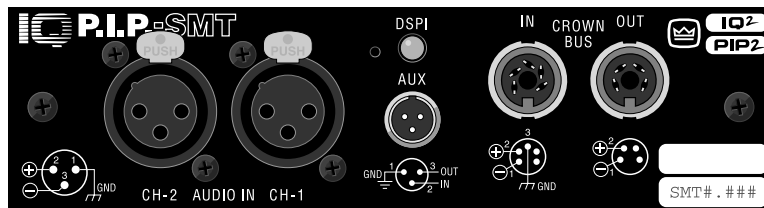


# IQ P.I.P.-SMT

## REFERENCE MANUAL



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

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THREE YEAR  
FULL WARRANTY

## 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 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 & 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.**

## WORLDWIDE

### 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<sup>1</sup> 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.

<sup>1</sup> 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.

### DISCLAIMER OF CONSEQUENTIAL & 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.

### 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

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.



THREE YEAR  
FULL WARRANTY

## 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.–SMT* 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.–SMT:**

1. Set the IQ address switch SW1 (see Figures 4.1 and 4.2) on the *IQ–P.I.P.–SMT* to an unused IQ address. (Tip: Record the IQ address on the small blank label that is provided on lower right corner of the *P.I.P.* panel.)
2. Set the input switches S1 and S2 (see Figures 4.3 and 4.4) for the desired input gain and, if a microphone input is desired, phantom power. (Tip: Record the input setting on the small blank label that is provided on lower right corner of the *P.I.P.* panel.)
3. Set jumpers JP4 and JP5. Set both jumper JP4 and JP5 to the "OUT" position if either a *PIP2*-compatible amplifier (such as the CT-10 Series or *Macro-Tech 5000VZ*) will be used (Figure 2.1 and 4.9). Both JP4 and JP5 should be set to the "IN" position for all other amplifiers.

### **Prepare the amplifier:**

5. Turn down the level controls of the amplifier and turn off the amplifier.
6. Unplug the power cord of the amplifier from the AC mains.
7. Remove the existing *P.I.P.* or cover panel from the amplifier back panel (two screws).
8. Set the amplifier input sensitivity switch to 0.775 V. (See the *Reference or Owner's Manual* of the amplifier.)

### **Install the IQ–P.I.P.–SMT into the amplifier:**

9. Carefully ground yourself to the chassis of the amplifier before installing the *IQ–P.I.P.–SMT*. It is a good idea to maintain ground contact between yourself and the amplifier while inserting the module into the *P.I.P.* card rails in the next step.
10. Install the *IQ–P.I.P.–SMT* into the amplifier:  
*Standard P.I.P. Amplifiers:* Align the edges of the *IQ–P.I.P.–SMT* in the *P.I.P.* card rails and firmly push the unit in until it is seated against the mounting bracket (Figure 4.6).  
*PIP2 Compatible Amplifiers:* Connect the *PIP2* input adapter to the amplifier input cables. Plug the *IQ–P.I.P.–SMT* into the *PIP2* input adapter and insert the assembly into the *P.I.P.* opening in the back of the amplifier (Figure 4.7 and 4.8).
11. Tighten the two *P.I.P.* mounting screws until it is secured to the amplifier back panel.

### **Install the wiring:**

12. Connect the *IQ–P.I.P.–SMT* to the *IQ System* via the Crown Bus (see Section 4.6 if more information is needed).
13. Connect the audio signal wiring to the *IQ–P.I.P.–SMT* (see Section 4.7 if more information is needed).
14. Connect the amplifier back to the AC receptacle.

### **Adjust the levels and scale factors:**

15. Turn the level controls of the amplifier to their full setting. Use the software-controlled input attenuators on the *IQ–P.I.P.–SMT* to adjust the input levels down.
16. *Standard P.I.P. Amplifiers:* Manually configure the scaling factors of the *IQ–P.I.P.–SMT* with appropriate *IQ System* software.  
*PIP2 Compatible Amplifiers:* The scaling factors will be automatically set.

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

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



**WARNING**

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

**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.”

## CONTENTS

<b>Quick Install Procedure .....</b>	<b>3</b>
<b>1 Welcome .....</b>	<b>8</b>
1.1 Unpacking .....	8
<b>2 Facilities .....</b>	<b>9</b>
<b>3 Features .....</b>	<b>12</b>
3.1 Amplifier Information .....	12
3.2 Amp Mode .....	12
3.3 Power Control .....	12
3.4 Input Signal Level Monitor .....	12
3.5 Signal Mute .....	12
3.6 Polarity Inverter .....	12
3.7 Input Signal Attenuator .....	12
3.8 Input Signal Compressor/Limiter .....	13
3.9 Output Signal Level Monitor .....	13
3.10 Smooth/Output Signal Limiter .....	13
3.11 <i>IOC</i> Event Monitor .....	14
3.12 Prolonged <i>IOC</i> Warning .....	14
3.13 <i>ODEP</i> Level Monitor .....	14
3.14 <i>ODEP</i> Conservation .....	14
3.15 Excessive <i>ODEP</i> Warning .....	15
3.16 Fault Warning .....	15
3.17 Auto Standby .....	16
3.18 Auto .....	16
3.19 Crown Bus "Drop Out" Relays .....	16
3.20 DSPI .....	16
3.21 AUX Output .....	17
3.22 Memory Backup .....	17
3.23 Reset .....	17
3.24 User Default Settings .....	17
<b>4 Installation .....</b>	<b>18</b>
4.1 Prepare the <i>IQ-P.I.P.-SMT</i> .....	18
4.2 Prepare the Amplifier .....	21
4.3 Install the <i>IQ-P.I.P.-SMT</i> into the Amplifier .....	21
4.4 Install the Wiring .....	22
4.5 Adjust the Levels & Scale Factors .....	22
4.6 A Closer Look at Crown Bus Wiring .....	23
4.7 A Closer Look at Audio Signal Wiring .....	26
4.8 Using the AUX Connector .....	27
4.8.1 AUX Output .....	27

Contents continued...

4.8.2	AUX Input .....	27
<b>5</b>	<b>Technical Information .....</b>	<b>29</b>
5.1	Audio Signals .....	29
5.2	Amplifier Monitoring: "Monitor Inputs" .....	29
5.3	Amplifier Control .....	29
5.4	<i>IQ System</i> Communications .....	30
5.5	Microprocessor and Reset Switch .....	30
<b>6</b>	<b>Specifications .....</b>	<b>32</b>
<b>7</b>	<b>IQ Address Tables .....</b>	<b>34</b>
<b>8</b>	<b>Service .....</b>	<b>37</b>
8.1	Worldwide Service .....	37
8.2	North American Service .....	37
8.2.1	Service at a N. Am. Service Center .....	37
8.2.2	Factory Service .....	37

## ILLUSTRATIONS

1.1	<i>IQ-P.I.P.–SMT</i> .....	8
2.1	The <i>IQ-P.I.P.–SMT</i> Facilities .....	9
4.1	IQ Address Switch (SW1) Location .....	18
4.2	IQ Address Switch (SW1) Values .....	19
4.3	Input Switch (S1, S2) Location .....	20
4.4	Input Switch (S1, S2) Settings .....	20
4.5	Installation into a Standard <i>P.I.P.</i> Amplifier .....	21
4.6	<i>PIP2</i> Input Adapter Connection .....	22
4.7	Installation into a <i>PIP2</i> Amplifier .....	22
4.8	Amplifier Scale Factor Values and Output Signal Pad Settings ...	23
4.9	<i>IQ-P.I.P.–SMT</i> Output to IQ Component with DIN .....	25
4.10	<i>IQ-P.I.P.–SMT</i> Output to IQ Component w/ Screw Term. Plug ....	25
4.11	IQ Component w/ Screw Term. Plug to <i>IQ-P.I.P.–SMT</i> Input .....	25
4.12	Crown Bus Wiring "Loops" from Output to Input .....	26
4.13	Audio Input Wiring .....	26
4.14	The Internal AUX Circuit .....	28
4.15	A Sample AUX Output Circuit .....	28
5.1	<i>IQ-P.I.P.–SMT</i> Circuit Block Diagram .....	31
7.1	IQ Address Switch (SW1) Settings from 0 to 83 .....	34
7.2	IQ Address Switch (SW1) Settings from 84 to 167 .....	35
7.3	IQ Address Switch (SW1) Settings from 168 to 250 .....	36

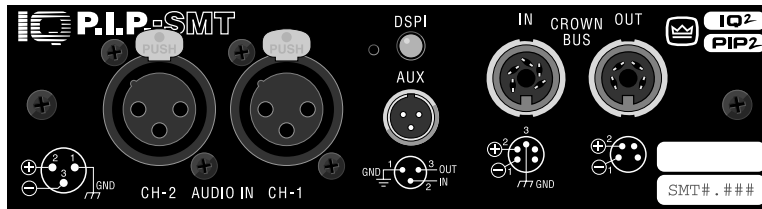


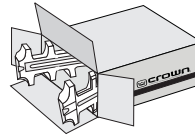
Fig. 1.1 IQ-P.I.P.–SMT

## 1 Welcome

The *IQ-P.I.P.–SMT* is a *PIP2* input module for Crown *P.I.P.*® (programmable input processor) and *PIP2*-compatible amplifiers. Because it is also an *IQ2*-series component, it supports Crown's *UCODE* protocol and requires an *IQ System*® with an *IQ2*-compatible *IQ* interface. *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.–SMT*.

