The

IMPULSE

BY PACIFIC RESEARCH & ENGINEERING

Digital
Broadcast
Console

Impulse-12: PRE99-1060-1 (Domestic)
PRE99-1060-1X (Export)
Impulse-20: PRE99-1060-2 (Domestic)
PRE99-1060-2X (Export)

Installation & Operation Manual

PR&E 75-42
Revision D • 3/02

HARRIS
GENERAL INFORMATION
1. Read All Instructions. All safety and operating instructions must be read before operating the product.
2. Retain All Instructions. All safety and operating instructions must be retained for future reference.
3. Head All Warnings. All warnings on the product and those listed in the operating instructions must be adhered to.
4. Follow All Instructions. All operating and product usage instructions must be followed.
5. Heat. This product must be situated away from any heat sources such as radiators, heat registers, stoves, or other products (including power amplifiers) that produce heat.
6. Ventilation. Slots and openings in the product are provided for ventilation. They ensure reliable operation of the product, keep it from overheating. These openings must not be blocked or covered during operation. This product should not be placed in a rack unless proper ventilation is provided through following the manufacturer’s recommended installation procedures.
7. Water and Moisture. Do not use this product near water—for example, near a bath tub, wash bowl, kitchen sink or laundry tub; in a wet basement; or near a swimming pool or the like.
8. Attachments. Do not use any attachments not recommended by the product manufacturer as they may cause hazards.
9. Power Sources. This product must be operated from the type of power source indicated on the marking label and in the installation instructions. If you are not sure of the type of power supplied to your facility, consult your local power company.
10. Grounding and Polarization. This product is equipped with a polarized AC plug with integral safety ground pin. Do not defeat the safety ground in any manner.
11. Power Cord Protection. Power supply cords must be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to the cords at AC wall plugs and convenience receptacles, and at the point where the cord plugs into the product.
12. Lighting. For added protection for this product during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the AC wall outlet. This will prevent damage to the product due to lightning and power line surges.
13. Overloading. Do not overload AC wall outlets, extension cords, or integral convenience outlets as this can result in a fire or electric shock hazard.
15. Accessories. Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious damage to a child or adult, and serious damage to the product. Any mounting of the product needs to follow manufacturer’s installation instructions.
16. A Product and Cart Combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product and the cart combination to overturn.
17. Servicing. Refer all servicing to qualified servicing personnel.
18. Damage Requiring Service. Unplug this product from the wall AC outlet and refer servicing to qualified service personnel under the following conditions:
   a. When the AC cord or plug is damaged.
   b. If liquid has been spilled or objects have fallen into the product.
   c. If the product has been exposed to rain or water.
   d. If the product does not operate normally (following operating instructions).
   e. If the product has been dropped or damaged in any way.
   f. When the product exhibits a distinct change in performance. This indicates a need for service.
19. Replacement Parts. When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or that have the same characteristics as the original parts. Unauthorized substitutions may result in fire, electric shock, or other hazards.
20. Safety Check. Upon completion of any repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.
21. Cleaning. Do not use liquid cleaners or aerosol cleaners. Use only a damp cloth for cleaning.

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Hazard / Warning Label Identification

The Exclamation Point symbol, with an equilateral triangle, alerts the user to the presence of important operating and maintenance (servicing) instructions in product literature and instruction manuals.

The Lightning Flash With Arrowhead symbol, within an equilateral triangle, alerts the user to the presence of uninsulated dangerous voltage within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

WARNING—This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions in this manual it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device (pursuant to Subpart J of Part 15 FCC Rules), which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.
The Impulse is a sophisticated console with a wide range of features held in a compact design. To obtain maximum benefit from the console, please read through this manual prior to product installation.

CONSOLE OVERVIEW
The Impulse has the following features:
- Four microphone preamps
- Plug-in cards to configure each channel for analog, digital, or optical signals
- Analog & digital program outputs
- Control Room & Studio monitoring
- 7 x 2 analog remote line selector
- ESE-compatible time of day clock
- Production Timer with manual and automatic control
- Welded steel chassis for strength and RFI immunity
- Countertop installation
- Easy-access rear panel connectors covered by a cosmetic cover after installation

Feature Descriptions
Microphone Preamplifiers
The Impulse has four preamplifiers with individual gain control and microphone phantom power (+48 VDC) switching. The preamp outputs are +4 dBu balanced mono for direct jumper cable connection to an analog input channel or to outboard mic processors.

Input Channels
The Impulse is available with 12 or 20 input channels. Each channel is configured, with a plug-in Input Card, for analog or digital (AES-3, S/PDIF or optical) signals.

Every channel has input selection (A or B), channel on/off control (with built-in logic interface), fader level control (with selectable global fader-start) and assignment selectors (to Cue, Off-Line and three output buses). Channel trimmers on the analog input Cards adjust signal gain to accept levels from -10 dB to +4 dBu.

Each input is electronically switched through an A/B Input selector. Logic wiring to external peripherals connects to a 24-pin logic connector on each channel. Logic and module functional options for either input A or B are set through internally-accessed DIP switches.

Telco Channels
Two dedicated Telco channels are provided adjacent to the monitor controls. They provide the audio connections for two telephone hybrids and a two-channel recorder. A board-mounted trim control allows the Impulse to interface with hybrids using outputs of -10 dBu up to +4 dBu.

Each Telco channel’s hybrid mix-minus output (Feed to Caller) can be set manually from between the three program buses and the Off-Line mix bus. An Autofeed function automatically switches the Feed to Caller between the Off-Line mix bus and the assigned Program buses as the Telco channel is turned off and on.

Outputs
Each audio bus (Program-1, Program-2 and Program-3) has its own AES-3 digital output as well as two analog outputs (main and auxiliary stereo line outputs) on Pgm-1 & Pgm-2 and one analog output on Pgm-3. The analog mono outputs (Main and Aux) can be jumpered to output the summed output of any program bus. Each analog output signal is +4 dBu balanced.

Monitoring
The monitoring and communication controls for a Control Room (CR) and a separate Studio (or voice booth, call screener or other room) are provided. Separate volume controls, with speaker muting logic for the CR and Studio speakers, are provided for the CR headphone and monitors, the Cue speaker and the Studio monitors. Both CR and Studio warning logic outputs are also provided.

Each room has independent multiple source selection from among three external inputs, Pgm-1, Pgm-2, Pgm-3, and a Telco monitor.

The Talkback system includes a built-in adjustable electret CR Talkback mic with line-level External and Talk to Studio outputs, and an external mic or line-level remote Talkback input with talkback logic input. In addition, any input channel can be set as a Studio mic input. Talkback to the CR can be talkback to the CR through the Cue speaker.

Clock & Timer
The digital clock and timer are located in the meter panel. The timer is controlled automatically by the channel logic or manually through the control surface’s Start, Stop, Hold, and Reset buttons.

Remote Line Selector (RLS)
The analog remote line selector is a 7x2 source selector for balanced, line-level, mono or stereo signals. Two banks of seven switches provide manual, exclusive source selection, for routing to the two RLS outputs.

Power Supply
The switching power supply is mounted within the meter panel. It has four regulated output voltages. Two outputs (+15 volts) power the analog circuits. A third (+5 volts) powers the DSP and logic control circuits. The remaining output supplies phantom powering (+48 volts) for condenser microphones connected to the Microphone Preamplifiers.
SPECIFICATIONS

Impulse-20 specifications are shown.

Test Conditions
Specifications are per channel, with 600 ohm loads on analog outputs.

0 dBu corresponds to 0.775 volts RMS regardless of circuit impedance. This equals 0 dBm into a 600 ohm circuit for convenient level measurements using meters calibrated for 600 ohm circuits.

Noise specs based on 22 kHz bandwidth. Noise increases about 1.7 dB if a meter with a 30 kHz bandwidth is used.

THD (Total Harmonic Distortion) is measured at +23.5 dBu output using a swept signal and a 22 kHz low pass filter.

FSD = Full Scale Digital, +24 dBu

Microphone Preamplifiers

Source Impedance: 150 kΩ
Input Impedance: 5 kΩ, min. balanced
Input Level Range: Adj. -70 to -30 dBu
Input Headroom: 20 dB above nom.
Output Load: > 4 ohms, balanced
Nominal Output: +4 dBu, balanced
Output Load Impedance: 2.5 kΩ, min.

Analog Inputs

Source Impedance: 600 Ω or less
Input Impedance: >40 kΩ, balanced
Input Level Range: Adj. -10 to +4 dBu
Input Headroom: 20 dB above nom.

Analog Main Outputs

Output Source Impedance: 80 kΩ, balanced
Output Load Impedance: 1 kΩ, min.
Nominal Output Levels:
Program Outputs: adj. +4 dBu
Telco Mix-Minus set at +4 dBu
Telco Recorder Mix Feed: +4 dBu
Maximum Output Levels:
Program and Monaural: +24 dBu
Telco Mix-Minus: +24 dBu
Telco Recorder Mix Feed: +24 dBu

Digital Inputs & Outputs

Reference: -4 dBu = -20 dB FSD
Signal Format: AES-3, S/PDIF on input only
AES-3 Input Compliance: 24-bit
AES-3 Output Compliance: 24-bit
Digital Reference Frequency: Internal crystal
Internal Sample Rate: 48 kHz
Processing Resolution: 24-bit fixed with external precision accumulators
Conversions: A/D 24-bit Delta-Sigma, Sample rate conversion on all digital inputs; D/A 24-bit, using 1-bit conversion.
Latency: <1 ms, Mic in-Monitor out; <300 μs digital in-digital out

Monitor Outputs

Output Impedance: 80 Ω, Z-balanced
Output Load: 2.5 kΩ or greater
Output Level: 0 dBu nominal, +20 dBu max.

Console Headphone Jack Output:
Output Impedance: 100 ohms
Output Level: +4 ohms
Output Level: >4 dBu nominal, +20 dBu max. into a 600 ohm load
External Headphone Amplifier Output:
Source Impedance: 80 Ω
Load Impedance: <2.5 kΩ
Output Level: +4 dBu nominal, +24 dBu max.

Frequency Response

Mic or Line Input to Program Output:
+0 dB/ -0.5 dB, 20 Hz to 20 kHz
Telco Input to Program Output:
+0 dB/ -1.0 dB, 20 Hz to 20 kHz

Equivalent Input Noise

Microphone Preamplifier: -127 dBu, 150 ohm source

Dynamic Range

Analog Input to Analog Output: 89 dB, 91 dB “A” weighted (both ref. to FSD)
Digital Input to Analog Output: 92 dB, 95 dB “A” weighted (both ref. to FSD)

Total Harmonic Distortion + Noise

Mic Pre Input to Mic Pre Output: <0.005%, 20 Hz to 20 kHz
-38 dBu input, +18 dBu output, 100 kΩ load, 22 kHz filter bandwidth.
Analog Input to Analog Output: <0.02%, 1 kHz, +18 dBu input, +18 dBu output, 1 kΩ load, 22 kHz filter bandwidth.
<0.05%, 20 Hz to 20 kHz, +18 dBu input, +18 dBu output, 1 kΩ load, 22 kHz filter bandwidth.
Digital Input to Digital Output: <0.0016%, 20 Hz to 20 kHz
+18 dBu input, +18 dBu output, 22 kHz filter bandwidth.
Digital Input to Analog Output: <0.005%, 1 kHz, +18 dBu input, +18 dBu output, 1 kΩ load, 22 kHz filter bandwidth.
<0.05%, 20 Hz to 20 kHz, +18 dBu input, +18 dBu output, 1 kΩ load, 22 kHz filter.

