
G-4 Digital Control Surface

TECHNICAL GUIDE

 *Wheatstone Corporation*

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G-4 Digital Control Surface Technical Manual - 1st Edition

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General Information

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General Information

Introduction

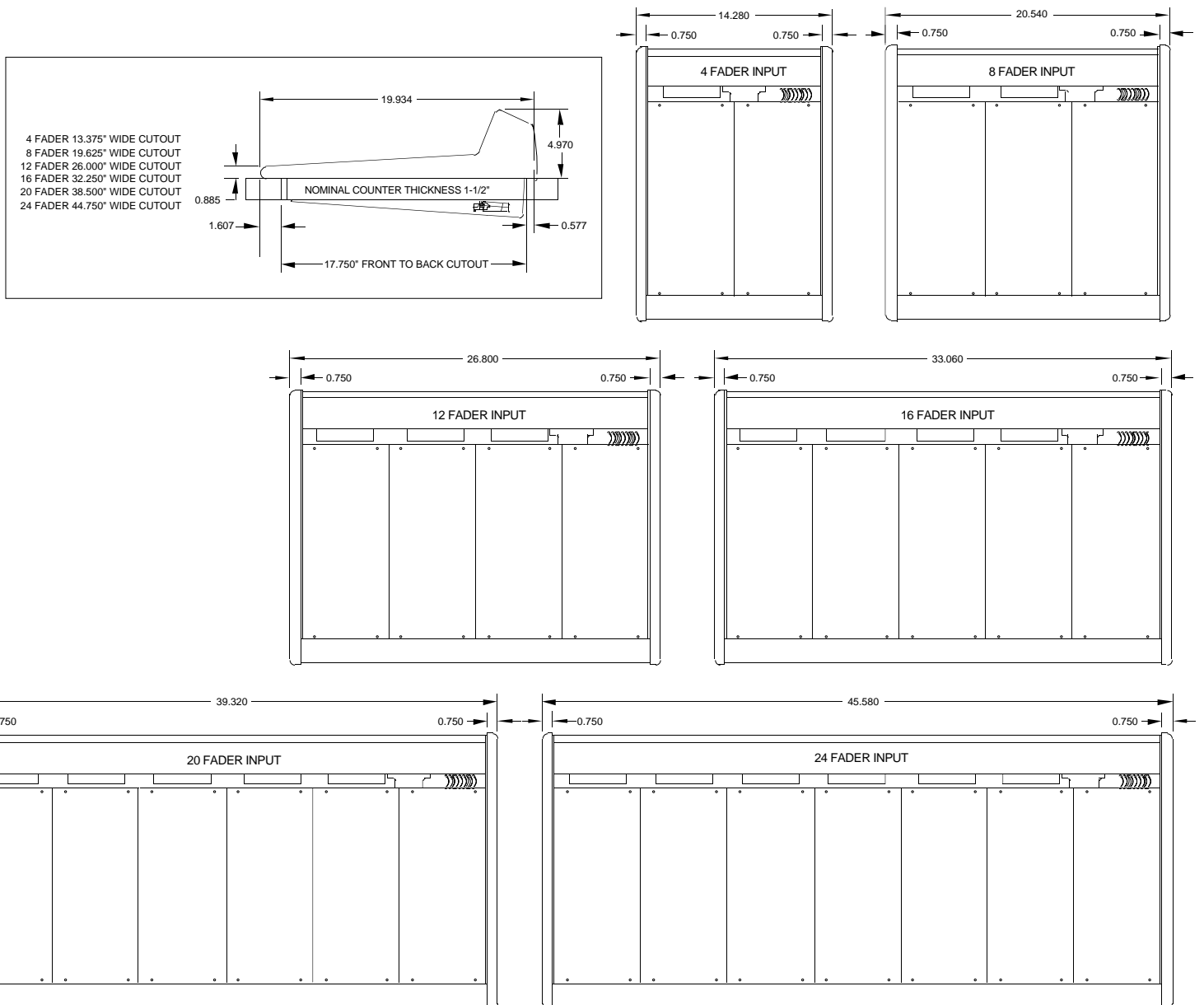
The G-4 Digital Control Surface is the latest addition to Wheatstone's intercompatible G-series of control surfaces. Above each fader is an 8-character dot matrix source display, eight mix-minus assignment displays, four stereo bus assigns, and a source select encoder. It's got four monitor outputs (each with source displays), automatic telephone support, a really simple event recall system (with security function), and an array of user-programmable switches. Designed to integrate flawlessly with the Wheatstone BRIDGE digital audio network router, the G-4 control surface allows you to easily create large or small platform-based systems that are exceptionally user-friendly and flexible. Wheatstone BRIDGE network cages house all I/O ports and engine cards, and may be wired in tandem within a single equipment room or interconnected to separate remote locations by means of CAT-5 cables to provide single wire studio integration schemes.

Once configured, the system operates entirely independently of external computers. Configuration itself is intuitive and carried out onsite by means of user-friendly graphic interfaces provided by Wheatstone desktop software. The G-4 system also takes full advantage of Wheatstone's exclusive VDip configuration software, so that studio functions (like mutes, fader and timer starts, tallies, etc.) are easily accomplished right at your desktop. Once completed, all settings are retained in non-volatile storage, allowing the entire system to run independently. Ethernet protocol is built in, providing interface with automation, scheduling, and hardware controllers as you require.

Control Surface Placement

The G-4 digital audio control surface is designed for simple drop-in installation in a countertop. Cutout dimensions (in inches) are shown in the drawings below for the six available frame sizes.

