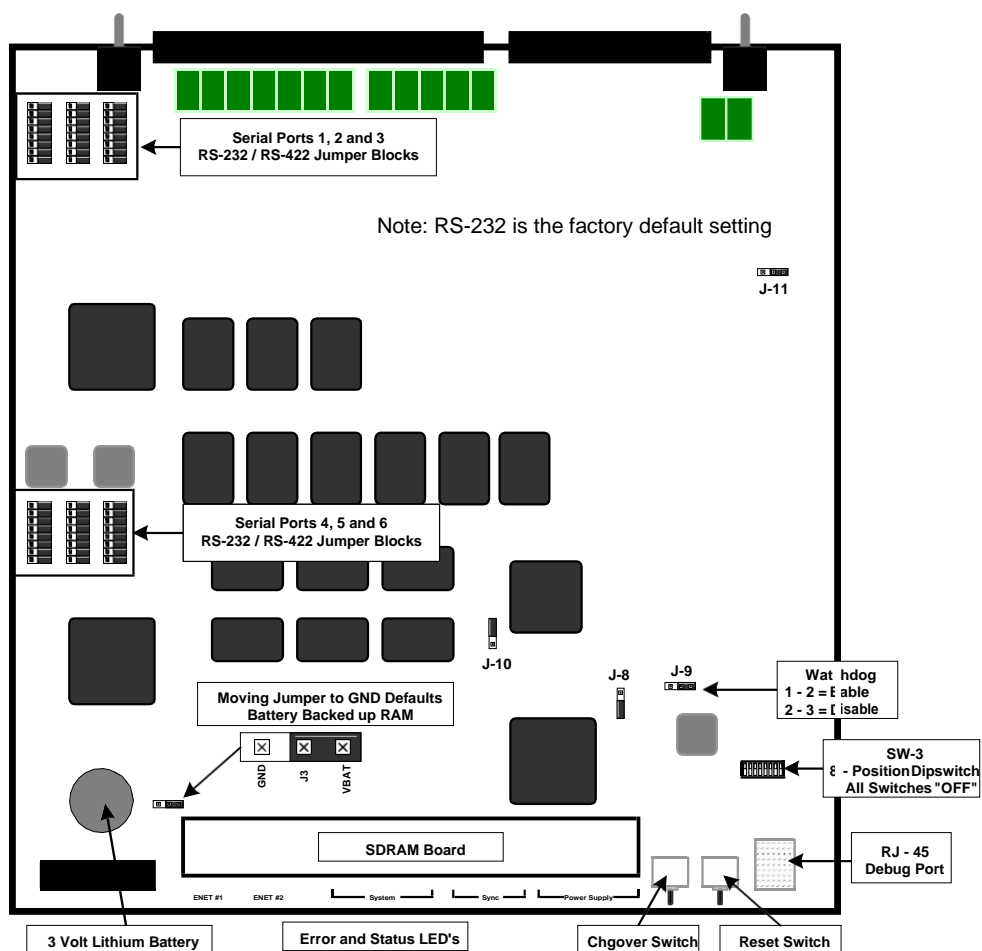Error and Status LED's

Chgover Switch

Reset Switch

FIGURE 3-2. SC-4 Control Board – Top View

SC-4 Control Board Error and Status LED's

The error and status LED's are located on the very front of the SC-4 Control Board, directly below the SD-Ram board. These LED's are not viewable with the front cover installed.

If a major voltage fault exists, it will be reflected on the front cover light pipes.

System or Sync error conditions may not be reflected on the front cover light pipes.

Should you suspect an error condition, remove the SC-4 Front Cover and verify if there is a fault on the control board.

If a fault is present contact Utah Scientific Technical Services at 1.800.447.7204.

Power Supply LED's

The Power Supply LED Group is described below:
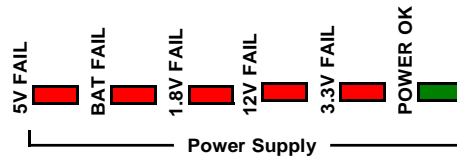
TABLE 3-2. Power Supply LED Group Indications

LED	Color	Status Indication
Power OK	Green	Off = P.S. Fail
		On = Normal
3.3V Fail	Red	Off = No Fault
		On = +3.3 Volts DC Failure
12 V Fail	Red	Off = No Fault
		On = +12 Volts DC Failure
1.8 V Fail	Red	Off = No Fault
		On = +1.8 Volts DC Failure

TABLE 3-2. **Power Supply LED Group Indications**

LED	Color	Status Indication
Batt Fail	Red	Off = No Fault
		On = 3 Volt Lithium Battery Failure
		*See note below
5V Fail	Red	Off = No Fault
		On - +5 Volt DC Failure

* If the system indicates a battery failure, observe the precautions on Page 3-4 before removing the board and checking or replacing the battery. Replacement batteries can be ordered through Utah Scientific Technical Services at 1.800.447.7204.

System LED's

The System LED Group is described below:
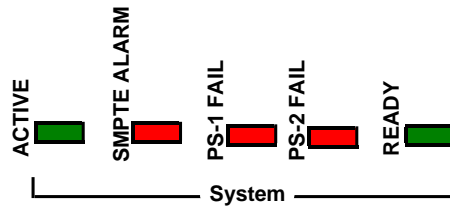
TABLE 3-3. System Status/Warning LED Group Indications

LED	Color	Status Indication
Ready	Green	**Off** = SC-4 not in sync with partner card
		On = Active and redundant boards are in sync and configuration data is being updated
PS-2 Fail	Red	**Off** = No Fault
		On = Left hand power supply failure
PS-1 Fail	Red	**Off** = No Fault
		On = Right hand power supply failure
SMPTE Alarm	Red	**Off** = No fault
		On = The SMPTE Alarm is indicating failure
Active	Green	**Off** = The SC-4 is in standby or inactive
		On = The SC-4 is controlling system activities.

