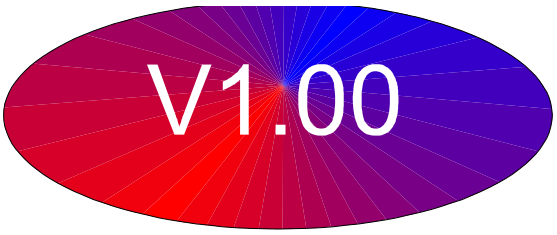
ALESIS
STUDIO ELECTRONICS

QS Series

64 Voice Keyboards and Rack Mount Synths

Edited by

T.J. Goodwin



Preface

This document is intended to assist the service technician in the operation, maintenance and repair of the QS Series 64 Voice Synthesizer/Controller Keyboards. Together with the User Reference Manuals, this document provides a complete description of the functionality and serviceability of the QS Series. Any comments or suggestions you may have pertaining to the document are welcome and encouraged.

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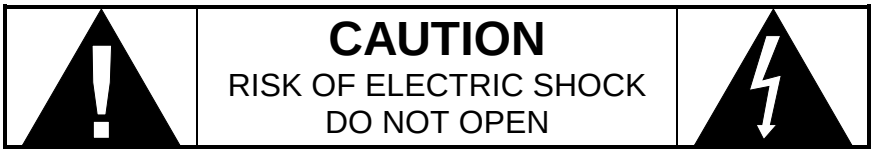

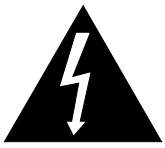

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The exclamation point inside a triangle is intended to alert the user to the presence of important operating, maintenance and servicing instructions in the literature which accompanies the product.

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CAUTION

Danger of explosion if battery is incorrectly replaced.
Replace only with the same type or equivalent type
recommended by the equipment manufacturer.

Battery Manufacturer: Panasonic/Matsushita
Type: BR2325
Rating 3V, 5mA

Safety Suggestions

Carefully read the applicable items of the operating instructions and these safety suggestions before using this product. Use extra care to follow the warnings written on the product itself and in the operating instructions. Keep the operating instructions and safety suggestions for reference in the future.

1. Power Source. The product should only be connected to a power supply which is described either in the operating instructions or in markings on the product.

2. Power Cord Protection. AC power supply cords should be placed such that no one is likely to step on the cords and such that nothing will be placed on or against them.

3. Periods of Non-use. If the product is not used for any significant period of time, the product's AC power supply cord should be unplugged from the AC outlet.

4. Foreign Objects and Liquids. Take care not to allow liquids to spill or objects to fall into any openings of the product.

5. Water or Moisture. The product should not be used near any water or in moisture.

6. Heat. Do not place the product near heat sources such as stoves, heat registers, radiators or other heat producing equipment.

7. Ventilation. When installing the product, make sure that the product has adequate ventilation. Improperly ventilating the product may cause overheating, which may damage the product.

8. Mounting. The product should only be used with a rack which the manufacturer recommends. The combination of the product and rack should be moved carefully. Quick movements, excessive force or uneven surfaces may overturn the combination which may damage the product and rack combination.

9. Cleaning. The product should only be cleaned as the manufacturer recommends.

10. Service. The user should only attempt the limited service or upkeep specifically described in the operating instructions for the user. For any other service required, the product should be taken to an authorized Service Center as described in the operating instructions.

11. Damage to the Product. Qualified service personnel should service the unit in certain situations including without limitation when:
    a. Liquid has spilled or objects have fallen into the product,
    b. The product is exposed to water or excessive moisture,
    c. The AC power supply plug or cord is damaged,
    d. The product shows an inappropriate change in performance or does not operate normally, or
    e. The enclosure of the product has been damaged.

General Troubleshooting

While this manual assumes that the reader has a fundamental understanding of electronics and basic troubleshooting techniques, a review of some of the techniques used by our staff may help.

- ☆ Visual Inspection - A short visual inspection of the unit under test will often yield results without the need of complex signal analysis (burnt, or loose components are a dead giveaway).
- ☆ Self Test - Alesis products that utilize microprocessor control contain built in test software which exercises many of the units' primary circuit functions. Self test should always be done following any repair to ensure basic functionality.
- ☆ Environmental Testing - Applying heat and cold (heat gun/freeze spray) will often reveal thermally intermittent components (Clock crystals, I.C.s, and capacitors are particularly prone to this type of failure).
- ☆ Burn in Testing - Leaving a unit running overnight often reveals intermittent failures such as capacitors that begin to leak excess current after a significant amount of time.
- ☆ Cable Checks - Wiggling cables can reveal intermittent failures such as loose cables or poorly soldered headers. Remember to check power supply cables as well.
- ☆ Flexing the PC Board - Poor solder joints and broken traces can often be found by pressing the PC Board in various places.
- ☆ Tapping Components - Sometimes tapping on a component (particularly crystals) will cause it to fail.
- ☆ Power Down/up - Turning the unit off and back on rapidly several times may reveal odd reset and/or power supply failures.
- ☆ Reset Threshold - A Variac (variable transformer) can be used to check reset threshold levels. This can be particularly useful in helping customers with low line problems.
- ☆ Compressors - Using a compressor/limiter is often helpful when attempting to solve low level noise problems, as well as assisting with DAC adjustments.
- ☆ Sweep Tests - Sweep generators are very useful in checking the frequency response envelopes of anti-aliasing filters.
- ☆ Piggybacking - Piggybacking I.C.s is particularly useful when troubleshooting large sections of logic. This is especially true when working with older units.

Acknowledgments

While I get the credit for the whole thing, as with any serious book, there is really a team effort behind it. So this is my opportunity to thank all of those who's special efforts help me look good. Technicians Joe Reyes, Steve McCain, and Ron Dorsey. Their day to day experience and help with proofreading are an integral part of this effort. Engineers Robert Rampley, and Mike Murphy for their insight and documentation assistance. Parts gods Chris Martin and Wayne Hamilton for help in procuring (you guessed it!) parts. My Boss John Sarappo for having the confidence in me to let me do things my way (as well as having the final proofreading say). The entire Alesis staff. Let's face it, without their professionalism and skill, there wouldn't be any Alesis products for me to write about.

In addition to the support of my family and thanking the usual crowd of slackers I call my friends, I'd also like to thank Speedvision network for almost satisfying my insatiable jones for motorsports. Congratulations to Damon Hill for winning the Formula 1 Championship. I have developed a great appreciation for how much effort it takes to win championships like that.

Last on the list, but first in class is of course You. Without You, none of this is needed, and I'm out of a job! Beyond that, You give me the feedback that allows me to continue to improve both myself, and the current state of the art in service documentation. It is always our intention to provide You with the best information possible. Tell us what You need, and we'll try to get it to You.

T.J. Goodwin
Technical Services Coordinator.

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1.00 General Descriptions

The QS series of 64 voice, keyboard and rack mount digital synthesizers represent the current state of the art in high end digital synthesizers. It is certainly recommended that technicians be thoroughly familiar with the operation of the units according to the User's Reference Manuals before attempting any repair. As is often the case when machines present the user with so many options, many "repairs" can be made simply through education in the correct way to use the product. The software histories in Appendix B of this manual may also prove to be an excellent aid in troubleshooting User difficulties.

Several of these units utilize the same PCBs. For example, the QS7 and QS8 have identical main PCBs, and all three keyboards (QS6, QS7, and QS8) use the same keypad PCB. However, some PCBs may be different between individual units while performing similar functions. In order to minimize confusion between reference designators for the different unit types, the following conventions will be used throughout this manual:

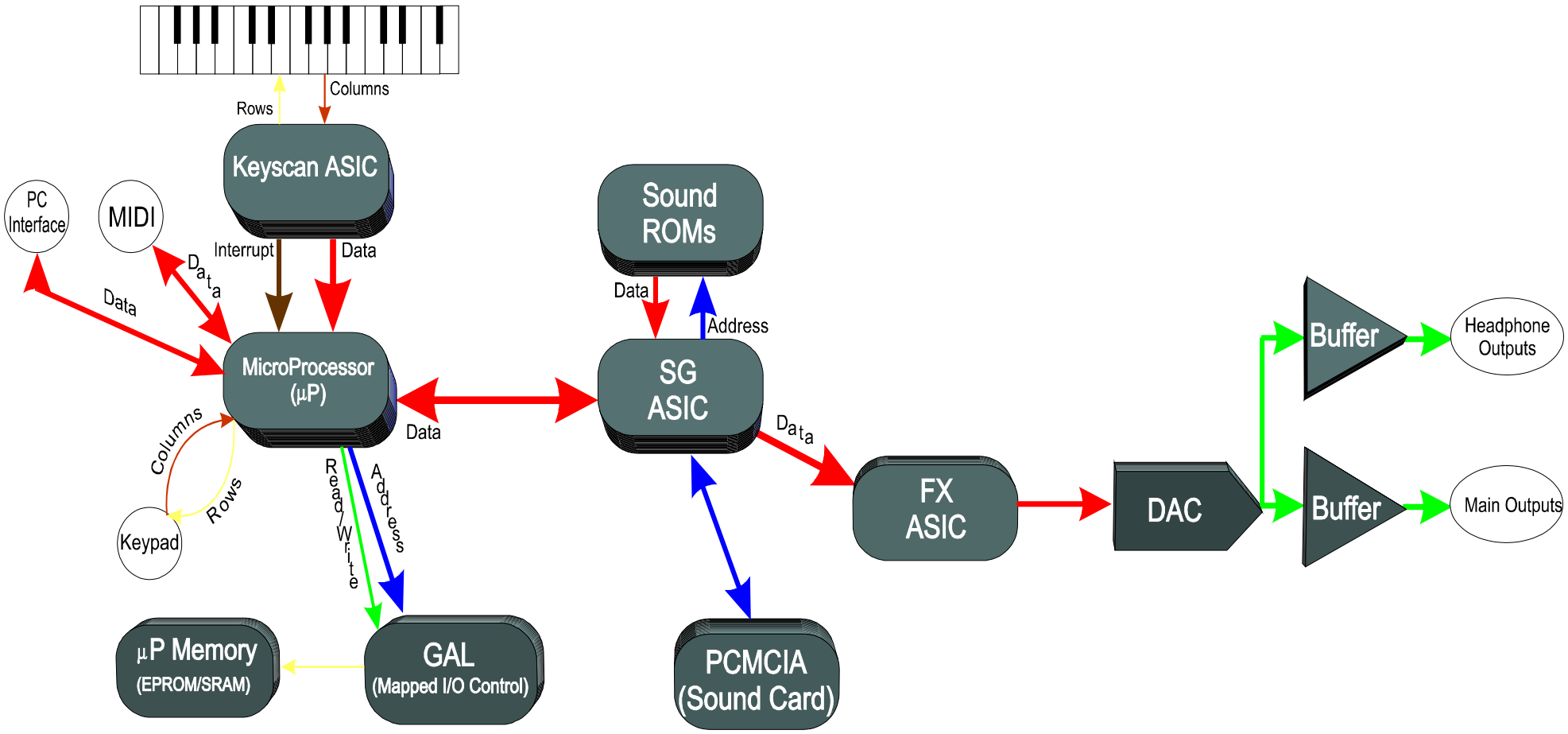
- QS6 Reference Designators are **BOLD** (e.g. **R6, C9**)
- QS7 Reference Designators are *Italicized* (e.g. *R6, C9*)
- QS8 Reference Designators are Underlined (e.g. R6, C9)
- QSR Reference Designators are Plain (e.g. R6, C9)
- Combinations are allowed (i.e. *Italicized* and underlined indicate both QS7 and QS8 references) (e.g. *R6, C9*)

1.10 QS6

With the release of the original S5 (later updated to S5+ A.K.A. S9) QuadraSynth keyboard and the S4 (later S4+ or S8), Alesis jumped to the forefront of a field in which it had no previous experience. Since then, we have learned a great deal about the construction of keyboards, as well as the needs of keyboard players in general. This inevitably led to the release of the QS6. Smaller, lighter, and with improved sound quality, the QS6 was an instant success. Still minor improvements have been made through the lifetime of this which have resulted in several main PCB revisions. Each revision incorporates previous changes as well as any new improvements made. These changes are outlined in Appendix A. This manual references the following schematics and component I.D.s unless otherwise noted:

PCB	Schematic Revision
Main	S6 B
Slider	S6 B
Keypad	QS6/7/8 C

Refer to Figure 1 for a simplified view of the QS6's electronic systems.



QS6 Simplified Block Diagram

Figure 1 - QS6 Simplified Block Diagram

1.20 QS7

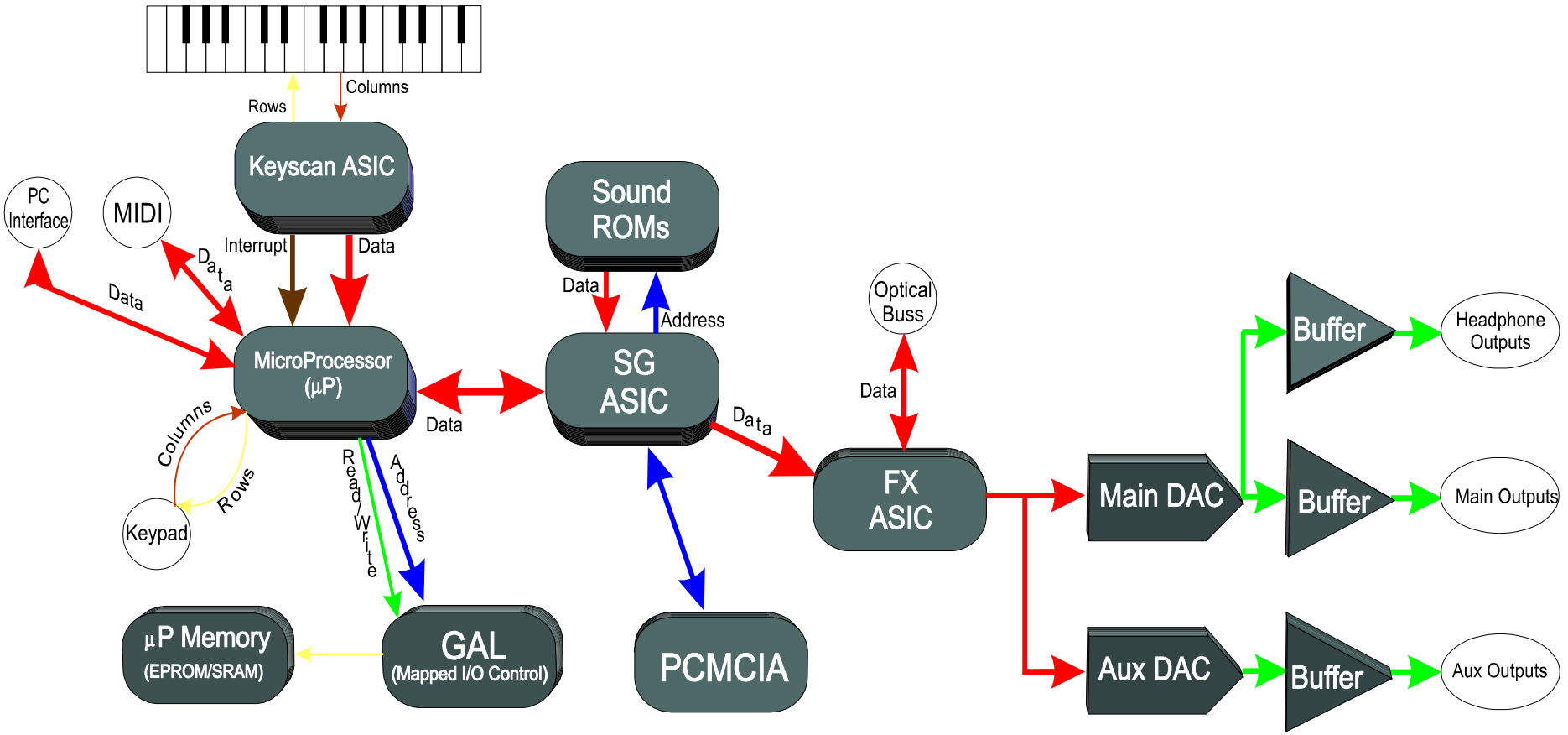
The QS7 further expanded and improved the system used in the QS6. The larger QS7 is heavier and therefore less portable, but it's expanded keyboard enhances it's use as a master keyboard controller for the studio. Refer to Figure 2 for a simplified view of the QS7's electronic systems. Note that the QS7 is electrically similar to the QS8 (same Main and Xformer PCBs) and only vary in the number of keys used.

PCB	Schematic Revision
Main	QS7/QS8 F
Slider	QS7/QS8 A
Keypad	QS6/7/8 C
XFormer	QS7/QS8 C

1.30 QS8

In listening to the needs of keyboard players around the world, what came up consistently was our need to improve the keys themselves. While the weighted keys of previous units would suffice for most purposes, many high end players still preferred the "feel" of real piano keys. In answer to this need, Alesis designed the QS8 88 key, piano weighted keyboard. The keys were specifically designed to simulate the same "feel" that acoustic piano keys have when the hammer strikes the piano strings. Incorporating the same basic sound engine as it's predecessors, the QS8 is sure to rank highly among players and composers alike. (Minor improvements have be made through the lifetime of this product. This has resulted in several main PCB revisions. Each revision incorporates previous changes as well as any new improvements made. These changes are outlined in Appendix A. This manual references the following schematics and component I.D.s unless otherwise noted: Refer to Figure 2 for a simplified view of the QS8's electronic systems.)