Do not connect the G-4 control surface to its power supply (and do not connect the power supply to the AC power line) until instructed to do so.



Power Supply



Front view of the SPS-180R rackmount power supply



Front view of the PSR rackmount power supply



Rear view of the SPS-180R rackmount power supply



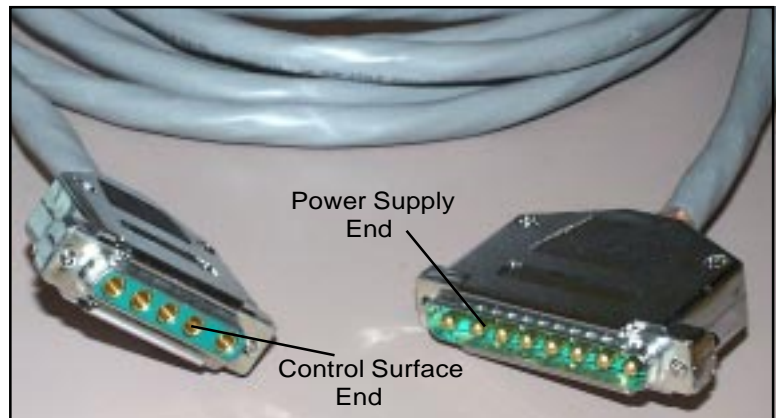
Rear view of the SPS-180 unit

The G-4 control surface is powered by a Wheatstone Model SPS-180R rackmount power supply, or an SPS-180 power supply installed in a Wheatstone Model PSR rackmount unit. Each of the units occupies two 19" wide rack spaces (total height 3-1/2"). The PSR unit houses up to four SPS-180 power supply units.

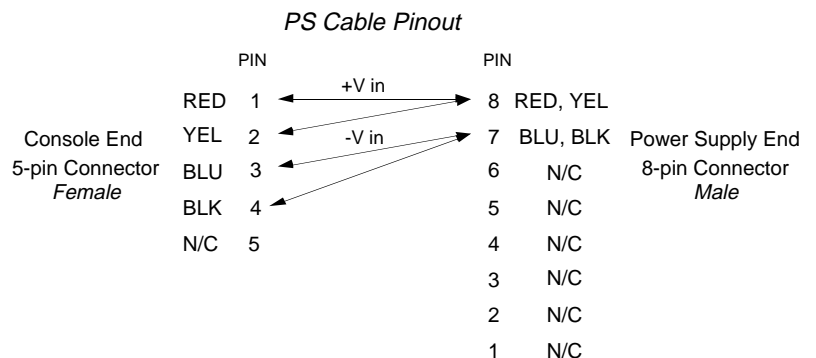
If failsafe redundant supplies have been ordered, you will be installing two SPS-180 units.

Note the power supply (supplies) should be mounted in an equipment rack within fifteen feet of the control surface (but no closer than 3 feet). Avoid locating any high gain equipment (such as phono preamps, tape recorders, etc.) too near the rackmount supplies, to avoid magnetic interference into that equipment.

This power supply contains high voltage circuits that are hazardous and potentially harmful. ***Under no circumstances should the metal cover be removed!*** If you have a problem with the power supply, the SPS-180R or SPS-180 unit must be returned to Wheatstone Corporation for repair.



Once the supply is rackmounted, it should be connected to the control surface using the factory supplied cable. The cable has two different types of connectors on it: a 5-pin female connector that connects to the control surface's power supply connector, and an 8-pin male connector that plugs into the power supply. The control surface's two power supply connectors are located at the rear of the control surface, in the middle of the meterbridge bot-



tom pan. If you are using one supply, connect it to one of the control surface connectors (it doesn't matter which one). If you are using the failsafe option (two SPS-180 supplies), connect one end of a power supply cable to either control surface power connector and connect the other end of the cable to one of the two power supply connectors. Then use the other cable to connect the second power supply connector to the remaining control surface power supply connector. Connect the cable(s) first to the control surface, then to the rear of the rackmount power supply.

Note each power supply is fitted with a 3-wire grounded AC cord that should be plugged into a "clean" AC power source, that is, an AC source that feeds only the control room audio gear. This source should be a separate feed from those powering lighting, air-conditioning, or any other non-audio machinery. The third pin ground wire of the AC source should be tied to the central system ground point.

The power feed recommended in the text is often installed and referred to in studios as an "isolated AC ground" outlet. It is usually orange in color.

Failsafe Dual Redundant Supply

Wheatstone failsafe power supply systems use two SPS-180 power supplies for each piece of powered equipment. Though either is capable of running a full load on its own, in failsafe operation both units run in tandem: if one fails, the other takes over, assuring uninterrupted operation.

In order for failsafe systems to perform as designed, always have BOTH rackmount supplies powered up and connected to their associated equipment.

Energizing

Assuming the G-4 control surface mainframe is properly placed, and its SPS-180 or SPS-180R power supply (or supplies) correctly rackmounted and connected to the control surface, you may now energize the rackmount power supply by plugging it into the AC mains. The control surface's LED meters will illuminate and individual module switches will assume factory default settings.