Sync LED's

The Sync LED Group is described below:
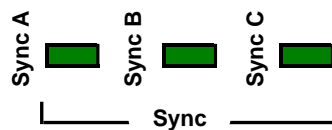
The Sync A, Sync B and Sync C LED's indicate there is a valid sync signal present when ON.

When **OFF** – no sync signal is present.

All LED's are Green.

ENET #1 and ENET #2 LED's

The Ethernet LED's are described below:

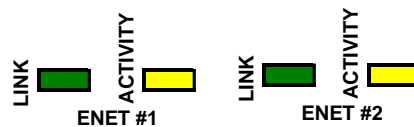The **green LINK LED's**, when "**ON**", indicate the Ethernet cable is connected and valid Ethernet data is present.

When the **LINK** LED is "OFF" either the Ethernet cable is unplugged or the network is down or has problems.

The **yellow** "**ACTIVITY**" LED's "Flash" to indicate data is transferring across the Ethernet.

SW3 – Switch 3 Description

The picture for SW3 is presented here so the user can identify the switch and each switch location as it is silk-screened on the SC-4 Control Board. Currently there are no user-defined functions for SW3. All of the switches will be in the "OFF" position on all controllers in the SC-4 Control Systems currently being shipped from the factory.
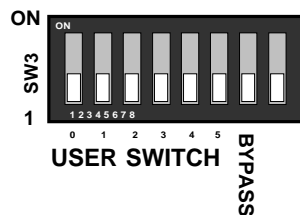

FIGURE 3-3. SW3 Identification – Viewed from the Top Rear of the SC-4

The SC-4 Monitor Display Operation

Note: This is considered a back-up method for changing the IP address. Please see "Changing IP address for SC4 chassis" on page 2-18 for the preferred process.

The SC-4 Monitor Display is located on the front - bottom center of the SC-4 Chassis. The clear plastic lens on the front cover allows the user to view the selected status with the cover on.

Currently the only displays available are Time, Date, the Name assigned the SC-4 Chassis and the Network Setup Menu.

Figure 3-4, below, identifies the main features of the SC-4 Monitor Display Board:
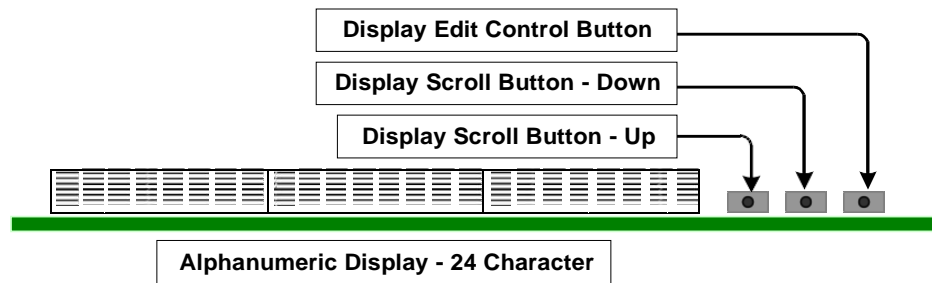
FIGURE 3-4. Monitor Display Features

Features and Functions of the SC-4 Monitor Display

- 24 Character Alphanumeric Display: 5 x 7 green dot matrix.
- Display Scroll Button – Up: scrolls the displays up or when in edit mode sequences characters / numbers up.
- Display Scroll Button – Down: scrolls the displays down or when in edit sequences characters / numbers down.
- Display Edit Button:

1. Pressing this button once enters into the edit mode for the current display.
2. Each press of the button thereafter moves the cursor one digit to the right from its starting point to select the characters or numbers to be edited.

3. Pressing and holding the button in momentarily activates the "Save" prompt for the display being edited.

    a. Press the Scroll Up button to "Save".

    b. Press the Scroll Down button to ignore or not save any changes.

Monitor Display Formats

The formats for each display are **fixed** so the user can only change specific characters / numbers in each display.

As you **scroll DOWN** through the formats starting with Time: the formats displayed are:

    • Time
    • Date
    • Name
    • Network Setup Menu

Network Setup Submenus: (scrolling down)

1. IP Addr1:	7. IP Addr2:
2. IP Mask1:	8. IP Mask2:
3. Brdcast1:	9. Brdcast2:
4. RouteIP1:	10. RouteIP2:
5. Routmsk1:	11. Routmsk2:
6. Gateway1:	12. Gateway2:

Note: Submenus 1 – 6 apply to Ethernet Port 1; Submenus 7 – 12 apply to Ethernet Port 2.

Character Set

After you select a format to edit, Table 4 shows the character set available to you. The character set may be scrolled up or down to select the character or number you need to fill the editable blocks.

The number (#) on the left of each character indicates the characters sequence number as it is being scrolled down from the top starting with the space and ending with the character "Z". There are no lower case characters in this character set.

TABLE 3-4.

#	Character	#	Character	#	Character	#	Character
1	**Space**	16	(forward slash) /	31	**>**	46	**M**
2	**!**	17	0	32	**?**	47	**N**
3	**-**	18	1	33	**@**	48	**O**
4	**#**	19	2	34	**A**	49	**P**
5	**$**	20	3	35	**B**	50	**Q**
6	**%**	21	4	36	**C**	51	**R**
7	**&**	22	5	37	**D**	52	**S**
8	**'(quote)**	23	6	38	**E**	53	**T**
9	**(**	24	7	39	**F**	54	**U**
10	**)**	25	8	40	**G**	55	**V**
11	*****	26	9	41	**H**	56	**W**
12	**+**	27	: (comma)	42	**I**	57	**X**
13	**, (comma)**	28	; (semicolon)	43	**J**	58	**Y**
14	**-**	29	<	44	**K**	59	**Z**
15	**. (period)**	30	= (equal)	45	**L**		

Time Format:

The display of the time is shown in Figure 3-5, below, indicating which characters may be edited in the display.

```
TIME: 01:24:30 PM
```