PCB	Schematic Revision
Main	QS7/QS8 F
Slider	QS7/QS8 A
Keypad	QS6/7/8 C
XFormer	QS7/QS8 C



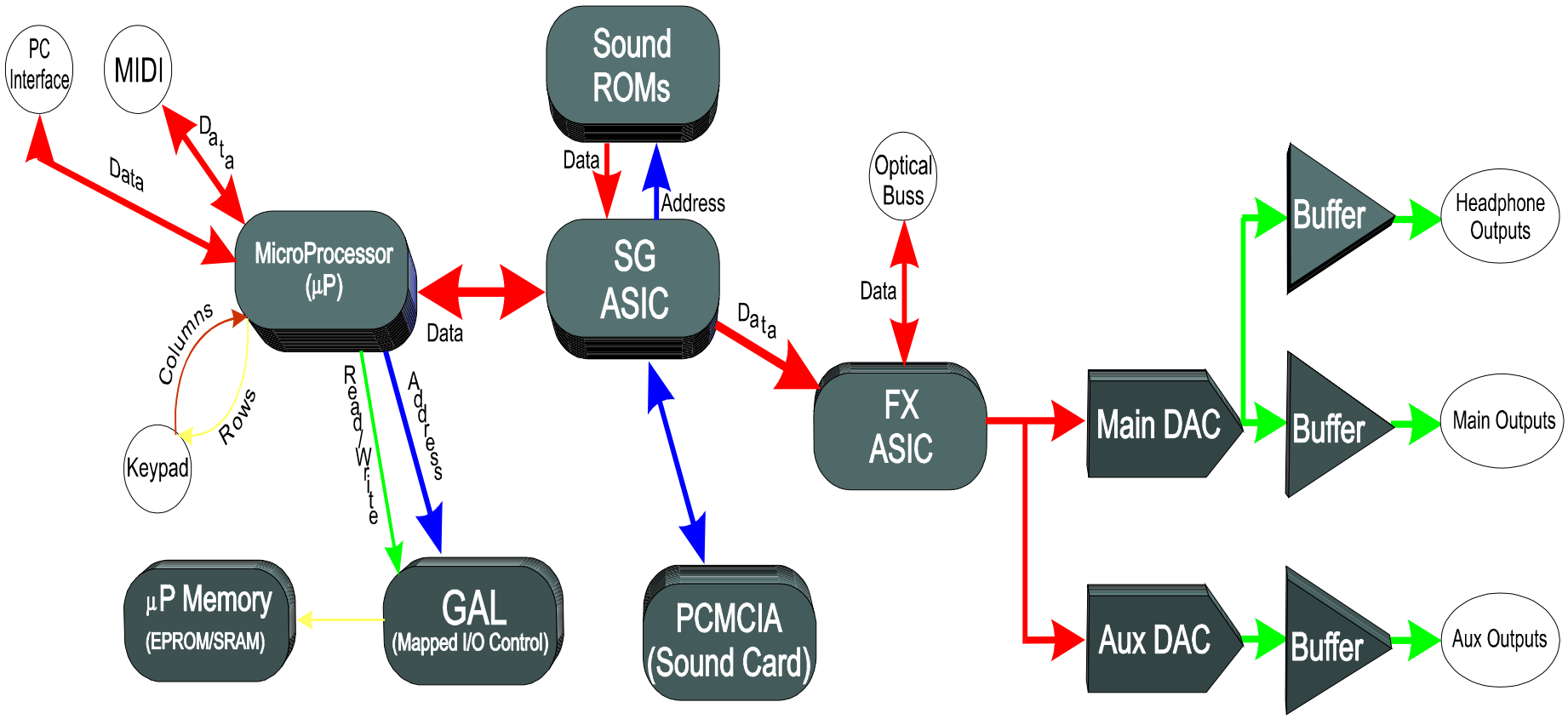
QS7/QS8 Simplified Block Diagram

Figure 2 - QS7/QS8 Simplified Block Diagram

1.40 QSR

Many current keyboard players already have their favorite controller keyboard, but still desire the great sound provided by the Alesis QS Series. Since multiple keyboards can take up excessive space, the obvious solution is a rack mount sound engine without keys. The QSR is just that solution. Whether used for the road or in the studio, the QSR is a powerful addition to any MIDI setup. Minor improvements have been made through the pre production lifetime of this product. This has resulted in several main PCB revisions. Each one incorporates previous changes as well as any new improvements made. These changes are outlined in Appendix A. This manual references the following schematics and component I.D.s unless otherwise noted:

PCB	Schematic Revision
Main	A
Front Panel	X2



QSR Simplified Block Diagram

Figure 3 - QSR Simplified Block Diagram

2.00 Theory Of Operation

2.10 Power Supplies

2.11 QS6/QSR Power Supply

The power supply begins with the Alesis P4 type transformer input at **J1** J15. After the power switch (**SW2** S1), the signal is rectified (**D1**, **D2** D12 D11), input filtered (**C3**, **C9** and **C25** C86, C80 and C81), regulated (**U9**, **U10** U31, U32), and finally output filtered (**C24**, **C32** and **C35**, **C34** C77, C78 and C82, C83) into the +5V and -5V supplies needed by the unit. In addition, many 0.1µF capacitors are located throughout the system to act as supply filters. Note that the +5V rail requires a lot more filtering due to the digital supply needs.

2.12 QS7/QS8 Power Supply

2.12A Transformer PCB

Input from R.F.I. filter enters the Transformer PCB via J1. The current is fused *(F1)* prior to the primary of the ECO 4 Transformer *(X1)*. Note that the transformers of countries outside the United States are varied according to the power grid requirements for that country. Output from the transformer PCB is routed to the main PCB via *J2*.

2.12B Main PCB

Transformer output is bridge rectified *(D1, D2, D4 , and D5)*, input filtered (*C8, C96, and C15*), regulated *(U6, U4*), and finally output filtered *(C38, C34, C18, and C24)* into the +5V and -5V supplies needed by the unit. In addition, many 0.1µF capacitors are located throughout the system to act as supply filters. Note that the +5V rail requires a lot more filtering due to the digital supply needs.

2.13 SRAM Battery Backup

The user storage/system SRAM requires a small standby supply current while it is normally powered down. The battery current is supplied via a transistor circuit (**Q7** *Q4* Q4) designed prevent the +5V rail from trying to charge the battery, while ensuring that a solid +5V is supplied to the SRAM during normal operation.

2.20 Analog Signal Paths

Since these units are largely digital in nature, analog signals are limited to two major types:

- ☞ Audio Signal Output
- ☞ Slider and Aftertouch strain gauge input

2.21 Main Outputs

Differential analog output from the DAC is anti-alias filtered and buffered by **U6A** *U3A* U3A (left) and **U6B** *U3B* U3B (Right). This signal is sent to the stereo output level slidepot **R1** *R2* via **J11** *J4* J1.

2.22 Headphone Outputs

The signal from the volume slider is sent through a **X10** *X3* X3 gain stage **U5A, U5B** *U2A, U2B* U1B, U1A, current limited **R12, R13** *R3, R2* R1, R2 and output through the stereo jack **J2** *J1* J1.

2.23 QS7/QS8/QSR Aux Outputs

The Aux outputs are completely isolated from the main outputs by virtue of a separate DAC *U3* U4. The differential output of the DAC is anti-alias filtered and buffered by *U3C* U3C (left) and *U3D* U3D (right). This signal is current limited (*R31, R32* R31, R32), R.F. Filtered (*C35, C36* C33, C34), and output via the ¼ " jacks (*J8, J9* J5, J4).

2.24 Power Up Mute

The Power Up (PUP) mute circuit ensures that no sound is output during the critical stages of powering the unit up and down. Most often noise is created due to the uneven power demands placed on the positive and negative rails, especially at power up. There also may be noise due to the random power up states in the digital hardware prior to the software establishing correct values. Muting is accomplished with the use of the microprocessor reset line (See Section 2.31A).

The positive and negative supplies are fed to the final analog output stages via transistors **Q2, Q4** *Q1,Q3* Q1, Q3. **R48, R50 and R51** *R13, R18 and R19* R13, R18 and R19 are used to bias these transistors into saturation when the circuit is switched on. **Q3** *Q2* Q2 provides the necessary current to switch the supply transistors on, as well as providing a threshold value for timing purposes. Since power up noise may extend past the time necessary for the digital hardware to physically reset, a further time delay is required before the output is allowed to turn on. This is accomplished with an RC circuit comprised of **R49 and C30** *R20 and C14* R21 and C13. **D15** *D3* D1 provides a quick discharge path for the capacitor so that the circuit functions correctly even if power is cycled off and on rapidly.

Note that in the QS6 it was found that this circuit did not load down the RST line (see Section 2.24), causing power up reset to take longer than it should. The extra inverter was eliminated in the QS7/QS8/QSR.

2.30 Digital Signal Paths

2.31 H8/510 Microprocessor

The H8 Microprocessor (**U16** *U21* U20) is the primary device in control of all information flow in the QS Series. At the appropriate times, the H8 accepts input from various sources (Keyboard, MIDI, etc.) and determines the correct response (play sound, output data to MIDI, etc.). All of this information flow is under the direct control of the software stored in the EPROM (**U19**, *U18*, U17).

Although a complete discussion of H8 programming is beyond the scope of this manual, it is appropriate at this time to state the importance of understanding overall unit operation including the interactions between hardware and software. Not only is it possible to troubleshoot usage errors (i.e. keyboard not loading DataDisk files because Sys-Ex is disabled), it can also make troubleshooting hardware easier as well. For example: it is easier to troubleshoot a MIDI output problem by sending longer files out through MIDI while examining the MIDI output circuit with an oscilloscope. The longer the file, the more time there is to look at the circuit before having to send the file again. While this is a relatively simple example, it

shows that knowing how the hardware is supposed to respond to software changes can greatly simplify the task of hardware troubleshooting.