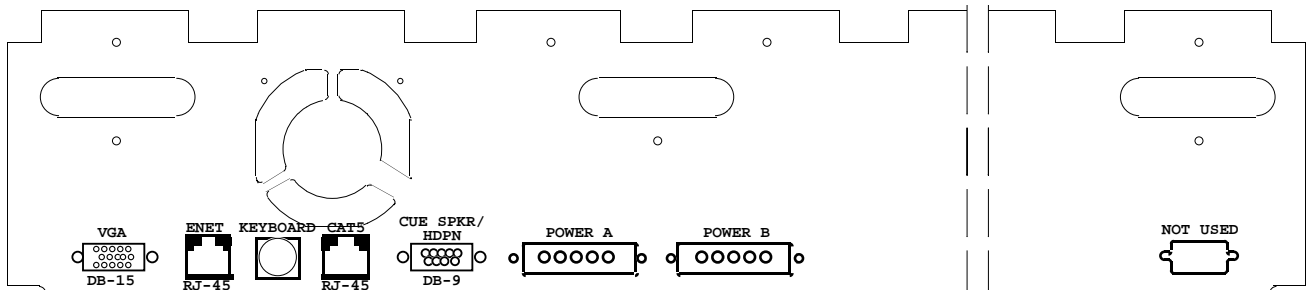
Note: To de-energize the control surface, unplug the rackmount power supply's AC cord from the AC mains. *Never de-energize the control surface by disconnecting the cable that connects the control surface and power supply together.*

Once you have verified proper power-up, unplug the rackmount power supplies to de-energize the control surface. You may now proceed to wire up audio and control connections.

I/O Connections

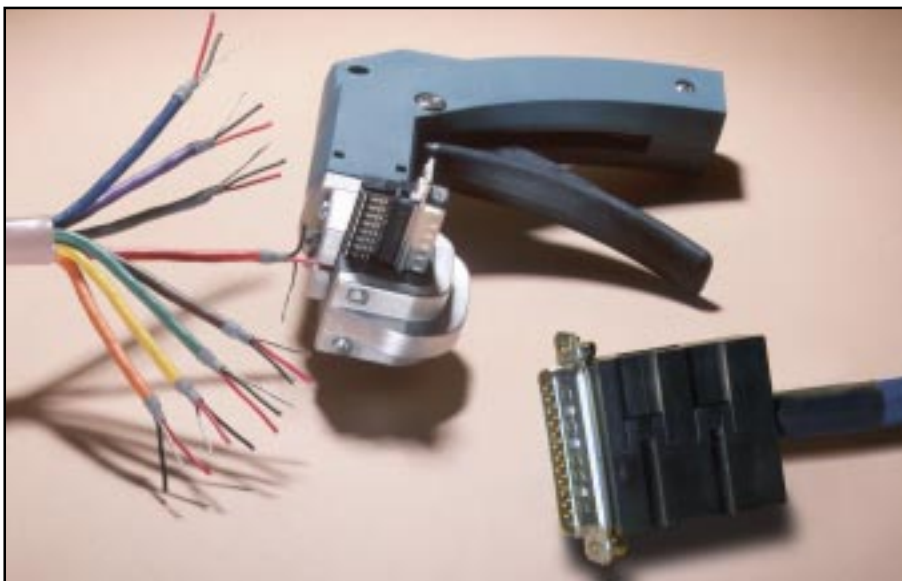
All user wiring to and from the G-4 control surface is made via connectors located on the control surface's rear panel. Two 5-pin male connectors at the left end of the control surface's rear are for power supply connections. A cue speaker/headphone plugs into the female DB-9 connector, located next to power supply connectors. There are two RJ-45 connectors for Ethernet connection and for CAT-5 connection. For all wiring pinout connections refer to Chapter 4. The sketch below show connector locations.

NOTE: Keyboard and VGA connectors for factory use only.



The Insulation Displacement Connector System

The I/O wiring interface system is based on insulation displacement technology. A special AMP wiring tool is included with each control surface; it is auto-indexing, and allows individual wire connections to be positively made with a single squeeze of the tool's trigger. The trigger action is ratchet controlled, and will not release until a full connection is made. Once released, the multipin connector held in the tool's jaw automatically indexes to the next connector pin. The technology is such that no stripping, soldering or tinning of wire ends is required; all that is needed is that the wires destined for the connector be snub cut and laid out in order (although tubing should be used on bare drain wires). An empty DB-9 or DB-15 connector is inserted into the



The AMP tool insulation displacement connector system. Note the right angle hood with self-locking tabs. The tool, multipin connectors (with gold plated pins) and latching hoods are supplied with each control surface.

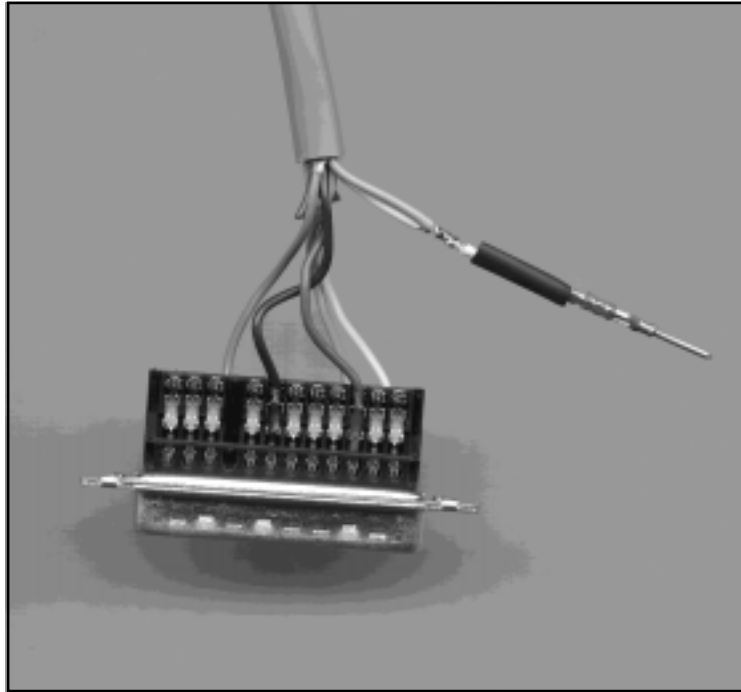
tool, indexed to the first pin, and the wires are inserted one by one into the jaw and the trigger squeezed. In this way a single multipin connector can be completely wired up in a minute or two. These connectors will accept wire gauge 22 - 26 AWG.