Crosstalk Isolation

Program-to-Program: >88 dB, 20 Hz - 20 kHz

Stereo Separation

Analog Program Outputs: >87 dB @ 1 kHz,
>78 dB, 20 Hz to 20 kHz

Power Requirements

Input: AC voltage 95 - 264VAC, 50/60 Hz
AC input: 8 foot IEC power cord
Impulse-12 current draw: 120 watts
Impulse-20 current draw: 170 watts
AC Ground: Chassis grounded through AC cord

Power Supply Outputs

Phantom power: +48VDC at 0.10 Amp
Audio power: ±15 VDC at 1.00 Amp (each leg)
Digital & Logic power: ±5 VDC at 7.5 Amps

WARRANTY

The Impulse console carries a manufacturer’s warranty subject to the following guidelines and limitations:

A) Except as expressly excluded herein, PR&E (“Seller”) warrants equipment of its own manufacture against faulty workmanship or the use of defective materials for a period of one (1) year from date of shipment to Buyer. The liability of the Seller under this Warranty is limited to replacing, repairing or issuing credit (at the Seller’s discretion) for any equipment, provided that Seller is promptly notified in writing within five (5) days upon discovery of such defects by Buyer, and Seller’s examination of such equipment shall disclose to its satisfaction that such defects existed at the time shipment was originally made by Seller, and Buyer returns the defective equipment to Seller’s place of business in Mason, Ohio, packaging and transportation prepaid, with return packaging and transport guaranteed.

B) Equipment furnished by Seller, but manufactured by another, shall be warranted only to the extent provided by the other manufacturer.

C) Thermal filament devices (such as lamps and fuses) are expressly excluded from this warranty.

D) The warranty period on equipment or parts repaired or replaced under warranty shall expire upon the expiration date of the original warranty.

E) This Warranty is void for equipment which has been subject to abuse, improper installation, improper operation, improper or omitted maintenance, alteration, accident, negligence (in use, storage, transportation or handling), operation not in accordance with Seller’s operation and service instructions, or operation outside of the environmental conditions specified by Seller.

F) This Warranty is the only warranty made by Seller, and is in lieu of all other warranties, including merchantability and fitness for a particular purpose, whether expressed or implied, except as to title and to the expressed specifications contained in this manual. Seller’s sole liability for any equipment failure or any breach of this Warranty is as set forth in subparagraph A) above; Seller shall not be liable or responsible for any business loss or interruption, or other consequential damages of any nature whatsoever, resulting from any equipment failure or breach of this warranty.

Harris reserves the right to change specifications without notice or obligation.
Installation

The Impulse console sits on top of the studio furniture countertop. A minimum of 15 inches of vertical clearance above the countertop is required to open the operator control surface to its service position.

The Impulse console consists of:
- The 12- or 20-input mainframe
- The standard configuration of Input Cards installed into the Input channels
- The Impulse Tool Kit: AA batteries, AMP MOD IV crimper and removal tools and clock set magnet tool
- Audio and Logic Connector Kit

To simplify console interconnection, logic cable drawings for specific peripheral devices are available from the Harris Technical Support Department (most popular are also on the Impulse Technical Service CD-ROM).

Custom engraving on the channel On/Off button caps and colored fader knobs are also available. See Accessories, page 19 for details.

INSTALLATION NOTE: Do not set Impulse near intense electromagnetic hum fields, such as those from power transformers and audio amplifiers using inexpensive power transformers operating in or near saturation, as this can impair console performance. Route audio cables to achieve maximum practical distance from all AC mains wiring.

CONSOLE CONFIGURATION
Impulse continues P.R.E.'s design philosophy of positioning the input channels in the physical center of the console. This gives the operator equal reach to peripheral equipment located to the sides of the console.

Channel Assignment
Any Input channel can be assigned as a line input or a microphone input. This is done through a DIP switch setting on the processor boards mounted on the floor of the chassis. See page 11 for details on setting these DIP switches.

The Meter Panel
Two bargraph meters provide stereo level monitoring for Pgm-1 and either Pgm-2 or Pgm-3 with momentary Cue bus metering selection. The meter scale (VU or PPM) is set via a DIP switch on the processor board prior to power up. The cue talkback speaker, a clock and event timer are also on this panel.

Connector Access
All audio and logic connectors are located along the rear of the console mainframe, normally hidden by the wire tray and cosmetic cover. To ease initial wiring, the cosmetic cover can be removed from the wire tray. The cover is fastened to the wire tray using Phillips screws.

In most installations, the wiring is dropped into the cabinetry through 2-inch access holes in the floor of the wire tray. A 2-inch access hole is also available at each end of the wire tray for countertop wiring. Console and wiring access dimensions are shown below.

Internal Control Access
To access the console's trimpots and DIP switches, the control surface must be opened to its service position. To do this, loosen the two quarter-turn fasteners at the rear corners of the control surface, then lift using the pull handle at the rear center of the panel.

Power Supply
The console power supply is mounted inside the meter panel. A power entry module (with power switch and IEC power connector) is mounted on the meter panel's rear cover, behind the Cue speaker.

The power entry module plugs into an isolated ground AC outlet using an eight-foot IEC power cord. Ensure that the cord is not under tension and that it does not parallel any audio wiring during installation.

AC GROUND NOTE: Do not defeat the AC safety ground in any way. Doing so may provide a potentially dangerous condition to the operator.

GROUNDING & SHIELDING
The broadcast facility's technical ground should only connect to the mainframe chassis ground stud located on the mainframe rear panel. Terminate the facility's technical ground wire in a crimped lug.

Connect the audio shields at both the console and the peripheral when all system components share a common ground potential and are using isolated-ground AC outlets individually tied back to the main technical ground.

If isolated-ground AC outlets are not available, connect the cable shields at the console end only. The shields should be floated (left unconnected) at the peripheral device. Ensure the peripheral devices connect to a clean ground through their power cords, or through separate ground wires to the facility's technical ground.

AUDIO GROUND NOISES: Buzz pickup is generally electrostatic—such as capacitive coupling between an audio line and a power line. Do not route audio lines in the same wireway as an AC power line.

BACKUP BATTERIES
Two AA alkaline batteries are supplied in the Impulse Tool Kit. They supply a "Keep Alive" voltage that holds each channel's logic state during momentary power outages. They mount in battery clips on the right hand processor board (see page 11 for location).

Observe the correct polarity (as marked on the circuit board) when installing the batteries.

CAUTION: Replace only with same or equivalent type batteries.

Replace batteries yearly to ensure continuous backup protection. Remove batteries if the console is unplugged for an extended period.
SETTING THE CLOCK

The digital time-of-day clock is part of the Meter Panel PCA mounted inside the meter panel. The clock operates in one of two modes: Free Run or ESE. In Free Run mode, the default setting, clock timing comes from a temperature-controlled quartz crystal oscillator. In ESE mode, clock timing comes from a coaxial TC89 or TC90-format ESE time code reference signal.

The operating mode is set by DIP switch DS1, #2. To access the DIP switch, open the hinged Meter Panel rear cover after removing the screws.

Clock/Timer Option Switches

With Free Run mode selected, the clock can be set to display time in either 12 or 24-hour format (set through DS1, #4). Free Run mode requires the clock time to be set manually. Three magnetically-activated Hall-effect sensors, below and between each pair of 7-segment displays just behind the bezel, adjust or hold the time. The Clock Set Magnet Tool (90-151, included in the console Tool Kit) activates the Hall-effect sensors.

To set the time, place the end of the magnet tool directly against the bezel over the appropriate sensor. Use Fast Slt to rapidly advance the time to the nearest hour and Slow Slt to advance the time in one second increments. To synchronize the clock display to real time, set the clock several seconds ahead and use Hold to freeze the display.

To start the clock, move the tool away from the bezel over the appropriate sensor. The time will automatically advance to the nearest minute after power is restored. Positive power is restored within 4 hours after power has been lost.

Cabling & Wiring

To simplify console connection, draw up a facility wiring plan listing the console’s audio and logic connections with peripheral devices. Identify and create tags for each cable and then list each connection in a master facility wiring logbook. This facilitates initial wiring installation and future system wiring changes, equipment updates or system troubleshooting. Refer to Cables & Connectors on page 9 for descriptions of the audio and logic inputs.

Cable selection is determined by the application. The number of conductors needed is determined by the application. Typically five and eight conductor cables are used for logic cabling, even though there are 18 distinct signals on the Logic Interface connector, since only a handful are actually used for any given application.

Clock Backup Battery

A 9-volt battery can be installed in J5 on the Meter PCA. This battery powers the clock during any momentary power outages so that it doesn’t have to be reset again after power is restored. The battery will power the clock for about four hours total and should be changed yearly. When the console is left turned off for an extended period, remove the battery.

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Wire Preparation

All Impulse audio and logic wiring terminates in AMP MOD IV receptacle contacts. Stranded wire of 22 to 26 AWG, with insulation diameters of .040 to .060 inch, can be used with the AMP MOD IV receptacle contacts. Follow these steps for wire preparation:

1. Strip the cable insulation jacket back 1 1/2” [38.10 mm].
2. Remove the foil shield from audio cables.
3. Sleeve the audio drain wire with Teflon sleeving, leaving 4” [3.572 mm] of the drain wire exposed.
4. Use 3/4” [19.05 mm] of heat-shrink tubing to sleeve the end of the jacket, centered on the cut. Shrink the tubing to hold any drain wire sleeving in place.
5. Strip the insulation back from all signal wires 9/64” [3.572 mm].

Audio Cable Shield Notes: To follow recommended grounding procedures, sleeve all drain wires with Teflon sleeving and put heat shrink tubing over all cable jacket cuts to insulate the shield wire.

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CRIMP TOOL OPERATION

A ratcheting AMP MOD IV hand crimper is included in the tool kit. The tool crimps the insulation and wire barrels on the AMP MOD IV receptacle contacts in one crimp action.

AMP Mod IV Crimp Tool

Follow these instructions for using the ratcheting crimp tool:

1. Hold the crimp tool with the printed side up. Insert the stripped wire into the contact until it hits the tool’s wire stop. Hold the wire in place while squeezing the tool handles to crimp the contact onto the wire. The tool handles automatically release and spring open after the crimp cycle is complete.

2. Insert the stripped wire into the contact until it hits the tool’s wire stop. Hold the wire in place while squeezing the tool handles to crimp the contact onto the wire. The tool handles automatically release and spring open after the crimp cycle is complete.

A properly crimped receptacle contact is inserted and locked into the appropriate connector housing following the pin-out diagrams found on this page and on pages 6 to 12. The receptacle contact must be inserted with its locking tab side facing the locking tab slots on the side of the connector housing. A light “click” will be felt as the contact’s locking tab engages the locking tab slot.