The *IQ-P.I.P.–SMT* connects the amplifier to the Crown Bus of an *IQ System* so the amplifier can be controlled and monitored. With its *SmartAmp*™ features, it offers several automation functions such as the ability to automatically turn on an amplifier channel (high voltage supply) when it is needed and then turn it back off when it is no longer needed. This conserves power and saves money.

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. For added safety, touch the outer metal collar of either Crown Bus connector. 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.**



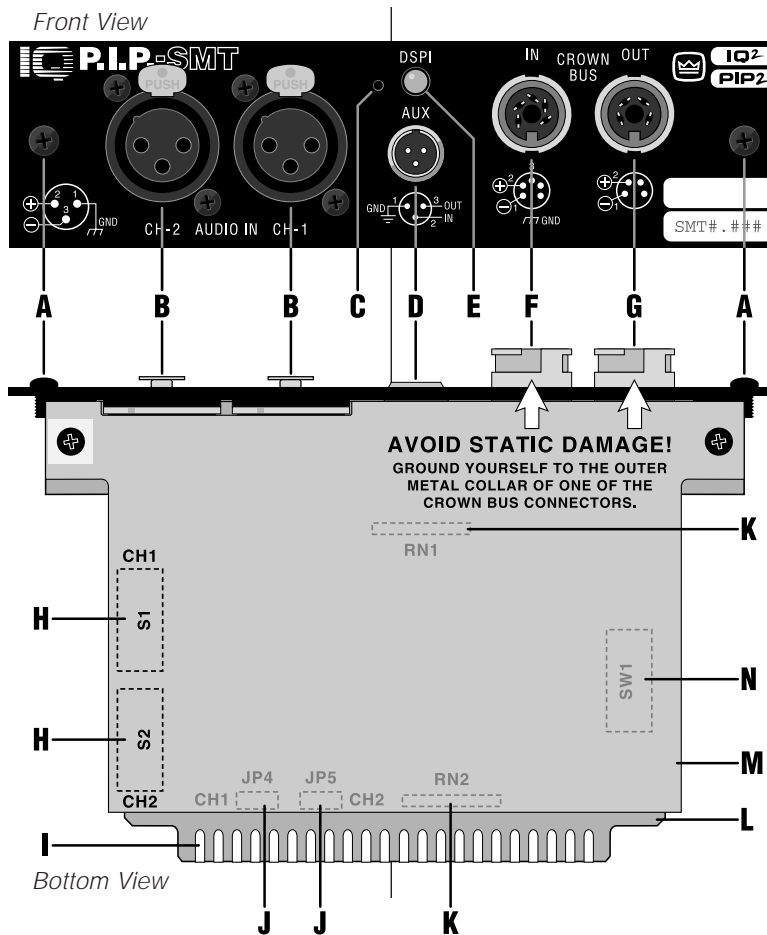


Fig. 2.1 The IQ-P.I.P.-SMT Facilities

## 2 Facilities

### A. Mounting Screws

The IQ-P.I.P.-SMT 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 female XLR connector is provided for balanced audio input to each channel of the amplifier. Pin 1 is chassis (gnd); pin 2 is not inverted (+); and pin 3 is inverted (-). *Do not use the Ch.2 input if the amplifier is configured in either Bridge or Parallel-Mono mode.*

### C. Reset Switch

A multifunction reset switch is provided to restore the *IQ-P.I.P.–SMT* 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, except the amplifier model scale factors, will be reset with “user default” parameters and the DSPI 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 DSPI 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* or it is toggled to the “user default” settings.

### D. AUX Connector

A 3-pin male mini XLR connector is provided to control auxiliary equipment. When the AUX feature is turned on, +15 VDC is provided across pin 1 (gnd) and pin 3 (+). A nominal current of 10 mA is available. The AUX connector also includes a high-impedance input that can sense logic signals.

### E. DSPI

The DSPI is a Data Signal Presence Indicator which 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 Connector

A lockable 5-pin female DIN connector is provided for input connection to

the Crown Bus. A mating Switchcraft 502 series connector can be ordered from Crown (part C 7776-5). Pin 1 is negative (-), pin 2 is positive (+), and pin 3 is ground (gnd). Pins 4 and 5 are not used.

### G. Crown Bus Output Connector

A lockable 4-pin female DIN connector is used for output connection to the Crown Bus. A mating Switchcraft 502 series connector can be ordered from Crown (part C 7777-3). Pin 1 is negative (-) and pin 2 is positive (+). Pins 3 and 4 are not used.

### H. Input Switches (S1, S2)

An 8-section DIP switch is used to configure each input. These switches are located on the bottom circuit board. S1 configures the input of Channel 1 and S2 configures the input of Channel 2. The switches activate a microphone preamp and enable phantom power. The preamp can be turned off (0 dB gain) or set to either 20 or 40 dB of gain. See Section 4.1.

### I. P.I.P. Edge Connector

The gold-plated edge connector of the top IQ circuit board inserts into the *P.I.P.* connector inside the back of the amplifier. Use care when installing a *P.I.P.* module to be certain that the edge connector is properly inserted into the amplifier's *P.I.P.* connector.

### J. Amplifier Output Pad Jumpers (JP4, JP5)

These jumpers enable the circuitry that pads the output signal feeding the *IQ-P.I.P.–SMT* so it can be properly scaled. They should be set to the “IN” position as marked on the digital

circuit board for MA-600 - 3600VZ and SR I & II. Use the "OUT" position whenever the unit is installed into a PIP2-compatible. (CT "10" Series or MA 5000VZ)

#### **K. PIP2 SIP Sockets (RN1, RN2)**

These eight-pin SIP (single in-line package) sockets are provided for full PIP2 compatibility. IQ-P.I.P.-SMT-PIP2 modules (required for PIP2-compatible amplifiers) should come with the SIP networks already installed. The SIP networks are not required and should be absent on standard IQ-P.I.P.-SMT modules.

#### **L. IQ Circuit Board (Top)**

The top circuit board contains the IQ communication circuitry, including the IQ address switch (SW1), amplifier output pad jumpers (JP4, JP5), PIP2 SIP sockets (RN1, RN2) and the P.I.P. edge connector.

#### **M. Audio Circuit Board (Bottom)**

The bottom circuit board contains the audio analog circuitry, including the input switches (S1, S2).

#### **N. IQ Address Switch (SW1)**

An 8-section DIP (dual in-line package) switch is used to set the IQ address of the unit (see Section 4.1). This switch is located on the top 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.

## 3 Features

With an *IQ–P.I.P.–SMT* module a Crown amplifier can be monitored and controlled by an *IQ System*. And the module has *SmartAmp™* features which enable the amplifier to function automatically. For example, an *IQ–P.I.P.–SMT* 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. And it can automatically limit the audio signal and detect and report various problems.

Most of the features can be either controlled or configured by a host computer attached to the *IQ System* via an IQ interface. The host computer is usually a PC and must be running some kind of IQ software. Please contact your Crown representative or Crown's Technical Support Group if you are unfamiliar with IQ software.

### 3.1 Amplifier Information

(*PIP2* amplifiers only.) 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.

### 3.2 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 are Stereo (Dual), Bridge-Mono and Parallel-Mono. This software amp mode setting is controlled by the *IQ System*.

### 3.3 Power Control

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

### 3.4 Input Signal Level Monitor

The input signal level of each channel can be monitored by IQ software. This monitor feature has a range from +16 dBu to –40 dBu in ½ dB steps.

### 3.5 Signal Mute

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

### 3.6 Polarity Inverter

The polarity of the input signal of each channel can be independently inverted by the *IQ System*.

### 3.7 Input Signal Attenuator

An attenuator is available at the input of each channel to control the input signal level. These attenuators are controlled and monitored by the *IQ System*. They may appear to move like "flying faders" on some IQ software screens because they reflect all reductions in gain that are dynamically applied by the input compressor/limiter, smooth/output signal limiter and *ODEP* conservation functions. Each input attenuator has a range from 0 dB to –80 dB in ½ dB steps. (Zero equals no attenuation.)