In the event of a wiring error, connector pins may easily be removed from the shell with the wire still attached, and inserted into the correct position. Observe the side of the connector, with the metal part down. You will see a row of "Vees"—simply press the top of the vee together with a scribe or other sharp instrument; this will unlock the pin from the shell, and it can be removed and inserted into the correct position. Spread the vee apart to lock the pin in the new position. It should never be necessary to discard a connector due to a wiring error.

Note that mating hoods for each connector are also supplied with the system. These have locking screws that hold the connectors securely to their mates.

Wiring Procedure - Double Connection to One Pin

ref: DB-25 male multi-pin connector



Most audio equipment machine interfaces (as well as Wheatstone consoles) use subminiature D-type connectors. Sometimes the interfaces require making two connections to a single DB pin. If the wiring has been set up using punchblocks, this is not a problem; however, for situations where direct machine-to-console wiring is used, Wheatstone recommends the following procedure:

- 1) Connect the first wire to the desired pin as you normally would.
- 2) Note connector pins may easily be removed from the DB-25 shell with the wire still attached: Hold the connector with the metal part down and observe its side. You will see a row of "Veeds"—simply press the top of the selected vee together with a scribe or other sharp instrument; this will unlock the pin from the shell, allowing it to be removed.
- 3) With the pin removed, strip out a short section of insulation from the connected wire and wrap and solder the second wire to the first as shown above.
- 4) A short piece of heatshrink tubing (pictured here before being slid into place) completes the connection.
- 5) Re-insert the pin into the DB-25 shell, spreading the vee apart to lock it in place.

Input Panel (IS-G4)

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Input Panel (IS-G4)

Controls and Functions

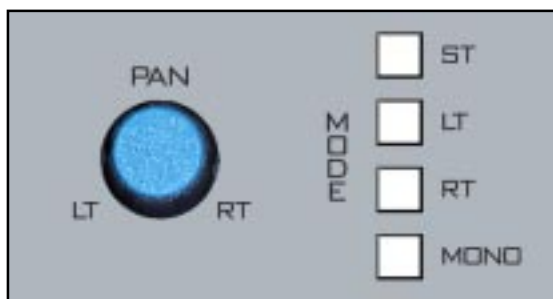
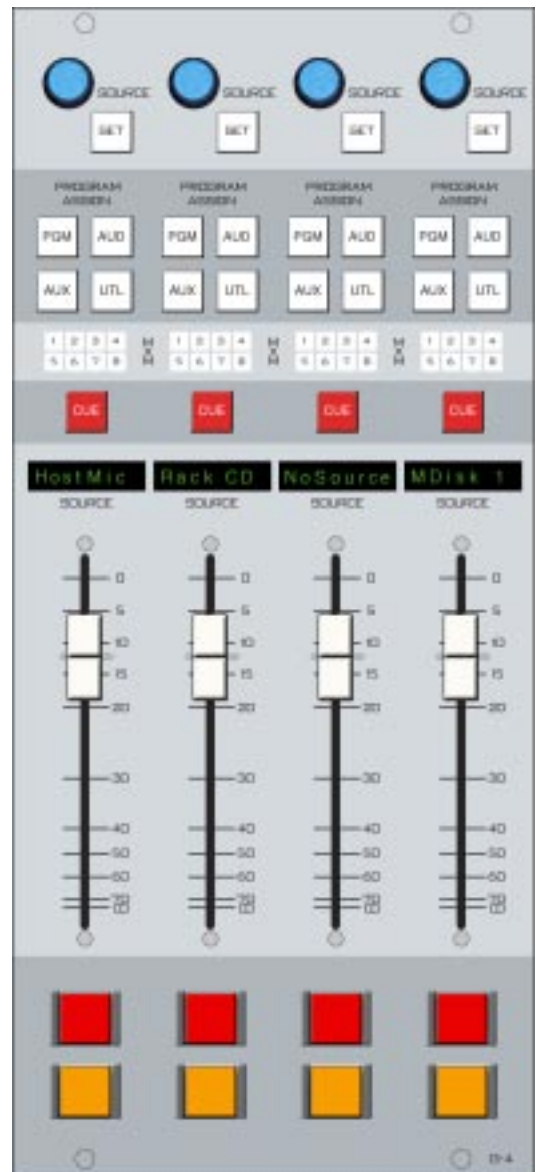
Each input panel of the G-4 digital audio control surface has four identical strips representing four input channels.

Input Sources

Each input panel controls four stereo sources. By turning the source selector (SOURCE knob) at the top of the panel, the available inputs are displayed in the 8-character SOURCE display. When the desired input source is scrolled into the SOURCE window, pressing the SET button will cause that source to be switched to the input of the channel, and the source name will be displayed in the SOURCE window.