Analog Connections

There are no analog interstage patch points within the Impulse channels or outputs. To use a patchbay, connect the line level outputs from the peripheral devices directly to the patch bay and then normal these to the appropriate Input channels. Likewise, Impulse’s outputs may also be routed through a patchbay normalled to standard peripherals such as On-Air processing gear, recorders, telephone hybrids, etc.

The Microphone Preamplifiers’ line-level outputs (+4 dBu, nominal, balanced, mono) can also be routed through a patchbay normalled to an Input channel. If mic processing is required, the Preamplifiers’ outputs may be routed through a line level mic processing equipment and then to an Input channel. When processors requiring mic-level inputs are used, the microphone should connect to the mic processor directly, with the processor’s line-level output directly connected to an Input channel.

Contact Insertion & Removal

For wiring changes, use a Contact Removal Tool (70-129) to depress the locking tab while pulling the contact and wire out of the connector.

PRE70-129

Contact Removal Tool (supplied with console)

ANALOG CONNECTIONS

The Impulse audio connector pin assignments take visual advantage of the three-pins-per-row design of the three-pin and six-pin AMP MOD IV connectors.

For analog stereo, the left channel cable connects to the bottom row of pins and the right channel to the top row of pins.

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Connecting S/PDIF Devices to Impulse AES/EBU Inputs

Digital Connections

The 99-1042-1 Digital Input Card is required for AES-3 inputs. The two balanced digital signals connect using pins 1, 2, and 3 of each six-pin AMP MOD IV connector. There is no connection on pins 4, 5, and 6 in this application.

Optical inputs use EIAJ RC-5720 fiber cables. Two optical inputs (A & B) are supplied per Optical Input Card (99-1042-2).

All digital outputs use three-pin AMP MOD IV connectors. These connections output AES-3 (AES/EBU) compatible signals.

S/PDIF Signals

To connect a S/PDIF digital device to an Impulse digital input, use a 249 ohm resistor to properly terminate the S/PDIF cable. Install the resistor onto the connector per the following illustration. Alternately, an unbalanced-to-balanced line transformer may be used.

Connecting Unbalanced Devices to Impulse Analog Inputs

Connecting Unbalanced Devices to Impulse Analog Inputs

Digital Connection Notes: AES/EBU outputs cannot connect directly to S/PDIF inputs, a signal conversion interface must be used.

Some S/PDIF devices may not work with the Impulse’s digital inputs, even with the additional load resistor, due to nonstandard signal levels or protocols in the S/PDIF device.

Unbalanced Analog Connections

Even though all analog inputs and outputs are active and balanced, unbalanced consumer or “semipro” equipment can be connected to Impulse. For best results use an IHF-F-RO match box. If a match box is not available, unbalanced analog devices can connect per the following illustration. Keep unbalanced cable lengths as short as possible.

Digital Connections

The 99-1042-1 Digital Input Card is required for AES-3 inputs. The two balanced digital signals connect using pins 1, 2, and 3 of each six-pin AMP MOD IV connector. There is no connection on pins 4, 5, and 6 in this application.

Optical inputs use EIAJ RC-5720 fiber cables. Two optical inputs (A & B) are supplied per Optical Input Card (99-1042-2).

All digital outputs use three-pin AMP MOD IV connectors. These connections output AES-3 (AES/EBU) compatible signals.

S/PDIF Signals

To connect a S/PDIF digital device to an Impulse digital input, use a 249 ohm resistor to properly terminate the S/PDIF cable. Install the resistor onto the connector per the following illustration. Alternately, an unbalanced-to-balanced line transformer may be used.

Connecting S/PDIF Devices to Impulse AES/EBU Inputs

Connect from S/PDIF Device to Impulse AES/EBU Input

Digital Connection Notes: AES/EBU outputs cannot connect directly to S/PDIF inputs, a signal conversion interface must be used.

Some S/PDIF devices may not work with the Impulse’s digital inputs, even with the additional load resistor, due to nonstandard signal levels or protocols in the S/PDIF device.

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Connecting Unbalanced Devices to Impulse Analog Inputs

Connecting Unbalanced Devices to Impulse Analog Inputs

Digital Connection Notes: AES/EBU outputs cannot connect directly to S/PDIF inputs, a signal conversion interface must be used.

Some S/PDIF devices may not work with the Impulse’s digital inputs, even with the additional load resistor, due to nonstandard signal levels or protocols in the S/PDIF device.

Unbalanced Analog Connections

Even though all analog inputs and outputs are active and balanced, unbalanced consumer or “semipro” equipment can be connected to Impulse. For best results use an IHF-F-RO match box. If a match box is not available, unbalanced analog devices can connect per the following illustration. Keep unbalanced cable lengths as short as possible.
Connecting Unbalanced Devices to Impulse Analog Outputs (Nominal Output level is -2 dBu)

- To Unbalanced Device
  - Console Balanced Output

- Shields

(Make no connections to pins 2 & 5)

LOGIC CONNECTIONS

Each channel has one 24-pin logic connector to interface a peripheral device or Guest Panel for use with either A or B input. The active input is set by switch 8 on each channel’s Logic Settings Switch, located on the main boards (see page 11 for switch locations).

With a peripheral device connected, one of the main functions of the logic interface is to start the peripheral at module on. The peripheral device logic can, in turn, control the Input channel; turning the audio off at the end of an event and then controlling the Off lamp to indicate the peripheral device status.

When a Guest Panel is connected, its remote On, Off, Cough and Talkback buttons control the channel functions while the logic control outputs from the console control the button tallies in the Guest Panel.

THE LOGIC INTERFACE

A simplified schematic for the logic interface is shown adjacent. Logic outputs (shown on the right side of the illustration) are isolated from peripheral devices by five solid-state devices that function like single-pole mechanical relays. The “relay contacts” can switch external voltages of up to 60 volts at 350 mA.

The top two relays use momentary logic to create a 220 ms Start Pulse when the channel On button is pressed and a 220 ms Stop Pulse when the channel Off button is pressed. These Pulses are normally also generated when external logic commands On or Off are received. To disable the Start and Stop Pulses when receiving an external On or Off command, set Logic Settings Switch #7 to the On position.

The “C” or common contacts for the two Pulse outputs tie together at Command Common. The other three output relays, Logic Active Tally, On Tally and Off Tally, are “commoned” together at Tally Common.

The six logic inputs (shown on the left side of the illustration) are opto-isolated and current limited for logic voltages from +5 to +40 VDC. The On, Off, Cough and Talkback inputs allow remote Guest Panel switches to control the Input channel through active low logic signals (pull to ground). These inputs are enabled by jumpering External Control In (+) to +5 Logic.

The Audio Reset and Ready inputs can use either active low logic (pull to ground) or active high logic (pull to +VDC) from peripheral devices. With active high logic, Ready (-) and Audio Reset (-) are tied to logic ground on the peripheral device. Ready (+) and Audio Reset (+) then connect to the appropriate logic outputs on the peripheral device.

When active low logic (pull to ground) is used by the peripheral device, Ready (+) and Audio Reset (+) connect to the logic supply voltage on the peripheral. Ready (-) and Audio Reset (-) connect to the appropriate logic outputs.

Impulse Quick Logic Guide

Page 7 offers a quick guide to configuring the console logic. Page 8 has example connection diagrams for a Guest Panel (remote mic control panel) and a Denon CD player.

Note: To completely isolate the console from a peripheral device, use only the control input and output connections. These are decoupled from the console’s ground and power supply through opto-isolator devices.

The Logic Ground and +5 Logic connections are referenced to the console’s logic power supply and ground. Connect these only to a peripheral device with isolated logic connections or to a Guest Panel. Connecting these to a non-isolated peripheral device can cause a ground loop between the console and the peripheral.

Microphone Logic

The two main functions of microphone logic are to automatically mute the monitor speakers in the room with the “hot” mic and to command the appropriate hot mic warning light.

Peripheral Device Logic

Peripheral devices are controlled through the Start, Stop and Command Common logic outputs, which follow the channel On and Off switches.

In the connection example shown on page 8, active low logic is used. This means Command Common is connected to the logic ground on the peripheral device (also labeled command common by Denon).

On peripherals requiring an active high logic, the Command Common is tied to the + logic voltage. To prevent a ground loop, this voltage must be supplied by the peripheral rather than by the console’s +5 Logic.

The peripheral device can also control the channel through the Audio Reset and Ready logic inputs. As shown in the Peripheral Device example on page 8, the

(text continues on page 9)
Impulse Quick Logic Guide

**Logic Settings Switch Definitions**

<table>
<thead>
<tr>
<th>#</th>
<th>Switch Name</th>
<th>ON Function (set away from operator)</th>
<th>OFF Function (set toward operator)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td>A CR Mute</td>
<td>Input A mutes CR speakers at channel On</td>
<td>No CR monitor mute while A is on</td>
</tr>
<tr>
<td>2*</td>
<td>B CR Mute</td>
<td>Input B mutes CR speakers at channel On</td>
<td>No CR monitor mute while B is on</td>
</tr>
<tr>
<td>3*</td>
<td>A Studio Mute</td>
<td>Input A mutes studio speakers at channel On</td>
<td>No Studio mon. mute while A is on</td>
</tr>
<tr>
<td>4*</td>
<td>B Studio Mute</td>
<td>Input B mutes studio speakers at channel On</td>
<td>No Studio mon. mute while B is on</td>
</tr>
<tr>
<td>5+</td>
<td>A Timer Reset</td>
<td>Input A resets timer at channel On</td>
<td>No timer reset when A is turned on</td>
</tr>
<tr>
<td>6+</td>
<td>B Timer Reset</td>
<td>Input B resets timer at channel On</td>
<td>No timer reset when B is turned on</td>
</tr>
<tr>
<td>7</td>
<td>Pulse Disable</td>
<td>No pulses output with ext. On or Off</td>
<td>Pulses output with external On or Off</td>
</tr>
<tr>
<td>8#</td>
<td>A/B RCL Select</td>
<td>Logic active when A input is selected</td>
<td>Logic active when B input is selected</td>
</tr>
<tr>
<td>9</td>
<td>Ready Bypass</td>
<td>Off lamp illuminates at channel Off</td>
<td>Off lamp controlled by ready logic</td>
</tr>
<tr>
<td>10</td>
<td>Cue Reset</td>
<td>Cue function resets at channel On/Off</td>
<td>No cue reset at channel On/Off</td>
</tr>
</tbody>
</table>

Notes:
- # = Remote Control Logic
- * = Both inputs can mute either or both rooms
- + = Both inputs can reset the Timer when Auto is active on the timer controller.
- # = Only one input (A or B) can be set for external logic.