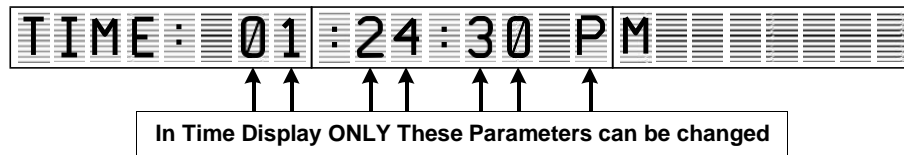In Time Display ONLY These Parameters can be changed

FIGURE 3-5. Time Display Edit Parameters

Date Display Format:

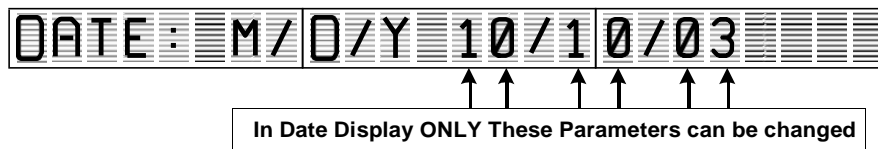The portions of the Date Display that can be edited are shown in Figure 3-6 below.

```
DATE: M/D/Y 10/10/03
```

In Date Display ONLY These Parameters can be changed

FIGURE 3-6. Date Display Edit Parameters

Name Display Format:

The edit portions of the Name Display are shown in Figure 3-7, below:

In "Edit" mode these blocks indicate SPACES (that can be edited).

```
NAME: USI SC-4
```

In Name Display ONLY The "NAME:" can't be changed.
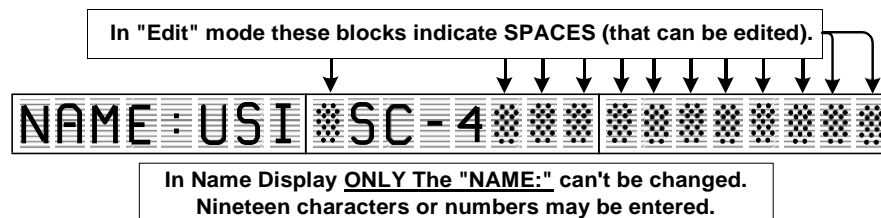Nineteen characters or numbers may be entered.

FIGURE 3-7. Name Display Edit Parameters

Network Setup Menu

To enter into the Network Setup Menu first scroll down to the Network Setup Menu Display. It will appear as shown in Figure 3-8.

This display cannot be edited.

FIGURE 3-8. Network Setup Menu Display

Network Setup Submenus

In the **IP Address 1** Submenu only the items can be changed shown in Figure 3-9:

In Network Setup Submenu - 1: ONLY These Parameters can be changed

FIGURE 3-9. Submenu-1; IP Address 1

The **IP Mask 1** Submenu items that can be changed are shown in Figure 3-10:

In Network Setup Submenu - 2: ONLY These Parameters can be changed

FIGURE 3-10. Submenu-2; IP Mask 1

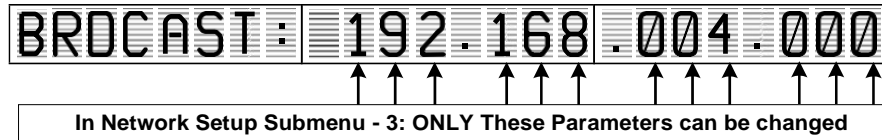The **Brdcast 1** Submenu items that can be changed are shown in Figure 3-11:

```
BRDCAST: 192.168.004.000
```
In Network Setup Submenu - 3: ONLY These Parameters can be changed

FIGURE 3-11. Submenu-3; Broadcast 1 Address

The **ROUTEIP 1** Submenu items that can be changed are shown in Figure 3-12:

```
ROUTEIP1:192.168.004.000
```
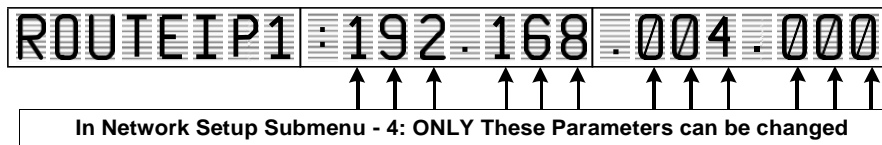In Network Setup Submenu - 4: ONLY These Parameters can be changed

FIGURE 3-12. Submenu-4: Route IP Address 1 Address

The **ROUTMSK 1** Submenu items that can be changed are shown in Figure 3-13:

```
ROUTMSk1:255.255.255.000
```
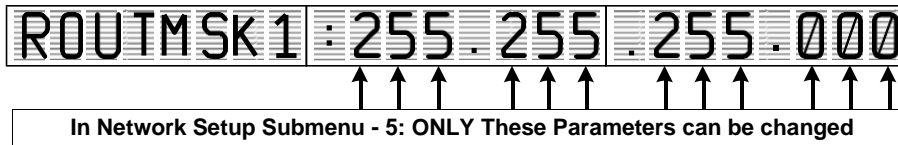In Network Setup Submenu - 5: ONLY These Parameters can be changed

FIGURE 3-13. Submenu-5; Route Mask 1 Address

The **Gateway 1** Submenu items that can be changed are shown in Figure 3-14:

```
GATEWAY1:192.168.004.001
```
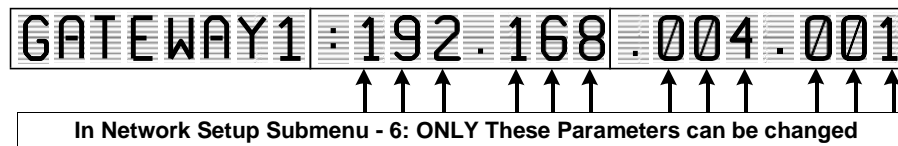In Network Setup Submenu - 6: ONLY These Parameters can be changed

FIGURE 3-14. Submenu 6; Gateway 1 Address

Submenus 7 through 12 include the same items and formats with the exception that each of the menu items are suffixed with a "2".