### 3.8 Input Signal Compressor/Limiter

An input signal compressor/limiter is available for each channel. Each one is controlled by the *IQ System* and has five parameters:

**Input Compressor:** Turns this function on/off.

**Threshold:** Sets the threshold, in dB, above which the compressor acts. The level is measured at the input to the *P.I.P.* and corresponds to the level shown on an input meter. The compressor is “feed-forward,” meaning that the level detection point is located before the gain control stage. The range is from +16 dBu to –40 dBu.

**Attack Time:** Sets the attack time of the compressor. The attack time is the time it takes the compressor to attenuate the input signal by 10 dB. The range is from 1 millisecond to 2 seconds.

**Release Time:** Sets the release time of the compressor. The release time is the time it takes the compressor to increase the input gain by 10 dB. The range is 100 milliseconds to 30 seconds.

**Ratio:** Sets the compression ratio for the compressor. The range is 1, 2, 4, 8, 16, 32, ∞ to 1. *Note: 1:1 is the same as “off.”*

### 3.9 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.)

The output signal of some amplifiers must be padded before the *IQ–P.I.P.–SMT* can scale them. This is accomplished by setting jumpers JP4 and JP5 on the IQ circuit board to the “IN” position. PIP2-compatible amplifiers such as the MA 5000VZ and Com-Tech “10” Series do not require these pads. Set jumpers JP4 and JP5 to the “OUT” position for them (see Figure 4.8).

The output signals of all amplifiers must be scaled in order to “calibrate” the 0 dB level. (See Section 4.5.) This is accomplished with either an **amplifier ID code** or a user **scale factor**. The factory default setting for this is an amplifier ID code of “CT-70V” which assumes that the output level is that of a *Com-Tech* amplifier (any model) with both channels in the 70-V output mode. *Note: PIP2-compatible amplifiers are automatically scaled by the IQ–P.I.P.–SMT.*

### 3.10 Smooth/Output Signal Limiter

An output signal limiter is available for each channel. They can be used either as “smooth” output levelers (similar to older *IQ P.I.P.s* with *SmartAmp* features) or they can be used as fast output limiters to protect drivers and other system components from large transient signals. The output voltage of the amplifier is limited (within 1 dB) based on real-time sampling of the actual amplifier output. The output limiters are controlled by the *IQ System* and have five parameters:

**Output Limiter:** Turns this function on/off.

**Threshold:** Sets the threshold, in dB, above which the limiter acts. The level is based on the scaled output voltage monitors (see Section 3.9). The range is from 0 dB to –40 dB.

**Attack Time:** Sets the attack time of the limiter. The attack time is defined as the time it takes the limiter to attenuate the input signal by 10 dB. The range is from 10 milliseconds to 30 seconds.

**Release Time:** Sets the release time of the limiter. The release time is defined as the time it takes the limiter to increase the input gain by 10 dB. The range is 100 millisecond to 30 seconds.

**Ratio:** The compression ratio is fixed at  $\infty$ :1.

### 3.11 IOC Event Monitor

The Input/Output Comparator (*IOC*<sup>®</sup>) of each channel of the amplifier can be monitored by the *IQ System*. 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 front of the amplifier to flash. By monitoring these events, the *IQ System* can flash an indicator on the screen of the host computer to alert a user that distortion is occurring.

### 3.12 Prolonged IOC Warning

A “trigger” can be set that will cause a warning message to appear on the host computer’s screen if too many

*IOC* events occur over a specified length of time. Three parameters control this feature:

**IOC Error Detect:** Turns this function on/off.

**IOC Error Time:** Sets the time interval over which *IOC* events will be counted. The range is from 1 to 10 seconds.

**IOC Error Count:** Sets the number of *IOC* events that must occur during the preceding time interval before a warning message is displayed. *Note: An “IOC event” is one complete on-off-on cycle.* The range is from 1 to 100 events per unit time.

### 3.13 ODEP Level Monitor

The Output Device Emulation Protection (*ODEP*<sup>®</sup>) 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*.)

### 3.14 ODEP Conservation

The effects of “*ODEP* limiting” the drive level of the output devices as described in Section 3.13 above are very audible. To overcome this, an *ODEP* conservation limiter is available to proportionally limit the input audio signal as the thermodynamic energy reserve of the amplifier is consumed. This helps to prevent the am-

plifier from “ODEP limiting” the drive level of the output devices as described earlier. In the majority of cases, limiting the input signal produces a very smooth sound. And since the input signal is only limited when and to the degree necessary, it is very difficult to detect. There are four parameters which control this feature:

**ODEP Conservation:** Turns this function on/off.

**Trigger Level:** Sets the *ODEP* level, in percent, above which the conservation limiting will begin. The range is from 1 to 100%.

**Amount:** Sets the amount, in dB, that the input signal level will be attenuated for each percentage point that the *ODEP* level exceeds the trigger level. The settings for this parameter are: 0.5 to 6.0 dB in ½ dB steps.

**Release Time:** Sets the release time of the conservation limiter. The release time is based on 10 dB of attenuation. For example, a setting of 10 seconds will result in the *IQ–P.I.P.–SMT* taking 10 seconds to release 10 dB of attenuation. The settings for this parameter are: 0.2, 0.4, 0.6, 0.8, 1.0, 1.5, 2.0, 3.0, 4.0, 6.0, 8.0, 10, 12, 15, 20 and 30 seconds.

### 3.15 Excessive *ODEP* Warning

The user can set a “trigger” that will cause a warning message to appear on the host computer’s screen if the *ODEP* level ever rises above a pre-determined level. It is generally assumed that a sudden rise in the *ODEP* level would indicate a sudden decrease in the load impedance—

such as a shorted speaker cable or shorted loudspeaker. There are two parameters which control this feature:

**ODEP Short Detect:** Turns this function on/off.

**ODEP:** Sets the *ODEP* level above which a short is presumed to have occurred in the load resulting in a warning message being displayed. The range is from 1 to 100%.

### 3.16 Fault Warning

Fault conditions can be monitored by the *IQ System* and a warning message displayed on the host computer’s screen if they occur. If desired, the AUX port can also be used to signal the presence of a “fault” condition. An amplifier “fault” condition occurs when a channel fails. The symptoms are a normal input signal, an *IOC* condition that is “locked” on, a high voltage supply (VCC) that reports a normal condition and no signal at the output of the amplifier. *PIP2*-compatible amplifiers monitor a “fault” signal from the amplifier while standard *P.I.P.*-compatible amplifiers deduce a “fault” condition from the aforementioned symptoms. There are two parameters which control this feature:

**Fault:** Turns this function on/off.

**Input Drive Level:** Sets the threshold below which a fault condition is presumed to exist in a standard *P.I.P.* amplifier. This parameter is necessary because it may be normal for an *IOC* error to persist if the audio input signal level is high. Monitoring the input level can help determine whether a fault condition really exists or

whether the amplifier output is distorted simply because of an excessive input level. The range is from +16 dBu to –40 dBu.

**Report Via Aux:** Enables or disables a feature which causes the AUX port output to stay on during normal operation and turn off whenever a fault condition exists (see Sections 3.21 and 4.8).

### 3.17 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:** Turns this function on/off.

**Standby 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.

**Standby Time:** 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.

**Use Turn-On Delay:** Enables or disables the IQ address turn-on delay. This is a delay that prevents all the amplifiers from

turning on at the same instant and tripping power breakers when an "all amps on" command is issued by the *IQ System*. The turn-on delay is calculated by: 10 msec x IQ address value. It may be desirable to disable this turn-on delay when using the Auto Standby feature so that the first syllable of speech is not missed when a voice page suddenly causes the Auto Standby function to turn a high-voltage supply back on.

### 3.18 Auto

An Auto function is available to provide consistency with other IQ components in the *IQ System*. It is controlled by the *IQ System* and it serves as a toggle to quickly enable or disable many of the functions in a *SmartAmp IQ–P.I.P.–SMT*. The functions that are enabled/disabled by the Auto control are: smooth/output signal limiter, auto standby and all error reporting functions (prolonged *IOC* warning, excessive *ODEP* warning and fault warning). Please refer to the documentation for your IQ software for more information about Auto.

### 3.19 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.–SMT* loses power.

### 3.20 DSPI

A Data Signal Presence Indicator (DSPI) is provided on the front panel. It flashes whenever commands addressed to the *IQ–P.I.P.–SMT* are re-



ceived. It can be forced to stay on by IQ software to assist with troubleshooting of an IQ System.

### 3.21 AUX Output

A 3-pin male mini XLR connector is provided to control auxiliary equipment. When the AUX feature is turned on, +15 VDC is provided across pin 1 (gnd) and pin 3 (+). A nominal current of 10 mA is available. The IQ System is used to control the AUX output.

### 3.22 Memory Backup

A memory backup feature is provided which can be disabled, if desired. The factory default setting is "enabled." When enabled, it stores all run-time parameters that can be controlled by the IQ software into non-volatile 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.–SMT loses power, the attenuators will be reset to 0 dB, resulting in the loudest possible signal.