**Logic Connector Signals**

<table>
<thead>
<tr>
<th>PIN #</th>
<th>SIGNAL</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LOGIC GND</td>
<td>Console logic ground</td>
</tr>
<tr>
<td>2</td>
<td>LOGIC GND</td>
<td>Console logic ground</td>
</tr>
<tr>
<td>3</td>
<td>LOGIC GND</td>
<td>Console logic ground</td>
</tr>
<tr>
<td>4</td>
<td>STOP PULSE</td>
<td>Stop command output</td>
</tr>
<tr>
<td>5</td>
<td>START PULSE</td>
<td>Start command output</td>
</tr>
<tr>
<td>6</td>
<td>+5 LOGIC</td>
<td>5 volt source</td>
</tr>
<tr>
<td>7</td>
<td>ON (-)</td>
<td>Remote On switch input</td>
</tr>
<tr>
<td>8</td>
<td>OFF (-)</td>
<td>Remote Off switch input</td>
</tr>
<tr>
<td>9</td>
<td>COUGH (-)</td>
<td>Remote Cough switch input</td>
</tr>
<tr>
<td>10</td>
<td>+5 LOGIC</td>
<td>5 volt source</td>
</tr>
<tr>
<td>11</td>
<td>+5 LOGIC</td>
<td>5 volt source</td>
</tr>
<tr>
<td>12</td>
<td>+5 LOGIC</td>
<td>5 volt source</td>
</tr>
<tr>
<td>13</td>
<td>COMMAND COMMON</td>
<td>Start &amp; Stop commands common</td>
</tr>
<tr>
<td>14</td>
<td>TALLY COMMON</td>
<td>Tally relay common connection</td>
</tr>
<tr>
<td>15</td>
<td>LOGIC ACTIVE TALLY</td>
<td>Logic active tally output</td>
</tr>
<tr>
<td>16</td>
<td>OFF TALLY</td>
<td>Off tally output</td>
</tr>
<tr>
<td>17</td>
<td>ON TALLY</td>
<td>On tally output</td>
</tr>
<tr>
<td>18</td>
<td>EXT. CONTROL IN (+)</td>
<td>Tie to +5 to enable external inputs</td>
</tr>
<tr>
<td>19</td>
<td>AUDIO RESET (-)</td>
<td>Remote Audio input</td>
</tr>
<tr>
<td>20</td>
<td>TALKBACK (-)</td>
<td>Remote Talkback input</td>
</tr>
<tr>
<td>21</td>
<td>READY (-)</td>
<td>Remote Ready input</td>
</tr>
<tr>
<td>22</td>
<td>AUDIO RESET (+)</td>
<td>+VDC to enable Audio Reset</td>
</tr>
<tr>
<td>23</td>
<td>spare</td>
<td>no connection</td>
</tr>
<tr>
<td>24</td>
<td>READY (+)</td>
<td>+VDC to enable the Ready function</td>
</tr>
</tbody>
</table>

Notes:
- VDC is between +5 and +40 VDC.
- Output relays can switch voltages up to +60 VDC.

**Logic Connector (Contact insertion end view)**

**Impulse Logic Interface Glossary**

<table>
<thead>
<tr>
<th>REMOTE SIGNAL (pin #)</th>
<th>FUNCTIONAL DESCRIPTION OF CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>START PULSE (pin 5)</td>
<td>Normally Open (N/O) relay contact outputs. A momentary “contact closure” of 220 ms is generated each time the channel On button is pressed (START) or Off button is pressed (STOP). Command Common is the Common (C) relay contact output. Typically connects to the Remote Start logic input on the peripheral device.</td>
</tr>
<tr>
<td>STOP PULSE (pin 4)</td>
<td>Normally Open (N/O) relay contact outputs. A momentary “contact closure” of 220 ms is generated each time the channel Off button is pressed (STOP). Command Common is the Common (C) relay contact output. Typically connects to the Remote Start logic input on the peripheral device.</td>
</tr>
<tr>
<td>COMMAND COM. (pin 13)</td>
<td>The Common (C) relay contact output for the Pulse relays. For active high logic, connect Command Com. to the logic voltage on the peripheral device. For active low logic, connect this pin to logic ground on the peripheral device.</td>
</tr>
<tr>
<td>EXT. CTRL IN (+) (pin 18)</td>
<td>Connect +5 to +40 VDC to enable the active low external control inputs (On, Off, Cough, Talkback). When the control inputs are isolated from other devices (e.g., mic control panel), jumper pin 18 to pin 6 on the Logic Connector to supply +5 VDC.</td>
</tr>
<tr>
<td>ON (-) (pin 7)</td>
<td>When pulled low, ON turns the channel On from Off, generating a Start Pulse. When pulled low, OFF turns the channel Off from On, generating a Stop Pulse.</td>
</tr>
<tr>
<td>OFF (-) (pin 8)</td>
<td>The channel audio is muted from all assigned buses for as long as this input is pulled low.</td>
</tr>
<tr>
<td>COUGH (-) (pin 9)</td>
<td>The channel audio is fed to the Talkback bus, but is muted from the assigned buses, as long as this input is pulled low.</td>
</tr>
<tr>
<td>TALKBACK (-) (pin 20)</td>
<td>The channel audio is fed to the Talkback bus, but is muted from the assigned buses, as long as this input is pulled low.</td>
</tr>
<tr>
<td>OFF TALLY (pin 16)</td>
<td>The three tally outputs are N/O “dry contact” outputs. Typically used to drive indicator lamps, the outputs can sink or source up to 60 volts at 350 mA. While the channel is Off, and the channel Logic Ready Bypass switch is set to on, the Off Tally is connected to Tally Common. With Ready Bypass off, the Off Tally is controlled by the Ready input logic while the channel is Off. While the channel is On, the On Tally is connected to Tally Common. Anytime the logic is enabled (Logic Settings switch #7 is on and switch #8 is true), the Logic Active Tally output is connected to Tally Common.</td>
</tr>
<tr>
<td>LOGIC ACTIVE (pin 15)</td>
<td>The C or common relay contact for the Tally relays. Typically connects to the lamp supply voltage (up to 60 volts). If the tallys use 6.3 volt, 40 mA lamps, and are isolated from peripheral devices as in a remote mic control panel, then the Tally Common can be jumpered to +5 Logic.</td>
</tr>
<tr>
<td>TALLY COM. (pin 14)</td>
<td>The “C” or common relay contact for the Tally relays. Typically connects to the lamp supply voltage (up to 60 volts). If the tallys use 6.3 volt, 40 mA lamps, and are isolated from peripheral devices as in a remote mic control panel, then the Tally Common can be jumpered to +5 Logic.</td>
</tr>
<tr>
<td>READY (+) &amp; (-)</td>
<td>These complementary logic inputs require +5 to +40 VDC on the (+) input and ground on the (-) input for activation. This can be done by connecting an active high logic to the (+) input and grounding the (-) input, or by supplying +5 to +40 VDC to the (+) input and an active low logic to the (-) input.</td>
</tr>
<tr>
<td>AUDIO RESET (+) &amp; (-)</td>
<td>When activated while the channel is On, the channel turns Off without generating a Stop Pulse. When the module is Off (and Logic Settings switch #7 is on and #9 is Off), the Ready logic controls the Off lamp illumination to indicate device status. Typically, lamp off indicates the peripheral is not ready to play, lamp on indicates the device is ready, and a flashing lamp indicates the device has already played or is not cued (or ready).</td>
</tr>
<tr>
<td>READY (pins 21 &amp; 24)</td>
<td>When activated while the channel is On, turns it Off without generating a Stop Pulse. Ignored if the channel is already Off.</td>
</tr>
<tr>
<td>AUDIO RESET (pins 19 &amp; 22)</td>
<td>Channel audio is muted from all assigned buses for as long as this input is pulled low.</td>
</tr>
<tr>
<td>+5 LOGIC (pins 6, 10, 11, 12)</td>
<td>The three tally outputs are N/O “dry contact” outputs. Typically used to drive indicator lamps, the outputs can sink or source up to 60 volts at 350 mA. While the channel is Off, and the channel Logic Ready Bypass switch is set to on, the Off Tally is connected to Tally Common. With Ready Bypass off, the Off Tally is controlled by the Ready input logic while the channel is Off. While the channel is On, the On Tally is connected to Tally Common. Anytime the logic is enabled (Logic Settings switch #7 is on and switch #8 is true), the Logic Active Tally output is connected to Tally Common.</td>
</tr>
<tr>
<td>LOGIC GND (pins 1, 2, 3)</td>
<td>The “C” or common relay contact for the Tally relays. Typically connects to the lamp supply voltage (up to 60 volts). If the tallys use 6.3 volt, 40 mA lamps, and are isolated from peripheral devices as in a remote mic control panel, then the Tally Common can be jumpered to +5 Logic.</td>
</tr>
</tbody>
</table>

**Notes:**
- # = Remote Control Logic
- * = Both inputs can mute either or both rooms
- + = Both inputs can reset the Timer when Auto is active on the timer controller.
- # = Only one input (A or B) can be set for external logic.
Ready logic both performs an Audio Reset, turning off the channel without generating a Stop Pulse, and then controls the Off lamp illumination to indicate device status.

In most applications, the Audio Reset (+) and Ready (-) commands connect to + Logic on the peripheral. The Ready (-) command and the Audio Reset (+) command are then pulled low by the active low logic outputs on the peripheral to trigger the Impulse logic.

When a peripheral uses active high logic, tie the Ready (-) and Audio Reset (-) lines to the logic ground on the peripheral. The Ready (+) and Audio Reset (+) lines connect to the logic outputs. Logic voltages of +5 to +40 can be used.

For peripheral devices that require a steady On or Off signal, the On and Off tallies can be used. When the peripheral uses active high logic, tie the Ready (+) and Audio Reset (+) lines to the logic ground on the peripheral. The Ready (+) and Audio Reset (+) command outputs control the OFF tally.

When a peripheral uses active high logic, tie the Ready (-) and Audio Reset (-) lines to the logic ground on the peripheral. When an active low logic output is needed on the peripheral, jumper pins 1 and 3 together and use pin 4 as the Control Room warning output. Jumper pins 5 and 7 together and use pin 8 when the Studio warning output requires an active low logic output.

Note: Jumping the solid-state relay to either +5 Volts or Logic Ground defeats ground isolation between the console and the warning lamp interface.

### Monitor Logic

There is one 8-pin logic connector (CR/ST WARN) for the “hot mic” logic command outputs for the Control Room and Studio on-air warning lamp systems.

Each logic command output is isolated by a solid-state relay with a pair of normally open “dry-contacts.” These relay contacts can switch external voltages at up to 60 Volts at 350mA for direct interface to most lamp control devices.

If a five volt lamp relay is used, one side of the interface relay can be jumpered to +5Volts (pins 2 and 6) or to Logic Ground (pins 1 and 5) to create an active high or active low output, respectively.

The connection example below shows the logic outputs for the Control Room and Studio warning lamp interface externally jumpered to yield an active high output from the relay.

When an active low logic output is needed on the Control Room, jumper pins 1 and 3 together and use pin 4 as the Control Room warning output. Jumper pins 5 and 7 together and use pin 8 when the Studio warning output requires an active low logic output.

### Console Connections

The Impulse sits on a countertop. The integral cable tray, with a cosmetic cover, is attached to the rear of the console mainframe. The cosmetic cover, held in place by Phillips screws, is removed during installation.

The cable tray has multiple two-inch (76.20 mm) holes that are used for cable connections. The Impulse includes four high-performance transformerless microphone preamplifiers on a single assembly (99-1045-1). A DIP switch (DS1) allows phantom power to be applied as required to any mic input. Individual gain trim controls (RV1 - RV4) set the preamp gain for each mic.