The most important pins are:

- D0-D16 — 16 Bit Data Buss (note that in the QS Series some of the other devices only use 8 bits of the data buss. This may cause some noise in the unused data lines during processor reads making the appear “bad” due to a floating input. While ignored by the software, it can make troubleshooting a real open in the data buss more difficult.
- A0-A23 — 23 Bit Address Buss (Note that only 20 bits are actually used).
- RES — System RESET line. Asserted only during power up/down. (See Section 2.31A)
- RD — Read Enable
- HWR — Write Enable
- XTAL, EXTAL — Input for system clock crystal.
- PX.X — I/O Ports are configured by the software and allow the software some direct hardware access. In particular are:
  - TXD1 — Transmit Serial Data line to MIDI output circuit (See Section 2.31D).
  - TXD2 — Transmit Serial Data line to PC/MAC output circuit (See Section 2.50).
  - RXD1 — Receive Serial Data line From MIDI In circuit (See Section 2.31D).
  - RXD2 — Receive Serial Data line From PC/MAC input circuit (See Section 2.50).
  - PITCH — Pitch Wheel data input (See Section 2.31C).
  - DATA — Data Slider data input (See Section 2.31C).
  - MOD — Mod Wheel data input (See Section 2.31C).
  - RES
  - CD1 — PCMCIA Card #1 Present Switch input (See Section 2.32B).
  - CD2 — PCMCIA Card #2 Present Switch input (See Section 2.32B).
  - PC/MAC — PC/MAC Serial Port Switch input (See Section 2.50).
  - KEYINT — Keyscan ASIC interrupt .input (See Section 2.33).
  - SUS — Sustain Pedal Input.
  - SMUTE — DAC Output Mute
  - EDIT PCB SWITCH MATRIX (See Section 2.31C).

2.31A RESET

Reset is one of the single most important circuits/signals in the entire unit. Without a correct RST signal during power up and power down, any number of problems can occur. These can range from an occasional failure such as an odd audio “blip”, to complete, system wide lock ups and data corruption. Therefore any time processor problems are suspected, RST should be the first thing checked.

In order to ensure that data will not be corrupted, the reset circuit uses the raw power supply signal to determine the correct time to assert the RST signal (i.e. not until the regulated +5V supply rail contains no ripple). This is done by using a raw supply threshold of approximately 7V. Since the power down sequence of events is generally the reverse of the power up process, only the power up events are described here.

It helps to know the initial state of the active devices in the circuit. While the raw supply is just below the raw supply threshold **Q5** *Q5* Q5 is turned off, allowing the base of **Q6** *Q6* Q6 to be pulled high via **R40** *R38* R62 , turning it on. This in turn holds the voltage across **C15** *C42* C59 at 0.7V (approximately ground). These in turn keeps the input to the first inverter **U7A** *U9C* U19A low. Thus RST is high and RST is low. In addition, the S6 incorporates an extra inverter (**U7E**) to drive the power up mute circuit (see Section 2.24).

The process begins when the raw +5V supply reaches the reset threshold. The voltage divider consisting of **R52, R39 and D6** *R36, R37 and D9* R60, R61 and D10 scales the level of the raw supply so that **Q5** *Q5* Q5 turns on at the preset threshold. This pulls the base of **Q6** *Q6* Q6 to 0.7V (low) turning it off. This allows the voltage across **C15** *C42* C59 to charge slowly via **R41** *R39* R63 (this also adds a time delay that prevents raw supply ripple from triggering multiple resets). Once this voltage rises above the threshold level of the Schmidt Trigger inverter it switches states, pulling RST low and RST high, completing the reset cycle.

2.31B The GAL and Memory Mapped I/O

While the H8 has been optimized as a controller device, it is none the less somewhat limited in the number of direct input and output lines available. Memory mapping is the simplest method of allowing software designers the ability to manipulate the large number of hardware registers directly from the microprocessor with a minimum of external hardware.

The idea is to “fool” the microprocessor into thinking that hardware register locations (latches) are actually memory locations. The process begins when the H8 sets up the address buss. The GAL (**U12** *U13* U9) checks this address to see if it is in the range of hardware registers. If the H8 address is within the confines of normal memory, the RAM or ROM signal is asserted and memory is accessed normally. However if the address is in the hardware range, the GAL decodes the address and strobes the chip select line of the appropriate device. Each device must interpret the state of the microprocessor ReaD and WRite lines and send or receive data appropriately. It is left up to the software to “know” which devices are written to as opposed to read from.

2.31C Other Processor I/O

All other “outside world” communication of the processor not handled via memory mapped I/O (See Previous Section) is sent and received via the H8’s built in I/O ports. These are automatically configured by the software at power up. These lines all have internal pullup resistors. These “outside world” devices include pedals, front panel key switches. and pitch, mod, and data wheel inputs.

2.31D MIDI

MIDI input is opto isolated (**U4** *U7* U14) from the MIDI Input Jack (**J7** *J12* J8). **R2** *R35* R49 current limits the incoming signal while **D3** *D7* D6 serves to protect the opto isolator from reverse bias currents. **R42** *R40* R51 serves to set the internal threshold level of the opto isolator while **R22** *R41* R50 augments the internal pullup of the H8’s input port.

MIDI output is initiated from the H8’s output port. Two elements of a Schmidt Trigger inverter (**U7C and U7D** *U9B and U9E* U19E and U19B) are used to buffer the outgoing signal. This signal is current limited (**R1** *R45* R53) before being sent to the MIDI Output Jack (**J8** *J13* J9).

In addition, the QS7, QS8, and QSR incorporate a similarly designed MIDI THRU (*U9A and U9F* U19C and U19D, *R45* R55, *J14* J10).

For further information about MIDI, consult MIDI SPEC available from the International MIDI Association.

2.31E PC Serial Connector

While technically a part of standard H8 I/O, Computer Serial I/O is complex enough to warrant it's own section (See Section 2.50).

2.32 The SG ASIC

In order for the unit to play a sound sample, the H8 µP (See Section 2.31B) must receive a command via the keyboard (via the Keyscan ASIC) or through MIDI. The Microprocessor then tells the SG ASIC three things:

1. The note value (e.g., C3, D#4, A6, ...).
2. The velocity of the note value.
3. The type of sound to be played (dependent on PROGRAM, MIX, MIDI Channel, etc.).

The SG ASIC then retrieves the correct 16-bit sound information from the SOUND ROM according to the instructions sent by the H8. In addition, the SG ASIC performs the duties necessary to create the envelope of the voice (e.g., Attack, Decay, Sustain and Release) as well as other audio functions such as changing filters.

SG ASIC instructions are passed to it by the H8 µP through memory mapped I/O (See Section 2.31B).

There is one clock signal for the SG ASIC. It is received at pin 19. The clock is generated from crystal **M2** via **U18A**. The clock signal is also frequency halved , and output via pin 12. This 12.288MHz clock is used in the QS6 by the 74HC390 (**U17**) {to derive other system clock signals (1MHz, 614.4MHz)}. System signals in the QS7, QS8 and QSR are derived slightly differently providing for better software control (See Section 2.54). Note also that the QS7, QS8 and QSR all utilize a digital VCO (*U11* U7) to provide extremely stable clocks to the sound generation system.

The SG ASIC can send sound information to the FX ASIC by two possible ways. The first is the 8 bit data buss. The second is via optical information from EOPTOUT (pin 3), to the FX ASIC. Currently, the optical buss is used for all communication.

2.32A Sound Generation

Sound is generated with the use of Sample ROM playback. The playback is accomplished by the SG ASIC while the sounds themselves are contained either in the MASK ROMs (2 Megabytes each) or in a PCMCIA CARD attached to the system. As far as sound generation is concerned, the only distinguishable difference between the two is their relative location in the SG ASIC's memory map, and as such will be referred to simply as Sound ROM. Besides actual sonic data, Sound ROM also contains data about the samples Start, End, and Loop points, start and end volumes, sample rate, and data smoothing coefficients.

When the H8 receives a command to play a sample (keyboard, MIDI, or PC Serial) it notifies the SG ASIC what note value and velocity have been requested. The SG ASIC then retrieves data for 2 samples. The first sample is the requested sample. The second is the sample at the next higher address. This is necessary because current technology does not allow for a sample to be taken at possible note value (the amount of necessary memory jumps prohibitively when this is attempted). Instead, a number of "key" samples are provided and the SG ASIC's DSP is called upon to interpolate for the correct note pitch value. The notes that each individual sample is responsible for is called a "Keygroup". Note that the pitch interpolation also takes into account any variations in pitch that may occur due to modulation (i.e. pitch wheel or LFO Modulation).

Once pitch scaling is done, the SG ASIC similarly scales the amplitude of the data. Again it must take into account such things as the sample's natural envelope, the Attack/Decay/Sustain/Release envelope provided for in the patch by the user, and any other modulations necessary.

The "massaged" data is now ready to be passed along to the FX ASIC for further processing and output. (See Sections 2.33, 2.40, and 2.20)

2.32B ROM Card Connector

Since Sound Cards serve the same function as the Sound ROMs, they are also generically referred to as "Sound ROM". The description of how the SG ASIC generates sound from this is equally valid for both (see Section 2.32A). However, several extra lines exist to help the H8 processor distinguish between Sound Cards and Sound ROM. This is especially important as the H8 must be able write to the Sound card as well as read from it. **CD1** and **CD2** are used to inform the H8 of the presence and type of Sound Card inserted into the unit. In addition, because the unit must be able to write to the Sound Card (as opposed to Sound ROM which is read only) ReaD and WRite from the H8 are passed along via the SG ASIC ***SOE SWR***.. Since the QS7, QS8 and QSR have 2 ROM card slots all chip enable and card enable lines must be duplicated (i.e. CE1, CE2).