### 3.23 Reset

A recessed reset switch, accessible from outside the IQ-P.I.P.–SMT, enables it to be restored to one of two sets of default settings. A straightened paper clip or similar small object is required to press the reset switch.

Press the reset switch for less than 2 seconds and all settings, except the

amplifier ID code or user scale factors, will be reset with "user default" parameters and the DSPI will flash once. This feature is only available if "user default" settings have been previously established. If none have, pressing the reset switch for any length of time will cause the unit to be reset to the "factory default" settings as described below.

Press the reset switch for more than 2 seconds and the same settings will be reset with "factory default" parameters and the DSPI 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 or it is toggled to the "user default" settings.

### 3.24 User Default Settings

The parameters for all functions, except the amplifier ID code or user scale factors, can be saved as "user default" parameters. Then, pressing the reset switch for less than 2 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.

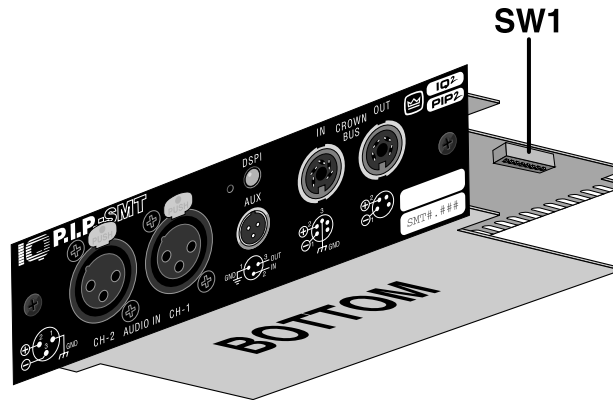


Fig. 4.1 IQ Address Switch (SW1) Location

## 4 Installation

Before beginning, please carefully note:

**CAUTION: STATIC ELECTRICITY MAY DAMAGE THE IQ-P.I.P.-SMT MODULE.** Use caution when handling the unit. Carefully ground yourself **BEFORE** touching the IQ-P.I.P.-SMT module. For added safety, touch the outer metal collar of either Crown Bus connector (see Figure 2.1). This should safely discharge any static electricity through the ground plane of the module. Avoid unnecessarily touching the components, edge connector or solder pads on the circuit boards.

### NOTE — Amplifier Compatibility

The version of the IQ-P.I.P.-SMT card you received will vary depending on whether you indicated the card will be installed on a PIP2-compatible amplifier (such as the Crown MA-5000VZ or CT-10 Series amplifiers). The correct card to install in a PIP2-compatible amplifier is the IQ-P.I.P.-

SMT-PIP2. The standard IQ-P.I.P.-SMT should be ordered for non-PIP2-compatible amplifiers.

Should you later wish to change the amplifier you are using for your IQ-P.I.P.-SMT installation, it is possible to alter the card's configuration by simply removing or installing two SIPS from the card's circuit boards<sup>1</sup>. For instructions on installing or removing these SIPS, contact Crown Technical Support.

### 4.1 Prepare the IQ-P.I.P.-SMT

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.

The 8-segment DIP switch (SW1) shown above is used

<sup>1</sup>IQ-P.I.P.-SMT-PIP2 has SIPS installed; IQ-P.I.P.-SMT has SIPS removed.

to set the IQ address of the *IQ-P.I.P.–SMT*. 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.–SMT* is installed into loop 1 and given address 77. No other *IQ-P.I.P.–SMT* can have the same address in loop 1. However, an *IQ-P.I.P.–SMT* 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.–SMT* 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.–SMT* 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).

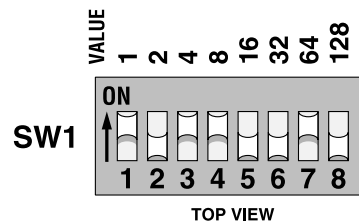


Fig. 4.2 IQ Address Switch (SW1) Values

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.

2. **Set the input switches S1 and S2.** Each input can be configured for either line-level or microphone-level signals with an 8-segment DIP switch. Phantom power is also available. Switches S1 and S2 (see Figure 4.3) are located on the left side of the lower circuit board. The table in Figure 4.4 shows how to set each switch.

**IMPORTANT:** Two switch

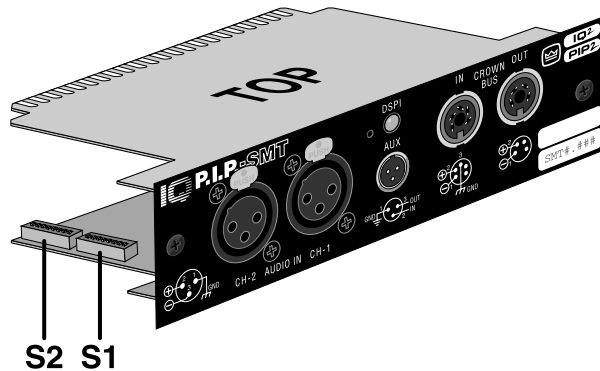


Fig. 4.3 Input Switch (S1, S2) Location

Function	Input Switch (S1, S2)							
	1	2	3	4	5	6	7	8
Phantom Power OFF	OFF	OFF						
Phantom Power ON	<b>ON</b>	<b>ON</b>						
Set Preamp to 0 dB Gain			<b>ON</b>	OFF	OFF	<b>ON</b>		
Set Preamp to 20 dB Gain			OFF	<b>ON</b>	<b>ON</b>	OFF		
Set Preamp to 40 dB Gain			OFF	OFF	OFF	OFF		

Note: DIP switch segments 7 and 8 are not used.

Fig. 4.4 Input Switch (S1, S2) Settings

segments (S1, S2) are required for each setting. Be careful to use both segments or improper operation will result.

Switch S1 configures the input to Channel 1 and switch S2 configures the input to Channel 2.

**CAUTION: The IQ–P.I.P.–SMT input preamplifiers should only be used with microphone or low-level signals.** Once the P.I.P. is in-

stalled, there will be no outward indication of the input preamplifier gain setting. The protection circuitry of the amplifier will probably be activated if the preamplifier gain is set to 40 dB and a line-level signal is connected to the input. If your amplifier appears to “cut out” when you drive it with a strong input signal, check to see if the input preamplifier gain is set too high.

**Recommendations:** Attach a small label to the back of the *P.I.P.* to identify whether it has been set for microphone or line-level input signals. And keep the output levels low if you are uncertain of the preamplifier settings. Remember, Crown is not liable for damage due to overpowering other components.

3. **Set the jumpers JP4 and JP5.** If the *IQ–P.I.P.–SMT* is being installed into a *PIP2*-compatible or *Macro-Tech 5000VZ* amplifier, move both jumper JP4 and JP5 on the IQ circuit board to the “OUT” position (Figures 2.1 and 4.8). Set both JP4 and JP5 to the “IN” position for all other amplifiers.

#### 4.2 Prepare the Amplifier

4. **Turn down the level controls** (full counterclockwise) and **turn off the amplifier.**
5. **Disconnect the amplifier’s power cord.**
6. **Remove the existing *P.I.P.*** or cover panel from the amplifier back panel (two screws). For *PIP2* amplifiers, this may involve disconnecting the *P.I.P.* from a *PIP2* input adapter (Figure 4.6). If a *PIP2* input adapter is already present, do not remove the ribbon cables from the adapter. Otherwise you will have to reconnect them in Step 10.
7. **Set the amplifier input sensitivity to 0.775 V.** (See the amplifier’s Reference Manual.)

#### 4.3 Install the *IQ–P.I.P.–SMT* into the Amplifier

8. **Carefully ground yourself** to the chassis of the amplifier before installing the *IQ–P.I.P.–SMT*. It is a good idea to maintain ground contact between yourself and the amplifier while inserting the module into the *P.I.P.* card rails (standard *P.I.P.*-compatible amplifiers) or the *PIP2* connector (*PIP2*-compatible amplifiers).
9. **Install the *IQ–P.I.P.–SMT* into the amplifier:**

*Standard P.I.P. Amplifiers:* Align the edges of the *IQ–P.I.P.–SMT* in the *P.I.P.* card rails and firmly push the unit in until it is seated against the mounting bracket (see Figure 4.5).

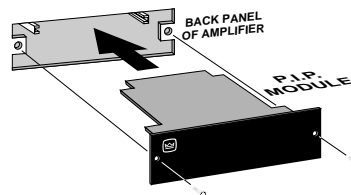


Fig. 4.5 Installation into a Standard *P.I.P.* Amplifier

*PIP2 Amplifiers:* Connect the *PIP2* input adapter to the two input cables of the amplifier (Figure 4.6). Notice that the *PIP2* input adapter should be positioned with the *P.I.P.* edge connector on top facing away from the amplifier. The 20 pin cable (A) is connected first then the 18 pin cable (B) is connected. Both ribbon

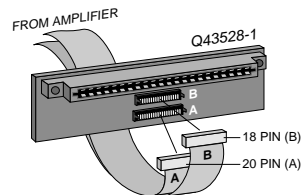


Fig. 4.6 PIP2 Input Adapter Connection

cables should extend below the PIP2 input adapter.

