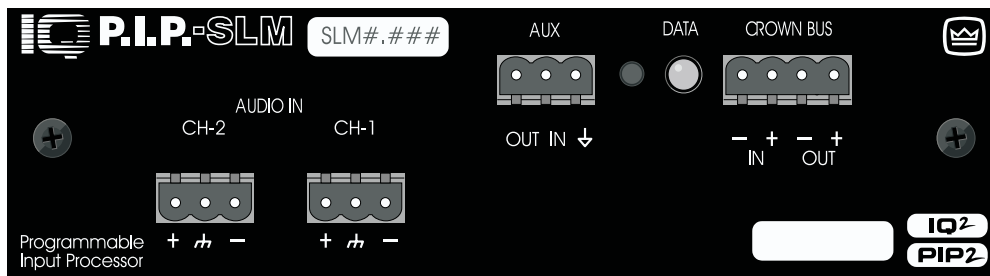


IQ P.I.P.-SLM

REFERENCE MANUAL



**An IQ System® Programmable Input Processor with Load Monitoring
for Crown® P.I.P.®-compatible Power Amplifiers**

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THREE YEAR FULL WARRANTY



WORLDWIDE

NORTH AMERICA

SUMMARY OF WARRANTY

The Crown Audio Division of Crown International, Inc., 1718 West Mishawaka Road, Elkhart, Indiana 46517-4095 U.S.A. warrants to you, the ORIGINAL PURCHASER and ANY SUBSEQUENT OWNER of each NEW Crown¹ product, for a period of three (3) years from the date of purchase by the original purchaser (the "warranty period") that the new Crown product is free of defects in materials and workmanship, and we further warrant the new Crown product regardless of the reason for failure, except as excluded in this Crown Warranty.

¹ Note: If your unit bears the name "Amcron," please substitute it for the name "Crown" in this warranty.

ITEMS EXCLUDED FROM THIS CROWN WARRANTY

This Crown Warranty is in effect only for failure of a new Crown product which occurred within the Warranty Period. It does not cover any product which has been damaged because of any intentional misuse, accident, negligence, or loss which is covered under any of your insurance contracts. This Crown Warranty also does not extend to the new Crown product if the serial number has been defaced, altered, or removed.

WHAT THE WARRANTOR WILL DO

We will remedy any defect, regardless of the reason for failure (except as excluded), by repair, replacement, or refund. We may not elect refund unless you agree, or unless we are unable to provide replacement, and repair is not practical or cannot be timely made. If a refund is elected, then you must make the defective or malfunctioning product available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers. We will remedy the defect and ship the product from the service center within a reasonable time after receipt of the defective product at our authorized service center.

HOW TO OBTAIN WARRANTY SERVICE

You must notify us of your need for warranty service not later than ninety (90) days after expiration of the warranty period. All components must be shipped in a factory pack. Corrective action will be taken within a reasonable time of the date of receipt of the defective product by our authorized service center. If the repairs made by our authorized service center are not satisfactory, notify our authorized service center immediately.

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YOU ARE NOT ENTITLED TO RECOVER FROM US ANY INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN THE NEW CROWN PRODUCT. THIS INCLUDES ANY DAMAGE TO ANOTHER PRODUCT OR PRODUCTS RESULTING FROM SUCH A DEFECT.

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No person has the authority to enlarge, amend, or modify this Crown Warranty. This Crown Warranty is not extended by the length of time which you are deprived of the use of the new Crown product. Repairs and replacement parts provided under the terms of this Crown Warranty shall carry only the unexpired portion of this Crown Warranty.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

No action to enforce this Crown Warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

THIS STATEMENT OF WARRANTY SUPERSEDES ANY OTHERS CONTAINED IN THIS MANUAL FOR CROWN PRODUCTS.

9/90

Telephone: 219-294-8200. Facsimile: 219-294-8301

SUMMARY OF WARRANTY

The Crown Audio Division of Crown International, Inc., 1718 West Mishawaka Road, Elkhart, Indiana 46517-4095 U.S.A. warrants to you, the ORIGINAL PURCHASER and ANY SUBSEQUENT OWNER of each NEW Crown product, for a period of three (3) years from the date of purchase by the original purchaser (the "warranty period") that the new Crown product is free of defects in materials and workmanship. We further warrant the new Crown product regardless of the reason for failure, except as excluded in this Warranty.

ITEMS EXCLUDED FROM THIS CROWN WARRANTY

This Crown Warranty is in effect only for failure of a new Crown product which occurred within the Warranty Period. It does not cover any product which has been damaged because of any intentional misuse, accident, negligence, or loss which is covered under any of your insurance contracts. This Crown Warranty also does not extend to the new Crown product if the serial number has been defaced, altered, or removed.

WHAT THE WARRANTOR WILL DO

We will remedy any defect, regardless of the reason for failure (except as excluded), by repair, replacement, or refund. We may not elect refund unless you agree, or unless we are unable to provide replacement, and repair is not practical or cannot be timely made. If a refund is elected, then you must make the defective or malfunctioning product available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at the factory. We will remedy the defect and ship the product from the service center or our factory within a reasonable time after receipt of the defective product at our authorized service center or our factory. All expenses in remedying the defect, including surface shipping costs in the United States, will be borne by us. (You must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other customs fees for such foreign shipments.)

HOW TO OBTAIN WARRANTY SERVICE

You must notify us of your need for warranty service not later than ninety (90) days after expiration of the warranty period. All components must be shipped in a factory pack, which, if needed, may be obtained from us free of charge. Corrective action will be taken within a reasonable time of the date of receipt of the defective product by us or our authorized service center. If the repairs made by us or our authorized service center are not satisfactory, notify us or our authorized service center immediately.

DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES
YOU ARE NOT ENTITLED TO RECOVER FROM US ANY INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN THE NEW CROWN PRODUCT. THIS INCLUDES ANY DAMAGE TO ANOTHER PRODUCT OR PRODUCTS RESULTING FROM SUCH A DEFECT. **SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.**

WARRANTY ALTERATIONS

No person has the authority to enlarge, amend, or modify this Crown Warranty. This Crown Warranty is not extended by the length of time which you are deprived of the use of the new Crown product. Repairs and replacement parts provided under the terms of this Crown Warranty shall carry only the unexpired portion of this Crown Warranty.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

THIS CROWN WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. No action to enforce this Crown Warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

THIS STATEMENT OF WARRANTY SUPERSEDES ANY OTHERS CONTAINED IN THIS MANUAL FOR CROWN PRODUCTS.

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Quick Install Procedure

This procedure is provided for those who are already familiar with Crown's *IQ System* and who would like to install the *IQ-P.I.P.-SLM* in the shortest time possible. Less experienced installers or those wishing a full explanation of the installation procedure are encouraged to go to Section 4 where the full installation procedure is described.

Prepare the IQ-P.I.P.-SLM:

1. Set the IQ address switch SW1 (see Figures 4.1 and 4.2) on the *IQ-P.I.P.-SLM* to an unused IQ address. (Tip: Record the IQ address on the small blank label that is provided on the *P.I.P.* panel.)

Prepare the amplifier:

2. Turn down the level controls of the amplifier and turn off the amplifier.
3. Unplug the power cord of the amplifier from the AC mains.
4. Remove the existing *P.I.P.* or cover panel from the amplifier back panel (two screws).

Install the IQ-P.I.P.-SLM into the amplifier:

5. Carefully ground yourself to the chassis of the amplifier before installing the *IQ-P.I.P.-SLM*. It is a good idea to maintain ground contact between yourself and the amplifier while inserting the module into the amplifier in the next step.
6. Turn the *P.I.P.* upside down so you can clearly see the two ribbon cable connectors located on the underside of the top board near the back corner (see Figure 4.3). Attach the ribbon cables from your amp to the ribbon-cable connectors. The 20-pin cable should be connected first, then the 18-pin cable should be connected. Both ribbon cables should run untwisted from the amplifier to the *P.I.P.* card.

Important: Be careful when attaching the ribbon cable to the connector that the cable is properly seated before applying pressure to the connector. Forcing the cable onto the connector could cause the keying tabs, which ensure proper pin alignment, to break. Connecting the ribbon cables with improper pin alignments may well result in catastrophic damage to the *P.I.P.* component.

When both cables are firmly attached, turn the *IQ-P.I.P.-SLM* back to an upright position and insert into the *P.I.P.* opening in the back of the amplifier. Take care while inserting the *P.I.P.* to make sure you do not crimp, pinch or stretch the ribbon cables.

7. Tighten the two *P.I.P.* mounting screws until it is secured to the amplifier back panel.

Install the wiring:

8. Connect the *IQ-P.I.P.-SLM* to the *IQ System* via the Crown Bus (see Section 4.6 if more information is needed).
9. Connect the audio signal wiring to the *IQ-P.I.P.-SLM* (see Section 4.7 if more information is needed).
10. Connect the amplifier back to the AC receptacle.

The information furnished in this manual does not include all of the details of design, production, or variations of the equipment. Nor does it cover every possible situation which may arise during installation, operation or maintenance. If you need special assistance beyond the scope of this manual, please contact our Technical Support Group.

Crown Audio Division Technical Support Group

Plant 2 SW, 1718 W. Mishawaka Rd., Elkhart, Indiana 46517 U.S.A.

Phone: **800-342-6939** (North America, Puerto Rico and Virgin Islands) or 219-294-8200

Fax: 219-294-8301 Fax Back (North America only): 800-294-4094 or 219-293-9200

Fax Back (International): 219-294-8100 Internet: <http://www.crownintl.com>

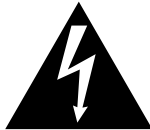


WARNING

TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE!

PLEASE NOTE

The following universal symbols may appear on your product and/or in various sections of this manual. Wherever they appear, they are to be interpreted as follows:



Lightning Bolt Symbol:

This symbol is used to alert the user to the presence of dangerous voltages and the possible risk of electric shock.



Exclamation Mark Symbol:

This symbol is used to alert the user to refer to the instruction manual for important operating or maintenance instructions.

FCC COMPLIANCE NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

“The user is cautioned that any changes or modifications not expressly approved by Crown International could void the user’s authority to operate the equipment.”

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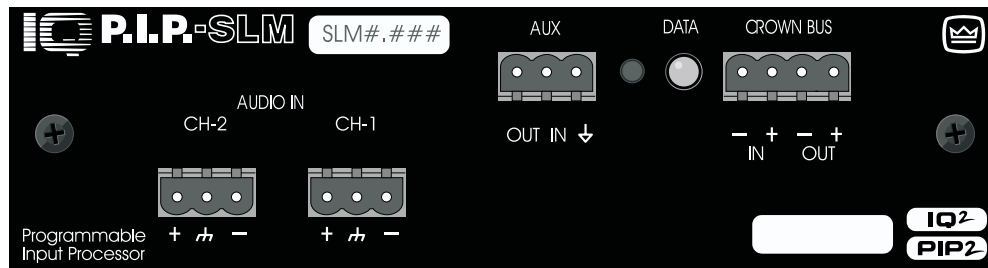


Fig. 1.1 IQ-P.I.P.-SLM

1 Welcome

The *IQ-P.I.P.-SLM* brings both load and current monitoring capabilities to your PIP2-compatible amplifier.* Featuring a built-in sine-wave generator and data-acquisition system, the P.I.P.-SLM allows you to perform independent testing of each amplifier channel for both load impedance and amplifier frequency response.

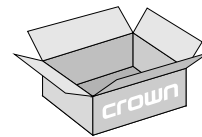
The *IQ-P.I.P.-SLM* is an *IQ2*-series component. This means it supports Crown's UCODE protocol and requires an *IQ System*[®] with an *IQ2*-compatible *IQ Interface* (such as IQ-INT V2.00+ or IQ-PSI) plus IQ for Windows 1.1+ software. UCODE (universal code) enables users and third parties to develop custom software objects to control and monitor *IQ2*-compatible components like the *IQ-P.I.P.-SLM*.