2.33 The FX ASIC

The FX ASIC is one of Alesis's custom digital signal processing ICs. Capable of up to 4 effects at once, this device is essentially a rack mount effects unit in a chip. The only other essential major parts are memory for storing samples currently being manipulated, instructions on what to do with the sound, and of course the sound data itself.

In the QS Series the Buffer DRAM is in the form of an HM514260AJ-7, a 4 Megabyte 70nS access part arranged as 16 bits X 256K words, for a maximum of approximately 5 seconds of sample time. This gives the FX ASIC plenty of room to create the convincingly realistic sonic effects Alesis is famous for. The main control signals for the FX DRAM are RAS (Row Address Strobe), CAS (Column Address Strobe), and WRN (WRite eNable). The 16 bit data and 9 bit address busses operate the same as any standard micro processor.

Algorithm instructions are passed to the FX ASIC's Writeable Control Store by the H8 processor via the memory mapped I/O process (See Section 2.31B).

In addition the FX ASIC is the last purely digital IC in the signal flow so the FX ASIC is also responsible for DAC and Optical output (See Section 2.40).

2.33A QS7/8/R Digital Optical I/O

While the SG ASIC is capable of handling Optical I/O directly, all outside (via the optical output jack *J10* J8) communication is directed by the FX ASIC. In addition, the optical buss is used internally to transfer data serially from the SG ASIC to the FX ASIC via the OPT_IN line (pin 20). Output from EOPT_OUT (pin 19) is sent directly to the optical output jack.

2.34 The KEYSCAN ASIC

While the task of polling the keyboard may seem difficult at first (up to 88 Keys with velocity), the Keyscan ASIC takes care of this task and passes the information back to the H8 processor . The main signals of the Keyscan ASIC are:

- DD0-DD7 Data Buss bits 0 to 7. Correspond to the upper 8 data bits of the H8.
- A0 H8 Address Buss bit 0
- RD H8 ReaD enable
- WR H8 WRite enable
- KEY Chip select line from GAL (Mapped I/O)
- KEYINT Output to H8 interrupt line
- KEYCLK Clock input from H8
- ROW0-7 Row input from keyboard switch matrix
- COL0-21 Column input from keyboard switch matrix
- VSS1-4 Source Supply (GND)
- VDD1-4 Drain Supply (+5V)

2.34A Reading Velocity

Velocity response is measured through the time differential between two switch closures and works like this:

- The harder a key is pressed, the faster it moves.
- Since **Rate = Distance/Time** knowing the time it takes to move the key through a specific distance tells us how fast it's moving and thus the force acting on it.
- This is accomplished by using 2 switch contacts mounted at different distances from each other. The rubber in the keypad acts as a spring, both absorbing the compression of switch 1, as well as pushing the carbon contacts away from the PCB contact points when the key is release.
- The Keyscan ASIC counts up the time it takes between switch 1 closing and switch 2 closing. Since distance (between the switches) is preset in the design, time difference is taken as a direct measure of velocity.

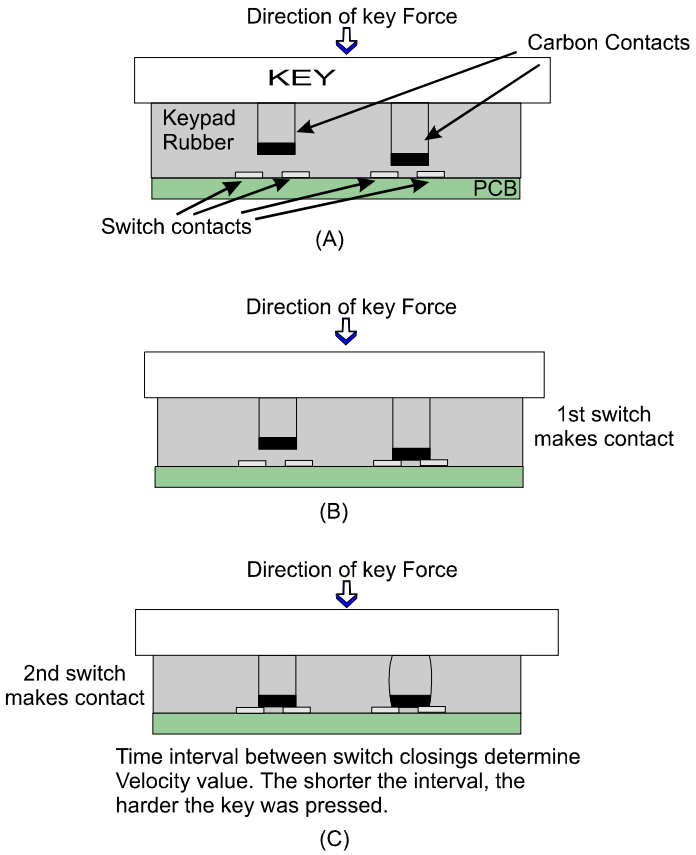


Figure 4 - Keyboard Velocity Reponse

2.34B QS8 Key Construction

All keyboards in the QS Series function identically in an electrical sense. However, since the QS8 keyboard is different in mechanical construction from the rest of the line, a word or two about it is appropriate at this point. In order the simulate the action of a true piano keyboard the FATAR TP/20 keyboard uses moving metal weights striking a felt strip to emulate the action of the piano's hammer striking a string.

Figure 5 shows the basic setup of the keys. Note the "action" of the two "levers" involved in the process. The first lever which is the key itself is single ended, with it's fulcrum located at the "back" end of the key. The second lever is the double ended counterweight. With it's

fulcrum offset from center to increase the relative momentum of the weight, it is pushed on one end by the motion of the key. The other end of the counterweight is free to move until it strikes the felt strip attached to the frame (i.e. the hammer hits the string).

The individual keys are isolated from the frame by a plastic clip. Individual broken keys are easily replaced by releasing the clip as shown in Figure 14.

Since the counterweight alone is not enough to force the key up again, a spring located near the key fulcrum is used to push the key back into place.

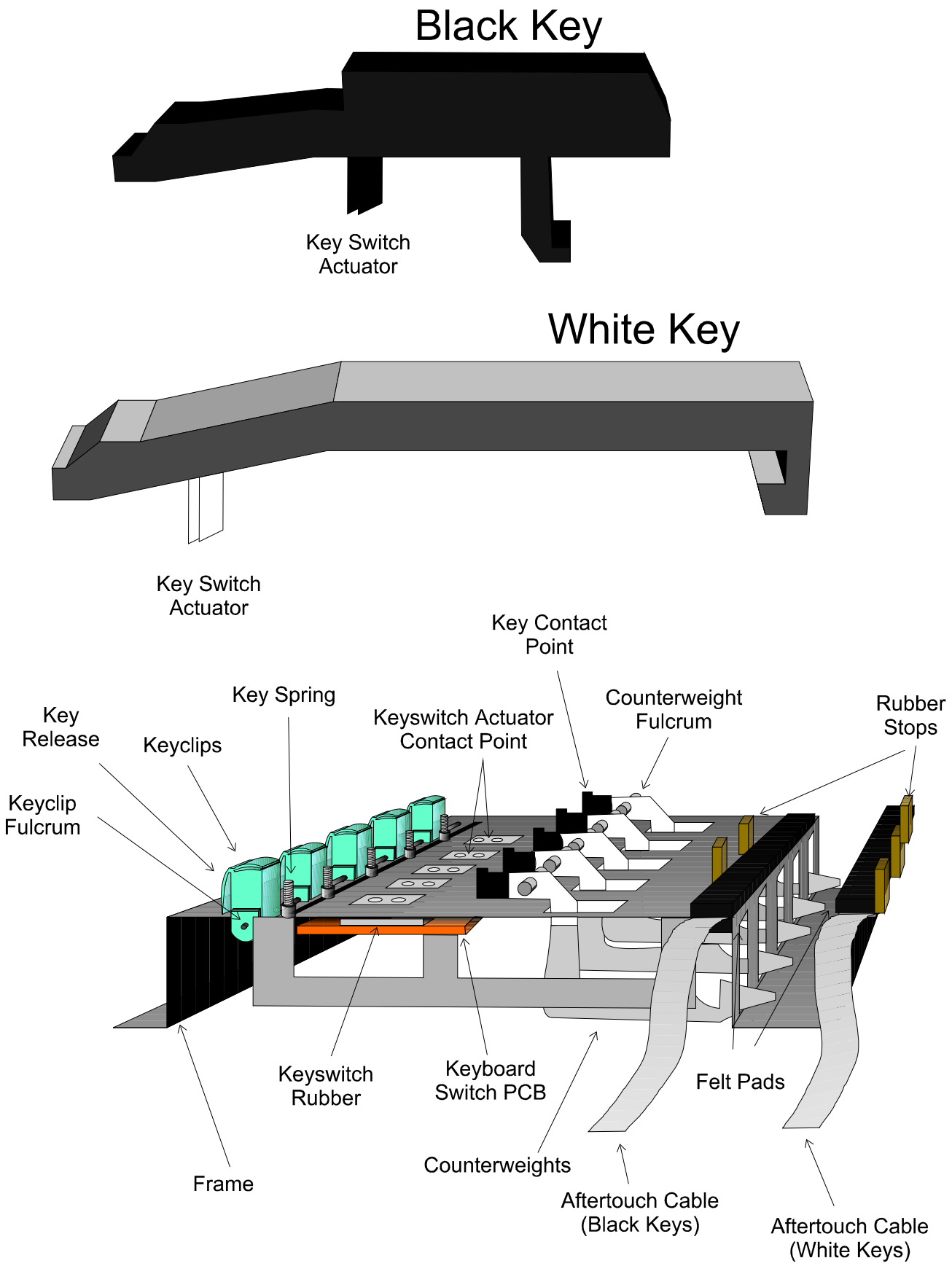


Figure 5 - QS8 Key Construction

2.40 D-A

The D-A sections of the QS Series vary slightly from unit to unit. These variations are minor so the circuits are relatively similar, especially on the digital side of the IC. Most of the analog differences depend on the D-A Device used. Both devices are made by AKM and come from the same “family” (43XX Series). The main differences between the two are in the power supply filtering required by these two devices. There are also internal differences resulting in slightly better noise characteristics for the 4319.