An IP Address entry as shown below will turn off the Ethernet Interface and that port will not be active.

IP ADDR2:000.000.000.000

Note: *Each network address is applied to the chassis backplane, the Date and Time is loaded into the SC-4 Control Board. When Date and Time are changed it must be changed on both control boards.*

Back to Main Menu:

Once all of the Network Setup Screens have been scrolled through and edited, the Back to Main Menu Screen appears. **To go back to the main menu press the Display Edit Button "Once"**, the Network Setup Menu Screen will again be displayed.

BACK TO MAIN MENU

At the end of the Network Setup Submenu this screen will be displayed - no parameters can be changed in this display.

FIGURE 3-15. End Display of Network Setup Menu.

The SC-4 Power - Supply and Connections

The power supply furnished with each SC-4 Control System utilizes auto-selectable (117 VAC / 234 VAC) switching power supplies. Each supply is capable of powering a fully loaded system by itself. Utah Scientific recommends redundant supplies as standard because redundant supplies share the load equally, which increases the total serviceable life of each supply.

Figure 16, Figure 17 and Table 5 identify and explain the features of the SC-4 Power Supply as viewed from the Front.

Note: The Left and Right Power Supplies are identical, when inserted into the chassis the air vents must align with the outside edge of the chassis. For example, if the Right Hand Supply is relocated to the Left, it must be rotated 180 degrees for proper insertion.

Left Power Supply

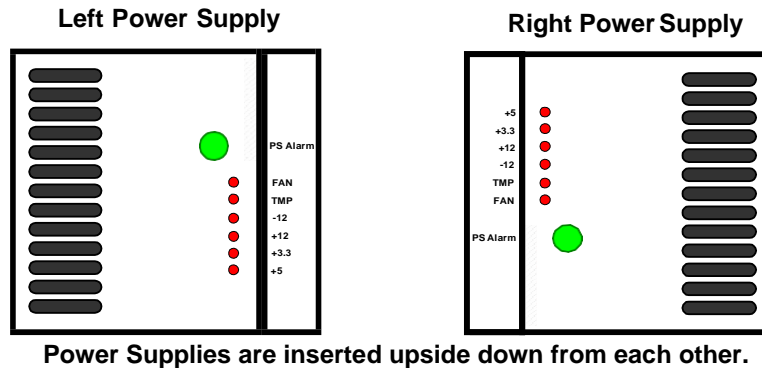**Right Power Supply**

Power Supplies are inserted upside down from each other.

FIGURE 3-16. Left and Right Power Supplies

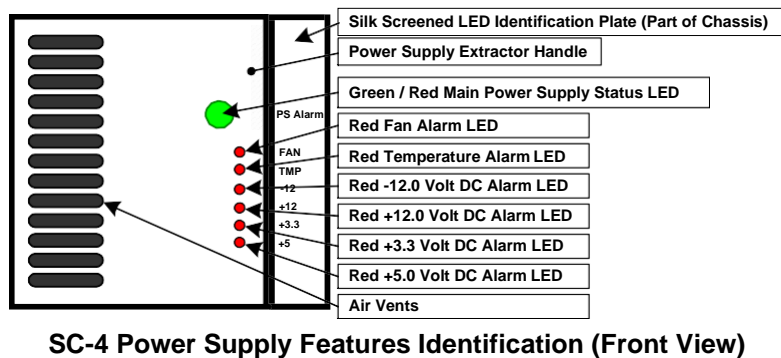**SC-4 Power Supply Features Identification (Front View)**

FIGURE 3-17. Front View of the SC-4 Power Supply Features

Voltage Alarms

Any voltage failures on the SC-4 Power Supply are also detected on the SC-4 Control Boards. For example, a 5 Volt DC failure occurring on the right hand power supply would cause the PS-1 Fail and SMPTE Alarm LED's to turn on the control board.

Removal of the defective power supply or correction of the problem should remove all SC-4 Control Board errors.

TABLE 3-5. **SC-4 Power Supply LED Functions**

LED	Color	Function
PS Alarm	Normal = Green Fault = Red	Turns "RED" if any faults on the power supply are detected. The SMPTE Alarm is also activated.
Fan	Normal = Off Fault = Red	Indicates a Fan Failure, either the fan has seized up or rotation is not being detected.
Tmp	Normal = Off Fault = Red	Indicates the power supply is overheating. Check the fan, or air vent obstructions.
-12	Normal = Off Fault = Red	Indicates the -12 volts DC has failed in the supply.
+12	Normal = Off Fault = Red	Indicates the +12 volts DC has failed in the supply.
+3.3	Normal = Off Fault = Red	Indicates the +3.3 volts DC has failed in the supply.
+5	Normal = Off Fault = Red	Indicates the +5 volts DC has failed in the supply.

SC – 4 Power Supply – Top View

When the SC-4 Power Supply is removed from the chassis you will see the components indicated in Figure 3-18.

Note: *None of the components shown are user serviceable. Contact Utah Scientific for a replacement supply if it is failing.*
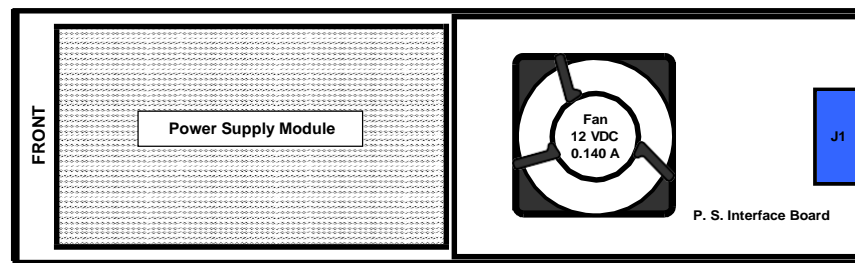
SC-4 Power Supply Components (Top View)

FIGURE 3-18. **SC-4 Power Supply – Top View**

The SMPTE and Remote Alarms

The SC-4 Control System has two SMPTE Alarm circuits and four Remote Alarm circuits. The features and/or functions of each alarm is shown in Table 6, below; the DB-9S Alarm Back-plane Connector is shown in Figure 19.