The *IQ-P.I.P.-SLM* connects the amplifier to the Crown Bus of an *IQ System* so the amplifier can be controlled and monitored. In addition, the *IQ-P.I.P.-SLM* contains a built-in sine-wave generator and data acquisition system which permits measurement and storage of load impedance and system frequency response reference curves for each channel. The generator on each card is independent of those on other cards, permitting each channel of each amplifier to be tested separately.

The *IQ-P.I.P.-SLM* is powered by the amplifier and includes a microprocessor with a memory backup feature that enables the amplifier to resume operation with all of its IQ settings intact after a power outage.

*Note: You must have a PIP2-compatible amplifier to use the *IQ-P.I.P.-SLM*. The *IQ-P.I.P.-SLM* is NOT compatible with older Crown P.I.P. amplifiers, with or without a PIP2 adapter.

This manual will help you successfully install your unit. We strongly recommend that you read all the instructions, warnings and cautions contained within. Also for your protection, please send in the warranty registration card today and save the bill of sale since it is your official proof of purchase.



1.1 Unpacking

The unit is shipped in a protective antistatic bag.

CAUTION: STATIC ELECTRICITY MAY DAMAGE THE UNIT. Use caution when handling the unit. Carefully ground yourself **BEFORE** touching the unit. Avoid unnecessarily touching the components, edge connector or solder pads on the circuit boards.

Please unpack and inspect the unit for any damage that may have occurred during transit. If damage is found, notify the transportation company immediately. Only you, the consignee, may initiate a claim with the carrier for shipping damage. Crown will be happy to cooperate fully as needed. Save the shipping carton as evidence of damage for the shipper's inspection.

Even if the unit arrived in perfect condition, as most do, save all packing materials. **NEVER SHIP THE UNIT WITHOUT THE FACTORY PACK.**

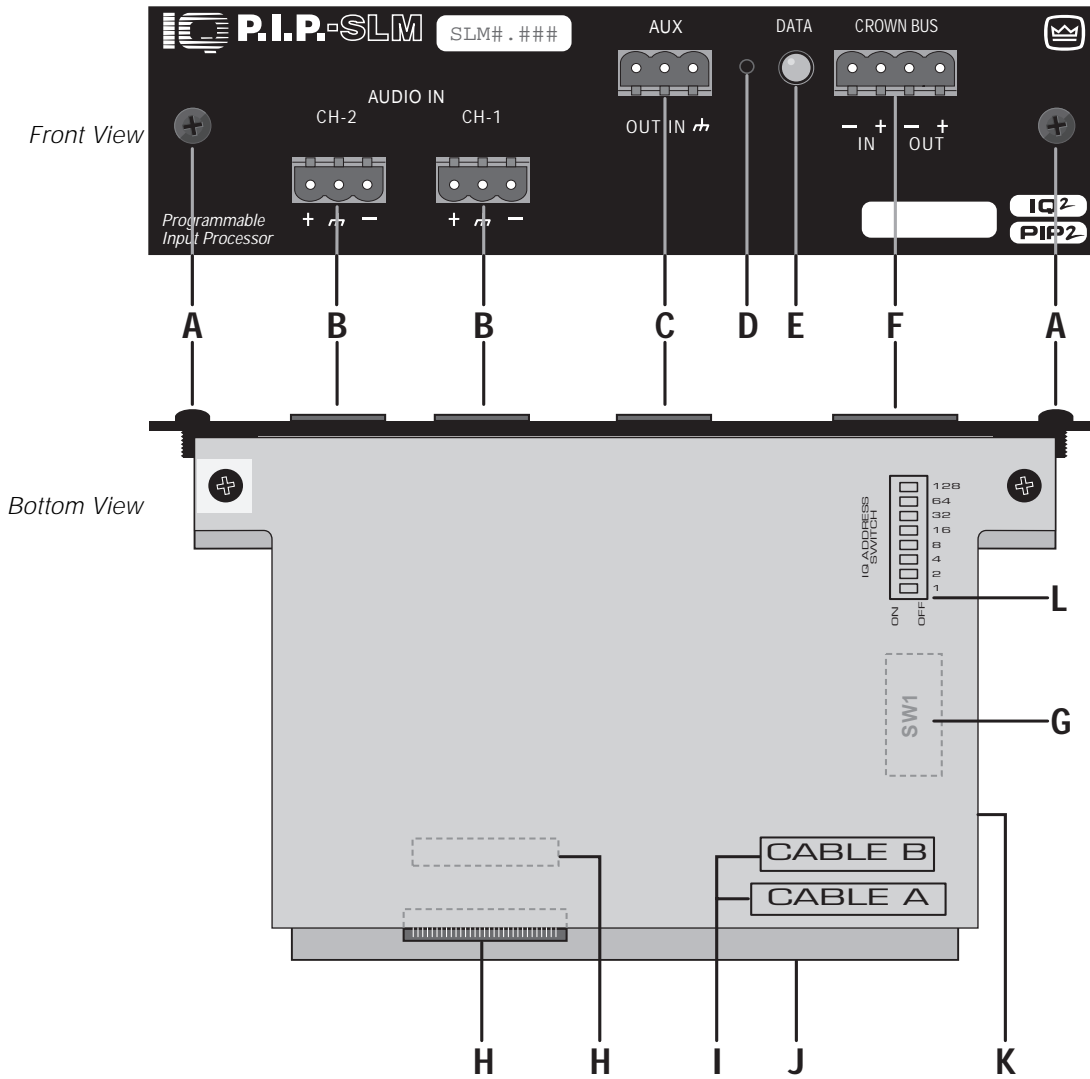


Fig. 2.1 The IQ-P.I.P.-SLM Facilities

2 Facilities

A. Mounting Screws

The IQ-P.I.P.-SLM is secured to the back panel of the amplifier with two Phillips-head screws and star-tooth lock washers. The lock washers are required for proper ground connection.

B. Balanced Audio Inputs

A 3-pin, Eurostyle®, removable barrier-block connector is provided for balanced audio input to each chan-

nel of the amplifier.* These removable connectors make it easy to attach an input cable with just three screws. Once the cable is attached, the connector can be quickly unplugged and, if desired, moved to a different amplifier. *Do not use the Ch.2 input if the amplifier is configured in either Bridge or Parallel-Mono mode.*

*Eurostyle is a registered trademark of Beau Interconnect, Gilford NH.

C. AUX Input/Output Connector

A 3-pin, Eurostyle, removable barrier-block connector is provided to control auxiliary equipment. The AUX output delivers 15 VDC at 15 mA maximum output when switched on and may be controlled via software or may be programmed to switch when a fail condition is present on any channel.* The AUX connector also includes a high-impedance (10 K ohm) input that can sense logic signals and can be programmed to trigger a test or report fault conditions when a logic high is present. In this case the sweep is leading-edge triggered and may be aborted by sending a second leading-edge trigger. (See Section 4.7 for more information.)

D. Reset Switch

A multifunction reset switch is provided to restore the *IQ-P.I.P.-SLM* to a prior state. It can be depressed with a straightened paper clip through the small hole in the *P.I.P.* panel. Press the reset switch for less than 2 seconds and all settings will be reset with "user default" parameters and the Data LED will flash once. (If no "user default" settings have been stored, the unit will be reset to the "factory default" settings described next.) Press the reset switch for more than 2 seconds, and the same settings will be reset with "factory default" parameters and the Data LED will flash twice. After the unit has been reset to the factory default settings, it will behave like a standard *P.I.P.-FX* until it is reprogrammed by an *IQ System* controller or it is toggled to the "user default" settings.

E. Data LED

The Data LED flashes whenever a valid IQ command has been received. The indicator can also be forced to stay on to aid rapid troubleshooting of the Crown Bus wiring.

F. Crown Bus Input/Output Connector

A 4-pin, Eurostyle, removable barrier-block connector is provided for both input and output connection to the Crown Bus.

*The AUX output uses inverse logic when it is configured to report a fail condition. Normally high, it switches low when any channel fails a test. In this way it can also indicate a power loss.

G. IQ Address Switch (SW1)

An 8-section DIP switch is used to set the IQ address of the unit (see Section 4.1 and (L) below). A valid IQ address is any number from 1 to 250. Do not use a number higher than 250 since they are reserved for special use. This switch is located on the top (IQ) circuit board. Each IQ component on a Crown Bus is given a unique IQ address so it can be independently controlled and monitored. Two or more IQ components of the same type should NEVER have the same address on the same Crown Bus loop.

H. Molex Ribbon Cable Connectors

An 18-pin and a 20-pin Molex ribbon-cable connector are used to connect the *IQ-P.I.P.-SLM* to the amplifier. The cable-connections diagram (I) printed on the bottom circuit board illustrates connector positioning. The *P.I.P.* card should be turned over (audio circuit board upward) when connecting the ribbon cables from the amplifier. Turn the *P.I.P.* card back to an upright position (audio circuit board downward) before inserting the card into the amplifier case.

I. Cable-Connections Diagram

The cable-connections diagram is printed on the bottom circuit board to illustrate the positioning of the Molex ribbon-cable connectors. When connecting the ribbon cables from your amplifier to the *IQ-P.I.P.-SLM*, the 20-pin cable (A) should be connected first, then the 18-pin cable (B) should be connected.

J. IQ Circuit Board (Top)

The top circuit board contains the IQ communication circuitry, including the IQ address switch (SW1).

K. Audio Circuit Board (Bottom)

The bottom circuit board contains the audio analog circuitry.

L. IQ Address Switch Diagram

This diagram illustrates the IQ address switch layout. Each switch, when activated (ON), carries the value indicated in the switch diagram. The address of the component is determined by adding the value of all switches which are turned on. Also see Section 4.1 for information on setting the IQ address.

3 Features

The *IQ-P.I.P.-SLM* is a powerful companion for any Crown PIP2 amplifier, with a range of features that allow an attached amplifier to be monitored, controlled and tested via the *IQ System*. The various functions of the *IQ-P.I.P.-SLM* can be categorized into two areas: auto-control features and signal-and-load-monitoring features.

The auto-control features provided by the *IQ-P.I.P.-SLM* enable the attached Crown amplifier to function automatically. For example, an *IQ-P.I.P.-SLM* can automatically turn off the high voltage supplies of the amplifier when no input signal is present. This can lower electrical usage and provide long-term cost savings.

In addition, a range of signal and load-monitoring features are provided in the *IQ-P.I.P.-SLM*, allowing it to be used as a powerful troubleshooting and security tool. For example, by testing the impedance of the attached load, you may be able to find and replace a damaged speaker before it fails completely. Or you may be able to detect unauthorized changes made to signal levels by testing the output signal.

Configuration of the *IQ-P.I.P.-SLM* requires a host computer (usually a PC), attached to the *IQ System* via an *IQ2*-compatible IQ interface, running *IQ for Windows 1.1* software. Please contact your Crown representative or Crown's Technical Support Group if you are unfamiliar with IQ software.

Once the *IQ-P.I.P.-SLM* is configured, it can function as a stand-alone device without an *IQ System*. This will require the use of the unit's AUX input for manually triggering tests, as well as an AUX output device for manually signalling failed tests (see Section 4.7 for more information).

3.1 Power/Standby Indicators

Power/standby indicators allow you to tell at a glance whether power is on for each channel and whether the output is muted. These indicators are accessed through *IQ for Windows 1.1* software.

3.2 IOC Event Monitor

The Input/Output Comparator (*IOC*[®]) of each channel of the amplifier can be monitored by the *IQ System* using *IQ for Windows 1.1* software. The *IOC* circuitry acts as a sensitive distortion meter to provide you *proof of distortion-free performance*. If distortion of any kind equals or exceeds 0.05%, the *IOC* circuit will cause an indicator on the software control panel to flash, alerting a user that distortion is occurring.