Connect only low impedance, balanced, dynamic or condenser microphones, with nominal mic output levels of -70 to -30 dBu, to the two MIC IN connectors. Mic 1 connects to pins 4, 5 & 6, and Mic 2 connects to pins 1, 2 & 3, of the left-hand connector (looking at the rear of the chassis). Mic 3 connects to pins 4, 5 & 6, and Mic 4 connects to pins 1, 2 & 3, of the right-hand MIC IN connector.

Each preamp has its own +4 dBu balanced analog output on a 6-pin stereo output connector. The Mic signal is paralleled to mono on the connector to simplify Input channel connection. Each MIC OUT is normally jumpered to an analog channel’s A or B input. Alternatively, a MIC OUT can be routed through external patching and/or a mic processor before feeding an Input channel.

### Input channels

Each channel’s audio inputs (A and B) support either analog or digital signals, depending upon which Input Card is installed in that channel. Input channels can be reconfigured in the field by exchanging the plug-in Input Card.

For analog inputs, an Analog Input Card (99-1041) is installed. It accepts audio signals from -10 dBu to +4 dBu, balanced or unbalanced. Left and right input trim controls on the Input Card set the input reference level.

---

### Warning Lamp Interface Connections

**CR MONITOR CONNECTION**

- Logic + 5 VDC [2]
- C/R Warning relay [3]
- C/R Warning relay [4]
- Logic Ground [1]

**STUDIO MONITOR CONNECTION**

- Logic + 5 VDC [6]
- Control Room Warning Lamp [NC]
- Studio Warning relay [7]
- Studio Warning relay [8]
- Logic Common [5]

**Warning Lamp**

- Logic + 5 VDC [2]
- Studio Warning Lamp [NC]
- Studio Warning relay [7]
- Studio Warning relay [8]
- Logic Common [5]

**Note:** Do not use the solid-state relay “contacts” to directly switch the AC line voltage to a lamp.
With a Digital Input Card (99-1042-1) installed, the module accepts AES-3 and most S/PDIF coaxial inputs. Digital signal connection is to pins 1, 2 and 3 only. There are no digital connections to pins 4, 5 & 6. There are no trim controls when a Digital Input Card is installed.

With a S/PDIF Optical Card (99-1042-2) installed, the module accepts EIAJ RC-5720 fiber optic cables for the A and B inputs.

Each Analog or Digital Input Card has two 6-pin audio input connectors (A and B) and one associated 24-pin logic interface connector (LOGIC). The Optical Card has two EIAJ connectors along with the 24-pin logic connector. A ten-position DIP switch for each channel sets whether the logic is active for the A or B input, along with other channel logic functions (Control Room or Studio Mutting, Timer and Cue Resetting, etc.).

Refer back to page 5 for connection information on using unbalanced analog or digital devices with an Input module. Typical logic connections are shown on page 8.

**Impulse channels**

Impulse includes two dedicated Telco channels for interfacing one or two telephone hybrids on the HYBR TEL 1 and HYBR TEL 2 connectors. A simplified block diagram of the Telco connections is shown below.

Each 6-pin HYBR connector connects the caller audio from the telephone hybrid to pins 1, 2 & 3 and the mix-minus audio returning to the caller on pins 4, 5 & 6.

A host and caller recorder connection (TAPE) is used to record on one or both callers. When only one hybrid is used, the caller is routed to the left tape channel and the mix-minus return feed to the caller (typically only the host) is routed to the right tape channel.

With two Telcos being used, Caller 2 can be routed to either the left or right Tape channels. When the Main processor board DIP switch, DS5, #3, is set to Off (as shown above), both callers are summed together onto the left channel. When DS5, #3 is set to On, Caller 1 remains on the left Tape channel and Caller 2 is routed to the right Tape channel, being summed with the mix-minus audio.

PGM1 MAIN is the primary balanced analog stereo on-air output. The PGM1 AUX output is an additional isolated PGM1 stereo output.

The PGM2 MAIN and AUX outputs are the balanced analog outputs of the PGM2 bus. The PGM3 MAIN and AUX outputs are the balanced analog outputs of the PGM3 bus.

Two MONO analog outputs are carried on a single 6-pin connector. Pins 1, 2 & 3 have the Main Mono audio while pins 4, 5 & 6 have an isolated Aux Mono output.

(text continues on page 12)
99-1045-1 Mic Preamp Card

Channel Logic & CR Logic DIP switches
(13 places on Impulse-12, 21 places on Impulse-20)
Switches shown set to the On position

DS1, #1 - Mic 1
DS1, #2 - Mic 2
DS1, #3 - Mic 3
DS1, #4 - Mic 4
DS1, #5 - no connection

99-1045-3, Output PCA
RV1 - PGM-1, left level trimpot
RV2 - PGM-1, right level trimpot
RV3 - PGM-2, left level trimpot
RV4 - PGM-2, right level trimpot
RV5 - PGM-3, left level trimpot
RV6 - PGM-3, right level trimpot
RV7 - Mono level trimpot
RV8 - Ext. Talkback level trimpot


99-1048-1 Left DSP & 99-1048-2 Center DSP
99-1054-1 (cont.)
DS1 - phantom power switches
DSI, #1 - Mic 1
DSI, #2 - Mic 2
DSI, #3 - Mic 3
DSI, #4 - Mic 4
DSI, #5 - no connection

99-1045-3, Output PCA
RV1 - PGM-1, left level trimpot
RV2 - PGM-1, right level trimpot
RV3 - PGM-2, left level trimpot
RV4 - PGM-2, right level trimpot
RV5 - PGM-3, left level trimpot
RV6 - PGM-3, right level trimpot
RV7 - Mono level trimpot
RV8 - Ext. Talkback level trimpot

99-1048-1 & -2, Left & Center DSP
99-1048-1 & -2, Left & Center DSP
99-1049-1 & -2, Left & Center DSP
99-1050, Meter & Bargraph
DS1 - Logic Select for Input 1 or 9
DS2 - Logic Select for Input 2 or 10
DS3 - Logic Select for Input 3 or 11
DS4 - Logic Select for Input 4 or 12
DS5 - Logic Select for Input 5 or 13
DS6 - Logic Select for Input 6 or 14
DS7 - Logic Select for Input 7 or 15
DS8 - Logic Select for Input 8 or 16

99-1050, Meter & Bargraph
DS1, see page 4 for DIP switch listing.

99-1051, Right-hand DSP
DS1 - Logic Select for Input 9 or 17
DS2 - Logic Select for Input 10 or 18
DS3 - Logic Select for Input 11 or 19
DS4 - Logic Select for Input 12 or 20
DS5 - System Logic Selector (as set to On:
#1 - Telco 1 resets timer at On
#2 - Telco 2 resets timer at On
#3 - Telco 2 goes to record out, left
#4 - Telco 2 channel is active
#5 - Cue resets at either Telco On
#6 - Fader Start feature enabled
#7 - Metering style is VU
#8 - Cue is routed to CR headphones
#9 - no connection
#10 - no connection

99-1050 Timer/Bargraph PCA
99-1045-3 Analog Output Interface Card

DIP Switch, Trimpot & Header Jumper Locations

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Monitor Connections

Two direct (fixed level, non-muting) outputs are available: CONTROL ROOM DIRECT follows the control room monitor selector and STUDIO DIRECT follows the studio selector. These can drive headphone amplifiers when a Guest Volume Control and Headphone Jack Panel (99-952) is used.

The CONTROL ROOM MAIN output feeds the amplifier for the control room monitor speakers. This output is controlled by the control room monitor level control and the control room mute logic.

The STUDIO MAIN output feeds the amplifier for the studio monitor speakers. The STUDIO HDPH output may be used to drive an outboard headphone amplifier. This output may be controlled by the CR Headphone level control, which also controls the internal headphone amplifier that drives the operator headphone jack located on the console’s right end panel.

Although input levels from -10 dBu to +4 dBu can be used, all RLS sources must use the same level as the RLS is an active device, therefore, the inputs and outputs cannot be swapped to make a 2 x 7 configuration.

Back to page 5 for unbalanced device connections in audio Input channels or to recording devices. Refer to page 9 for their connection information.

External Talkback

An 8-pin connector (EXT TKBK) has the Talk To and the Talk From audio connections and the Talk To CR logic control from an external location.

The external Talk To CR mic (or line input) is connected to pins 1, 20 & 3. The audio is switched to the Cue speakers as long as the External Talkback control logic on pin 8 is held low (typically by connecting it through a talk switch to pin 7, Logic Ground, on the same connector).

A switched, unbalanced audio output of the CR Talkback Mic is on pin 6 with the audio shield on pin 5. This is activated whenever the Talk button is pressed on the operator panel.

To use a line level External Talkback signal, an internal pad must be used to avoid overloading the input. Jumper pads J1 and J2 together and remove two 0 ohm resistors (R1 and R2) on the Output/Monitor PCA (99-1045-3).

Remote Line Selector (RLS)

The seven RLS inputs (RLS IN) are for analog balanced line-level devices. The seven inputs are independently selected between the two outputs (RLS OUT).

Although input levels from -10 dBu to +4 dBu can be used, all RLS sources must use the same level as the RLS is a unity gain device with no trim adjustments.

The two RLS OUTs are typically connected to analog input channels or to recording devices. Refer back to page 5 for unbalanced device connection information.

Note: The RLS is an active device, therefore, the inputs and outputs cannot be swapped to make a 2 x 7 router device.

Configuration Jumpers

Several three-pin configuration jumpers are on the right-hand DSP Board (99-1051). These set operating conditions for Cue, Ext. Talk and the Mono output. Refer to page 11 for jumper locations.

Note: Do NOT change the jumpers on J31, J32, J33, J51 or J52.

Cue Routing

Jumper J58 sets how the Cue audio is sent to the CR headphone jack and the CR HDPH output. The default setting (pins 1 & 2 jumpered) routes Cue to the right headphone channel and sums the monitor audio into the left headphone channel, while Cue is active. With the jumper on pins 2 & 3, Cue feeds both headphone channels, cutting off monitor audio, while Cue is active.

J48 and J49 select whether the CR HDPH output is fixed level (PRE) or comes after (POST) the respective volume control. The default setting is POST (pins 2 & 3 jumpered on J48 & J49). When CR HDPH feeds a Headphone Panel with Volume Control, move the jumpers to pins 1 & 2 on both J48 & J49 for an output that is not volume controlled.

Note: External Talk can be independently set to bypass the CR volume control regardless of the J48/J49 jumper settings.

Mono Output Selection

The Mono outputs can be fed by one or more Program buses. Jumper j63, j64 and j65 control which bus feeds the Mono outputs (by jumpering pins 2 & 3 together). The unused buses must be grounded through jumpering pins 1 & 2 together.

The default jumper settings route Pgm-1 to the Mono outputs (J63 has pins 2 & 3 jumpered, while J64 and J65 have pins 1 & 2 jumpered).

To route Pgm-2 to the Mono outputs, jumper pins 2 & 3 of J64 and jumper pins 1 & 2 on J63 and J65.

To send Pgm-3 to the Mono outputs, jumper pins 2 & 3 of J65 and jumper pins 1 & 2 on J63 and J64.

Talk to Control Room Routing

Talkback from a Studio microphone is routed onto the Cue bus and is therefore only affected by the Cue Routing jumpers (j48, j49 & j50).