As Aux Outputs are functionally identical the unit’s main outputs, only the mains will be discussed here.

2.41 S6 D-A

The S6 Digital-to-Analog Converter is an **AKM4318A** (**U3**). A bit clock (BICK) of 3.072 MHz, buffered by an inverter (**U18B**), is sent from the FX ASIC (**U11**). This clock signal is sent to **pin 13** of the DAC which is used to latch the serial data on SDATA (**pin 14**) into the device. The LRCK (**pin 12**) input is the left and right channel clock. This 48KHz clock signal is originated from the FX ASIC at pin 11. SMUTE mutes the analog outputs and is controlled by the H8 processor (**pin 53**).

The analog supply (+5V) is filtered by **C28** and **C29**. The digital supply is provided via **D4** and **D5** (for approximately a 1.4V drop) from the +5V supply and filtered by **C22** and **C21**.

The DAC outputs are balanced and are routed through differential amplifiers to the unit's output jacks, via the analog output circuitry (See Section 2.20).

2.42 QS7/QS8/QSR D-A

The QS7/8/R Digital-to-Analog Converter is an AKM4319 (*U3* U2). A bit clock (BICK) of 3.072 MHz, buffered by a NAND gate acting as an inverter (*U12D* U10D), is sent from the FX ASIC (*U10* U6). This clock signal is sent to pin 5 of the DAC which is used to latch the serial data on SDATA (pin 6) into the device. The LRCK (pin 4) input is the left and right channel clock. This 48KHz clock signal is originated from the FX ASIC at pin 11. SMUTE mutes the analog outputs and is controlled by the H8 processor (pin 53).

The analog supply (+5V) is filtered by *C3* C3 and *C7* C8. The digital supply is also provided from the +5V supply and filtered by *C6* C26.

In addition the QS7/8/R use an AUX DAC (*U5* U4) for the Aux Output which functions identically to the Main output.

The DAC outputs are balanced and are routed through differential amplifiers to the unit's output jacks, via the analog output circuitry (See Section 2.20).

2.50 PC/MAC Serial I/O

As with MIDI, this connector is a serial device with the majority of the work being expedited by the software running in the H8. Since there are two basic types of computer in general use, a great deal of extra hardware is required. As much as possible, the Alesis design team engineered the circuitry to reduce the parts count, and combine as much of the two different types as possible. The IBM compatible PC uses a single ended serial buss while the Macintosh version uses a balanced line signal for transmission and reception. In addition, the two different types require different handshake and BAUD rate clock circuitry. Figure 6 shows the pinout of the Alesis QS serial port and Tables 1-3 show the pin to pin connections of the various Alesis Serial Cables 1, 2, and 3.

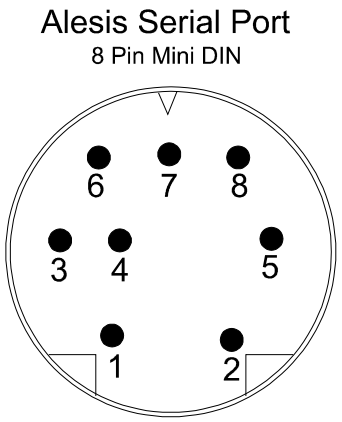


Figure 6 - Alesis Serial Port Pinout

Note that the QS6 is hardware limited to a BAUD rate of 38.4 KHz. All subsequent designs use software controlled frequency division to achieve a variable baud rate (See Section 2.54).

Table 1 - Pin to Pin Connections for 9 Pin PC Serial to QS

Purpose	QS Serial Pin	PC Pin
HSKO (Enable 4-12V)	1	8
Return (Enable Return)	2	7
TXD	3	2
GND	4	5
RXD	5	3
NC	6	NC
NC	7	NC
NC	8	NC

Table 2 - Pin to Pin Connections for 25 Pin PC Serial to QS

Purpose	QS Serial Pin	PC Pin
HSKO (Enable 4-12V)	1	5
Return (Enable Return)	2	4
TXD	3	3
GND	4	7
RXD	5	2
NC	6	NC
NC	7	NC
NC	8	NC

Table 3 - Pin to Pin Connections for MAC Serial to QS

Purpose	QS Serial Pin	MAC Pin
1MHz	1	2
NC	2	1
TXD -	3	5
GND	4	4
RXD-	5	3
TXD+	6	8
GPI (NC)	7	7
RXD+	8	6

2.51 QS Serial Input

PC/MAC input is passed through a buffer/translation stage consisting of **U2A** *U31C* U24C and some resistors. **R8 and R7** *R96 and R97* R85 and R86 provide some resistive isolation and **R8** *R96* R82 in combination with **R27** *R94* R83 provide hysteresis for waveshaping the incoming signal. **R9 and R10** *R95 and R93* R83 and R84 act as pullups to further assist in waveshaping. The output of the comparator is resistively isolated from the H8 input port by **R28** *R87* R74. Pullup resistor **R30** *R41* R50 ensure the correct TTL signal levels (pulled up to +5V).

2.52 QS Serial Output

PC/MAC output initiated by the H8 processor is differentiated into the balanced signals required by the MAC via the comparator pair of **U2D and U2C** *U31B and U31A* U24A and U24B. (Note that the PC interface ignores the TXD- and RXD- lines.) Pullups **R26 and R25** *R96 and R81* R73 and R67 help maintain the outgoing signal despite possible losses from long cable runs. **R6 and R24** *R85 and R80* R72 and R71 help match impedances as well as current limit and resistively isolate the signal before output.

2.53 PC/MAC Switch

Note the seemingly minor hardware changes that occur when switching between the PC and MAC lines. Since these changes are critical this switch should be checked carefully when computer interface problems occur. The PC version sends and receives a D.C. voltage handshake signal (Enable). The MAC needs to see a bit clock handshake signal which it uses to determine BAUD rate.

2.53A QS6/7/8 PC Serial

In these units the Enable handshake signal is provided by simply closing the loop provided by the host computer (Enable Return) via the DPDT PC/MAC switch (**SW1** *SW1*). The switch also is used to inform the H8 that the PC type is currently in use and should adjust the software and/or hardware accordingly. The BAUD rate is determined by the FREQ input to the H8 (See Section 2.54). In the QS6, handshake hardware is fixed at 614.4KHz, so no adjustment can be made by the H8, hence it's BAUD rate limitations.

2.53B QS6/7/8 MAC Serial

In the MAC interface, BAUD rate information must be passed along to the host computer along with the data itself. This is provided via comparator **U2B** *U31D* U24D (used here as a line driver). In the MAC position, SW1 sends the bit clock out through pin 1 of the QS Serial port. The switch also is used to inform the H8 that the MAC type is currently in use and should adjust the software and/or hardware BAUD rate accordingly. The bit clock signal is also needed by the FREQ input to the H8 (See Section 2.54). In the QS6, handshake hardware is fixed at 614.4KHz,so no adjustment can be made by the H8, hence it's BAUD rate limitations.

2.53C QSR Variant

Note that the QSR varies slightly in that it's PC/MAC switch is a software function rather than a physical switch. Q7 is used here provide the necessary switching action to correctly bias the handshake signal driver U24D.

2.54 H8 UART Clocking

There are 2 internal UARTs (Universal Asynchronous Receiver Transmitter) in the H8 (1 for MIDI and 1 for computer serial I/O). It should be noted here that the MIDI UARTs all operate at the same fixed rate so further discussion of UART clocking will be limited here to the UART used for computer serial I/O.

In order for serial data to be transmitted and received at the correct speed, the UART must be clocked at the correct speed via the FREQ input (pin 92). In the QS6 it is simply derived from the system clock via **U17** and **U20A** limiting it's BAUD rate. In later models however, the BAUD rate is variable to match the speed of the host computer, so a little extra hardware is needed. *U26* U27 is used as a software controlled variable frequency divider. Control input to the 74HC161 is provided by the H8 in the form of a "count" value. The Carry output is used to force the device to load the new "count" input via *U25A* U26A. The Carry output is also passed along to a divide by 2 waveshaping flip-flop (*U29A* U29A) before being sent to the H8 FREQ input. There are also 2 clock sources available (again selectable by the H8 via gate logic comprised of *U28 and U25C* U28 and U26C). The first is the 20MHz system clock (*M2* M2), and the second is a 14MHz clock (*M3* M3) intended strictly for this purpose. The ultimate purpose of all of this is to determine how fast the H8's TXD and RXD lines send and receive data.