Mode Selector Indicator

MODE selection switches in the EFS panel (see Chapter 3) enable input channels to operate in Stereo, Mono, Left only, or Right only. The switch lights up to indicate the selected mode. This feature is activated for a given channel by pressing the channel's SET button (see page 2-3).



EFS-G4 Panel

PAN/BALANCE Knob

The PAN knob (in the EFS panel) acts as a panpot in MONO, LEFT only and RIGHT only modes; and as a balance control in STEREO mode. Once again, this feature is activated for a given channel by pressing the channel's SET button. To easily set the PAN to center, you can press the control twice in rapid succession, like double-clicking a mouse button.

Main Bus Assign

PROGRAM ASSIGN buttons assign the input channel signal to the four main busses: PGM (program), AUD (audition), AUX (auxiliary), and UTL (utility) respectively. Note that the UTL bus can be set up during configuration to be pre/post fader or ON switch.

MXM Displays

Each channel can be assigned to any combination of the eight MIX-MINUS (EFS panel). The assigned setting is displayed in the MXM 1-8 display group. Channels are assigned to these MXMs in the following manner: press the channel SET button on the input fader section and then press the desired MIX-MINUS ASSIGN button, located on the EFS panel.



EFS-G4 Panel

SET Button

This allows the operator to access various controls and displays in the EFS CONTROL panel and apply them to the selected channel. To use, press the SET button and then make your appropriate section settings in other areas of the control surface. Once a SET button has been pressed, the button lights up, and all setting changes will apply to **that input channel** until a different input SET button is pressed, or until a timeout of about 20 seconds has occurred.

CUE Switch

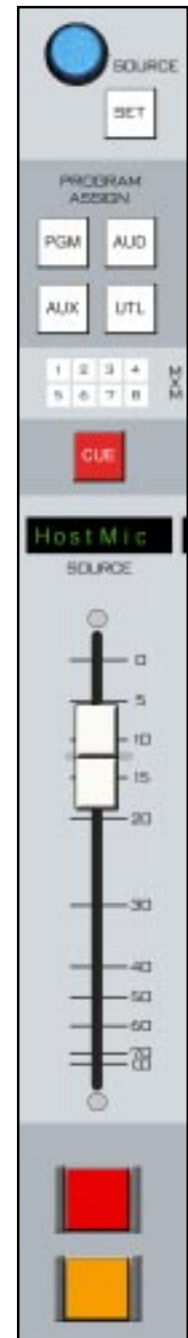
The CUE switch lets the operator monitor the channel's pre-fader signal.

Fader

Channel output level is set by a long-throw fader.

ON/OFF Switches

Channel ON (red) and OFF (orange) switches are at the bottom of the input section. The ON switch turns the channel signal ON and fires the channel ON/START logic; the switch LED lights to indicate the channel is ON. The OFF switch turns the channel signal OFF and fires the channel OFF/STOP logic; the switch LED lights to indicate the channel is OFF.



Control Panel (EFS-G4)

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Control Panel (EFS-G4)

Controls and Functions

The G-4 digital audio control surface is equipped with one CONTROL panel. This panel contains MONITORS, CUE, TALKBACK, MODE, MXM ASSIGN, EVENT PRESET, TIMER, METER, and PROGRAMMABLE controller sections.

Monitors

There are four monitor outputs available: CONTROL ROOM, STUDIO 1, STUDIO 2, and HEADPHONE.

Each monitor has a LEVEL control, a SET button, and a SOURCE display, located at the bottom section of the EFS panel. There are also TB buttons in the two STUDIO sections.

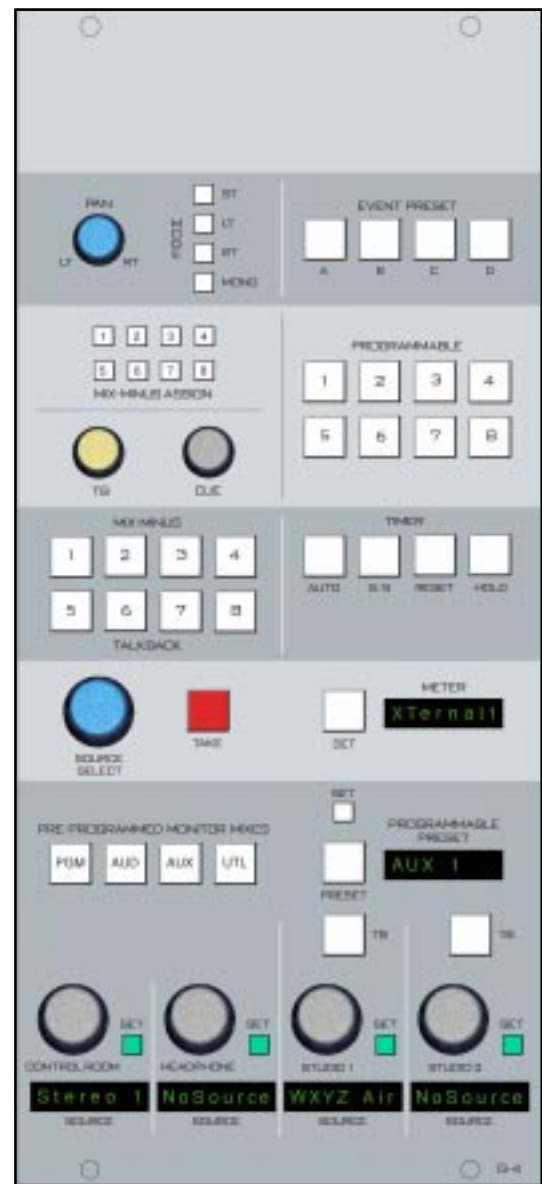
Monitor sources can be selected several ways:

- Four PRE-PROGRAMMED MONITOR MIXES switches (PGM, AUD, AUX, and UTL) allow direct access to the main mixes most frequently monitored.
- Sources can be randomly selected with the SOURCE SELECT knob and the TAKE button.
- A source can be loaded as a monitor preset by first selecting it with the SOURCE SELECT knob, and then holding the PRESET button down until the source shows in the PROGRAMMABLE PRESET display. That source can then be monitored by pressing the PRESET button.