Talkback from an External location is routed separately and is controlled by five jumpers (j43, j44, j45, j46, j47). These jumpers set how External Talk is added to the Cue speaker and CR headphone feed—either before (PRE) or after (POST) the respective volume control. Because the jumpers interact, they must be set per the following Table.
Impulse Operation

Console operation is covered in this section.

Input Channels

Impulse has five types of inputs: Microphone Preamplifier, analog Input, digital Input, Telco Input and analog Remote Line Selector (RLS).

Microphone Preamplifiers

The four microphone preamplifiers have no user-accessible controls. A processor board-mounted DIP switch allows the engineering staff to turn phantom power on or off to each microphone. Four Mic Gain trimpots, located adjacent to the DIP switch, set the individual gain as required for each microphone.

Input Channels

Each Input channel can be set to control a pre-amplified microphone, analog line-level source or a digital source. Each of the 12 or 20 input channels has its own fader level control with separate channel on and off push-buttons and program bus selections.

A Cue function allows the channel’s pre-fader and pre-switched audio to be auditioned through a cue speaker mounted in the meter panel. The Off-line button sends this same audio (pre-fader and pre-switch) to the caller’s Off-line mix-minus bus.

Telco Channels

These two channels are dedicated as Telco inputs in order to assign the callers together to one or more buses, and to control the Return Feed (also called the mix-minus feed) that is sent to the callers to prevent either caller’s voice from being fed back to themselves.

The Telco channel controls are similar to the Input channel controls except there is only one set of Program assignments for the two Telco channels. The Program Select buttons also control the Return Feed source for the two callers.

Because the Off-line source takes priority, anytime the Telco Off-Line button is lit, the callers’ Return Feed is the off-line audio. When Off-Line is not lit, then the Return Feed source comes from the lowest selected bus (i.e. Pgm-1, when selected, otherwise it comes from Pgm-2, unless only Pgm-3 is lit, then Pgm-3 is the source). Auto Feed is used to automatically toggle the Return Feed from Off-Line (when both Telco channels are OFF) to the selected PGM bus (when either Telco channel is ON).

Separate Cue buttons allow either or both callers to be routed to the Cue speaker.

Input Channel Controls

A/B Input Selector Selects the active input (A or B). The button is lit while the B input is selected. Changing inputs while the channel is Off forces the channel Off.

PGM-1, PGM-2, PGM-3 Assigns the channel to any combination of buses. The buttons are lit when the channel is assigned to a bus.

Off-Line When active (button lit), the pre-fader and pre-On/Off audio is sent to the Telco channels’ off-line telephone Foldback bus.

Cue Sends the pre-fader audio to the Cue speaker and to the operator’s headphones. The button is lit while Cue is active.

Fader Set the fader to the reference level (-12 dB) to achieve 0 VU on the program output meters with a nominal +4 dBu analog input signal (and properly adjusted input level trimpots). This position provides unity gain on digital input signals.

Red On Button Turns the channel on, applying the channel’s audio to the selected program buses. It may also initiate logic control commands Start Pulse, Timer Reset, On Tally. Cue Off as well as mute the control room or studio speakers (and turn on the appropriate warning lamp), depending upon the settings of the channel’s Logic Settings DIP switches.

Yellow Off Button Turns the channel off, removing the channel’s audio from all program buses. May also initiate the logic control commands Stop Pulse and Off Tally, depending upon the settings of the channel’s Logic Settings DIP switches.

Telco Channel Controls

Autofeed When lit, the callers’ Return Feed is automatically switched between Off-Line and the PGM mix-minus, as described under Telco Operation, Autofeed Mode. When unlit, the Return Feed comes from the selected bus with the highest priority, as selected by the Operator.

PGM-1, PGM-2, PGM-3 Any one bus or combination of buses can be selected and the Return Feed mix-minus is determined by a preset priority structure as follows: 1) Off-line, 2) PGM-1, 3) PGM-2, 4) PGM-3. When any PGM button is lit and the channel is On, the caller is assigned to the selected buses while the selected bus with the highest priority is fed back to the callers.

Off-Line When lit sends the Off-Line mix bus audio to the callers.

Cue When lit sends the pre-fader, pre-On/Off audio for that Telco channel to the Cue speaker and to the Operator’s headphones.

Fader Set the fader at the reference level (-12 dB) to achieve 0 VU on the program output meters.

Red On Button Turns the channel On, applying the caller’s audio to the selected PGM buses. The Return Feed is the selected PGM bus mix-minus with the highest priority. When the Timer reset switch is set to on, the timer is reset. When the Cue reset switch is set to on, and the Cue is on, the Cue function for that channel is turned off.

Yellow Off Button Turns the channel Off, removing the caller’s audio from the selected PGM buses. The Return Feed will switch to the Off-Line mix bus when Autofeed is active.
Telco Channel Modes

There are two operating modes for the Telco channels: Autofeed or Manual.

Autofeed Mode

This is active when the red Autofeed button is lit. Any combination of buses can be selected (Off-Line, Pgm-1, Pgm-2, Pgm-3). When either Telco channel is Off, the callers' Return Feed is the lowest number bus that is selected.

When both Telco channels are Off, the callers' Return Feed is automatically changed to the Off-Line bus and the Off-line button is lit. The selected Pgm buttons *wink* to indicate their assigned status.

If no program bus has been assigned, then all three Pgm buttons flash together to indicate no bus is selected. In such a case, the caller will not go on-air when their channel is turned On.

Manual Mode

In this mode the Autofeed button is NOT lit. Any combination of assignment buttons can be selected (Off-Line, Pgm-1, Pgm-2, Pgm-3), but these buttons also determine the callers' Return Feed in a prioritized order, with Off-Line taking precedence.

Thus, anytime Off-Line is lit in manual mode, the callers' Return Feed is the Off-Line bus, regardless of the Telco channels' On/Off status.

When the Telco channels are assigned to Pgm-1, and the Off-Line button is NOT lit, then both callers hear the Pgm-1 mix-minus feed (even if Pgm-2 and Pgm-3 are also selected). When Pgm-2 is lit, but Off-Line and Pgm-1 are NOT lit, then the Return Feed is the Pgm-2 mix-minus bus. When only Pgm-3 is lit (Off-Line, Pgm-1, Pgm-2 are NOT lit), the Pgm-3 bus is the Return Feed.

Assigning a bus while either channel is already On immediately adds that caller onto the assigned bus. Turning the channel Off removes the caller from the assigned bus, but does not change the caller's return Feed (it remains the mix-minus from the assigned bus with the highest priority).

Monitor Controls

The Monitor controls are located on the right side of the Operator Panel. They hold the control room (CR) and studio monitor source selectors and monitor volume controls and the Talkback mic and Talk switch.

Monitor Controls

**Control Room and Studio Monitor Source Selectors** Selects the audio sent to the Control Room and Studio outputs from three external audio inputs, PGM-1, PGM-2, PGM-3 and the **Telco Mix** (mix-minus feed on one channel, callers on the other). Multiple sources can be selected for simultaneous monitoring.

**Meter Select** Cue, while pressed, routes the Cue audio to the left channel of the right hand meters. Pgm-2/Pgm-3 selects which program bus feeds the right hand meters.

**Cue** Controls the level of the Cue speaker.

**Talkback Mic** Allows communication to the studio and an external location while the Talkback button is pressed.

**Headphone** Controls the volume of the headphone audio sent to the **Headphone jack** and to the **CONTROL ROOM HD/PH** output.

**Control Room Monitor** Controls the volume of the **CONTROL ROOM MAIN** output.

**Studio Monitor** Controls the level of the **STUDIO MAIN** output.

**Talkback** Sends the Talkback mic to the **STUDIO MAIN, HD/PH and EXT TALK** outputs, while pressed.

**Headphone** Low- or high-impedance stereo headphones can be plugged into the jack mounted on the right side of the console. To prevent headphone or hearing damage, always turn the **Headphone control** fully counterclockwise before plugging in headphones.

**Timer Control**

The Timer Control is pre-wired to the Clock/Timer assembly in the meter panel. The Timer may be manually operated by the Timer control buttons. Automatic timer operation occurs through the console's Timer Reset bus when the Auto button is lit.

In Auto mode, when an Input channel has been set for Timer reset (the Logic Settings switches 5 or 6 have been set to On), the Timer resets and counts up from 00:00 when that Input channel is turned on. Any number of Input channels can be set for Timer Reset.

**Remote Line Selector (RLS)**

The RLS has two switch banks which share seven common input sources. This creates a 7 x 2 switcher. The seven sources are independently selectable between the two outputs. Often one output will connect to an Input channel, while the other will be connected to a patch bay or recording device.
Meter Panel

The meter panel holds the Clock/Timer assembly, the two sets of bargraph level meters and the Cue Talkback speaker.

The clock has no external controls. Clock time setting requires the use of the Clock Setting Magnet Tool (supplied in the Tool Kit) when the clock is set for master mode. In slave mode, where clock timing is derived from an ESE time code signal, the clock does not need to be set. See page 6, Setting the Clock, for information on setting the time.

There are no meter calibrations on the electronic meter movements. The meters use IEEE standard #152-1991 (standard audio program level measurement). When set for PPM display mode (a board mounted DIP switch), the PPM indications light and a +4 dBu sine wave output signal displays -8 on the PPM scale.

When set for displaying VU, the VU indications light and a +4 dBu sine wave output displays 0 on the VU scale. Each of these settings corresponds to -20 dBFS (decibels below Full Scale digital output). A Peak indicator lights up when the output signal reaches -3 dBFS.

The meters display the left channel audio output on the top row and the right channel audio on the bottom row of each meter. The right hand meter shows either the Pgm-2 or Pgm-3 output. It also can momentarily show the Cue bus level by pressing the Cue button (see the illustration on page 13). While this button is pressed the top row of LEDs show the Cue bus output level.

The Cue Talkback speaker's impedance is 45 ohms with a 3-watt power-handling capacity. The speaker volume is controlled by the Cue volume control. A 3-watt amplifier IC drives the speaker.

Mic Preamps & RLS

The four mic preamps and dual 7-input RLS are located on separate circuit boards that plug into the left-hand main board.

Each balanced microphone input uses a precision surface-mount microphone preamplifier IC to amplify the microphone signals. Buffer amplifier ICs, along with the gain trimpots (RV1 - RV4), boost the mic signals for a nominal output level of +4 dBu on the MIC OUT connectors.

Phantom power switch DS1 controls whether +48 volts is applied, via a pair of 6.8k resistors, to any MIC IN connector. The switches ship from the factory set in the off position.

6-pin MIC OUT connectors simplify connection to Input channels by paralleling the microphone signal to both the left and right outputs.

The analog RLS has seven line-level inputs with two outputs in a 7 x 2 matrix. Pressing a front panel RLS button routes the selected input audio through solid state switches to op-amps that buffer the audio for the appropriate output (RLS OUT 1 and RLS OUT 2).

INPUT CHANNELS

Each channel's two balanced inputs (A and B) connect directly to an Input Card. Three Input Cards are available: Analog Input (99-1041), Digital Input (99-1042-1); for two AES/EBU or 5/PDIF inputs, or Optical Input (99-1042-2).