3.3 Power Control

Each channel's high-voltage supply can be independently turned on and off with the Power control. The *IQ for Windows* software is used to set this control.

3.4 Signal Mute

The output signal of each channel can be independently muted by the *IQ for Windows* software. The function typically provides 80 dB or more of attenuation.

3.5 Polarity Inverter

The polarity of the input signal of each channel can be independently inverted by the *IQ System*. *Note: Small ticks or pops may be heard when changing polarity. These are perfectly normal and should not be a cause for concern.*

3.6 Input Signal Level Monitor

The input signal level of each channel can be monitored by IQ software. This monitor feature has a range from +15 dBu to -40 dBu in ½-dB steps.

3.7 Output Signal Level Monitor

The output signal level of each channel of the amplifier can be monitored by the *IQ System*. This monitor feature has a range from -40 dB to 0 dB where 0 dB is referenced to the rated output voltage of the amplifier model. (This is assumed to be 70-V or the rated 8-ohm output for *Com-Tech* amplifiers or the rated 8-ohm output voltage for all other amplifiers.)

3.8 ODEP Level Monitor

The Output Device Emulation Protection (*ODEP*[®]) level of each channel of the amplifier can be monitored by the IQ software. This level represents the percent of available thermodynamic energy that is currently being used. When the *ODEP* level reaches 100%, the amplifier cannot produce any more power and "ODEP limiting" will begin to limit the drive level to the output devices, thereby protecting them from too much stress. (See the amplifier's *Reference* or *Owner's Manual* for more information about *ODEP*.)

3.9 Input Signal Attenuation

An attenuator is available for each channel via *IQ for Windows* software to control the output level signal. Each output attenuator has a range from 0 dB to -80 dB in ½-dB steps. (Zero equals no attenuation.)

3.10 Data Indicator

A Data LED is provided on the front panel. It flashes whenever commands addressed to the *IQ-P.I.P.-SLM* are received. It can be forced to stay on by IQ software to assist with troubleshooting of an *IQ System*.

3.11 Aux Port

A 3-pin Eurostyle removable barrier-block connector is provided to control auxiliary equipment. The status of the Aux In and Aux Out ports can be monitored, and the Aux Out port can be controlled, via the *IQ System* using IQ software.

The Aux output can be used to signal a failed test, amp fault, or to signal or switch external equipment like other IQ Aux ports. When used in this mode, the Aux Out uses reverse logic (high = pass; low = fail), so the unit will not give a false pass signal when it has no power.

Both an Aux Out control and indicator are provided in IQ software to turn the output auxiliary port of the P.I.P. on and off., and to indicate the current on/off status of the Aux port. When on, +15 VDC is supplied across the OUT and ↓ (GND) pins of the Aux port. A total of 15 milliamps of current is available. A 1.5 K ohm resistor protects against shorts.

In addition, the Aux input can be used to manually trigger a test. This is required when the unit is operated without a computer running IQ software actively attached. When the presence of an input signal (5 to 15 VDC) is detected across the IN and ↓ (GND) pins of the Aux port, the IQ software will signal the presence of a logic high.

For more information on configuring the Aux port to activate Aux In Testing and Aux Out Reporting options, see Section 4.9.

3.12 Memory Backup

Local EEPROM memory provides secure, nonvolatile storage of all measurements and settings. This means that the generator settings and test data will not be lost when power is removed from the unit. The factory default setting for the memory backup feature is "enabled," although this can be disabled, if desired. When enabled, the backup stores all run-time parameters that can be controlled by the IQ software into nonvolatile memory (EEPROM) at approximately one-second intervals. When disabled, all run-time parameters are returned to the factory defaults whenever the unit loses power.

Caution: Be careful to turn on the memory backup feature if the input attenuators will be used to set critical levels. If the memory backup feature is turned off and the *IQ-P.I.P.-SLM* loses power, the attenuators will be reset to 0 dB, resulting in the loudest possible signal.

3.13 Amp Mode

The stereo/mono mode of the amplifier can be stored into the unit's memory so the *IQ System* is aware of the amplifier's stereo/mono switch setting. Storing this setting serves as an "electronic reminder" to the system—however, the stereo/mono mode cannot be controlled with this setting. The modes available are Stereo (Dual), Bridge-Mono and Parallel-Mono. This software amp mode setting is controlled by the *IQ System*.

3.14 Amplifier Information

Several items of information about an amplifier can be displayed by the IQ software. These include the manufacturer, model, date code, serial number and revision level. Which items are available depends on both the amplifier and the IQ software used.

3.15 User Labels

The *IQ-P.I.P.-SLM* features a "user label" capability which gives you a way to enter and keep any information you choose into two user labels of 15 characters each. Once created, the text of these labels is stored both in the dataframe and in the memory of the P.I.P. itself. The text in user label 1 is also used as a part of the caption at the top of the control panel. The text of these labels is edited using the IQ software.

3.16 User Default Settings

The parameters for all functions (except the amplifier ID code or user scale factors) can be saved as "user default" parameters within the component itself. This user preset, which can only be triggered by pressing the reset switch located on the component for less than two seconds, will restore all settings to the "user default" values. Please consult the documentation of your IQ software for instructions on setting the "user default" values.

3.17 Reset

A recessed reset switch, located on the P.I.P.'s front panel, enables the *IQ-P.I.P.-SLM* to be restored to one of two sets of default settings. A straightened paper clip or similar object is required to press the reset switch.

If “user default” settings have been previously established through the IQ software, these settings will be enabled when the reset switch is pressed and immediately released. The “Data” indicator (located on the front panel of the *IQ-P.I.P.-SLM*) will also flash once to verify this change.

When the reset switch is pressed and held (at least two seconds), the component will switch to the factory-default settings. At the same time, the “Data” indicator will flash twice to verify this change. Once placed in factory-default mode, the *IQ-P.I.P.-SLM* will operate like a standard *P.I.P.-FX* until it is reprogrammed by an *IQ System* or it is toggled to the “user default” settings.

If no “user default” has been defined, either action will result in the component reverting to the factory-default settings.

3.18 Load/Output Monitoring

The *IQ-P.I.P.-SLM* can monitor both the impedance response of a load (typically a loudspeaker) and the frequency response of the amplifier. This makes it possible to monitor the amplifier output and each loudspeaker load to make sure that the loudspeakers are functioning normally and that they are being fed a correct signal at a correct level.

In order to provide the required swept sine wave signal for the tests, the *IQ-P.I.P.-SLM* includes its own internal, variable amplitude, direct digital synthesis (DDS) sine wave generator. The generator’s sine-wave output can vary in frequency from 20 Hz to 22 kHz and is selectable in increments from 1 octave to $1/24$ octave. Generator frequencies are channel independent, so each channel can sweep over a different range of frequencies.

The generator output level (amplitude) range is -40 dBu to +10 dBu in 1 dB steps via a digitally controlled attenuator. The duration of a sweep will be determined by the sweep resolution setting and the start/stop frequencies.

In addition, the generator level is summed with the attenuator input level, so the net generator output will be the sum of the two faders. For example, a -15 dB generator level paired with a -10 dB attenuator level will result in a net generator output of -25 dB.

When a test is not being conducted, the signal generator can also be used to produce a steady sine wave signal (test tone) at a fixed frequency for other applica-

tions. See Section 3.20 for more information on using the Fixed Frequency Generator.

Monitoring is performed by the *IQ-P.I.P.-SLM* via a three-part process. First, reference curves are created and stored to document the “normal” operating conditions of the system. Then, acceptable tolerances are set for all test parameters, to describe acceptable deviation from “normal” operations. Finally, monitor test(s) are performed to gauge the system’s current operating conditions, with results measured against the stored reference curves. Results recorded outside of the acceptable tolerances receive “fail” status; results within acceptable tolerances receive “pass” status.

To begin the monitoring process, the audio system must first be configured to duplicate, as closely as possible, normal operating conditions. Then the signal generator must be configured using the *IQ System* and *IQ for Windows 1.1* software to set the following parameters:

Label: These text input areas (one for each channel) allow you to label each channel with an identifier. Simply type in any label of up to 15 characters. Both labels are held in the memory of the P.I.P. itself.

Acquire Mode: Any one of six “Acquire Modes” can be specified as part of the channel’s test parameters. The selected mode determines whether or not data is gathered during a test, the type of data gathered, and even whether testing is performed, or if an automatic “Pass” is generated for that channel. Select any of the following six Acquire Modes:

1. Off/Pass - performs no new data gathering—reports “Pass” as a test result.

Note: The remaining five acquire modes report “Pass/Fail” based on a comparison of test data with reference data (The parameters for this comparison are set through Test Tolerances). Consequently, the differences have to do with what new data, if any, is gathered during a test.

2. Off/Report - performs no new data gathering.

3. Impedance Test - gathers new impedance data

4. Frequency Test - gathers new frequency data

5. Imp/Freq Test - gathers new impedance and frequency data

6. Reference - gathers new impedance and frequency reference data

Test Range (20 - 22,000 Hz): Sets both the beginning and ending frequency of a test, plus the beginning and ending frequency of the returning data.

Note: While the frequency ranges of the tests for each channel will be restricted to those set by individual start/stop parameters, the sweep itself will begin at the lower of the two Start frequencies and end at the higher of the two Stop frequencies. The sweep becomes active/audible only over the frequency range defined for each channel.

Generator Amplitude: This controls the level of the sweep for the respective channel (channel 1 or 2). Its range is -40 dBu to +10 dBu. Note that the generator amplitude is also used to control the level of output for the Fixed Frequency Generator.

Sweep Resolution: Sets the frequency step size of the test sweep. It can be set to 1/24-, 1/12-, 1/6-, 1/3-, 1/2-, 2/3- and 1-octave steps. Both channels of the PIP-SLM share the same Sweep Resolution.

When both the audio system and the signal generator have been properly configured, tests should be performed to establish the "baseline" results for normal operating conditions. Reference test results will be stored as voltage, impedance, or voltage and impedance curves in local memory; one curve per channel. In addition, the most recent test results may also be retained in local memory: one curve per channel of voltage, impedance, or voltage and impedance. User-defined labels for all curves may also be created and stored in local memory. Please consult the documentation for your IQ software for instructions on initiating, monitoring, and aborting tests, as well as viewing test results.

3.19 Fixed Frequency Generator

When a test is not being conducted, the signal generator can be used to produce a steady sine wave signal (test tone) at a fixed frequency for other applications.

Caution: Use care when operating the test oscillator manually. The oscillator is capable of supplying high-level sine waves to the amplifier, which will, in turn, supply them to the load. A poorly adjusted oscillator could easily damage loudspeakers or other sensitive components. Remember, Crown is not liable for damage due to the overpowering of other components.

The signal generator is configured using the *IQ System* and *IQ for Windows 1.1* software to set the following parameters:

Fixed Frequency Generator On/Off: When turned on, the generator will output a fixed sine wave to that channel at the frequency specified by the Fixed Fre-

quency Generator Frequency Setting.

Fixed Frequency Generator Frequency Setting:

This determines the frequency setting for the fixed sinewave generator. It can be set from 20 to 22,000 Hz.

3.20 Test Tolerances

Once the audio system's baseline results for normal operating conditions has been established, tolerances should be set to define an acceptable "window" of operating conditions. Two tolerance settings are available for configuration: Impedance and Frequency. Consult your IQ software documentation for information on using the software interface to set tolerance amounts.

Impedance tolerance: This sets the percentage of difference by which an impedance test may vary from the reference and still be considered "passing." Tests conducted where the impedance is measured at a percentage outside this tolerance at any point along the frequency range will be considered "failed" for purposes of the impedance test.

Frequency tolerance: This sets the difference in dB by which a frequency test may vary from the reference and still be considered "passing." Tests conducted where the frequency is measured at a dB level outside of this tolerance at any point along the frequency range will be considered "failed" for purposes of the frequency test.