3.00 Test Procedures

If at all possible, user memory should always be saved (PCMCIA Card or MIDI SYS-EX) prior to service. It's also important to remember that user data itself may be corrupted for a variety of reasons. So if for some reason a unit continues to "crash" when reloaded, it's not unreasonable to expect bad data to be the cause.

3.10 Self Tests

The QS Series Software is specifically designed to assist in troubleshooting hardware problems. This assistance comes in the form of a series of self test routines that check various aspects of the hardware. There are two different methods of accessing these routines. One is an automated run through all tests, while the other allows the choice of which individual tests are run. Note that due to the extreme difference in the QSR's front panel, the self tests themselves and the method they are accessed are also different. See Section 3.13 for a thorough discussion of the QSR Self Tests.

- ✔ Pressing "0" and "03" during Power up reinitializes all software values to their ROM presets.
- ✔ Pressing "0" and "10" during power up initiates the Automated Self Test Mode.
- ✔ Pressing "0" and "00" during power up establishes Individual Test Mode.

3.11 Automated Test Mode

Before initiating the automated self Test Mode it is necessary to plug in all necessary cables (MIDI IN to MIDI OUT, PC Serial Test Cable). If this is not done the test will fail when the missing cable is encountered. Pressing the Value ↑ button will skip the failed test and proceed to the next. (See the next section for a full description of each test)

3.12 Individual Test Mode

When in Individual Self Test Mode, the Value ↑ and Value ↓ are used to select which test is to be run and pressing "STORE" will select it. All tests stop upon completion of the test (display shows "TEST PASSSED" or "TEST FAILED"). Pressing Value ↑ or Value ↓ will exit the test and return to the Individual Test Menu. The tests are:

1. TEST EPROM - This routine does a Checksum test of the Software EPROM. This test ends with either a pass or fail. A failure probably indicates a faulty EPROM, but may also indicate a problem with the H8 itself, or in fact any of the other device attached to the data and address busses, or the busses themselves (i.e. broken address trace).
2. TEST SRAM - This routine performs a functionality test of the H8's Storage memory. As with the EPROM test above, a failure here probably indicates a truly faulty SRAM, however a persistent failure (one that occurs after the SRAM has been replaced) may be in fact due to errors in the H8's subsystems.
3. TEST MIDI I/O - A MIDI Cable must be connected between MIDI IN and MIDI OUT prior to starting this test. It will the send and receive a data stream to ensure functionality of both IN and OUT. Note that due to the fact that the MIDI Input and Output circuits are internally grounded (through the PCB traces), this test can not detect a broken ground on either jack (i.e. poor solder or broken jack pin).
4. TEST PC I/O - Prior to initiating this test pins 3 and 5 must be shorted together (this can be done with a paperclip, although a cable expressly made for this purpose is preferred) and the PC/MAC switch set to the PC position. Since there are so few components in this

circuit, failures should be relatively easy to troubleshoot although failures with the BUAD rate circuitry can also affect serial operation.

5. TEST F/X DRAM - This routine forces the F/X ASIC to write to and read from every location in the F/X DRAM. This will take about 40 seconds. As with the EPROM test above, a failure here probably indicates a truly faulty DRAM, however a persistent failure (one that occurs after the DRAM has been replaced) may be in fact due to errors in the F/X ASIC's subsystems.
6. TEST SOUND ROM - Like the EPROM Test above, this routine does a checksum of each of the QS's Sound ROMs. Again the associated address or data buss failures may appear as a legitimate Sound ROM failures.
7. TEST SWITCHES - After initiating this test, each front panel button must be pressed in the correct sequence. This ensures that each button is not only functional, but it also checks for key debounce errors (i.e. the unit "sees" the key pressed several times even though it was only pressed once). The sequence starts at the rearmost left hand button continues forward, then to the right (See Figure 7 for an example).

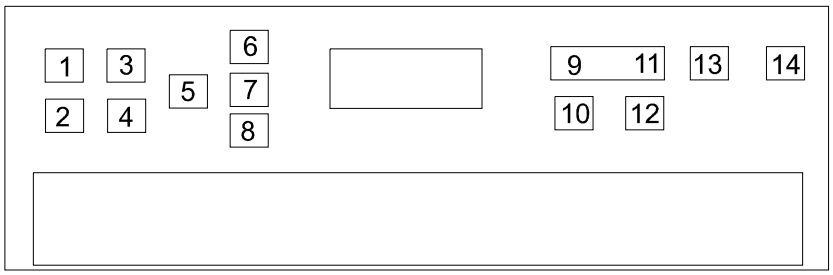


Figure 7 - Examples of Switch Self Test Key Press Order

8. TEST POTS - This test allows the technician to verify the function of the mod and pitch wheels, as well Data pots or sliders. Once initiated, the LCD will show several numbers. Each of these numbers represents the position of one of the pots. Data Pots will normally show a range of 0 - 1023. Pitch and Mod wheels have a range of 0 - 600 and the Aftertouch has a range of 0 - 300. Moving each pot will cause the corresponding number in the display to change.

3.13 Differences In QSR Self Tests

Because it is a rack mount unit and it's buttons are different from the keyboard versions, the self test routines for the QSR are slightly different. The manual self test (there is no automated version) is initiated by holding MIDI CH ← and →. Use Cursor ← or → to select the test to run. Pressing STORE initiates the test. Pressing either cursor button exits the test. Note that pressing Cursor ← and → shows the current software version, but only if the unit is in MIX or PROGRAM Play modes (i.e. the unit is not in EDIT or SELF TEST). The tests are:

0. Test EPROM - Same as the keyboard test.
1. Test SRAM - Same as the keyboard test.
2. Test MIDI I/O - Same as the keyboard test.
3. Test PC I/O - Same as the keyboard test.
4. Test F/X DRAM - Same as the keyboard test.
5. Test Sound ROM - Same as the keyboard test.
6. Test Switches - Same as the keyboard test.
7. Test Encoder/LED - Once initiated, front panel LEDs (under the buttons) will cycle according to the direction the data wheel is turned. Press STORE to exit this test.
8. Test Display - This test simply turns on all of the display elements in the LCD.
9. Test Audio - This test simply sends audio through all outputs. This is extremely useful when troubleshooting analog circuit problems.

3.20 Further Testing

Naturally it is a good idea to actually play the keyboard. Be sure to check that pitch and velocity scaling sound normal. It's also important to check the Aftertouch to ensure it's function. Note that in the QS8 it is important to check the Aftertouch of white and black keys separately as each of these key sets has it's own Aftertouch cable.

While the self test will pick up most circuit errors, MIDI should still be tested in both send and receive. This can be done 3 ways:

- Record and playback from a MIDI Sequencer
- Save and load Sys-ex data from a MIDI Librarian or DataDisk.
- Use a second keyboard to send trigger notes to the unit under test. Also test that key presses from the unit under test trigger notes on the other keyboard or an extra module.

If at all possible, the PC/MAC Serial connector should be tested similarly, as well as all other I/O type circuitry such as 48KHz, PCMCIA, and optical (with the use of an ADAT Multitrack).

3.21 Testing 48KHz

Obtain an ADAT-XT or a classic ADAT and a BRC. Connect the sync cable from the ADAT to the BRC. Connect a BNC cable from the BRC's 48K OUT to the QS's 48K IN. Connect a fiber optic cable from the QS's OPTICAL OUT to the ADAT's OPTICAL IN. Finally connect the ADAT's analog outputs 1 and 2 to an amplifier and speakers or headphones as shown in Figure 8. Make sure the BRC syncs to the ADAT. Press the DIG IN and ALL INPUT MONITOR on the ADAT-XT or BRC.

Turn on the QS under test's 48K IN **ON** (under Global button).

Change the Pitch control on the ADAT-XT or BRC from 000 to -300. Play the QS and

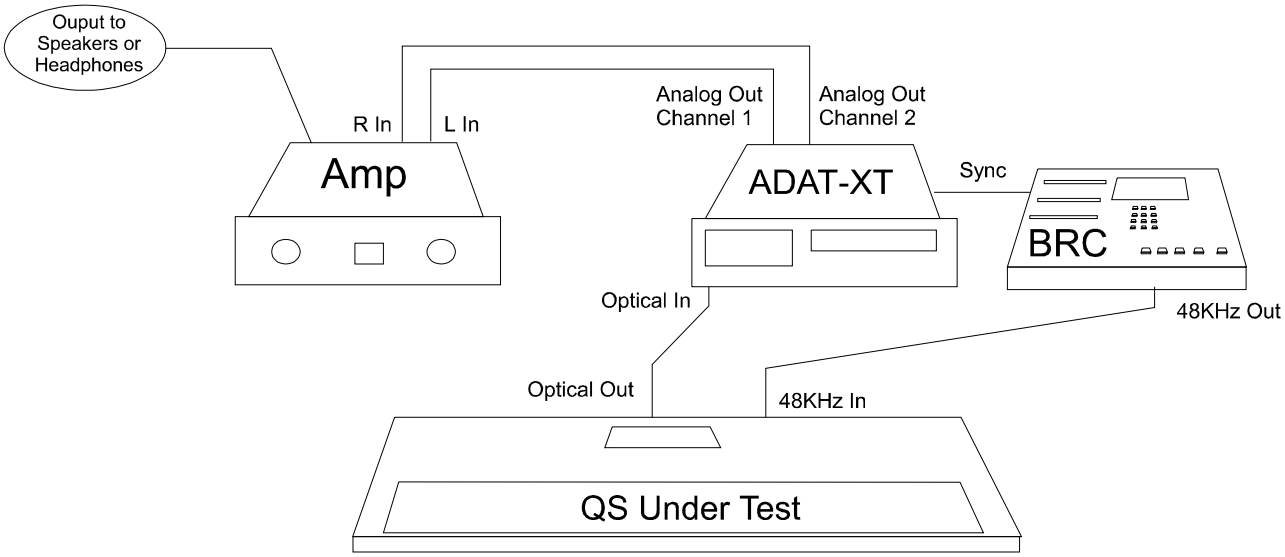


Figure 8 - 48KHz Test

listen for a change in pitch. Also, play the DEMO and monitor the QS's audio from the ADAT's analog outputs 1 and 2. The audio should be clean and undistorted for the above. In this event, pass the unit. If the unit has a clipping noise after the 48K IN has been turned on, fail the unit.