The channel "faders" use control voltages only, getting their reference voltages (both high and low) from the Main DSP boards. Each fader's wiper output connects via a separate line to a DSP board for individual channel level control. All of the channel controls (switches and fader) for a pair of input channels (1 & 2, 3 & 4, 5 & 6, etc.) are mounted onto a single control circuit board. All six, or ten, input control boards are identical. Each connects to the DSP using a plug-in flex cable.

The channel assignment switches are momentary SPST switches with integral LED indicators. The channel's On/Off switches are also momentary SPST switches, but they are illuminated with incandescent lamps.

When any Program select button is active, fader-controlled audio for that channel is connected to the selected digital Program bus(es). When the Cue or Off-Line function is active, the input audio signal is applied to the appropriate digital summing bus. A DAC (Digital-to-Analog Converter) converts the digital bus into analog audio for the Cue and caller Return Feed.

Ten-position Logic Settings DIP switches (DS2 - DS21) set whether logic control is active on the A or the B input for each channel. There are five logic control outputs and six logic control inputs on each logic interface. All control inputs and outputs are optically coupled for isolation and to prevent ground loops in addition to being current limited so logic levels from +5 to +40VDC can be accommodated.

TELCO CHANNELS

The two Telco channels are located next to the Monitor controls. Each Telco channel connects to one telephone hybrid. All of the caller mix-minus audio and caller audio program assignment is built into the channel switching.

The Telco faders and the switches, like those on the Input channels, connect directly to the main DSP boards. The Telco Hybrid audio outputs carry a sum of the Telco mix-minus audio and the caller's audio from the...
other Telco channel. The Telco mix-minus audio also goes to the right channel of the TAPE output. The caller audio from the second hybrid may be summed with the mix-minus or with the other caller, following the setting of DIP switch DS5, #3.

Auto-Feed

When the Auto-Feed function is active, the mix-minus output of the selected bus with the highest priority is fed back to both callers. When both Telco channels are Off, the Off-line bus audio is automatically sent to the callers.

When Auto-Feed is not selected, the mix-minus for the assigned bus with the highest priority is sent to both callers regardless of which condition (On or Off) the Telco channels are in.

Note: With Off-line selected and Auto-Feed turned off, neither caller will go on-air when the Telco channel is turned On since there is no Program bus assignment.

MAIN DSP BOARDS

Each Main Board fastens to the bottom of the mainframe, plugging directly into the adjacent Main Board. The power supply cable plugs onto the right-hand Main Board.

Digital Signal Processing

Impulse’s digital processing is based on Motorola’s 24-bit fixed point DSPs. 24-bit data words provide 144 dB of dynamic range. The DSP operates at a nominal sample rate of 48 kHz with on-board crystal synchronization. The internal resolution of 56-bits provides 336 dB of computational dynamic range.

The left-hand Main DSP Board handles the first eight input channels on both the Impulse-12 and the Impulse-20. Each of the first eight Input channel positions connect their serial data outputs, along with their switch outputs and fader wiper voltage, directly to the DSP on this board. On the Impulse-20, the next eight channels (input channels 9 - 16) are handled by a second “left-hand” Main DSP Board centered between the left- and right-hand Main DSP Boards.

The right-hand Main DSP Board handles the remaining four Input channels for each console and the two Telco channels. This DSP also creates the main digital program, Cue and Talkback outputs and the meter outputs. Each board generates its own DSP reference signals with the right-hand Main DSP Board generating the system clocks and system reset signals.

OUTPUTS

An FPGA on the 95-1047 PCA divides the single multiplexed data stream output from the DSP into its component data parts to create digital Cue, Off-line, Pgm-1, Pgm-2 and Pgm-3 buses. The digital PGM program signals go through AES/EBU transmitters to create the transformer-coupled Digital Pgm-1, Pgm-2 and Pgm-3 outputs. There are no level adjustments on the digital outputs.

These signals also go through DA Cs (Digital-to-Analog Converter) and buffer amps to create the six analog outputs (Analog Pgm-1, Pgm-2, Pgm-3). The DACs left and right outputs are capacitively-coupled through buffers and output trim controls (RV1 - RV7), which set the output levels to a nominal +4 dBu output. The three PGM MAIN outputs are also connected to the CR and Studio source selectors.

The MONO outputs (Main and Aux) are selected from between the three program buses by Output board jumper J63-J65. RV7 sets the MONO output level to +4 dBu.

A single stereo DAC converts the combined CUE/TALK audio output from the FPGA into the analog Cue and Telco mix-minus signals. The Cue signal goes to the audio from the second hybrid may be summed with the mix-minus or with the other caller, following the setting of DIP switch DS5, #3.

Single stereo DAC converts the combined CUE/TALK audio output from the FPGA into the analog Cue and Telco mix-minus signals. The Cue signal goes to the audio from the second hybrid may be summed with the mix-minus or with the other caller, following the setting of DIP switch DS5, #3.

MONITORING

The left-hand row of monitoring controls (the Source Select buttons, Cue, Headphone and Monitor level pots) are for the Control Room. The right-hand row has the Source Select buttons, the Studio monitor speaker level control and the Studio Talkback button.

Control Room Functions

The selected CR monitor source is coupled to both the CR Monitor Pot and to the CR headphone signal assignment switcher. The output of the CR monitor pot goes through mute switch, controlled by the CR Mute logic bus, before being buffered and balanced for output to create the main CR Monitor Output.

Studio Functions

The selected Studio monitor source is coupled to both the Studio Monitor Pot and to the Talent headphone circuit. Talkback is inserted into the studio monitor signal under control of the Talkback command.

Cue/Talkback

The Cue Talkback audio (after it is converted from digital by a DAC) is coupled to the Cue pot and to the headphone audio assignment switcher. The output of the Cue pot connects to the speaker amplifier IC which is muted by the Cue Mute logic signal.

The built-in electret Talkback microphone is gain controlled by trimpot (RV3) on the right-hand Main Board. The Talkback mic audio is switched into the Studio outputs and the External Talkback output by the Talkback switch.

CR Headphone

The CR headphone audio is either the selected source monitor or the Cue Talk bus. When a channel has Cue active, or when a Guest panel is activating the Talk logic, the monitor audio is cut off and Cue Talk audio is fed to the console headphones. The CR Headphone Level control sets the level to the internal headphone amplifier for the headphone jack on the right side of the console and to the balanced CONTROLS ROOM HD/PH output.

TIMBER CONTROLS

The operator panel timer control switches (Start, Stop, Reset, Hold) manually control the timer section of the clock/timer assembly. The Auto button controls whether the timer reset bus logic is connected to the timer. When Auto is active (button lit) the timer automatically resets at channel On for any channel with the Timer Reset logic function turned on (Logic Settings switches 5 or 6 set to On).

CLOCK/TIMER ASSEMBLY

Eleven 7-segment displays are used in the clock and timer. The clock and timer are controlled by the on-board oscillator. The on-board oscillator is controlled by the CR Mute logic, the monitor audio is cut off and Cue/Talk audio is fed to the console headphones. The CR Headphone Level control sets the level to the internal headphone amplifier for the headphone jack on the right side of the console and to the balanced CONTROLS ROOM HD/PH output.

BARGRAPH METERS

The switching supply outputs four DC voltages: +5 volts at 7.5 A for the console’s logic circuitry, ±15 volts at 1.0 A each for the audio circuitry and +48 volts at 0.100 A for phantom powering of condenser microphones.
**The Impulse Digital Console**

### Main DSP Boards (99-1047, 99-1048-1 & 99-1048-2 in Impulse-20 only)
- **Monitor/Meter PCA (95-1045-1)**
- **Operator Panel**
- **Monitor Switches, LEDs, CR Pots & Studio Pots**
- **Dips**
- **Microcontrollers**
- **Bus Interfacing**
- **Memory**
- **Clock Generation**

### Power Supply
- 84 - 268 VAC
- 50/60 Hz
- Power Supply (95-1052)
- +48 volts (V+48A)
- +15 volts (V+15A)
- +5 volts (V+5A)
- +5 volts (V+5A)

### Analog Input Card (95-1041)
- A/B Input Select
- Mic Gain
- Preamplifier Outputs

### Digital Input Card (AES: 99-1042-1 Optical: 99-1042-2)
- **Digital Input PCA**
- **AES/EBU Receivers**
- **Sample Rate Converters**
- **Clocks**

### Output / Monitor Connect Board (95-1045-3)
- **Pgm Outputs**
- **Pgm Outputs**

### Right Main Board (99-1047) (Output Section)
- **Central Gain Level**
- **Cue Audio**
- **Talk & Cue Routing, HP Routing, Switching & Muting**
- **CR Level**
- **CR Direct Output**
- **CR Main Output**
- **CR Main Output**

### Impulse Block Diagram

- **Clocks**
- **Digital Buses**
- **Control Logic**
- **Digital-to-Analog Converters**
- **Mono Source Select**
- **AES/EBU Transmitter**
- **Digital Program Bus**
- **Mono Program Bus**
- **Cox Audio**
- **Digital Program Outputs**
- **To Hybrid 1**
- **To Hybrid 2**
- **To Tape Left**
- **To Tape Right**
- **To Tape Mix/Minis**
- **Record & Hybrid Output Switching**
- **To DSP**
- **To DSP Interconnect**
- **DIP Switches DS 5**
- **CR Warning**
- **Studio Warning**
- **Logic Bus Signals**

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IIl of the switches, button caps and faders on Impulse are easily field replaceable.

Although schematics are available in the Impulse Technical CD-ROM (sold separately), it is recommended that circuit boards be returned to PR&E for component servicing due to their surface mount construction.

PARTS & REPAIR INFORMATION

Spare parts and accessories are available from PR&E’s Technical Support Department. Most repair parts are shipped within 24 hours, but circuit boards and other assemblies may have lead times exceeding two weeks, so order spare parts accordingly.

Parts returned to PR&E for service, exchange or credit must have a Return Material Authorization (RMA) tracking number assigned to them by Technical Support. Items returned without an RMA number written on the outside of the packaging are subject to customer return or to additional handling fees.

To order parts or request an RMA, contact Technical Support by phone, fax, e-mail or post:

Harris
Attention: PR&E Technical Support
4240 Irwin Simpson Road
Mason, OH 45040 USA
Phone: 800.622.0022 8:00 to 5:00 PT
Fax: 513.701.5309
E-mail: service@pre.com

All items are shipped FOB Mason, OH using two-day service, unless otherwise specified at time of order. Overnight or Next Day A.M. delivery is available for most items. Orders must be placed before 2:00 P.M. Eastern Time for parts to ship the same day (applies to in-stock items only).

Parts or repair services can be shipped COD, or charged to American Express, VISA or Mastercard, if in-stock items only).

Orders must be placed before 2:00 P.M.

Parts returned to PR&E for service, exchange or credit must have a Return Material Authorization (RMA) tracking number assigned to them by Technical Support. Items returned without an RMA number written on the outside of the packaging are subject to customer return or to additional handling fees.