3.21 Dataframe Trigger

(*IQ for Windows 1.1* software only) This software option configures the *IQ System* so that any subsequent loading of the specified dataframe will result in the initiation of a test.

3.22 Synchronous Operation (Sync Mode)

When used in conjunction with an *IQ-SLM-8*, multiple *IQ-P.I.P.-SLMs* can be configured for synchronous operation using the shared *IQ-SLM-8* test signal. When this option is specified via IQ software, data gathering will take as long as the longest possible sweep as required by eight channels of data gathering in the Crown SLM-8. When set in this configuration, a single *IQ-SLM-8* generator may be used to provide the source signal for all units under test. To use this feature to its best advantage, all Start/Stop frequencies and the Sweep Resolutions must be set the same for all units under test. Also, the start of the test must be synchronized either by using the "All Start" option or by using remote Aux In trigger.

Please note that when Sync Mode is selected, the main audio inputs are used and no digital signal is produced by the *IQ-P.I.P.-SLM*'s internal DDS, since it is assumed that an appropriate alternate DDS (from an *IQ-SLM-8*, for example) is being properly utilized. When Sync Mode is not selected, however, the *IQ-P.I.P.-SLM* uses its own DDS and the main audio inputs are disabled.

See Section 4.10 for more information on Synchronous Operation.

3.23 Auto Standby

The Auto Standby feature automatically turns off the high-voltage supplies of the amplifier when no audio signal is detected at the input for a predetermined period of time. The channels are controlled independently. Using it, many *IQ Systems* can pay for themselves in just a few years due to reduced energy costs. There are four parameters which control this feature:

Auto Standby on/off: Turns this function on/off.

Input Gate Level: Sets the level, in dB, below which an amplifier channel's high voltage supply will be turned off. The range is from +16 dBu to -40 dBu.

Turn Off Delay: Sets the time, in minutes, that the input signal must remain below the Standby Level before the channel's high-voltage supply is turned off. The range is from 0 to 255 minutes. A setting of 0 (zero) yields a turn-off delay of approximately 2 seconds to facilitate setup of the function.

3.24 Short Errors

The Short Errors Reporting feature will automatically signal the presence of excessive ODEP levels (a status most often caused by a short). When Short Error Reporting is turned on, a warning will appear when the ODEP level exceeds that set by the level control. The level control value will be a percentage ranging

from 1% to 100%. NOTE: High ODEP levels indicate that the amplifier is running to "hot." Oftentimes, this is the direct result of a short along the outputs. Set the ODEP Level to a value over which you believe it is reasonable to assume that a short has occurred.

3.25 Fault Conditions

The Fault Conditions Reporting feature will automatically signal the condition where the IOC is "locked"; that is, input signal is present and appears normal, but no output signal is being generated. You can choose to have fault conditions reported to you via screen warnings for either channel of an amplifier. When Fault Condition Error Reporting is turned on, a warning will be displayed if a fault condition exists while the input level is below a level that you set (-40 dB to +16 dB).

Some P.I.P.s also have the ability to report Fault Errors through the Aux Out port. This control, when turned on, will automatically set the Aux Out port "high." Any fault error detected will set this port "low." In this case, the Aux Out on is the normal state of affairs, while Aux Out off means trouble!

NOTE: It may be normal for an IOC error to exist at extremely high input levels. Set your level at a level below which an IOC event would be truly abnormal and not just the product of excessive input level.

3.26 Crown Bus "Drop Out" Relays

"Drop out" relays are provided on the Crown Bus ports to maintain the continuity of the IQ communication loop even if the *IQ-P.I.P.-SLM* loses power.

3.27 "No-Fault" Warranty

A three-year "No-Fault" full warranty is provided to guarantee the specifications and protect your investment.

4 Installation

Before beginning, please carefully note:

CAUTION: STATIC ELECTRICITY MAY DAMAGE THE IQ-P.I.P.-SLM MODULE. Use caution when handling the unit. Carefully ground yourself BEFORE touching the IQ-P.I.P.-SLM module. Don't unnecessarily touch the connectors, components or solder pads on the circuit boards.

4.1 Prepare the IQ-P.I.P.-SLM

1. **Set the IQ address switch SW1.** By giving each IQ component a unique address, it can be individually controlled and monitored. Whenever the IQ System wants to send a command to just one IQ component, it first sends its address and then the command down the Crown Bus.

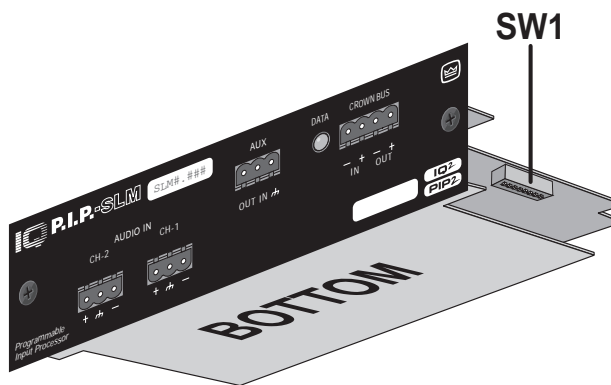


Fig. 4.1 IQ Address Switch (SW1) Location

The 8-segment DIP switch (SW1) shown above and in Figure 4.2 is used to set the IQ address of the IQ-P.I.P.-SLM. No two IQ components of the same type which are connected to the same Crown Bus can have the same address. Suppose, for example, the IQ System has two Crown Bus loops and this IQ-P.I.P.-SLM is installed into loop 1 and given address 77. No other IQ-P.I.P.-SLM can have the same address in loop 1. However, an IQ-P.I.P.-SLM in loop 2 can have the same address.

Different IQ components in the same Crown Bus loop can have the same address. For example, both an SMX-6 mixer and an IQ-P.I.P.-SLM can use address 77 in the same loop.

A valid IQ address is any number from 1 to 250. Do not use a number higher than 250 since they are reserved for special use. An address of "0" (zero) should never be used except to put the IQ-P.I.P.-SLM into a stand-alone mode where it is invisible to the IQ System and acts as a "dumb" balanced audio input.

Switch SW1 is located on the right side on the underside of the top circuit board (Figure 4.1). It has eight segments because it actually contains eight tiny switches inside. There is an arrow printed on the switch along its left side that points to the "ON" position and the switches are numbered along the bottom (Figure 4.2).

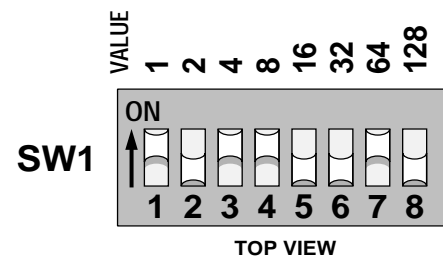


Fig. 4.2 IQ Address Switch (SW1) Values

Each of the eight switches in SW1 has a value which doubles as the switch number increases. For example switch 1 has a value of 1; switch 2 has a value of 2; switch 3 has a value of 4; switch 4 has a value of 8 and so on.

The address is determined by adding the values of all switches which are turned on. In Figure 4.2 switches 1, 3, 4 and 7 are on. Simply add the values to find the address: $1+4+8+64=77$.

A convenient series of IQ address tables are included in Section 7. The tables show the switch settings for all 250 addresses. A diagram illustrating the IQ address switch values is also printed on the right side of the bottom circuit board for easy reference.

4.2 Prepare the Amplifier

2. **Turn down the level controls** (full counter-clockwise) and **turn off the amplifier**.
3. **Disconnect the amplifier's power cord.**
4. **Remove the existing P.I.P.** or cover panel from the amplifier back panel (two screws). If the amp is a PIP2 amplifier, it may contain a P.I.P.

card and a PIP2 input adapter. If so, remove both the P.I.P. card and the PIP2 adapter by detaching the ribbon cables from the PIP2 adapter. The P.I.P. card and PIP2 adapter may then be inserted into another P.I.P.-compatible amplifier, or may be stored for future use. Be sure to store both the P.I.P. and adapter in antistatic packaging.

4.3 Install the *IQ-P.I.P.-SLM* into the Amplifier

5. Carefully ground yourself to the chassis of the amplifier before installing the *IQ-P.I.P.-SLM*. It is a good idea to maintain ground contact between yourself and the amplifier while inserting the module into the *P.I.P.*

6. Install the *IQ-P.I.P.-SLM* into the amplifier: Turn the *IQ-P.I.P.-SLM* over so that you can clearly see the two ribbon-cable connectors located on the underside of the top board near the back corner (see Figure 2.1). Connect the two input ribbon cables of the amplifier. The 20-pin cable (A) should be connected first, then the 18-pin cable (B) should be connected. Both ribbon cables should run untwisted from the amplifier to the *P.I.P.* card (see Figure 4.3).

Important: Be careful when attaching the ribbon cable to the connector that the cable is properly seated before applying pressure to the connector. Forcing the cable onto the connector could cause the keying tabs, which ensure proper pin alignment, to break. Connecting the ribbon cables with improper pin alignments may well result in catastrophic damage to the P.I.P. component.

When both cables are firmly attached, turn the *IQ-P.I.P.-SLM* back to an upright position and insert into the *P.I.P.* opening in the back of the amplifier. Take care while inserting the *P.I.P.* to make sure you do not crimp, pinch or stretch the ribbon cables.

7. Tighten the two *P.I.P.* mounting screws until the *P.I.P.* is secured to the amplifier back panel.

4.4 Install the Wiring

8. Connect the *IQ-P.I.P.-SLM* to the IQ System via the Crown Bus. See Section 4.7 for full instructions.

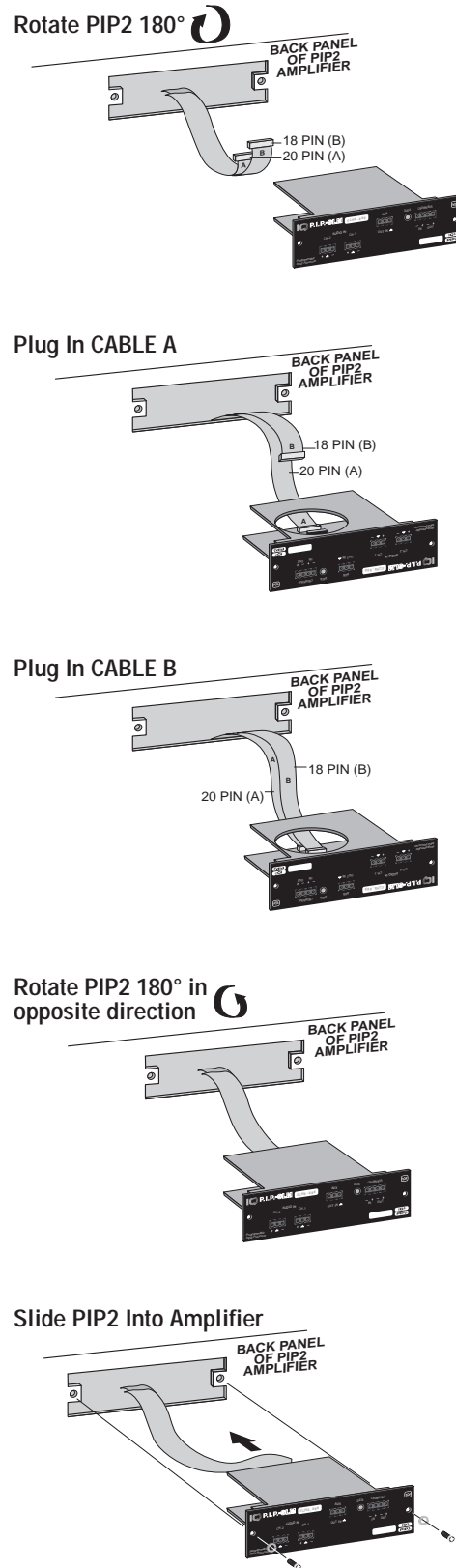


Fig. 4.3 Installing the *IQ-P.I.P.-SLM*

9. Connect the audio signal wiring to the IQ-P.I.P.-SLM. Two 3-pin Eurostyle barrier block input wiring connectors, one for each channel, are provided on the IQ-P.I.P.-SLM. See Section 4.8 for full instructions.