Next, insert the edge connector of the IQ–P.I.P.–SMT into the PIP2 input adapter (see Figure 4.7) and insert the assembly into the P.I.P. opening in the back of the amplifier.

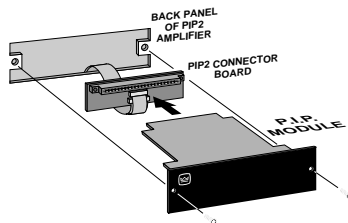


Fig. 4.7 Installation into a PIP2 Amplifier

10. **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

11. **Connect the IQ–P.I.P.–SMT to the IQ System via the Crown Bus.** See Section 4.6 for full instructions.
12. **Connect the audio signal wiring** to the IQ–P.I.P.–SMT. This includes the XLR input

wiring and, if desired, the phone jack daisy chain wiring. See Section 4.7 for full instructions.

13. **Reconnect amplifier to the AC receptacle.**

#### 4.5 Adjust the Levels & Scale Factors

14. **Turn the level controls of the amplifier to their full or maximum setting.** This is required by the IQ–P.I.P.–SMT. If needed, use the software-controlled input attenuators on the IQ–P.I.P.–SMT to reduce the audio levels.
15. **Configure the amplifier scale factors.** (Standard P.I.P.-compatible amplifiers only—the scale factors for PIP2-compatible amplifiers are set automatically.) It is necessary to configure software scale factors in the microprocessor of the IQ–P.I.P.–SMT in order for it to properly interpret the output signal level of the amplifier model in which it is installed. This is easily done by connecting a host computer to the IQ–P.I.P.–SMT via an IQ interface and the Crown Bus and running the appropriate software (see the IQ software *User's Manual* for details). The software will prompt you for the amplifier model and send the appropriate scale factors to the P.I.P. The scale factor values are listed in Figure 4.8 along with the settings of jumpers JP4 and JP5.  
 Note: Since it is possible to configure one channel of a

Amplifier Model	Scale Values (Decimal)		Output Signal Pads (JP4, JP5)
	Channel 1	Channel 2	
Com-Tech 200 (8 ohm)	57	57	IN
Com-Tech 400 (8 ohm)	45	45	IN
Com-Tech 800 (8 ohm)	40	40	IN
Com-Tech 1600 (8 ohm)	30	30	IN
All Com-Tech (70-volt)	27	27	IN
Macro-Tech 600	44	44	IN
Macro-Tech 1200	39	39	IN
Macro-Tech 2400	30	24	IN
Macro-Tech 24x6	30	44	IN
Macro-Tech 3600VZ	14	14	IN
Macro-Tech 36x12	14	39	IN
Macro-Tech 5000VZ	30	30	OUT
Macro-Tech 10000	24	24	IN
Reference I	17	17	IN
Reference II	30	30	IN
PIP2-Compatible (Auto)	51	51	OUT

Fig. 4.8 Amplifier Scale Factor Values and Output Signal Pad Settings

Com-Tech amplifier in the 8-ohm output mode and the other channel in the 70-volt output mode, it may be necessary to configure the scale factors differently for each channel.

#### 4.6 A Closer Look at Crown Bus Wiring

The *IQ-P.I.P.–SMT* 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. The Crown Bus is a serial communication loop designed to transmit IQ commands and data. As implemented in the *IQ-P.I.P.–SMT*, 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.–SMT* 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 shielded twisted-pair wire** at least 26 AWG in size when interference is a problem. 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. However, in most cases interference is not a problem and, since unshielded wire has lower capacitance, it is a better choice.
- **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 required by high-capacitance wire. Although we recommend a repeater for loops longer than 1,000 feet, it is of-

ten 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 screw terminal plugs. The *IQ-P.I.P.—SMT* uses a 5-pin DIN connector for input and a 4-pin DIN connector for output. Figure 4.11 shows how they should be wired.



**IQ-P.I.P.-SMT Output**

**IQ Component Input**

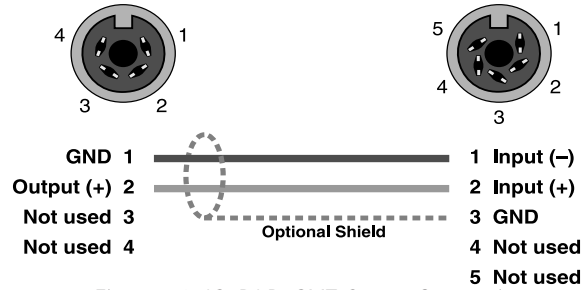


Figure 4.9 IQ-P.I.P.-SMT Output Connection to Another IQ Component with DIN Connectors

**IQ-P.I.P.-SMT Output**

**IQ Mixer**

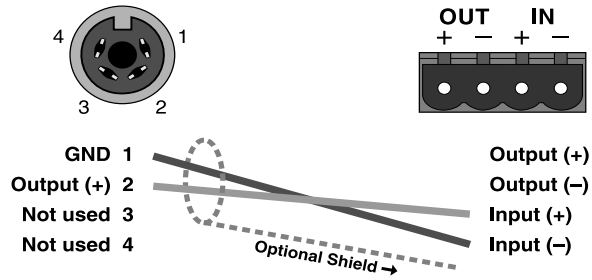


Figure 4.10 IQ-P.I.P.-SMT Output Connection to an IQ Component with a Screw Terminal Plug Connector

**IQ Mixer**

**IQ-P.I.P.-SMT Input**

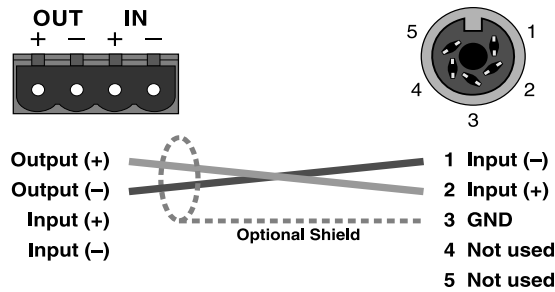
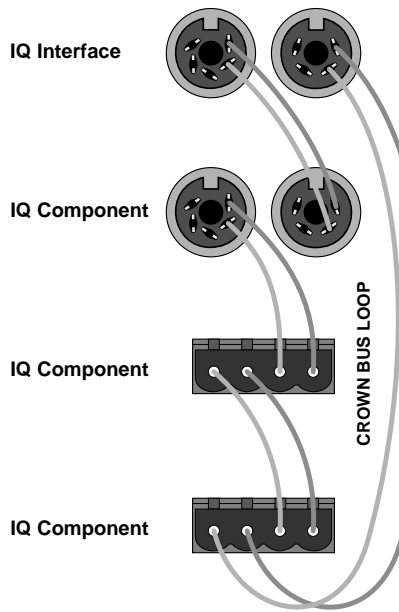


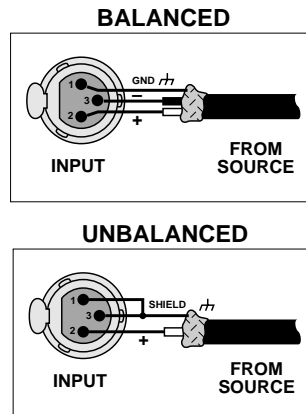
Figure 4.11 An IQ Component with Screw Terminal Plug Connected to the IQ-P.I.P.-SMT Input

The next two figures show how to connect the *IQ-P.I.P.-SMT* to other IQ components with different connectors. Figure 4.10 shows how the Crown Bus output of the *IQ-P.I.P.-SMT* should be connected to an IQ component with a screw terminal plug. Figure 4.11 shows how the Crown Bus input of the *IQ-P.I.P.-SMT* should be connected to an IQ component with a screw terminal plug.

The IQ components in a 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 4.12.



*Fig. 4.12 Crown Bus Wiring “Loops” from the Output to the Input of Each IQ Component*



*Figure 4.13 Audio Input Wiring*

### 4.7 A Closer Look at Audio Signal Wiring

Balanced 3-pin female XLR connectors are provided for audio input connection. The audio cables should be wired in one of the following manners:

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.–SMT* 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.–SMT* 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.

#### 4.8 Using the AUX Connector

The *IQ System* offers tremendous flexibility and the auxiliary feature connector provides a means of tapping into it. It can be used to turn something on/off, send a signal to another component and receive a signal from another component.