To select a source for a monitor by one of the above methods, first press the SET button next to the knob for the desired monitor. The knob will control the level of the monitor signal.

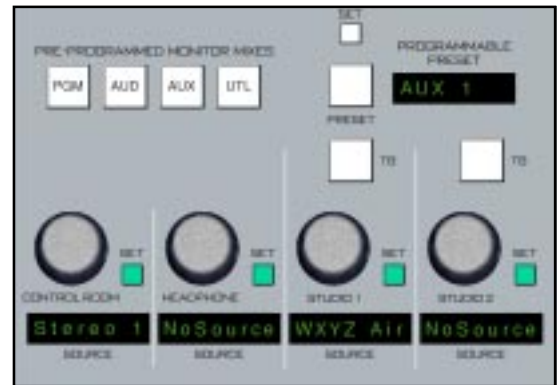
Control Room Section

In a typical radio application the control surface is located in the audio control room. Speakers in the control room allow the control surface operator to listen to the various control surface bus outputs to be assured that the control surface is performing as desired. These speakers are fed by a stereo signal routed from the control surface's control room output. In addition to the



control room output, the operator may also desire to listen to specific isolated faders via the cue system and the control surface's internal or external cue speaker, or may want to listen via headphones.

In some instances the control surface operator may also be performing talent whose voice will be heard over the radio. The operator's microphone may thus provide a part of the signal that is going out over the air. If that signal is the one being monitored with the control room speakers, there is the potential for feedback. The amplified signal from the control room speakers is picked up by the microphone and reamplified to a new, higher, level, which then is once again picked up by the microphone. The signal quickly rises to an ear-splitting screech. To prevent this, the operator's microphone is normally set in the configuration software to MUTE the control room output to prevent the occurrence of feedback.



CR SET BUTTON - lets the operator select the source to be listened to in the control room speakers.

CR DISPLAY - the eight character display shows the source that is selected for monitoring in the control room.

CR LEVEL CONTROL - determines the overall loudness of the signal being monitored as it appears in the control room speakers.

Studio Section

In addition to the control room, there may be one or two studios in which one or more performers will be assembled, usually with microphones so that their voices can become part of the mix. Speakers may be provided in the studio to allow the talent to listen to the various control surface bus outputs at times that they are not actually on air. These speakers are fed from one of the control surface's two stereo studio outputs.

As in the control room, the potential for feedback also exists in the studio. The talent microphones will usually provide a part of the signal that is going out over the air. If that signal is the one being monitored with the studio speakers, feedback will occur. To prevent this, the studio mic faders are usually set to MUTE the studio output in the configuration software to prevent the occurrence of feedback.

ST SET BUTTON - lets the operator select the source to be listened to in the studio.

ST DISPLAY - the eight character display shows the source that is selected for monitoring in the studio.

ST LEVEL CONTROL - determines the overall loudness of the signal being monitored as it appears in the studio speakers.

Headphone Section

HDPN SET BUTTON - lets the operator select the source to be listened to in the headphones.

HDPN DISPLAY - the eight character display shows the source that is selected for monitoring in the headphones.

HEADPHONE LEVEL CONTROL - determines the overall loudness of the headphone output signal.



Talkback

TALKBACK (TB) BUTTON - there may be times when the control surface operator wants to talk to one of the talent in the studio. When the TB button in the studio monitor section is pressed, a predefined signal, usually the operator's mic, will "interrupt" the speaker feed that is normally heard in the studio.

If there is a live mic in the studio which has activated the mute feature, talkback will also be muted in the speakers.

In the center of the EFS control panel is the TB master level control that sets the talkback output and the level of the talkback interrupt signal.



CUE Section

The CUE master level control is located in the center section of the EFS panel. The CUE signal is pre-fader, and is normally used to check signals. When a channel is CUEd, its pre-fader signal will appear in the cue speaker, and the switched meter array in the meterbridge will show the level of the pre-fader signal.

The CUE level control determines the overall loudness of the cue signal (normally wired to the cue speaker in the meterbridge).

Similar to the control room speakers, the cue speaker also has the potential for feedback and should be muted (using the configuration software—VDIP menu) whenever the control room speakers are.

Switched Meters Section

The control surface has provision for a switched meter.

To select a signal to meter, first press the SET button, then rotate the encoder SOURCE SELECT. Available sources will be displayed in the eight character METER display. When the desired signal is displayed, press the TAKE button. The switched meter array will then display the signal level. If, however, after a timeout period of 20 seconds, the TAKE button is not pressed, the array will revert back to its previous selected program.