10. Reconnect amplifier to the AC receptacle.

4.5 Prepare the Audio System

Since the IQ-P.I.P.-SLM will be used to verify that the system is working properly, the “normal” condition of the audio system must be established before the IQ-P.I.P.-SLM can be configured. This involves the next two steps:

11. Set all equalizers, filters and delays. (NOTE: This step applies only to IQ-P.I.P.-SLMs synchronized with an IQ-SLM-8.) If you plan to use the IQ-P.I.P.-SLM to monitor the frequency response of the audio system, you must first place the IQ-P.I.P.-SLM in Syn Mode with an IQ-SLM-8 (see Section 4.10 for more information).

Then you will need to adjust and verify the setting of all equalizers, filters, delays and any other processing gear that will affect the monitor points.

12. Set and verify all levels. You will also need to adjust and verify the gain structure of your audio system. This means adjusting all levels to the optimal setting for your system. For example, determine the master volume setting for your mixer or preamps and adjust your compressors, limiters and other processing gear with gain controls to their optimal setting.

Steps 11 and 12 are included so you will understand that your audio system must be prepared before the IQ-P.I.P.-SLM can be configured. However, a full description of these steps is beyond the scope of this manual.

4.6 Configure the Load Monitoring Functions of the IQ-P.I.P.-SLM

Once the IQ-P.I.P.-SLM has been installed and the audio system has been properly prepared, it is time to configure the IQ-P.I.P.-SLM. This will require that the IQ-P.I.P.-SLM be connected to an IQ System. The minimum required equipment is an IQ interface and a host computer running *Turbo 1.4* or *IQ for Windows 1.1+* software.

The following steps summarize the process used to configure your IQ-P.I.P.-SLM. Please refer to your IQ software documentation for complete instructions.

13. Perform and verify reference tests. Using the IQ software, make a reference measurement for each channel that you plan to use. The reference measurements will be used for comparison with all future measurements to determine if the system is still within tolerance. *Note: Reference measurements may include both impedance and frequency response.*

Remember that environmental conditions can cause natural variations in any audio system. Make several preliminary measurements before the final reference measurements in order to determine how the system varies under normal operating conditions. For example, temperature, humidity, wind and ambient noise levels can all have a significant effect on loudspeakers. Try to obtain reference measurements that reflect the average response of your system.

14. Set the tolerance levels. After the natural system variations have been determined in Step 13, use the IQ software to set the tolerance of each channel's impedance and frequency response measurements. The tolerance of the impedance measurements is set as a \pm percent range (%) and the tolerance of the frequency response is set as a \pm decibel range (dB).

In the future you will need to use either the IQ software or the AUX input to trigger a test. You will also need to use the IQ software or the AUX output to signal a failed test.

If you choose to disconnect the IQ-P.I.P.-SLM from the IQ System for stand-alone operation, refer to Section 4.9.1 for instructions on how to use the AUX input to manually trigger a test without an IQ System and Section 4.9.2 for instructions on how to use the AUX output to signal a failed test without an IQ System.

Finally, we suggest that you establish a schedule for making tests on a regular basis. The scheduling features included in your IQ software can assist with this process. See the IQ software documentation for more information.

4.7 A Closer Look at Crown Bus Wiring

The IQ-P.I.P.-SLM must be connected to a Crown Bus loop having an IQ2-compatible IQ interface in order for the IQ System to control or monitor it. An IQ2-compatible interface is an IQ-INT (containing a V2.0+ chip) or an IQ-PSI (Pocket Serial Interface). The Crown Bus is a serial communication loop designed to transmit IQ

commands and data. As implemented in the *IQ-P.I.P.-SLM*, it is a 20 milliamp current loop operating at a BAUD rate of 38.4 K. The loop must be unbroken.

If the system includes an *IQ-INT II* interface, it can accept eight different Crown Bus loops or zones. Dividing the sound system into different zones, each with its own Crown Bus loop, can have several advantages. The following list contrasts those advantages with those of a single loop.

Multiloop Advantages

- A break in communication in one loop does not affect other loops.
- Over 250 IQ components of the same type can be used in a system.
- The same IQ address can be used more than once (once per loop per model).

Single Loop Advantages (with IQ-INT II interfaces)

- The *IQ System* can send and retrieve data faster in a single loop.
- “Real time” level display of a greater number of units is possible.

The *IQ-P.I.P.-SLM* can be connected to the Crown Bus with inexpensive twisted-pair wiring (shielded or unshielded). If fiber optic wiring is required, contact the Crown Technical Support Group (see page 4).

Here are some guidelines for twisted-pair wiring:

- **Use unshielded twisted-pair wire** in most cases, since unshielded wire has lower capacitance and, typically, interference is not a problem. However, when interference is a problem, you should use shielded twisted-pair wiring at least 26 AWG in size. The wire should be of good quality and should have low capacitance—30 picofarads/foot or less is good. (West Penn 452 or an equivalent wire works well.) The shield serves two purposes: First, it helps prevent the IQ data signal from transmitting to nearby audio wiring. Second, it helps prevent outside RF from interfering with the data signal.
 - **Minimize the total capacitance of each Crown Bus loop.** The total capacitance should be less than 30 nanofarads. Allow for approximately 60 picofarads for each IQ component in a loop. This accounts for a slight delay which occurs as data signals pass through a component.
- **Add an IQ Repeater** for very long loops—greater than 1,000 feet (305 m)—or when re-

quired by high-capacitance wire. Although we recommend a repeater for loops longer than 1,000 feet, it is often possible to go 2,000 feet (610 m) or more. The most significant characteristic of the wire is its capacitance. Lower capacitance allows longer loops. Unshielded wire usually has less capacitance.

- **Never use the ground wire in a mic snake line.** It may sometimes be convenient to run Crown Bus data signals to and from stage monitor amplifiers along unused wire pairs in a mic snake. Do not use the ground wire which is normally connected to pin 1 on an XLR connector or data noise will be added to the audio lines. Use only the signal lines which normally connect to pins 2 and 3 of the XLRs. *Note: Because typical mic cables have high capacitance, the maximum possible Crown Bus loop distance will be less.*

Outside RF interference is seldom a problem for a Crown Bus loop—especially if shielded twisted-pair wire is used. However, there are extreme situations when fiber optic wiring is recommended. For example, locating a Crown Bus loop next to an AM radio transmission line may require fiber optic cabling. An extremely long Crown Bus loop distance may also require fiber optic cabling.

There are two different types of connectors used for Crown Bus wiring: DIN connectors and removable Eurostyle barrier block connectors. The *IQ-P.I.P.-SLM* uses a single 4-pin Eurostyle barrier block connector that accepts a removable mating plug like the one shown in Figure 4.4.

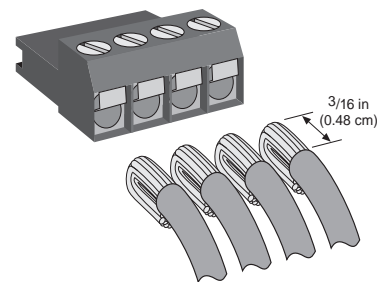


Fig. 4.4 A Removable, Eurostyle Mating Plug

For reliable connection, cleanly strip the jacket from the wire, twist and fold conductor back over the jacket. Insert wire into Eurostyle connector and tighten the set screw.

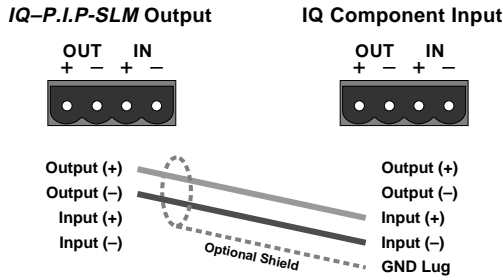


Fig. 4.5 IQ-P.I.P.-SLM Output Connection to Another IQ Component with a Barrier Block Connector

Figure 4.5 shows how the output of the IQ-P.I.P.-SLM is wired to an IQ component with a similar connector. Wiring the output of a similar IQ component back to the input of the IQ-P.I.P.-SLM is simply the reverse.

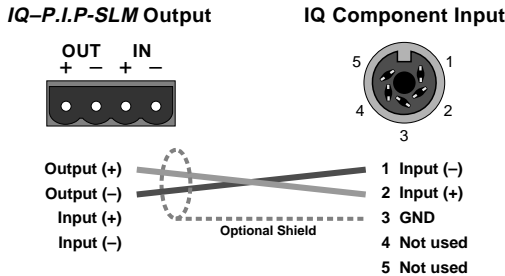


Fig. 4.6 IQ-P.I.P.-SLM Output Connection to an IQ Component with a DIN Input Connector

The next two figures show how to connect the IQ-P.I.P.-SLM to IQ components with different connectors. Figure 4.6 shows how to connect the IQ-P.I.P.-SLM to an IQ component with a DIN input connector.

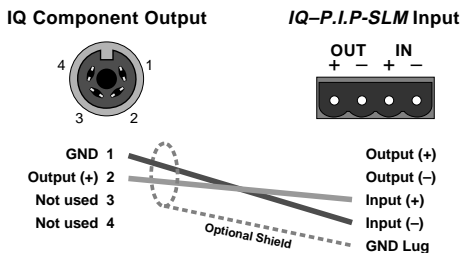


Fig. 4.7 An IQ Component with a DIN Output Connector to an IQ-P.I.P.-SLM Input Connection

Figure 4.7 shows how to connect an IQ component with a DIN output connector to the IQ-P.I.P.-SLM.

The IQ components in each Crown Bus loop are wired sequentially. The loop begins and ends with the IQ interface. The output of one IQ component "loops" to the input of the next and so on as shown in Figure 4.8.

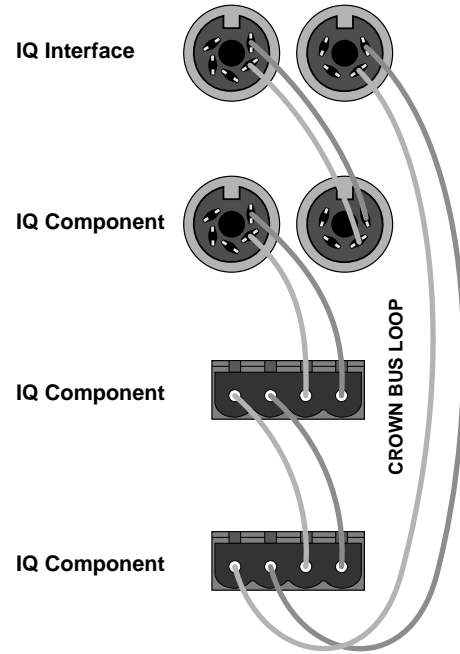


Fig. 4.8 Crown Bus Wiring "Loops" from the Output to the Input of Each IQ Component

4.8 A Closer Look at Audio Signal Wiring

Balanced 3-pin removable Eurostyle barrier block connectors are provided for audio input connection. The audio cables should be wired in one of the following manners (see Figure 4.9):

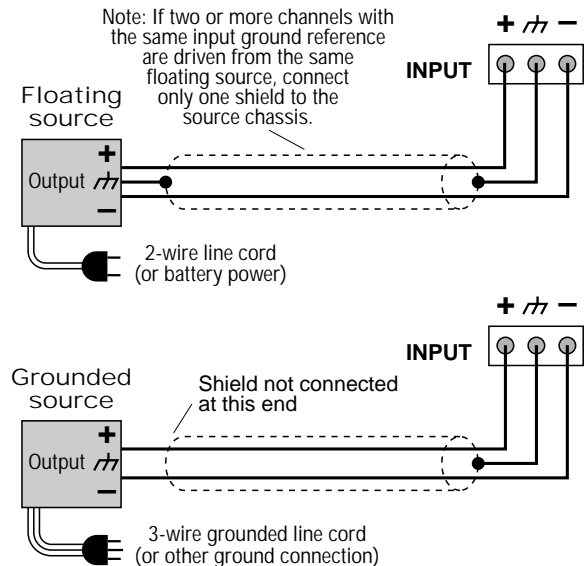


Fig. 4.9 Audio Input Wiring

We strongly recommend that balanced wiring be used if possible. Some important guidelines follow:

- Always use shielded wire. The higher the density of the shield (the outer conductor), the better. Spiral wrapped shield is not recommended.
- When using unbalanced lines, keep the cables as short as possible. Avoid lengths greater than 10 feet (3 meters).
- Do not run audio input cables together with high-level wiring such as loudspeaker wires or AC cords. (This lessens the chance of hum or noise being induced into the input cables.)
- Do not connect audio and data grounds together. For example, do not connect the audio ground to the Crown Bus ground.
- Turn the entire sound system off before changing any connections. Turn the level controls down before powering the system back up. Crown is not liable for damage incurred when any transducer or component is overdriven.