The AUX connector is a 3-pin male mini XLR connector. Pins 1 and 3 are used to send a signal and pins 1 and 2 are used to receive a signal.

##### 4.8.1 AUX Output

When the auxiliary feature is turned on by the *IQ System* software +15 VDC is supplied across pins 1 (ground) and 3 (+). A total of 10 milliamps of current is available. A 1.5 k ohm resistor protects against shorts.

There are many possible uses for the AUX output. For example, it can be used to turn on auxiliary cooling fans. To do this the AUX connector would be used to close a relay. The relay would then turn the fans on or off. This is shown in Figure 4.15.

Note: A Crown part number is provided in the above illustration for a suitable solid-state relay (C 7308-7). Contact your local Crown representative or the Crown factory Parts Department (219-294-8200) to order.

By monitoring the operating condition of amplifiers with the *IQ System* software, the need for additional cooling will be apparent. The same software could then be used to turn on the appropriate AUX connector. (For more information about turning the auxiliary feature on/off, consult the *IQ software Online Help System*.)

In addition to the preceding examples, the AUX ports of more than one *IQ* component can be used to send binary codes to auxiliary equipment. For example, eight AUX ports can be used to send 8-bit binary codes to external equipment.

##### 4.8.2 AUX Input

Depending on the *IQ* software being used, the AUX connector can be

used to sense the presence of an input signal across pins 1 (ground) and 2 (+). A 2.5 to 15 VDC signal at the input will be interpreted as a logic "high" and will be communicated to the Crown Bus where a host computer or drone can act upon it. A sig-

nal less than 2.5 VDC is interpreted as a logic "low." *Note: A negative signal can also be used as a logic low because the signal is internally clamped to protect the internal circuitry.*

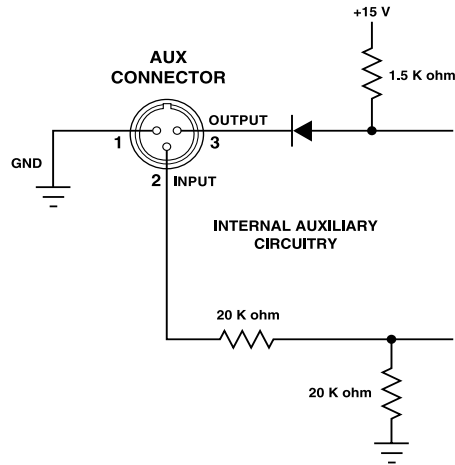


Fig. 4.14 The Internal AUX Circuit

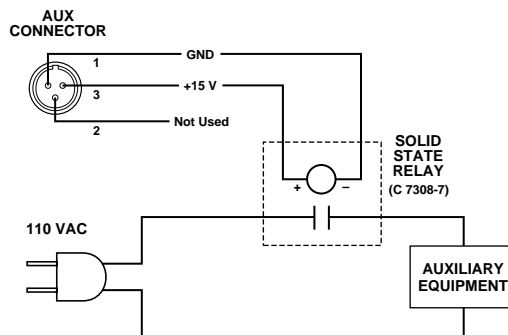


Fig. 4.15 A Sample AUX Output Circuit

## 5 Technical Information

The purpose of the *IQ-P.I.P.–SMT* is to enable an *IQ System* to control and monitor a *P.I.P.*-compatible amplifier. The exact features of your unit are determined by the firmware in its microprocessor. Here is a typical list of features:

- Control the audio signal polarity.
- Control the high-voltage power supplies.
- Control the DSPI LED.
- Control and monitor the AUX port.

In addition, all units can monitor these parameters:

- Monitor the input level to the *IQ-P.I.P.–SMT*.
- Monitor the output level from the amplifier.
- Monitor the *ODEP* level.
- Monitor the *IOC*.

### 5.1 Audio Signals

Balanced and unbalanced audio signals enter the module at the XLR connectors. From these connectors, the signals are RFI filtered and fed into a balanced to single-ended conversion stage. Additional gain and/or phantom power for a microphone are also provided in this stage. From this point, the audio signal is sent to a monitor input (discussed below) and also to a digitally controlled attenuator. Following the attenuator, the signals pass through a final output buffer stage, which also can invert the polarity of the signal when required. The audio signal is then fed through the *P.I.P.* edge card connector and into the amplifier.

### 5.2 Amplifier Monitoring: “Monitor Inputs”

The *IQ-P.I.P.–SMT* can monitor the status of the amplifier using a number of “monitor inputs.” There are two types of signals—audio and status.

The audio signals that are monitored are the input to the *P.I.P.* and the output of the amplifier. These signals enter the *P.I.P.* and are fed into a precision peak detector which insures that instantaneous signal peaks are not “missed” by the *P.I.P.* The detector outputs are then fed through a multiplexer into a logarithmic conversion circuit for dynamic range scaling. The output of this circuit is then fed into the *A/D* converter on the microprocessor, where the signal is converted and sent to the host computer via the Crown Bus.

The status signals that are monitored are *ODEP* level, *IOC* status and *VCC* status. These signals enter the *P.I.P.*, pass through a buffer stage, and are fed into the *A/D* converter on the microprocessor. The signals are then converted and sent to the host computer via the Crown Bus.

### 5.3 Amplifier Control

The *IQ-P.I.P.–SMT* can control the following functions: audio level, audio polarity, high-voltage power supplies, DSPI and the AUX port. 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 DSPI LED flashes whenever a valid *IQ* command has been received and can be forced to stay on to facilitate diagnosis of Crown Bus wiring problems.

#### **5.4 IQ System Communications**

The *IQ–P.I.P.–SMT* communicates with the host computer via the Crown Bus. Connections to the Crown Bus are made via the 4 and 5-pin locking DIN connectors 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.

#### **5.5 Microprocessor and Reset Switch**

The “brains” of the *IQ–P.I.P.–SMT* are contained in the microprocessor. It interprets commands

received from the Crown Bus and responds accordingly. The *IQ–P.I.P.–SMT* is designed to provide an “automatic reset” in the event of a power failure, but the rear reset switch has also been added. Pressing this switch restores all *P.I.P.* settings to the “user defaults” if it is pressed for less than 2 seconds or to the factory defaults if it is pressed for more than 2 seconds. The only exception is the initialization data which can only be changed with *IQ System* software on the host computer.

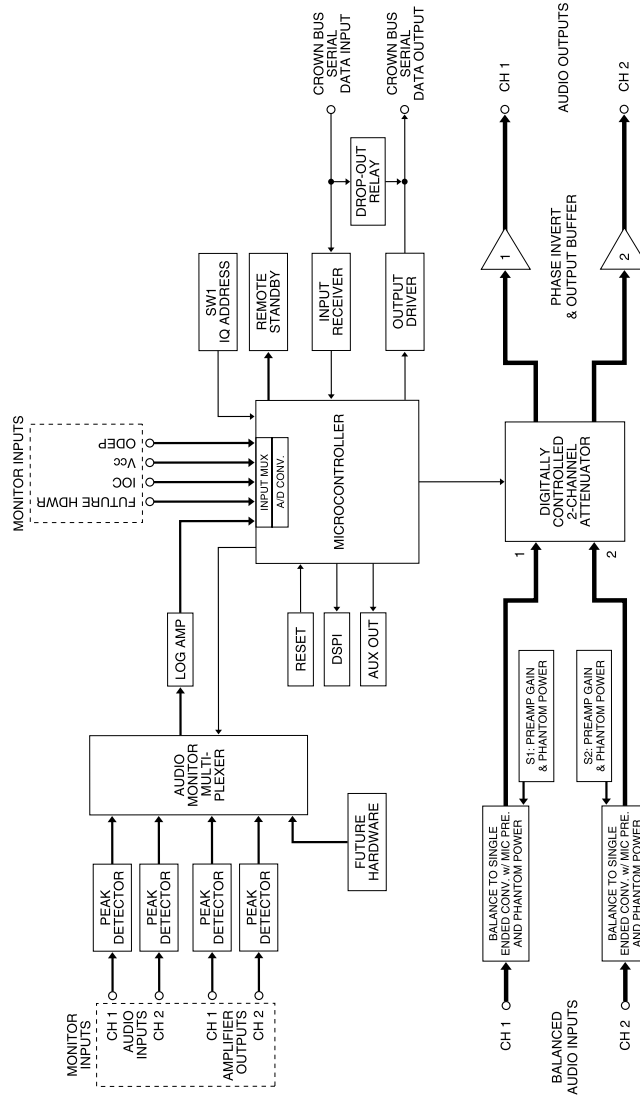


Fig. 5.1 IQ-P.I.P.-SMT Circuit Block Diagram

## 6 Specifications

### General

**Internal Controls:** An 8-segment DIP switch is used to set the IQ address (decimal range: 1–250). Note: If address “0” is selected, the *IQ–P.I.P.–SMT* will operate in stand-alone mode. Two additional 8-segment DIP switches (one for each channel) set the preamp gain of each input and turn phantom power on and off. 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: Locking 5-pin female DIN connector. Crown Bus Output: Locking 4-pin female DIN connector. Audio Input: Balanced 3-pin female XLR connector for each channel. AUX: A 3-pin male mini connector.