TABLE 3-6.

Alarm	Specification	Function
SMPTE 0	SMPTE 269M-1999	Standard relay closure fault reporting
SMPTE 1	SMPTE 269M-1999	Standard relay closure fault reporting
Alarm 0	N/A	TTL Logic, 5 Volts @ 5 milliamps
Alarm 1	N/A	TTL Logic, 5 Volts @ 5 milliamps
Alarm 2	N/A	TTL Logic, 5 Volts @ 5 milliamps
Alarm 3	N/A	TTL Logic, 5 Volts @ 5 milliamps

DB-9S (FEMALE on Chassis)   **DB-9P (MALE on Cable)**
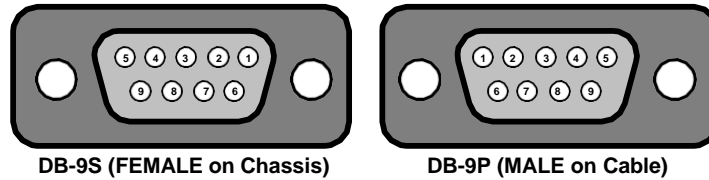
FIGURE 3-19. DB-9 Alarm Port Connectors

Alarm Port Pin-Outs

Table 3-7 shows the Alarm Port Pin-Outs for the DB-9 Connector.

TABLE 3-7.

Connector Pin	Signal
1	ALM0
2	ALM1
3	ALM2
4	ALM3
5	SMPTE0
9	SMPTE1
6, 7, 8	GND

Serial Port Pinouts

DB-9S (FEMALE on Chassis)   DB-9P (MALE on Cable)
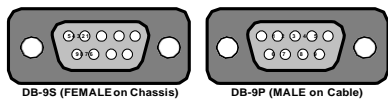
TABLE 3-8.

	RS-232 Mode		RS-422 Mode
1	RI	1	Not used
2	TXD	2	TX-
3	RXD	3	RX+
4	DSR	4	Not used
5	Ground	5	Ground
6	DTR	6	Not used
7	CTS	7	TX+
8	RTS	8	RX-
9	CD	9	Not used

CHAPTER 4   *Operations*

In this Chapter

SC4 Operations

The Debug Port

Introduction

The debug port of the SC4 is the major source of operational information and control. While configuration info is downloaded to the SC4 via UCON, some operational information is still best determined by a direct connection to the debug port.

Physical Connection

Supplied with your SC4 is an adapter intended to plug on to the serial port of any standard PC. This adapter is USI PN 140100-2. It has a male 9 pin D connector on one end and a female RJ-45 connector on the other. The user supplies a straight thru CAT 5 cable between the adapter and the debug port on the SC4 (see figure 3-1 in this manual for location).

Terminal Emulation software setup

Any terminal emulation program such as windows Hyper terminal is useful for debug port operation. Utah Scientific recommends TeraTerm, a freeware terminal emulation software package available on the internet. Serial Port parameters necessary to communicate to the SC4 are as follows:

TABLE 4-1.

Baud Rate	19.2K
Data Bits	8
Stop Bits	1
Parity	NONE
Hardware Handshaking	NONE

General Status

Once you are connected to the SC4, pressing the return key should return a prompt of "/>". From this prompt various operations can be performed.

The most valuable data is gathered after a system reset. This is the point where the SC4 'finds' all connected routers and control panels. The best method for determining what the SC4 discovers is to connect the debug port to the upper SC4 and then press and release the reset buttons (See figure 3-1) simultaneously. After several screens of data that deal with the bootup process, you will see messages such as the following:

MX H/W found: input 0, output 0, level 0, id 0x40

configServer: register PL panel 3, name CSP-500, model CSP-16160

MX H/W messages indicate that the SC4 has found and MX-Bus based router at the specified address. The ID number varies with different address types.

configServer messages indicate panel types and address found.

Specific Operations

Reading system setup information

The chassis command is used to read and/or set the chassis IP address(es), system name and other parameters. It's usage is detailed below.

chassis

Synopsis: chassis [OPTIONS] [FILE]

This program allows the user to interact with the chassis identification ROM located in the local chassis. Not all new USI products support this feature. If you aren't sure or are getting unexpected results, please check the appendix and verify the operation is supported on the platform you are working with.

Options:

- -h – displays the help information

- -d – activates debug mode which displays low level interactions with the device hardware.

- -r – read and display data contained in the local chassis config ROM.

- -init – write a set of default values into the chassis config ROM

- -ip1 <xxx.xxx.xxx.xxx> – sets the IP address for network interface 1 to the specified value.

- -ip1 <xxx.xxx.xxx.xxx> network <xxx.xxx.xxx.xxx> optionally sets subnet mask

- -ip2 <xxx.xxx.xxx.xxx> – sets the IP address for network interface 2 to the specified value.
     - Please note not all devices support a 2nd network interface.

- ip2 <xxx.xxx.xxx.xxx> netmask <xxx.xxx.xxx.xxx> - optionally sets subnet mask

- -cust <customer name> - Sets the customer name to the text specified. Typically this will be the call letters of the station using the device.

- -chid <chassis ID> - This sets the chassis ID to the text specified. Typically this will be a description of the physical device location. Ex: MCP-CR01-KUSI

- -unet <xxx> - set the unet node for this device to that specified.

- mask1 <xxx.xxx.xxx.xxx> - sets subnet mask for network interface 1 to...

- mask2 <xxx.xxx.xxx.xxx> - sets subnet mask for network interface 2 to...