IMPORTANT: Do not feed a signal into the phone jacks on the back panel of the amplifier (if provided). The phone jacks are wired in parallel with the output of the *P.I.P.* connector inside the amplifier. Any audio signal fed into the phone jacks could feed back into the output of the *IQ-P.I.P.-SLM* and generate a distorted input signal. The phone jacks can be used to “daisy chain” the post-processed signal from the *IQ-P.I.P.-SLM* to the inputs of other amplifiers.

DO NOT USE THE CHANNEL 2 INPUT if the amplifier is used in either Bridge-Mono or Parallel-Mono mode.

For additional information on audio input connection please refer to the amplifier’s *Reference* or *Owner’s Manual*. It contains helpful information on preventing unwanted subsonic frequencies, radio frequency interference, ground loops, and feedback oscillation.

4.9 Using the AUX Connector

The *IQ System* offers tremendous flexibility and the AUX connector provides a means of tapping into it. For example, the AUX input can be used to trigger a test and the AUX output can be used to signal that one or more channels have failed an impedance and/or frequency response test. Both of these features must be configured via IQ software.

The AUX port can also function like a traditional IQ AUX port. For example, the AUX output can be used to switch a relay that can turn on/off other non-IQ components in the system.

The internal AUX circuit is shown below in Figure 4.10:

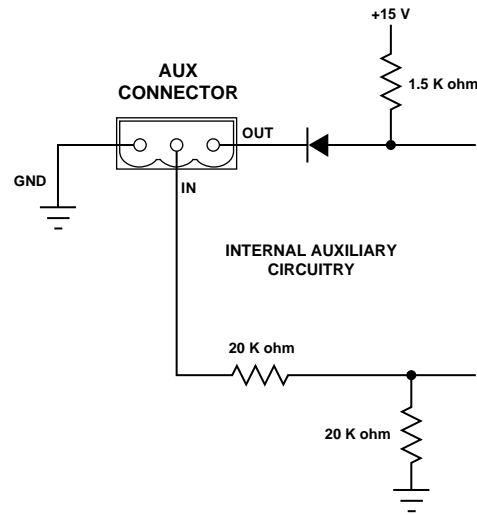


Fig. 4.10 The Internal AUX Circuit

The AUX connector is a 3-pin removable Eurostyle barrier block connector. The OUT and ↓ (GND) pins are used to send a signal and the IN and ↓ (GND) pins are used to receive a signal.

4.9.1 Triggering a Test (AUX Input)

The AUX input is a high-impedance (10 K ohm) input. To trigger a test with it you must do two things: 1) Use IQ software to set the *IQ-P.I.P.-SLM* to respond to a logic “high” at the AUX input; and 2) Connect an external voltage (TTL level) to the AUX input across the IN and ↓ (GND) pins. A +5 to +15 VDC signal will be recognized as a logic high. A signal less than +1.6 VDC or an electrical open will be interpreted as a logic “low.” See the IQ software *User Manual* for instructions on configuring the *IQ-P.I.P.-SLM* to respond to the AUX input.

Note: A negative signal can also be used as a logic low because the signal is internally clamped to protect the internal circuitry.

4.9.2 Signaling a Failed Test (AUX Output)

When the AUX output is turned on, +15 VDC is supplied across the OUT and ↓ (GND) pins. A total of 15 milliamps of current is available. A 1.5 K ohm resistor protects against shorts.

The *IQ-P.I.P.-SLM* can be configured by the IQ software to signal a failed test via the AUX output. It does this with reverse logic. The AUX port will be turned on to indicate that all channels have passed the most recent test and turned off to indicate that one or more

channels have failed a test. By reversing the logic, the AUX output will not send a pass signal when the unit is turned off or has no power.

4.9.3 Controlling External Devices (AUX Output)

There are many other possible uses for the AUX output. For example, it can be used to turn on auxiliary cooling fans. To do this the +15 VDC AUX output would be used to close a relay. The relay would then turn the fans on or off. This principal is illustrated in Figure 4.11 below:

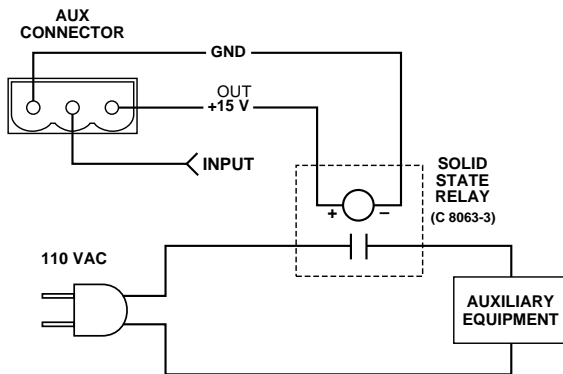


Fig. 4.11 A Sample AUX Output Circuit

Note: A Crown part number is provided in Figure 4.11 for a suitable solid-state relay (C 8063-3). Contact your local Crown representative or the Crown factory Parts Department (219-294-8200) to order.

4.10 Synchronous Setup

In a large audio system it may be desirable to use the IQ-P.I.P.-SLM with one or more IQ-SLM-8s and/or IQ-P.I.P.-SLMs. When this is done, these load-monitoring

devices can be synchronized so they function in unison as a group. At least one IQ-SLM-8 must be active in the IQ System in order to configure the system in Sync mode. Here are the steps for synchronizing multiple IQ-P.I.P.-SLMs and IQ-SLM-8s:

- 1 Select one of the SLM-8s and use its Generator Out to insert the test signal upstream of all IQ-SLM-8 and IQ-P.I.P.-SLM monitor points in the audio system.
- 2 Set the "Generator" and "Sweep" settings of all SLM P.I.P.s and components so they are all the same.
- 3 Turn on the "Sync" control of each unit.

After the above preparations have been made, there are two ways to generate a synchronized test. The first way is to use the IQ software's "All Start" command to simultaneously initiate a test with all units. Of course, this requires that all units be connected to an IQ System. Incidentally, you can stop a test that is in progress with the "All Abort" command.

The second way to generate a synchronized test is with the AUX input. This enables you to perform synchronized testing with stand-alone units that are no longer connected to an IQ System. To use this method you will need to turn on the AUX In Trigger setting when the units are being configured before they are disconnected from the IQ System. Then you will need to connect the AUX inputs of all units to the same trigger circuit (a +5 to +15 VDC logic circuit as described in Section 4.7.2). When the AUX inputs sense a logic high, the units will start a test. To abort a test, simply send a second logic high.

5 Technical Information

The purpose of the *IQ-P.I.P.-SLM* is to provide remote control and monitoring of a PIP2-compatible amplifier. In addition, the *IQ-P.I.P.-SLM* provides Load Monitoring functions which allow storage of amplifier voltage (frequency response) and load impedance curves. See Sections 1 and 2 for a detailed description of features and facilities. Figure 5.1 on the following page shows the block diagram of the unit.

5.1 Audio Signals

Audio enters the *IQ-P.I.P.-SLM* through the dual 3-pin Eurostyle barrier block connectors. The signal is RFI filtered and converted from balanced to single-ended. From this point, audio is passed through a routing switch, which connects either the incoming audio or the signal generator to the stages that follow. The signal then is fed to a digitally controlled analog attenuator, which provides level control and muting. At this stage, the signal is also split off and sent to the A/D converter, which is used to report input signal levels via the IQ bus. Following the attenuator, the signal passes through a final output buffer which also can invert the signal polarity under microprocessor control. The audio signal is then fed through the PIP2 ribbon cable to the amplifier.

5.2 Amplifier Monitoring

The *IQ-P.I.P.-SLM* can monitor the status of the amplifier using a variety of monitor inputs, obtained from two basic signal types: audio and status.

Audio signals which are monitored include input level to P.I.P., output voltage of amplifier, and output current of amplifier. The signals enter the P.I.P., are buffered, level-shifted, and sent to an A/D converter. The converter samples the signals and converts them to a form suitable for use by the *IQ System*. The conversion includes averaging, peak hold, and log functions.

Status signals which are monitored include ODEP Level (thermodynamic headroom), IOC Indicators, AUX input, and amplifier fault status. The signals enter the P.I.P. and are sent to the microprocessor through an A/D converter or logic input. The microprocessor then converts the signals to a form suitable for use by the *IQ System*.

5.3 Amplifier Control

The *IQ-P.I.P.-SLM* can control the following functions: high-voltage supplies on/off, audio input level (0 to -80 dB in 0.5-dB steps), audio polarity, DATA LED, and AUX output. These functions are controlled using ports on the microprocessor and some external support circuitry. The audio level is controlled by the microprocessor through a digitally controlled analog attenuator. The data LED flashes for 10 mS whenever a valid IQ command is received by the P.I.P.

5.4 Signal Generator

Test signals are generated using direct digital synthesis. The DDS chip is controlled by the microprocessor and the audio output of the generator is switched into the signal path with digitally controlled analog switches.

5.5 IQ System Communications

The *IQ-P.I.P.-SLM* communicates with the host computer via the Crown Bus. Connections to the Crown Bus are made via the 4-pin removable Eurostyle barrier block connector on the rear panel. IQ commands entering the *P.I.P.* are fed into an input receiver circuit that converts the 20 mA current loop signal into a standard logic signal that the microprocessor can understand. This signal is also passed directly to the Crown Bus for output where it is passed on to the remainder of the loop. Data sent in response to IQ commands is also sent through the Crown Bus output where it passes through the remainder of the loop and back to the host computer. A "drop out" relay is also present which makes a physical contact between the Crown Bus input and output connectors in the event of a power failure. This means that as long as the Crown Bus cables are connected to the *P.I.P.*, the Crown Bus will remain unbroken—even if power to the *P.I.P.* is lost.

5.6 Microprocessor, Digital Logic, and Reset Switch

The "brains" of the *IQ-P.I.P.-SLM* are contained in the microprocessor. It interprets commands received from the Crown Bus and responds accordingly. The microprocessor also interfaces with several support components, including RAM, EEPROM, an A/D converter, memory decode, and data latches. The reset switch is connected to the microprocessor and generates an interrupt when pressed. Depending on how long the switch is held, the system resets with either factory default (>2 seconds) or user preset operating parameters (<2 seconds).