To order parts or request an RMA, contact Technical Support by phone, fax, e-mail or post:

Harris
Attention: PR&E Technical Support
4240 Irwin Simpson Road
Mason, OH 45040 USA
Phone: 800.622.0022 8:00 to 5:00 PT
Fax: 513.701.5309
E-mail: service@pre.com

All items are shipped FOB Mason, OH using two-day service, unless otherwise specified at time of order. Overnight or Next Day A.M. delivery is available for most items. Orders must be placed before 2:00 P.M. Eastern Time for parts to ship the same day (applies to in-stock items only).

Parts or repair services can be shipped COD, or charged to American Express, VISA or Mastercard, if company is not on-account with Harris. Contact your sales representative regarding your company’s account.

Parts or repair services can be shipped COD, or charged to American Express, VISA or Mastercard, if company is not on-account with Harris. Contact your sales representative regarding your company’s account.

Parts marked with an * are those typically subject to usage wear and tear. It is recommended that one or more of each be kept in the on-site spares stock.

Impulse Replacement Parts

Parts marked with an * are those typically subject to usage wear and tear. It is recommended that one or more of each be kept in the on-site spares stock.

PR&E # | Description or Use
--- | ---
12-95 | Lamp & Housing, On-Off & Talkback
12-101 | Lamp only, On-Off & Talkback
23-1 | Cue speaker
24-98 | Cue Pot
24-100 | Monitor levels & H/P Pot
25-853 | Pgm. A/B, RLS, Monitor switch
25-854 | Autoed switch
25-855 | Cue switch
25-856 | Off-Line switch
25-858 | On switch w/red button cap
25-859 | Off switch w/yellow button cap
25-860 | Talk switch w/white button cap
25-870 | White button cap
25-871 | Red button cap
25-872 | Yellow button cap
50-21 | Power Supply asy.
80-1121 | Clock/Timer bezel
80-1500-4 | 1.5” wide blank cover
80-1500-5 | 3” wide blank cover
80-1500-6 | 4.5” wide blank cover
* 95-1044 | Channel fader asy.
99-1041 | Analog Input PCA
99-1042-1 | Digital Input PCA
99-1042-2 | Optical Input PCA
99-1045-1 | Mic Preamplifier
99-1045-2 | Remote Line Selector PCA
99-1045-3 | Output amplifier PCA
99-1046-1 | RLS/Timer switchboard
99-1046-2 | Monitor/Meter switchboard
99-1046-3 | Main DSP Board, left
99-1046-4 | Main DSP Board, center
99-1048-2 | Dual Input Control PCA
99-1049-2 | Dual Tele Control PCA
99-1050 | Bargraph/Timer/Clock asy
99-1051 | Main DSP Board, right

Installation Kit Parts

The Tool and Connector kits supplied with each console contain these parts:

PR&E # | Description |
--- | ---|
76-899 | Impulse-12 Connector Kit
14-482 | 3-pin AMP housing
14-484 | 6-pin AMP housing
14-486 | 8-pin AMP housing
14-500 | 24-pin AMP housing
15-938-1 | Receptacle contacts

76-900 | Impulse-20 Connector Kit
14-482 | 3-pin AMP housing
14-484 | 6-pin AMP housing
14-486 | 8-pin AMP housing
14-500 | 24-pin AMP housing
15-938-1 | Receptacle contacts

76-901 | Impulse Tool Kit
50-2 | All-Balline Battery
50-126 | Crimp Tool
70-129 | Contact Tool
90-151 | Clock Meter Tool

SERVICING

Refer to the Impulse Technical CD-ROM (sold separately) for complete servicing instructions and parts listings.

Operator Panel

To place the operator panel into its service position:

1. Loosen the two rear corner 1/4-turn screws.
2. Pull up on the Pull Handle (middle rear of operator panel) to tilt the panel forward to its service position.

Circuit Board Replacement

The Dual Input Channel circuit boards can be removed or installed with the console powered, and with it on-air, without causing audio interruption or noises in the program audio. Removal or installation of any other circuit board requires that the console power be turned off.

When the console is first turned on, all Inputs come up in their default turn-on state—no bus assignments active, the channel turned Off. Each pair of channel controls (1 & 2, 3 & 4, etc.) are on one Dual Input circuit board.

Note: Prior to removing any Input board from the operator panel, turn off all bus assignments.

Dual Input Channel Board Removal

1. Unplug the flex cable connecting that board to the Main board.
2. Remove the fader screws from the front surface of the operator panel. The two faders are removed along with the Dual Input board.
3. Remove the flat head Phillips screws holding the circuit board to the underside of the operator panel and remove the circuit board and faders.

Monitor Pot or Switch Removal

Note: Impulse uses sealed pots that cannot be “cleaned.”

1. Unplug the pot, or the flex cable, connecting the component to the Main board.
2. To replace a pot, remove the colored end cap from the knob by prying it loose. Use a 70-44 Sifam Knob Removal Tool or hex driver to loosen the lock nut so the knob assembly can be removed from the pot shaft. Use a 7/16 inch nutdriver to remove the shaft nut.
3. To remove the monitor selector circuit board, remove the flat head Phillips screws holding the circuit board to the operator panel and remove the circuit board.

Main Board Removal

1. Unplug the flex cables connecting the Input boards, or the pots and Monitor board to the Main board.
2. Unplug all external cables from the audio and logic connectors on the rear panel.
3. Unplug the Input Cards from the Main board.
4. Remove the flat head Phillips screws holding the Main board to the bottom chassis. Unplug the board from the adjacent Main boards and remove and the circuit board.

**Fader Servicing**

All faders are single-element, conductive plastic (PR&E # 95-1044). There are no replaceable nor rebuildable parts on the Impulse fader assembly. Fader service is comprised of cleaning and lubricating, or replacing.

Use only a cotton swab wet with distilled water to wipe off the conductive plastic.

**Note:** The use of chemical cleaners on the conductive plastic will substantially shorten fader life. Never touch the fader slider contact fingers while cleaning the fader parts.

If the fader movement is rough, either the lubricant on the glide rail has evaporated or foreign material has gotten into the fader. Dow Corning 510 is the preferred glide rail lubricant as it will not migrate to the slider contact fingers like other lubricating oils.

Each fader is fastened to the operator panel using two 1/16 inch button head screws and plugs into a circuit board connector.

To lubricate the top rail, remove the fader side cover and center the fader slider. Place a drop of Dow Corning 510 on the rail to each side of the slider. Move the slider through the full range of fader travel to lubricate the rail. Wipe off any excess lubricating fluid using a dry cotton swab.

**Button Engraving**

Input and Telco channels come standard with their red and yellow button caps engraved ON and OFF. Custom engraving on the button caps can be ordered at the time of purchase or engraved replacement button caps can be ordered once the input sources have been determined.

Each button cap can have one or two lines of engraving with up to four alphanumeric characters and a ½ character punctuation divider (space, period, hyphen, slash, backslash, etc.) on each line.

Engraving is normally done on the yellow button cap to identify the A input source on the top line and the B input source on the bottom line.

Custom engraving can be specified when a blank button cap is ordered. For a yellow button cap, order 25-872. For a red button cap, order 25-871. For a white button cap, as used for the Talkback button, order 25-870.

**CONSOLE CONTROL PANELS**

To the left of the channel 1 controls is the User Panel area. This area can hold up to three custom or standard PR&E control panels. Panel dimensions are listed on page 20.

**Recorder Remote Panel**

The Recorder Remote panel used on the PR&E Integrity console (99-993-x) can also be used on Impulse. It is a single recorder remote with five control buttons (Play, Stop, Record, Forward and Reverse).

The panel comes with a 24-pin Molex connector for use with standard PR&E cables. The mating Molex connector and pins are included for making up a custom cable in the field.

The panel can be ordered without lamps (99-993-0), with 5 volt lamps (99-993-1), with 14 volt lamps (99-993-2) or with 24 volt lamps (99-993-3) to match the recorder’s tally voltages.

**Custom Remote Control Panels**

Three blank panels are available to create custom panels: Single width, 1.5” x 6.0” (80-1663-4), Dual width, 3.0” x 6.0” (80-1663-3) and Triple width, 4.5” x 6.0” (80-1663-2). Minimum clearance below these panels is 2” (50.8 mm). A small cover panel, 2.25” x 4.5” (80-1663-1), located directly below the User Panel area, can also be used, although vertical clearance below this panel is limited.

All control wiring routes through an opening on the console’s rear panel. We recommend that custom wiring terminate in a connector to ease installation and future servicing.

Custom remote panels can also be fabricated by Harris, contact a sales representative for pricing and availability.

**Guest Panels**

Two Guest Mic Control Panels are available for Impulse: cabinet-mounted (99-949-1) and turret-mounted (99-949-2).

Each panel has four engraved illuminated buttons (On, Off, Cough, Talkback). The Guest Panel schematic and the connecting cable drawing (99-716-CU) are shown on page 20.

**LOGIC CONTROL CABLES**

To help in logic cable design and construction, logic wiring diagrams for many popular peripherals are available from PR&E. The most common cable diagrams are also included on the Impulse Technical CD-ROM.

Pre-made logic cables for many peripherals are also available, contact a sales representative for pricing and availability.
GUEST PANEL, CABINET MOUNT (99-949-1), TURRET MOUNT (99-949-2)

J4: Housing, wafer, 10-pin female locking Molex # 22-01-2107 (PR&E # 15-524)
Terminals, gold, female crimp Molex # 08-58-0110 (PR&E # 15-8)

S1 - S4: Switch, 17 mm JAE # 11LC17-0 (PR&E # 25-873)
Lamp, JAE # 11LB17-0 (PR&E # 12-101)

99-716-CU LOGIC CABLE, CHANNEL LOGIC TO GUEST PANEL (99-949-x)

J1: Housing, 24-pin AMP Mod IV # 2-87631-0 (PR&E # 14-513)
Terminals, female AMP Mod IV # 102128-1 (PR&E # 15-938-1)

J2: Housing, wafer, 10-pin female locking Molex # 22-01-2107 (PR&E # 15-524)
Terminals, crimp, gold female Molex # 08-56-0110 (PR&E # 15-8)

Cable: 9-cond. Belden # 9423 or equivalent
Wire: 26 AWG white hook up, UL1429 or equivalent

INPUT CHANNEL LOGIC FUNCTION | J1 Pin | BLK | OUTPUT GUEST PANEL FUNCTION | J2 Pin
--- | --- | --- | --- | ---
+5 VDC | 10 | BLK | Tally +VDC | 1
Talkback (-) | 20 | WHT | 2
On Tally | 17 | RED | Talkback Switch | 2
Off Tally | 16 | GRN | On Lamp | 7
Logic Active | 15 | BRN | Off Lamp | 9
Logic Ground | 1 | BLU | Talkback/Cough Lamp | 5
On (-) | 7 | ORN | Switch Common | 10
Off (-) | 8 | YEL | On Switch | 6
Cough (-) | 9 | VIO | Off Switch | 8
+5 VDC Logic | 6 | WHT | Cough Switch | 4
Ext. Ctrl In (+) | 18 | WHT |
Logic Ground | 2 |
Tally Common | 14 |

ACCESSORY PANEL DIMENSIONS
(Left end of operator panel, below the Timer and RLS buttons)

SINGLE BLANK: 80-1500-4
DOUBLE BLANK: 80-1500-5
TRIPLE BLANK: 80-1500-6 *
* supplied with console

INTEGRITY CONSOLE RECORDER REMOTE

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