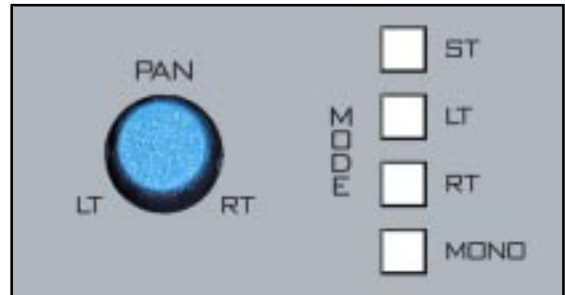


Mode Select Section

The mode selector switchbank (ST, LT, RT, MONO buttons) and mode knob (PAN) are located at the top of EFS panel. There are four available channel modes: STEREO, LEFT ONLY, RIGHT ONLY and MONO. When pressed, the switch will light up to indicate the selected mode.

The PAN knob acts as a panpot in MONO, LEFT ONLY and RIGHT ONLY modes, and as a balance control in STEREO mode. The PAN knob is only used with input channels, and has no effect when setting the mode of the monitor signals.

To select a MODE, press the SET button of the desired channel or mix; the SET button will illuminate, and the current mode setting for that channel will be displayed on the MODE switches. MODE can be reconfigured by pressing any allowable button.



MXM Assign

These buttons are used to control the makeup of the eight MIX-MINUS buses. Press the SET button on any input. If that input is assigned to feed an MXM bus, the corresponding MIX-MINUS ASSIGN switch will be lit. Pressing a MIX-MINUS ASSIGN switch will toggle that input's signal into or out of the corresponding MXM bus.



MXM Talkback

To interrupt an MXM output with the TB signal, press any of the eight MIX-MINUS/TALKBACK momentary switches.

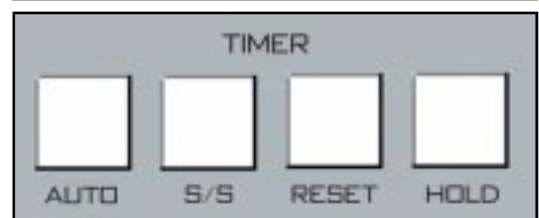


Timer Section

The digital timer display is mounted in the righthand end of the control surface's meterbridge, and its control buttons are in the center of the EFS panel.

The control surface timer is provided with an AUTO-RESTART function so programmed (via GUI) input modules can automatically reset the timer display to zero and start a new count (if the timer is currently running), allowing the announcer to easily track his own pace.

The START/STOP button halts the timer, holds the last count, and then restarts and accumulates the count when depressed again—perfect for compiling tapes of desired duration.



RESET has a dual-mode capability:

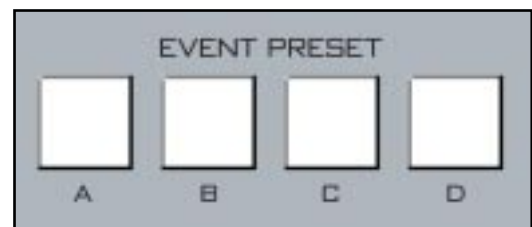
- if you depress it while the timer is counting, the display will instantly reset to zero and start a fresh count;
- if the timer is already stopped, depressing this button will reset the timer to zero, where it will hold until start is pressed.

The HOLD button allows you to hold the display for a longer viewing duration, while still allowing the counter to continue in the background. Releasing the button will then display the current count.

Event Preset

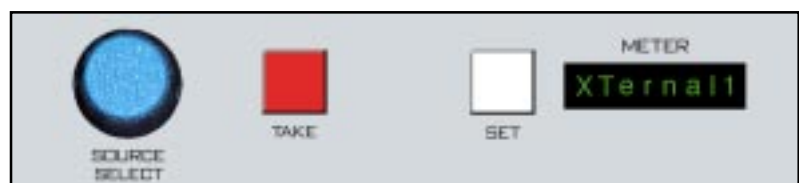
This section provides a means for storing and retrieving control surface settings. In this manner complete configuration and setting information that is used repeatedly (for example, morning show) can be saved and recalled. Up to 4 different events can be stored.

To activate a preset button, press the button and hold it until it illuminates (about two seconds). The button is now flashing and ready for use. To recall an event already stored for that button, simply press and release the button. Or to save the current control surface status to an active button, press the button and hold it until the light goes out (about five seconds). If you fail to press a button once activated, it will deactivate and stop flashing after about five seconds.



Control Modes

The G-4 control surface is operated in one of three modes. In Administrator mode access is allowed to all surface functions. In User mode a limited set of user functions is allowed. The set of functions allowed in User mode is set independently for each console using the Bridge XPoint software (see the Bridge Router manual for details). The third mode, Guest, blocks out MXM level, MXM assign, Event takes, and visibility changes from being controlled by the surface.



To change the control mode, begin by pressing and holding the SOURCE SELECT knob until the display reads "Admin" and the TAKE button lights (if the surface is currently in Admin mode the SET button will also light). Turn SOURCE SELECT until the desired new mode (Admin, User, or Guest) is showing in the display and press TAKE. Turn SOURCE SELECT again to select the first digit of the password. Default passwords, which may be changed in XPoint, are "1234" for Admin, "2222" for User, and "0000" for Guest. After dialing up the first character of the password, press TAKE. Then dial up the second digit. Continue this procedure until the four characters have been entered. Upon pressing TAKE after entering the fourth

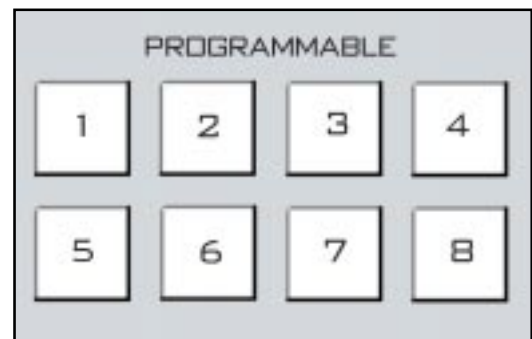
character, the display will read “Okay...” if you were successful and “Sorry...” if you were not. When finished, turn SOURCE SELECT until the display reads “<<Exit” and press TAKE to finish the mode select operation.