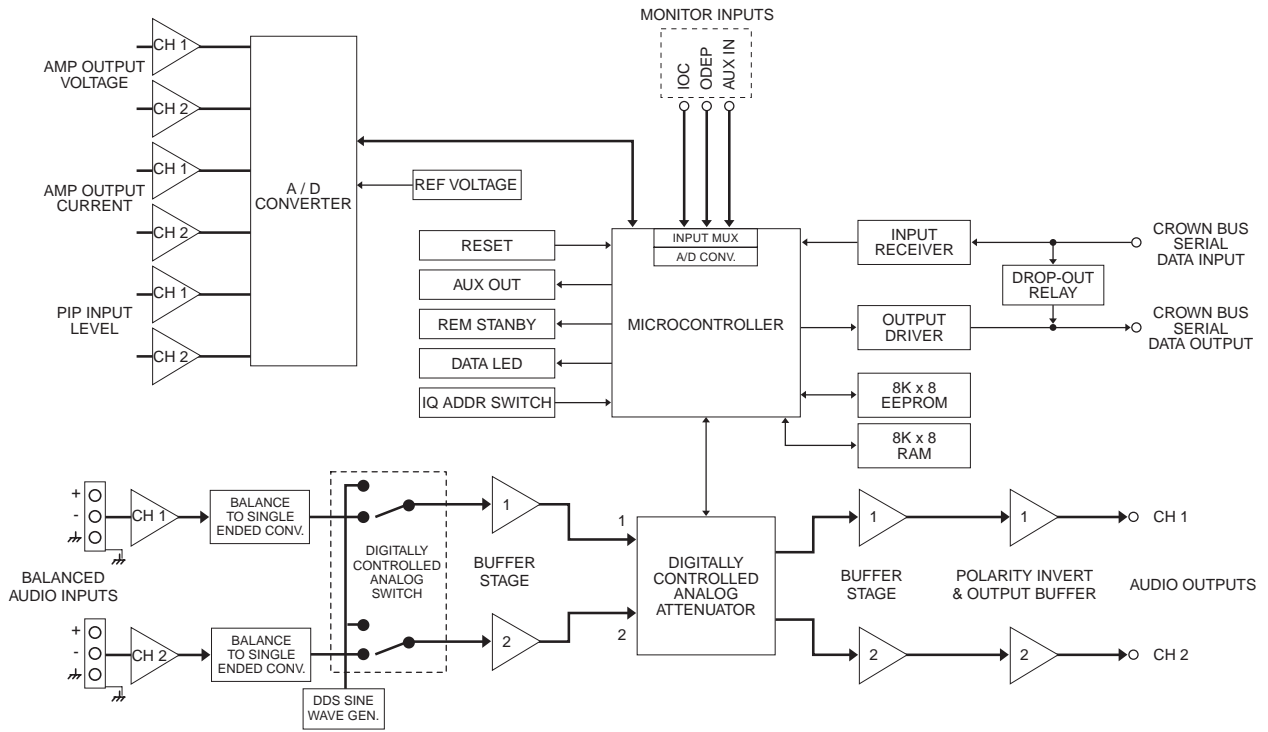


Fig. 5.1 IQ-P.I.P.-SLM Circuit Block Diagram

6 Specifications

General

Internal Controls: An 8-segment DIP switch is used to set the IQ address (decimal range: 1–250). A Reset switch, accessible with a straightened paper clip through the *P.I.P.* panel, resets all settings (except the amplifier initialization data) to the “user defaults” if it is pressed for less than 2 seconds or the factory defaults if it is pressed for more than 2 seconds.

Connectors: Crown Bus Input/Output: A 4-pin removable Eurostyle barrier block connector; a mating plug is shipped with the product. Audio Input: A 3-pin removable Eurostyle barrier block connector for each channel; mating plugs are shipped with the product. AUX: A 3-pin removable Eurostyle barrier block connector; a mating plug is shipped with the product.

Indicators: A yellow DATA LED flashes when a valid IQ command is received from the *IQ System* via the Crown Bus. Depending upon the firmware version in your unit, the DATA indicator can be forced on to facilitate rapid troubleshooting of Crown Bus wiring.

Auxiliary Feature: +15 VDC is supplied across pins 1 (ground) and 3 (+) of the AUX connector when turned on by the *IQ System* software.

Power Requirements: When installed into a Crown *P.I.P.*-compatible amplifier, the unit receives ±24 VDC.

Crown Bus Data Communication

Protection: If communication is lost, the unit will continue to function with the last commands received.

Data Rate: 38.4 K BAUD.

Data Format: Serial, binary, asynchronous; 1 start bit; 1 stop bit; 8 data bits; no parity.

Crown Bus Interface Type: Optically isolated 20 milliamp serial loop.

Operation: Half duplex.

Intelligence: 8-bit microprocessor with 12 K byte control program.

Transmission Distance: Variable from 200 to 3,000 feet (61 to 914 m), depending upon wire capacitance. Typically 1,000 feet (305 m) using shielded twisted-pair wire, #26 AWG or larger. Can be extended with an *IQ Repeater*.

Load Monitor

Impedance Measurement Capabilities: 50 ohms, ±5% from 20 Hz to 22 kHz.

Generator Frequency Range: 20 Hz to 22 kHz.

Frequency Resolution: 1/24-, 1/12-, 1/6-, 1/3-, 1/2-, 2/3-, or 1-octave spacing.

Generator Amplitude: Adjustable from +10 dBu to –40 dBu.

Generator Total Harmonic Distortion (THD): <1%.

Audio

Please note: The audio specifications are referenced to 0.775 V (0 dBu). Measurements were made at the output of the *IQ-P.I.P.-SLM* module, itself.

Input Impedance: Nominally 20 K ohms balanced and 10 K ohms unbalanced.

Maximum Input Level: +25 dBu, peak.

Gain: Adjustable from 0 to –80 dB in 0.5-dB steps.

Muting: >100 dB.

Output: Unbalanced to amplifier via PIP2 ribbon cables.

Maximum Output Level: +25 dBu, peak.

Output Noise: <–90 dBu from 20 Hz to 22 kHz.

Signal-to-Noise Ratio: >90 dB from 20 Hz to 20 kHz.

Frequency Response: ±0.25 dB from 20 Hz to 20 kHz.

Crosstalk: <–80 dB from 20 Hz to 22 kHz.

Common Mode Rejection (CMR): >50 dB at 60 Hz.

Total Harmonic Distortion (THD): <0.1% at 10 kHz, +12 dBu input.

IQ System Data Acquisition

Input/Output Monitor Accuracy: Typically ±1 dB, ±2 dB maximum.

7 IQ Address Tables

This section contains lookup tables for every valid IQ address. The valid addresses are 1 to 250. Remember that address "0" (zero) will put the IQ-P.I.P.-SLM into a stand-alone mode where it is invisible to the IQ System and acts like a "dumb" balanced audio input. **Do not use an address number higher than 250!** Addresses above 250 are reserved for special system use.

Remember: No two IQ components of the same type which are connected to the same Crown Bus loop can have the same address.

To use the IQ address tables, simply find the address you want and set the IQ address switch of the IQ-P.I.P.-SLM as shown. See Section 4.1 also.

IQ Address Switch									IQ Address Switch									IQ Address Switch								
IQ Address	1	2	3	4	5	6	7	8	IQ Address	1	2	3	4	5	6	7	8	IQ Address	1	2	3	4	5	6	7	8
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	42	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	84	OFF	OFF	ON	OFF	ON	OFF	ON	OFF
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	43	ON	ON	OFF	ON	OFF	ON	OFF	OFF	85	ON	OFF	ON	OFF	ON	OFF	ON	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	44	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	86	OFF	ON	ON	OFF	ON	OFF	ON	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	45	ON	OFF	ON	ON	OFF	ON	OFF	OFF	87	ON	ON	ON	OFF	ON	OFF	ON	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	46	OFF	ON	ON	ON	OFF	ON	OFF	OFF	88	OFF	OFF	OFF	ON	ON	OFF	ON	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	47	ON	ON	ON	ON	OFF	ON	OFF	OFF	89	ON	OFF	OFF	ON	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	48	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	90	OFF	ON	OFF	ON	ON	OFF	ON	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	49	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	91	ON	ON	OFF	ON	ON	OFF	ON	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	50	OFF	ON	OFF	OFF	ON	ON	OFF	OFF	92	OFF	OFF	ON	ON	ON	OFF	ON	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	51	ON	ON	OFF	OFF	ON	ON	OFF	OFF	93	ON	OFF	ON	ON	ON	OFF	ON	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	52	OFF	OFF	ON	OFF	ON	ON	OFF	OFF	94	OFF	ON	ON	ON	ON	OFF	ON	OFF
11	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	53	ON	OFF	ON	OFF	ON	ON	OFF	OFF	95	ON	ON	ON	ON	ON	OFF	ON	OFF
12	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	54	OFF	ON	ON	OFF	ON	ON	OFF	OFF	96	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF
13	ON	OFF	ON	ON	OFF	OFF	OFF	OFF	55	ON	ON	ON	OFF	ON	ON	OFF	OFF	97	ON	OFF	OFF	OFF	OFF	ON	ON	OFF
14	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	56	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	98	OFF	ON	OFF	OFF	OFF	ON	ON	OFF
15	ON	ON	ON	ON	ON	OFF	OFF	OFF	57	ON	OFF	OFF	ON	ON	ON	OFF	OFF	99	ON	ON	OFF	OFF	OFF	ON	ON	OFF
16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	58	OFF	ON	OFF	ON	ON	ON	OFF	OFF	100	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	59	ON	ON	OFF	ON	ON	ON	OFF	OFF	101	ON	OFF	ON	OFF	OFF	ON	ON	OFF
18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	60	OFF	OFF	ON	ON	ON	ON	OFF	OFF	102	OFF	ON	ON	OFF	OFF	ON	ON	OFF
19	ON	ON	OFF	OFF	ON	OFF	OFF	OFF	61	ON	OFF	ON	ON	ON	ON	OFF	OFF	103	ON	ON	ON	OFF	OFF	ON	ON	OFF
20	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	62	OFF	ON	ON	ON	ON	ON	OFF	OFF	104	OFF	OFF	OFF	ON	OFF	ON	ON	OFF
21	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	63	ON	ON	ON	ON	ON	ON	OFF	OFF	105	ON	OFF	OFF	ON	OFF	ON	ON	OFF
22	OFF	ON	ON	OFF	ON	OFF	OFF	OFF	64	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	106	OFF	ON	OFF	ON	OFF	ON	ON	OFF
23	ON	ON	ON	OFF	ON	OFF	OFF	OFF	65	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	107	ON	ON	OFF	ON	OFF	ON	ON	OFF
24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	66	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	108	OFF	OFF	ON	ON	OFF	ON	ON	OFF
25	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	67	ON	ON	OFF	OFF	OFF	OFF	ON	OFF	109	ON	OFF	ON	ON	OFF	ON	ON	OFF
26	OFF	ON	OFF	ON	ON	OFF	OFF	OFF	68	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	110	OFF	ON	ON	ON	OFF	ON	ON	OFF
27	ON	ON	OFF	ON	ON	OFF	OFF	OFF	69	ON	OFF	ON	OFF	OFF	OFF	ON	OFF	111	ON	ON	ON	ON	OFF	ON	ON	OFF
28	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	70	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	112	OFF	OFF	OFF	OFF	ON	ON	ON	OFF
29	ON	OFF	ON	ON	ON	OFF	OFF	OFF	71	ON	ON	ON	OFF	OFF	OFF	ON	OFF	113	ON	OFF	OFF	OFF	ON	ON	ON	OFF
30	OFF	ON	ON	ON	ON	OFF	OFF	OFF	72	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	114	OFF	ON	OFF	OFF	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON	OFF	OFF	OFF	73	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	115	ON	ON	OFF	OFF	ON	ON	ON	OFF
32	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	74	OFF	ON	OFF	ON	OFF	OFF	ON	OFF	116	OFF	OFF	ON	OFF	ON	ON	ON	OFF
33	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	75	ON	ON	OFF	ON	OFF	OFF	ON	OFF	117	ON	OFF	ON	OFF	ON	ON	ON	OFF
34	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	76	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	118	OFF	ON	ON	OFF	ON	ON	ON	OFF
35	ON	ON	OFF	OFF	OFF	ON	OFF	OFF	77	ON	OFF	ON	ON	OFF	OFF	ON	OFF	119	ON	ON	ON	OFF	ON	ON	ON	OFF
36	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	78	OFF	ON	ON	ON	OFF	OFF	ON	OFF	120	OFF	OFF	OFF	ON	ON	ON	ON	OFF
37	ON	OFF	ON	OFF	OFF	ON	OFF	OFF	79	ON	ON	ON	ON	OFF	OFF	ON	OFF	121	ON	OFF	OFF	ON	ON	ON	ON	OFF
38	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	80	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	122	OFF	ON	OFF	ON	ON	ON	ON	OFF
39	ON	ON	ON	OFF	OFF	ON	OFF	OFF	81	ON	OFF	OFF	OFF	ON	OFF	ON	OFF	123	ON	ON	OFF	ON	ON	ON	ON	OFF
40	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	82	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	124	OFF	OFF	ON	ON	ON	ON	ON	OFF
41	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	83	ON	ON	OFF	OFF	ON	OFF	ON	OFF	125	ON	OFF	ON	ON	ON	ON	ON	OFF