**Indicators:** A yellow DSPI (Data Signal Presence Indicator) 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 DSPI 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  $\pm 24$  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 3000 feet (61 to 914 m), depending upon wire capacitance. Typically 1000 feet (305 M) using shielded twisted-pair wire, #26 AWG or larger. Can be extended with an IQ Repeater.

### 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.–SMT* module, itself.

**Input Impedance:** Nominally 24 k ohms balanced and 12 k ohms unbalanced.

**Phantom Power:** Nominally +15 VDC, 1.5 mA.

**Microphone Preamp:** Adds +20 or +40 dB of gain.

**Maximum Input Level:** +12 dBu.

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



**Frequency Response:**  $\pm 0.1$  dB from 20 Hz to 20 kHz.

**Crosstalk Ratio:**  $>75$  dB at 1 kHz.  
 $>65$  dB at 20 kHz.

**Common Mode Rejection (CMR):**  
 $>70$  dB at 60 Hz with +10 dBu input.

**Total Harmonic Distortion (THD):**  
 $<0.05\%$  from 20 Hz to 20 kHz.

***IQ System Data Acquisition***  
**Input/Output Monitor Accuracy:**  
Typically  $\pm 1$  dB.  $\pm 2$  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.-SMT 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

IQ Address	IQ Address Switch								IQ Address	IQ Address Switch							
	1	2	3	4	5	6	7	8		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
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	43	ON	ON	OFF	ON	OFF	ON	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	44	OFF	OFF	ON	ON	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	45	ON	OFF	ON	ON	OFF	ON	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	46	OFF	ON	ON	ON	OFF	ON	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	47	ON	ON	ON	ON	OFF	ON	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	48	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	49	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	50	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	51	ON	ON	OFF	OFF	ON	ON	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	52	OFF	OFF	ON	OFF	ON	ON	OFF	OFF
11	ON	ON	ON	ON	OFF	OFF	OFF	OFF	53	ON	OFF	ON	OFF	ON	ON	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	54	OFF	ON	ON	OFF	ON	ON	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF	OFF	OFF	55	ON	ON	ON	OFF	ON	ON	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	56	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF	OFF	OFF	57	ON	OFF	OFF	ON	ON	ON	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	58	OFF	ON	OFF	ON	ON	ON	OFF	OFF
17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	59	ON	ON	OFF	ON	ON	ON	OFF	OFF
18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	60	OFF	OFF	ON	ON	ON	ON	OFF	OFF
19	ON	ON	OFF	OFF	ON	OFF	OFF	OFF	61	ON	OFF	ON	ON	ON	ON	OFF	OFF
20	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	62	OFF	ON	ON	ON	ON	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	63	ON	ON	ON	ON	ON	ON	OFF	OFF
22	OFF	ON	ON	OFF	ON	OFF	OFF	OFF	64	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
23	ON	ON	ON	OFF	ON	OFF	OFF	OFF	65	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	66	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF
25	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	67	ON	ON	OFF	OFF	OFF	OFF	ON	OFF
26	OFF	ON	OFF	ON	ON	OFF	OFF	OFF	68	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
27	ON	ON	OFF	ON	ON	OFF	OFF	OFF	69	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
28	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	70	OFF	ON	ON	OFF	OFF	OFF	ON	OFF
29	ON	OFF	ON	ON	ON	OFF	OFF	OFF	71	ON	ON	ON	OFF	OFF	OFF	ON	OFF
30	OFF	ON	ON	ON	ON	OFF	OFF	OFF	72	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF
31	ON	ON	ON	ON	ON	OFF	OFF	OFF	73	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
32	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	74	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
33	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	75	ON	ON	OFF	ON	OFF	OFF	ON	OFF
34	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	76	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
35	ON	ON	OFF	OFF	OFF	ON	OFF	OFF	77	ON	OFF	ON	ON	OFF	OFF	ON	OFF
36	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	78	OFF	ON	ON	ON	OFF	OFF	ON	OFF
37	ON	OFF	ON	OFF	OFF	ON	OFF	OFF	79	ON	ON	ON	ON	OFF	OFF	ON	OFF
38	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	80	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
39	ON	ON	ON	OFF	OFF	ON	OFF	OFF	81	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
40	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	82	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
41	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	83	ON	ON	OFF	OFF	ON	OFF	ON	OFF

Fig. 7.1 IQ Address Switch (SW1) Settings from 0 to 83

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.–SMT* as shown. See Section 4.1 also.

IQ Address	IQ Address Switch								IQ Address	IQ Address Switch							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
84	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	126	OFF	ON	ON	ON	ON	ON	ON	OFF
85	ON	OFF	ON	OFF	ON	OFF	ON	OFF	127	ON	ON	ON	ON	ON	ON	ON	OFF
86	OFF	ON	ON	OFF	ON	OFF	ON	OFF	128	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
87	ON	ON	ON	OFF	ON	OFF	ON	OFF	129	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
88	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	130	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
89	ON	OFF	OFF	ON	ON	OFF	ON	OFF	131	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
90	OFF	ON	OFF	ON	ON	OFF	ON	OFF	132	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
91	ON	ON	OFF	ON	ON	OFF	ON	OFF	133	ON	OFF	ON	OFF	OFF	OFF	OFF	ON
92	OFF	OFF	ON	ON	ON	OFF	ON	OFF	134	OFF	ON	ON	OFF	OFF	OFF	OFF	ON
93	ON	OFF	ON	ON	ON	OFF	ON	OFF	135	ON	ON	ON	OFF	OFF	OFF	OFF	ON
94	OFF	ON	ON	ON	ON	OFF	ON	OFF	136	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
95	ON	ON	ON	ON	ON	OFF	ON	OFF	137	ON	OFF	ON	ON	OFF	OFF	OFF	ON
96	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	138	OFF	ON	OFF	ON	OFF	OFF	OFF	ON
97	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	139	ON	ON	OFF	ON	OFF	OFF	OFF	ON
98	OFF	ON	OFF	OFF	OFF	ON	ON	OFF	140	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
99	ON	ON	OFF	OFF	OFF	ON	ON	OFF	141	ON	OFF	ON	ON	OFF	OFF	OFF	ON
100	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	142	OFF	ON	ON	ON	OFF	OFF	OFF	ON
101	ON	OFF	ON	OFF	OFF	ON	ON	OFF	143	ON	ON	ON	ON	OFF	OFF	OFF	ON
102	OFF	ON	ON	OFF	OFF	ON	ON	OFF	144	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON
103	ON	ON	ON	OFF	OFF	ON	ON	OFF	145	ON	OFF	OFF	OFF	ON	OFF	OFF	ON
104	OFF	OFF	OFF	ON	OFF	ON	ON	OFF	146	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
105	ON	OFF	OFF	ON	OFF	ON	ON	OFF	147	ON	ON	OFF	OFF	ON	OFF	OFF	ON
106	OFF	ON	OFF	ON	OFF	ON	ON	OFF	148	OFF	OFF	ON	OFF	ON	OFF	OFF	ON
107	ON	ON	OFF	ON	OFF	ON	ON	OFF	149	ON	OFF	ON	OFF	ON	OFF	OFF	ON
108	OFF	OFF	ON	ON	OFF	ON	ON	OFF	150	OFF	ON	ON	OFF	ON	OFF	OFF	ON
109	ON	OFF	ON	ON	OFF	ON	ON	OFF	151	ON	ON	ON	OFF	ON	OFF	OFF	ON
110	OFF	ON	ON	ON	OFF	ON	ON	OFF	152	OFF	OFF	OFF	ON	ON	OFF	OFF	ON
111	ON	ON	ON	ON	OFF	ON	ON	OFF	153	ON	OFF	OFF	ON	ON	OFF	OFF	ON
112	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	154	OFF	ON	OFF	ON	ON	OFF	OFF	ON
113	ON	OFF	OFF	OFF	ON	ON	ON	OFF	155	ON	ON	OFF	ON	ON	OFF	OFF	ON
114	OFF	ON	OFF	OFF	ON	ON	ON	OFF	156	OFF	OFF	ON	ON	ON	OFF	OFF	ON
115	ON	ON	OFF	OFF	ON	ON	ON	OFF	157	ON	OFF	ON	ON	ON	OFF	OFF	ON
116	OFF	OFF	ON	OFF	ON	ON	ON	OFF	158	OFF	ON	ON	ON	ON	OFF	OFF	ON
117	ON	OFF	ON	OFF	ON	ON	ON	OFF	159	ON	ON	ON	ON	ON	OFF	OFF	ON
118	OFF	ON	ON	OFF	ON	ON	ON	OFF	160	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON
119	ON	ON	ON	OFF	ON	ON	ON	OFF	161	ON	OFF	OFF	OFF	OFF	ON	OFF	ON
120	OFF	OFF	OFF	ON	ON	ON	ON	OFF	162	OFF	ON	OFF	OFF	OFF	ON	OFF	ON
121	ON	OFF	OFF	ON	ON	ON	ON	OFF	163	ON	ON	OFF	OFF	OFF	ON	OFF	ON
122	OFF	ON	OFF	ON	ON	ON	ON	OFF	164	OFF	OFF	ON	OFF	OFF	ON	OFF	ON
123	ON	ON	OFF	ON	ON	ON	ON	OFF	165	ON	OFF	ON	OFF	OFF	ON	OFF	ON
124	OFF	OFF	ON	ON	ON	ON	ON	OFF	166	OFF	ON	ON	OFF	OFF	ON	OFF	ON
125	ON	OFF	ON	ON	ON	ON	ON	OFF	167	ON	ON	ON	OFF	OFF	ON	OFF	ON