The SET button lights as you select the mode that the surface is currently in. If you press TAKE when displaying the current mode, the display will switch to “Okay...” and you will not need to enter the password. If you stop partway through the procedure, the mode selection process will time out after about 15 seconds.

Once a given control mode is selected for a surface, that setting will persist through a power cycle or surface reset.

Programmable Buttons

These (8) momentary switches and indicating LEDs are designed for user accessible external functions (GPIs). With these switches the user can fire Salvos or make a temporary crosspoint without having to wire any physical logic ports. These switches may also be mapped to control physical Logic card output ports, and the LEDs on the Spare buttons may also be lit by a remote device connected to a Logic card input port. See the Bridge Router manual for details.



Meterbridge and Clock

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Meterbridge and Clock



Overview

According to the frame size the control surface meterbridge can accommodate up to four pairs of left-right VU meters (Program, Audition, Auxiliary, and Switched).

FRAME SIZE	VU METER (pair)
4 FADER INPUT	1 (PGM)
8 FADER INPUT	2 (PGM, SWT)
12 FADER INPUT	2 (PGM, SWT)
16 FADER INPUT	4 (PGM, AUD, AUX, SWT)
20 FADER INPUT	4 (PGM, AUD, AUX, SWT)
24 FADER INPUT	4 (PGM, AUD, AUX, SWT)

The meterbridge also houses the four-digit LED timer display (control buttons are located on the EFS panel - see Chapter 3, page 3-5), the control surface clock, and the cue speaker.

The G-4 control surface's LED metering system provides readout of both VU and full scale digital peak.

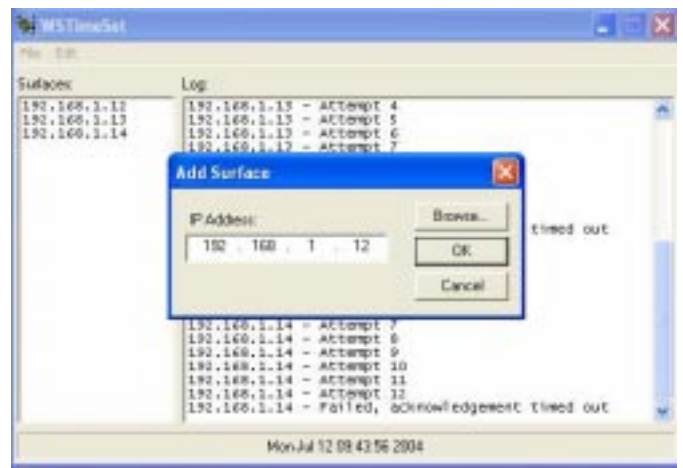
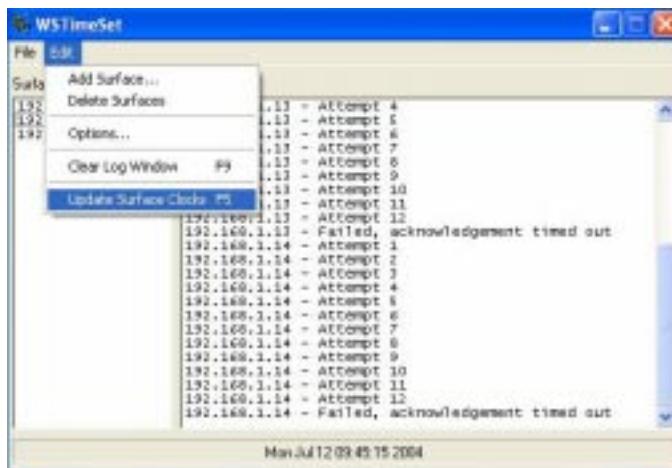
Control Surface Clock

The Wheatstone digital clock is a six-digit time-of-day clock with LED display.

Setting the Time

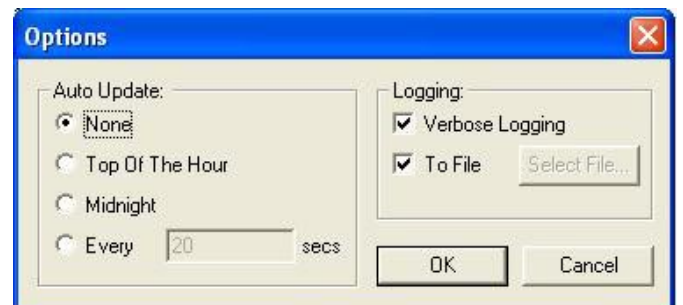
Setting the time of the control surface's clock is made via the Wheatstone Surface Time Manager software:

1. Select *Edit / Add Surface...* from the Main Menu, which will display the following form.
2. Enter an IP address of the control surface.
3. Select *Edit / Update Surface Clocks* or press *F5* key to update all surface clocks.



Update Options

Select *Edit / Options...* from the Main Menu. The Options form gives you different auto update options. Select the appropriate option for your application.



Synchronize

For the best accuracy synchronize the PC's clock to a master clock system. Refer to your master clock documentation for more information.