Shutting down the SC4 application

The sc4down command will turn off the SC4 application. This command might be used prior to reprogramming the SC4's main image.

sc4down

Synopsis: sc4down

This command sends a signal to all active SC-4 processes and tells them to shutdown. This replaces the need to perform a <ps> command followed by a kill –INT <pid> command which is the method for stopping the current SC-4 software from running. A message will tell the user whether the shutdown has been successful or not.

Resetting the SC4

sc4reset

Synopsis: sc4reset

This command resets the SC-4 board being accessed. When this action is performed on an active board in a redundant system, control will switch over to the other board.

Gathering data from the onboard log

logdump

Synopsis: logdump [OPTIONS]

This command displays log entries from NVRAM. If no option is specified then ALL log entries will be dumped to the screen. Optionally, a number can follow the command, which specifies that only that number of final entries will be displayed. The log can only handle a certain number of entries. Older entries will be lost as the log overflows saving only the most recent events.

Example:logdump 10   - dumps the last ten log messages to the screen

Viewing / Setting Configuration parameters

sc4config is used to display and in some cases modify the custom configuration parameters of the SC4. Various options are detailed below.

sc4config

sc4config display – displays all config tables

sc4config sim – Turns on simulation for all router levels. Append a level number to simulate that level

sc4config nosim – Turns off simulation for all router levels. Append a level number to unsimulate that level

sc4config mx – Displays MX Bus configuration

sc4config pl – Displays Party Line Configuration

sc4config routers – Displays router configuration

sc4config levels – Displays level mapping

sc4config srcs – Displays source table

sc4config dsts – Displays destination table

sc4config serial – Displays serial port parameters

sc4config misc – Displays miscellanous parameters

sc4config dstattrs – Displays router attribute status

tiedump

Displays the tieline status

tiedump clear – clears out the tieline status (crosspoints are not affected.) This will free all tie lines.

lockdump

This displays the output lock status.

lockdump – displays lock status.

lockdump clear – removes all locks.

router

This utility provides certain router status functionality such as setting, viewing, and saving status.

- **router xy** - This connects each source to its corresponding destination; i.e., 0-0, 1-1, etc. This is best used with the SC-4 default configuration.
- **router source** <srcnum> - This routes the source value specified as srcnum to all outputs. This is best used with the SC-4 default configuration.
- **router killstatus** - This clears all router and tieline status (except for attributes) but leaves the SC-4 configuration intact.
- **router save display** - provides a display of all routes that have occured.

The router utility can also save the router status to a file that can be subsequently loaded. This functionality is best used with the *rtrsave* and *rtrload* scripts, found in the SC-4 installation directory; i.e., C:\usi\<cust> - sc401\updates.

Simply double-click the *rtrsave.ba*t file after running the NFS server, then enter the PC IP address and the SC-4 IP address as prompted. You will also be prompted to enter a filename where the current router status will be stored. You may then enter a list of destinations whose status you want to Sav. (Leave this blank to default to all destinations.)

The destination list should look something like this:

1-5,7,11,300-350 (no spaces)

Other destinations will not have their status saved in the file, so a load operation using that file will not affect them. Double-click the *rtrload.bat* file to load one of the saved files. The router connections will be restored to the saved status.

chassis

This utility provides various chassis commands for modifying the IP address, gateway, mask addresses, chassis ID, and viewing all settings.

```
/>
/> chassis

Application:    USI Chassis Interface Program
Version:        0.01A

*** Utah Scientific Chassis Configuration Program
*
*    USIchassis [options] [filename]
*
*    -d,    display debug data
*    -r,    read and display existing chassis config data
*    -ip1, set the ip address for 1st ethernet interface
*        Example: chassis -ip1 192.168.4.239
*        Option: chassis -ip1 192.168.4.239 netmask 255.255.255.0
*    -ip2, set the ip address for 2nd ethernet interface
*        Example: chassis -ip2 192.168.4.239
*        Option: chassis -ip1 192.168.4.239 netmask 255.255.255.0
*    -gw1, set the gateway ip address for 1st ethernet interface
*        Example: chassis -gw1 192.168.4.1
*    -gw2, set the gateway ip address for 2nd ethernet interface
*        Example: chassis -gw2 192.168.4.1
*    -mask1, set the subnet mask for 1st ethernet interface
*        Example: chassis -mask1 255.255.255.0
*    -mask2, set the subnet mask for 2nd ethernet interface
*        Example: chassis -mask2 255.255.255.0
*    -init,    initialize flash data
*    -cust,    change customer name
*    -chid,    change chassis id
*    -unet,    change unet node #
*    filename, place config data in filename into configuration flash
/> █
```

FIGURE 4-1. **Chassis terminal display**

APPENDIX A *Audio Attributes Notice*

Important Note

The following information is presented in response to ongoing issues concerning SC-4 attributes. It is critical to note that the 'router killstatus' command will clear *status* and *tielines*, but not audio attributes. To clear the audio attributes, you will need to follow the getencode/burnencode procedure detailed within this section.

A 'router killstatus' command can be carried out on later versions of the SC-4 code, which will clear all status, including attributes and tielines. Use 'sc4config dstattrs' to view the current attribute status. If you are using an earlier version of the SC-4 code (or if you only want to clear out the attribute status), complete a 'getencode' operation, delete the attribute status, then complete a 'burnencode' operation.