Fig. 7.2 IQ Address Switch (SW1) Settings from 84 to 167

IQ Address	IQ Address Switch								IQ Address	IQ Address Switch							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
168	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	210	OFF	ON	OFF	OFF	ON	OFF	ON	ON
169	ON	OFF	OFF	ON	OFF	ON	OFF	ON	211	ON	ON	OFF	OFF	ON	OFF	ON	ON
170	OFF	ON	OFF	ON	OFF	ON	OFF	ON	212	OFF	OFF	ON	OFF	ON	OFF	ON	ON
171	ON	ON	OFF	ON	OFF	ON	OFF	ON	213	ON	OFF	ON	OFF	ON	OFF	ON	ON
172	OFF	OFF	ON	ON	OFF	ON	OFF	ON	214	OFF	ON	ON	OFF	ON	OFF	ON	ON
173	ON	OFF	ON	ON	OFF	ON	OFF	ON	215	ON	ON	ON	OFF	ON	OFF	ON	ON
174	OFF	ON	ON	ON	OFF	ON	OFF	ON	216	OFF	OFF	OFF	ON	ON	OFF	ON	ON
175	ON	ON	ON	ON	OFF	ON	OFF	ON	217	ON	OFF	OFF	ON	ON	OFF	ON	ON
176	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	218	OFF	ON	OFF	ON	ON	OFF	ON	ON
177	ON	OFF	OFF	OFF	ON	ON	OFF	ON	219	ON	ON	OFF	ON	ON	OFF	ON	ON
178	OFF	ON	OFF	OFF	ON	ON	OFF	ON	220	OFF	OFF	ON	ON	ON	OFF	ON	ON
179	ON	ON	OFF	OFF	ON	ON	OFF	ON	221	ON	OFF	ON	ON	ON	OFF	ON	ON
180	OFF	OFF	ON	OFF	ON	ON	OFF	ON	222	OFF	ON	ON	ON	ON	OFF	ON	ON
181	ON	OFF	ON	OFF	ON	ON	OFF	ON	223	ON	ON	ON	ON	ON	OFF	ON	ON
182	OFF	ON	ON	OFF	ON	ON	OFF	ON	224	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
183	ON	ON	ON	OFF	ON	ON	OFF	ON	225	ON	OFF	OFF	OFF	OFF	ON	ON	ON
184	OFF	OFF	OFF	ON	ON	ON	OFF	ON	226	OFF	ON	OFF	OFF	OFF	ON	ON	ON
185	ON	OFF	OFF	ON	ON	ON	OFF	ON	227	ON	ON	OFF	OFF	OFF	ON	ON	ON
186	OFF	ON	OFF	ON	ON	ON	OFF	ON	228	OFF	OFF	ON	OFF	OFF	ON	ON	ON
187	ON	ON	OFF	ON	ON	ON	OFF	ON	229	ON	OFF	ON	OFF	OFF	ON	ON	ON
188	OFF	OFF	ON	ON	ON	ON	OFF	ON	230	OFF	ON	ON	OFF	OFF	ON	ON	ON
189	ON	OFF	ON	ON	ON	ON	OFF	ON	231	ON	ON	ON	OFF	OFF	ON	ON	ON
190	OFF	ON	ON	ON	ON	ON	OFF	ON	232	OFF	OFF	OFF	ON	OFF	ON	ON	ON
191	ON	ON	ON	ON	ON	ON	OFF	ON	233	ON	OFF	OFF	ON	OFF	ON	ON	ON
192	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	234	OFF	ON	OFF	ON	OFF	ON	ON	ON
193	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	235	ON	ON	OFF	ON	OFF	ON	ON	ON
194	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	236	OFF	OFF	ON	ON	OFF	ON	ON	ON
195	ON	ON	OFF	OFF	OFF	OFF	ON	ON	237	ON	OFF	ON	ON	OFF	ON	ON	ON
196	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	238	OFF	ON	ON	ON	OFF	ON	ON	ON
197	ON	OFF	ON	OFF	OFF	OFF	ON	ON	239	ON	ON	ON	ON	OFF	ON	ON	ON
198	OFF	ON	ON	OFF	OFF	OFF	ON	ON	240	OFF	OFF	OFF	OFF	ON	ON	ON	ON
199	ON	ON	ON	OFF	OFF	OFF	ON	ON	241	ON	OFF	OFF	OFF	ON	ON	ON	ON
200	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	242	OFF	ON	OFF	OFF	ON	ON	ON	ON
201	ON	OFF	OFF	ON	OFF	OFF	ON	ON	243	ON	ON	OFF	OFF	ON	ON	ON	ON
202	OFF	ON	OFF	ON	OFF	OFF	ON	ON	244	OFF	OFF	ON	OFF	ON	ON	ON	ON
203	ON	ON	OFF	ON	OFF	OFF	ON	ON	245	ON	OFF	ON	OFF	ON	ON	ON	ON
204	OFF	OFF	ON	ON	OFF	OFF	ON	ON	246	OFF	ON	ON	OFF	ON	ON	ON	ON
205	ON	OFF	ON	ON	OFF	OFF	ON	ON	247	ON	ON	ON	OFF	ON	ON	ON	ON
206	OFF	ON	ON	ON	OFF	OFF	ON	ON	248	OFF	OFF	OFF	ON	ON	ON	ON	ON
207	ON	ON	ON	ON	OFF	OFF	ON	ON	249	ON	OFF	OFF	ON	ON	ON	ON	ON
208	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	250	OFF	ON	OFF	ON	ON	ON	ON	ON
209	ON	OFF	OFF	OFF	ON	OFF	ON	ON									

Fig. 7.3 IQ Address Switch (SW1) Settings from 168 to 250

## 8 Service

This unit has very sophisticated circuitry which should only be serviced by a fully trained 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 in one of two ways: from an authorized service center or from the factory. You may choose either. It is important that you have your copy of the bill of sale as your proof of purchase.

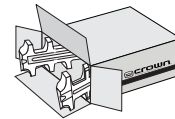
#### 8.2.1 Service at a North American Service Center

This method usually saves the most time and effort. Simply present your bill of sale along with the defective unit to an authorized service center to obtain service. They will handle the necessary paperwork and repair. Remember to transport the unit in the original factory pack. A list of authorized service centers in your area can be obtained from our Technical Support Group.

#### 8.2.2 Factory Service

To obtain factory service, fill out the **service information page** that fol-

lows and send it along with 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.



**Always use the original factory pack to transport the unit.**

#### 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 or metal). Ignoring this warning may result in extensive damage to the unit and the cabinet.



Accessories are not needed—do not send the *Reference* or *Owner's 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

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

*Internet:* <http://www.crownaudio.com>

## Crown Factory Service Information

Shipping Address: Crown International, Inc., Factory Service,  
Plant 2 SW, 1718 W. Mishawaka Rd., Elkhart, IN U.S.A. 46517  
Phone: 1-800-342-6939 or 1-219-294-8200 Fax: 1-219-294-8124

Owner's Name: \_\_\_\_\_

Shipping Address: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Model: \_\_\_\_\_ Serial Number: \_\_\_\_\_

Purchase Date: \_\_\_\_\_

### NATURE OF PROBLEM

*(Be sure to describe the conditions that existed when the problem occurred and what attempts were made to correct it.)*

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Other equipment in your system: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

If warranty has expired, payment will be:

Cash/Check  VISA  MasterCard  C.O.D.

Card Number: \_\_\_\_\_

Exp. Date: \_\_\_\_\_ Signature: \_\_\_\_\_

ENCLOSE THIS PORTION WITH THE UNIT.  
DO NOT MAIL SEPARATELY.

Detach and send with unit.