Fig. 7.1 IQ Address Switch (SW1) Settings from 0 to 125

IQ Address Switch									IQ Address Switch									IQ Address Switch									
IQ Address	1	2	3	4	5	6	7	8	IQ Address	1	2	3	4	5	6	7	8	IQ Address	1	2	3	4	5	6	7	8	
126	OFF	ON	ON	ON	ON	ON	ON	OFF	168	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	210	OFF	ON	OFF	OFF	ON	OFF	ON	ON	
127	ON	ON	ON	ON	ON	ON	ON	OFF	169	ON	OFF	OFF	ON	OFF	ON	OFF	ON	211	ON	ON	OFF	OFF	ON	OFF	ON	ON	
128	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	170	OFF	ON	OFF	ON	OFF	ON	OFF	ON	212	OFF	OFF	ON	OFF	ON	OFF	ON	ON	
129	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	171	ON	ON	OFF	ON	OFF	ON	OFF	ON	213	ON	OFF	ON	OFF	ON	OFF	ON	ON	
130	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	172	OFF	OFF	ON	ON	OFF	ON	OFF	ON	214	OFF	ON	ON	OFF	ON	OFF	ON	ON	
131	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	173	ON	OFF	ON	ON	OFF	ON	OFF	ON	215	ON	ON	ON	OFF	ON	OFF	ON	ON	
132	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	174	OFF	ON	ON	ON	OFF	ON	OFF	ON	216	OFF	OFF	OFF	ON	ON	OFF	ON	ON	
133	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	175	ON	ON	ON	ON	OFF	ON	OFF	ON	217	ON	OFF	OFF	ON	ON	OFF	ON	ON	
134	OFF	ON	ON	OFF	OFF	OFF	OFF	ON	176	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	218	OFF	ON	OFF	ON	ON	OFF	ON	ON	
135	ON	ON	ON	OFF	OFF	OFF	OFF	ON	177	ON	OFF	OFF	OFF	ON	ON	OFF	ON	219	ON	ON	OFF	ON	ON	OFF	ON	ON	
136	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	178	OFF	ON	OFF	OFF	ON	ON	OFF	ON	220	OFF	OFF	ON	ON	ON	OFF	ON	ON	
137	ON	OFF	OFF	ON	OFF	OFF	OFF	ON	179	ON	ON	OFF	OFF	ON	ON	OFF	ON	221	ON	OFF	ON	ON	ON	OFF	ON	ON	
138	OFF	ON	OFF	ON	OFF	OFF	OFF	ON	180	OFF	OFF	ON	OFF	ON	ON	OFF	ON	222	OFF	ON	ON	ON	ON	OFF	ON	ON	
139	ON	ON	OFF	ON	OFF	OFF	OFF	ON	181	ON	OFF	ON	OFF	ON	ON	OFF	ON	223	ON	ON	ON	ON	ON	OFF	ON	ON	
140	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	182	OFF	ON	ON	OFF	ON	ON	OFF	ON	224	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	
141	ON	OFF	ON	ON	OFF	OFF	OFF	ON	183	ON	ON	ON	OFF	ON	ON	OFF	ON	225	ON	OFF	OFF	OFF	OFF	ON	ON	ON	
142	OFF	ON	ON	ON	OFF	OFF	OFF	ON	184	OFF	OFF	OFF	ON	ON	ON	OFF	ON	226	OFF	ON	OFF	OFF	OFF	ON	ON	ON	
143	ON	ON	ON	ON	OFF	OFF	OFF	ON	185	ON	OFF	OFF	ON	ON	ON	OFF	ON	227	ON	ON	OFF	OFF	OFF	ON	ON	ON	
144	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	186	OFF	ON	OFF	ON	ON	ON	OFF	ON	228	OFF	OFF	ON	OFF	OFF	ON	ON	ON	
145	ON	OFF	OFF	OFF	ON	OFF	OFF	ON	187	ON	ON	OFF	ON	ON	ON	OFF	ON	229	ON	OFF	ON	OFF	OFF	ON	ON	ON	
146	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	188	OFF	OFF	ON	ON	ON	ON	OFF	ON	230	OFF	ON	ON	OFF	OFF	ON	ON	ON	
147	ON	ON	OFF	OFF	ON	OFF	OFF	ON	189	ON	OFF	ON	ON	ON	ON	OFF	ON	231	ON	ON	ON	OFF	OFF	ON	ON	ON	
148	OFF	OFF	ON	OFF	ON	OFF	OFF	ON	190	OFF	ON	ON	ON	ON	ON	OFF	ON	232	OFF	OFF	OFF	ON	OFF	ON	ON	ON	
149	ON	OFF	ON	OFF	ON	OFF	OFF	ON	191	ON	ON	ON	ON	ON	ON	OFF	ON	233	ON	OFF	OFF	ON	OFF	ON	ON	ON	
150	OFF	ON	ON	OFF	ON	OFF	OFF	ON	192	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	234	OFF	ON	OFF	ON	OFF	ON	ON	ON	
151	ON	ON	ON	OFF	ON	OFF	OFF	ON	193	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	235	ON	ON	OFF	ON	OFF	ON	ON	ON	
152	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	194	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	236	OFF	OFF	ON	ON	OFF	ON	ON	ON	
153	ON	OFF	OFF	ON	ON	OFF	OFF	ON	195	ON	ON	OFF	OFF	OFF	OFF	ON	ON	237	ON	OFF	ON	ON	OFF	ON	ON	ON	
154	OFF	ON	OFF	ON	ON	OFF	OFF	ON	196	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	238	OFF	ON	ON	ON	OFF	ON	ON	ON	
155	ON	ON	OFF	ON	ON	OFF	OFF	ON	197	ON	OFF	ON	ON	OFF	OFF	OFF	ON	ON	239	ON	ON	ON	ON	OFF	ON	ON	ON
156	OFF	OFF	ON	ON	ON	OFF	OFF	ON	198	OFF	ON	ON	OFF	OFF	OFF	ON	ON	240	OFF	OFF	OFF	OFF	ON	ON	ON	ON	
157	ON	OFF	ON	ON	ON	OFF	OFF	ON	199	ON	ON	ON	OFF	OFF	OFF	ON	ON	241	ON	OFF	OFF	OFF	ON	ON	ON	ON	
158	OFF	ON	ON	ON	ON	OFF	OFF	ON	200	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	242	OFF	ON	OFF	OFF	ON	ON	ON	ON	
159	ON	ON	ON	ON	ON	OFF	OFF	ON	201	ON	OFF	OFF	ON	OFF	OFF	ON	ON	243	ON	ON	OFF	OFF	ON	ON	ON	ON	
160	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	202	OFF	ON	OFF	ON	OFF	OFF	ON	ON	244	OFF	OFF	ON	OFF	ON	ON	ON	ON	
161	ON	OFF	OFF	OFF	OFF	ON	OFF	ON	203	ON	ON	OFF	ON	OFF	OFF	ON	ON	245	ON	OFF	ON	OFF	ON	ON	ON	ON	
162	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	204	OFF	OFF	ON	ON	OFF	OFF	ON	ON	246	OFF	ON	ON	OFF	ON	ON	ON	ON	
163	ON	ON	OFF	OFF	OFF	ON	OFF	ON	205	ON	OFF	ON	ON	OFF	OFF	ON	ON	247	ON	ON	ON	OFF	ON	ON	ON	ON	
164	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	206	OFF	ON	ON	ON	OFF	OFF	ON	ON	248	OFF	OFF	OFF	ON	ON	ON	ON	ON	
165	ON	OFF	ON	OFF	OFF	ON	OFF	ON	207	ON	ON	ON	ON	OFF	OFF	ON	ON	249	ON	OFF	OFF	ON	ON	ON	ON	ON	
166	OFF	ON	ON	OFF	OFF	ON	OFF	ON	208	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	250	OFF	ON	OFF	ON	ON	ON	ON	ON	
167	ON	ON	ON	OFF	OFF	ON	OFF	ON	209	ON	OFF	OFF	OFF	ON	OFF	ON	ON										

Fig. 7.2 IQ Address Switch (SW1) Settings from 126 to 250

8 Service

This unit has very sophisticated circuitry which should only be serviced by a fully trained technician. This is one reason why each unit bears the following label:

CAUTION: To prevent electric shock, do not remove covers. No user serviceable parts inside. Refer servicing to a qualified technician.

8.1 Worldwide Service

Service may be obtained from an authorized service center. (Contact your local Crown/Amcron representative or our office for a list of authorized service centers.) To obtain service, simply present the bill of sale as proof of purchase along with the defective unit to an authorized service center. They will handle the necessary paperwork and repair.

Remember to transport your unit in the original factory pack.

8.2 North American Service

Service may be obtained directly from the Crown factory. It is important that you have your copy of the bill of sale as your proof of purchase.

8.2.1 Factory Service

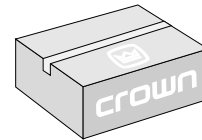
To obtain factory service, fill out the **service information page** that follows and send it along with your proof of purchase and the defective unit to the Crown factory. For warranty service, we will pay for ground shipping both ways in the United States after receiving copies of the shipping receipts. Shipments should be sent "UPS ground." (If the unit is under warranty, you may send it C.O.D. for the cost of freight via UPS ground.) The factory will return it via UPS ground. Please contact us if other arrangements are required.

Factory Service Shipping Instructions:

1. When sending a Crown product to the factory for service, be sure to fill out the service information form that follows and enclose it inside your unit's shipping pack. Do not send the service information form separately.
2. To ensure the safe transportation of your unit to the factory, ship it in an original factory packing container. If you don't have one, call or write

Crown's Parts Department. With the exception of polyurethane or wooden crates, any other packing material will not be sufficient to withstand the stress of shipping. **Do not use loose, small size packing materials.**

3. Do not ship the unit in any kind of cabinet (wood



Always use the original factory pack to transport the unit.

or metal). Ignoring this warning may result in extensive damage to the unit and the cabinet. Accessories are not needed—do not send the instruction manual, cables and other hardware.

If you have any questions, please call or write the Crown Technical Support Group.

Crown Audio Division

Technical Support / Factory Service
Plant 2 SW, 1718 W. Mishawaka Rd., Elkhart,
Indiana 46517 U.S.A.

Telephone: 219-294-8200
800-342-6939 (North America,
Puerto Rico, and Virgin Islands only)

Facsimile: 219-294-8301 (Technical Support)
219-294-8124 (Factory Service)

Fax Back: 219-293-9200 (North America only)
800-294-4094 (North America only)
219-294-8100 (International)

Internet: <http://www.crownintl.com>