See the example on the following pages:

```
#########################################################################
#
# Destination Device Attribute Table
#
# Audio attrs: 0 Normal, 1 Swap, 2 Mix, 3 MonoLeft, 4 MonoRight, 5 InvLeft,
#         6 InvRight, 7 MuteLeft, 8 MuteRight, 9 Mute
#
# Dig. video attrs: 10 Rate143, 11 Rate177, 12 Rate270, 13 Rate360
#
# Data attrs: 0 Tributary devices, 1 Controller devices, 2 Auto devices
#
# Note: A value of -1 means router default.
#
[PHYS_DST_ATTR_TABLE]
#     L 1 L 2 L 3 L 4 L 5 L 6 L 7 L 8 L 9  L10
# INDEX ATTR ATTR ATTR ATTR ATTR ATTR ATTR ATTR ATTR
  227,  -1,  4,  4,  -1, -1, -1, -1, -1,  4,  4
  228,  -1,  4,  4,  -1, -1, -1, -1, -1,  4,  4
  229,  -1,  4,  4,  -1, -1, -1, -1, -1,  4,  4
  230,  -1,  4,  4,  -1, -1, -1, -1, -1,  4,  4
```

You can delete the status and leave the file as follows:

```
#########################################################################
#
# Destination Device Attribute Table
#
# Audio attrs: 0 Normal, 1 Swap, 2 Mix, 3 MonoLeft, 4 MonoRight, 5 InvLeft,
#         6 InvRight, 7 MuteLeft, 8 MuteRight, 9 Mute
#
```

Dig. video attrs: 10 Rate143, 11 Rate177, 12 Rate270, 13 Rate360

#

Data attrs: 0 Tributary devices, 1 Controller devices, 2 Auto devices

#

Note: A value of -1 means router default.

#

[PHYS_DST_ATTR_TABLE]

If you want to clear the status out, do NOT delete the [PHYS_DST_ATTR_TABLE] tag. Just delete the status. The status will be cleared when you do a 'burnencode'.

Caution: As you may be already aware, a reset done immediately after a burn encode (on a redundant system) will cause the slave board to take over and rewrite the status to both cards.

![US logo]

System Timing Consideration

Overview

This appendix addresses a timing issue that can affect certain system configurations, causing switches to occur out of sync.

The following illustration contains an explanation of HD and SD line switching, and in particular, where the switching should occur.

Switching Example

This is an example of PAL switching. It should be noted that NTSC switching follows suit.

1125/50/I, 25/PsF Tri-level analog sync ..... and ..... 1125/50/I Video signal

1125/25/P Tri-level analog sync

625/50/I Analog sync ..... and ..... 625/50/I Video signal

750/50/P Video signal

V and H sync phase relationship between 1125 tri-level sync
and 625/50/I analog sync

..... and .....

Signal alignment in 50-Hz field rate systems
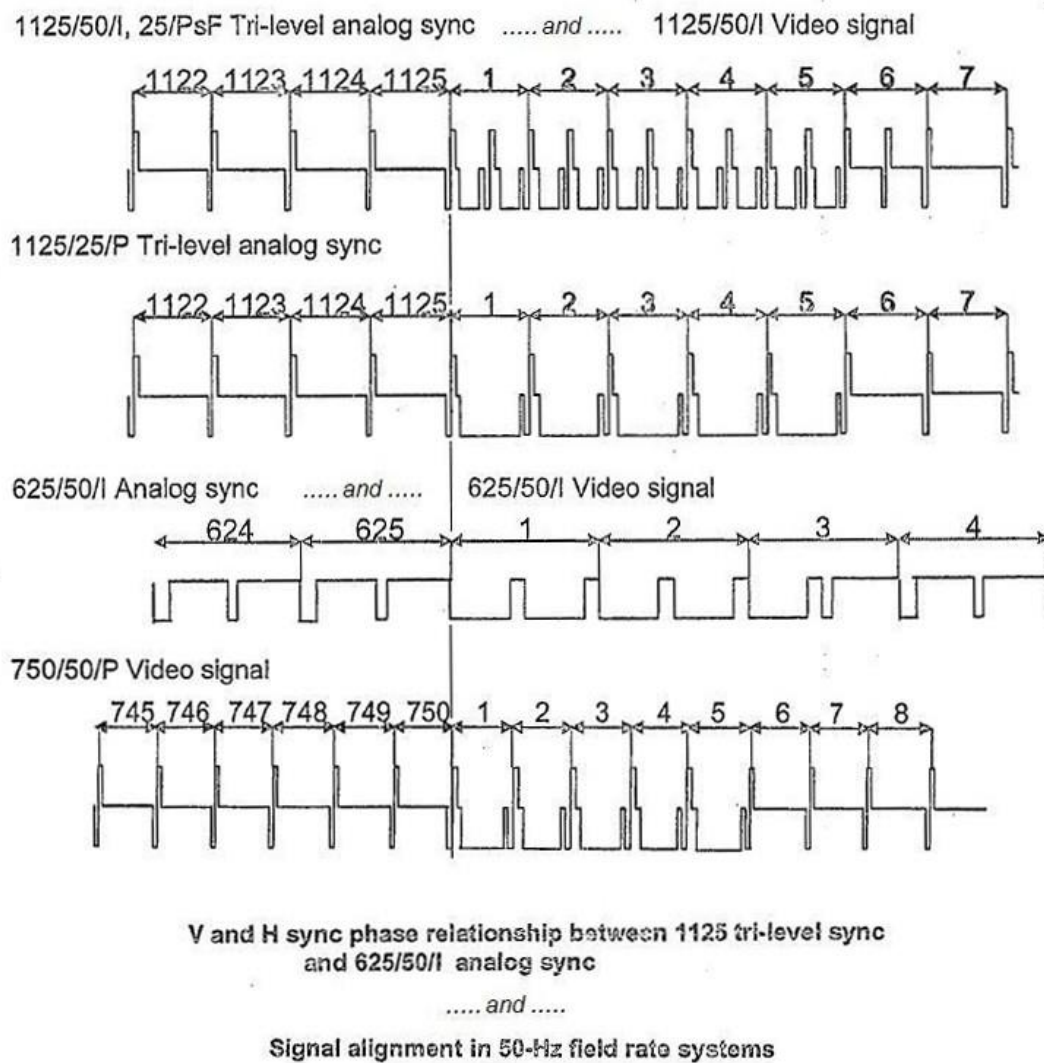
FIGURE B-1. PAL Sync

The Critical Issue

The SC-4 uses an analog signal (black burst or tri-level) as reference for vertical interval switching. If single sync is used (i.e., black burst), the following should be noted:

Within NTSC configurations, the system is attempting to switch on line 10 of reference, yet within HD/SD environments, the switching of HD signals should occur at line 7. See Figure B-2, "Line Switching," on page 4.

If these line positions are all timed or synced on line 1 (as displayed in the following Figure), the line 10 [switch] will cause the HD signal to switch late (at line 21 approximately in HD) and therefore *out of sync*.

PAL-specific HD/SD systems will make the switch at (black burst) line 6, while 1080i systems will execute the switch at line 7. If the rows are lined up along line 1(see illustration), the switch would occur at line 11, resulting in a switch at the incorrect location.

Potential Alternatives

The sync of one format can be offset, allowing the switch to drift back in relationship to the HD. If HD signal devices are referenced to tri-level, that reference can be offset for the black burst reference to bring the different format switching lines [in line]. In particular, you can force the HD line 10 to line up with black burst line 7.

The top line on the chart represents the correct adjustment. This line has shifted back so that line 1 does not line up anymore – however, the lines in the other rows (below in chart) are correctly lining up.

This represents one potential solution. However this is not satisfactory in all cases as an acceptable timing adjustment. Many operational situations require the router as a means for handling this adjustment. The SC-4 does in fact support multiple syncs.

A user can assign each individual router output device to one of the three sync inputs.

> *Note: Sync port assignment using U-CON must be completed by modifying the batch files. See the System Installation Guide, Appendix B, for more information.*

Proper line switching is illustrated below:

Total line No.	Raster structure	Serial interface data rate	Serial interface structure	Switching line	Switching area	Informative note		Normative
						Signal	Mapping structure	Serial interface
1125	1920×1080 60/P, 50/P	1.485Gb/s×2	I	7, 569	625-1070	274M	274M, RP211	372M
	60/I, 50/I	1.485Gb/s or 1.485Gb/s×2	I	7, 569			or 372M	292M or 372M
	30/P, 25/P, 24/P	1.485Gb/s or 1.485Gb/s×2	P	7				
	30/PsF, 25/PsF, 24/PsF	1.485Gb/s or 1.485Gb/s×2	I	7, 569				
750	1280×720 60/P, 50/P, 30/P, 25/P, 24/P	1.485Gb/s	P	7	455-780	296M	296M	292M
625	720×576/50/P	1.485Gb/s	I	6, 319	565-835	BT1358	349M	292M
		540Mb/s	P	6			347M	344M
		270 Mb/s × 2 360 Mb/s	I	6, 319			BT1362	BT1362
	960×576/50/I	1.485Gb/s	I	6, 319		BT601	349M	292M
		360Mb/s					BT656	259M
	720×576/50/I	1.485Gb/s				BT601	349M	292M
		540Mb/s				BT799	347M	344M
		270Mb/s×2				BT601	BT799	259M
		270Mb/s				BT601	BT656	259M
		177Mb/s			267-445	BT407	BT656	259M
525	720×483/59.94/P	1.485Gb/s	I	10, 273	565-835	293M	349M	292M
		540Mb/s	P	10			347M	344M
		270Mb/s×2 360Mb/s	I	10, 273			294M	294M
	960×483/59.94/I	1.485Gb/s	I	10, 273		267M	349M	292M
		360Mb/s					267M	259M
	720×483/59.94/I	1.485Gb/s				125M	249M	292M
		540Mb/s				RP174	347M	344M
		270Mb/s×2				RP175	RP175	259M
		270Mb/s				125M	125M	259M
		143Mb/s			232-376	170M	125M	259M
HD-SDTI	1920×1080 30/P, 25/P, 24/P	1.485Gb/s	P	7	625-1070	274M	274M +348M	292M
	1920×1080 60/I, 50/I, 30/PsF, 25/PsF, 24/PsF	1.485Gb/s	I	7, 569				
	1280×720 60/P, 50/P, 30/P, 25/P, 24/P	1.485Gb/s	P	7	455-780	296M	296M + 348M	
SDTI	720×576/50/I	270Mb/s	I	6, 319	565-835	BT656	BT656 +305M	259M
	720×483/59.94/I			10, 273		125M	125M +305M	

FIGURE B-2. Line Switching[1]

---

1. SMPTE Form RP 168-2002

It should be noted that if you are using two formats through the router with just a single sync reference, you will need to adjust your timing between the two signals in order to line up switching points.

Again the solution is to offset the timing as described so that the switch properly occurs on sync, and on the correct line.

Also refer to 'multiple sync domain'.

Specifications

SC-4E Control System

Reference Input
(6) Video BNC looping Analog PAL, NTSC, or tri-level (3) Separate reference signals Used to switch on vertical interval

Ethernet
(2) RJ-45 10/100 Ethernet CAT5 cable (2) Separate network ports Operates all Utah software and UCP Series panels Utah RCP-3 Ethernet protocol

U-Net
(8) RJ-45 10/100 CAT5 cable (8) Separate panel ports, 32 panels per port Cable length 1000 feet per port Operates all UCP Series panels

Control
(6) RS-232/422 DB-9F Subminiature Remote control of third party devices Utah Scientific RCP-1 serial protocol

Party Line
(4) BNC - Operates all legacy CSP Series panels

MX
(2) MX-Bus looping DB-25F Subminiature Cable length 300 feet Connects controller to all UTAH Series routing switchers

Alarm
(1) DB-9F Subminiature SMPTE 269M

GPI/O
(4) Phoenix System 0-3 salvo trigger

Timecode
(1) Phoenix Syncs front panel time display Timecode values for logging messages

Power
(2) 90-240 VAC, 50/60 Hz
35 watts max

Physical
Depth:SC-4E frame - 13" (33cm)
Width: 19" (48.26cm)
Height: SC-4E frame - 2RU, 3.5" (8.89cm)
Weight: SC-4E frame - 17lb (7.7kg)
Environmental: Operating temperature 50-104 degrees F, (10-40° C) Relative humidity range: 0-90%, non-condensing

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