Note: If the QS's power is turned off, the 48K IN must be turned on again. The display may show that the 48K IN is on, but it MUST be toggled back to ON to get it to work

4.00 Troubleshooting and Repair

With the release of the original QuadraSynth keyboard, Alesis engineers and technicians began a heavy learning curve into what works and what doesn't in keyboard design. Because of this experience, it's descendants are not only extremely stable designs but also very easy to troubleshoot and repair. Once the keyboard "clamshell" is open, the technician has instant access to all of the units essential components. The QSR of course uses all of the experience Alesis has gained over the years in making quality rack mount cases.

4.10 QS6/QS7/QS8 Disassembly/Reassembly

All of the keyboards use the same "clamshell" type of casetop. The top and sides are one piece and are removed together. Figure 9 shows the only way to correctly remove the top panel. It should be noted here that extreme caution is required when opening and closing the unit due to the delicate nature of the aftertouch cable(s). Damaging these cables might easily result in having to change the entire keyboard, which can be expensive and time consuming.

Figure 10 shows the casetop and keyboard screw locations for the QS6. Figure 11 does the same for the QS7 and QS8 (while the QS8 is physically larger, it has the same screw footprint as the QS7).

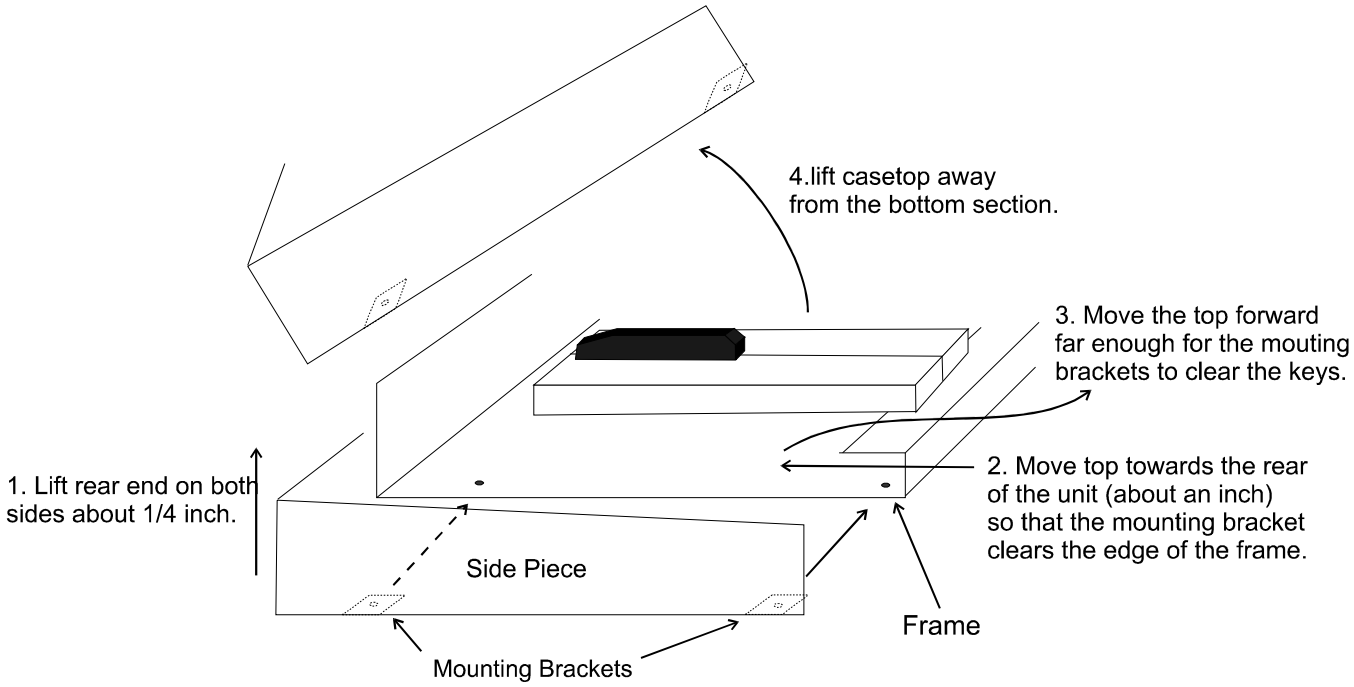


Figure 9 - Keyboard Casetop Removal

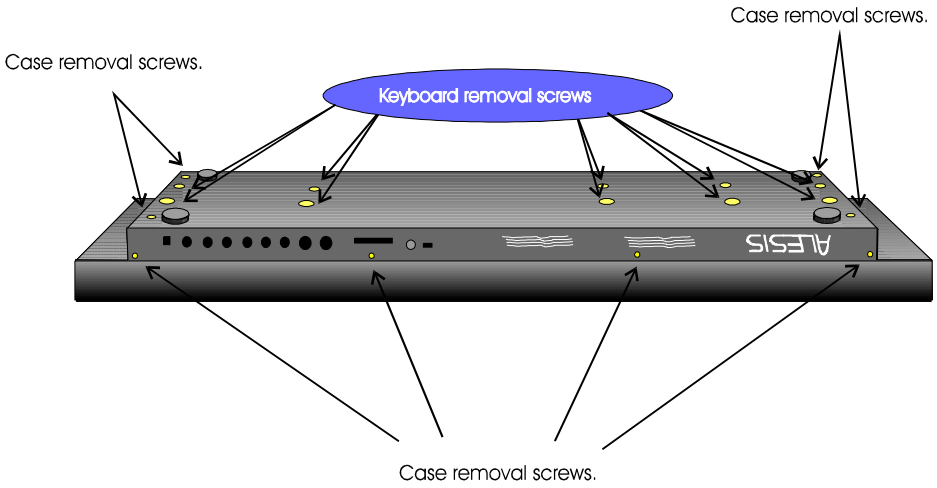


Figure 10 - S6 Case Screw Locations

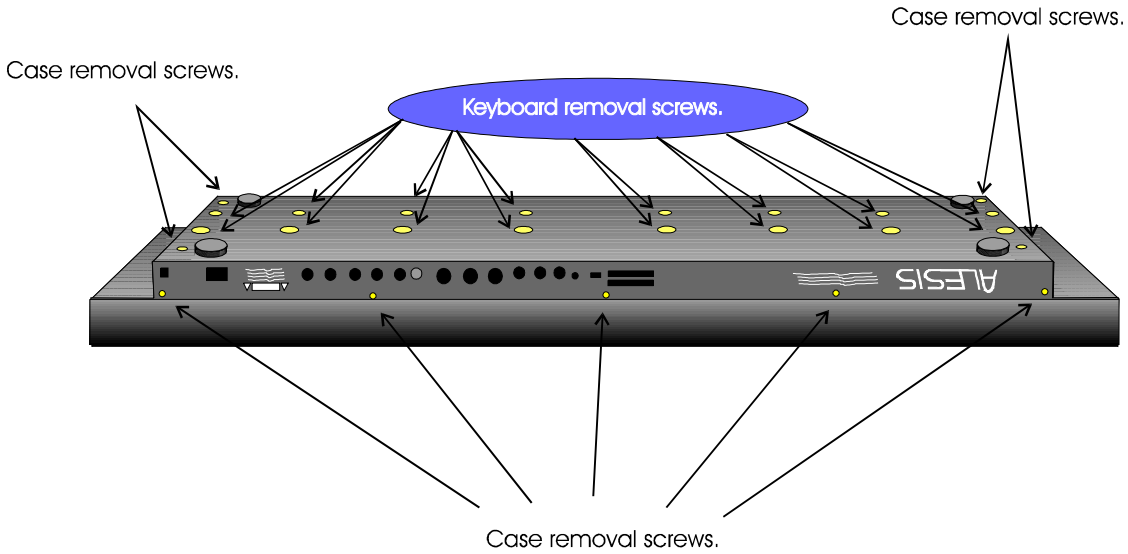


Figure 11 - QS7QS8 Case Screw Locations

4.20 QSR Disassembly/Reassembly

Figure 12 shows the location of the top panel screws. While this gives access to the top of the PCB and is adequate for simple repairs, serious troubleshooting will require the removal of the main PCB from the frame. Unscrewing the last 3 case screws on the bottom releases the front panel and the rack ear/side panels from the frame. Finally the nuts are removed from the cliff jacks to release the PCB from the frame. Reassembly is essentially the reverse process.

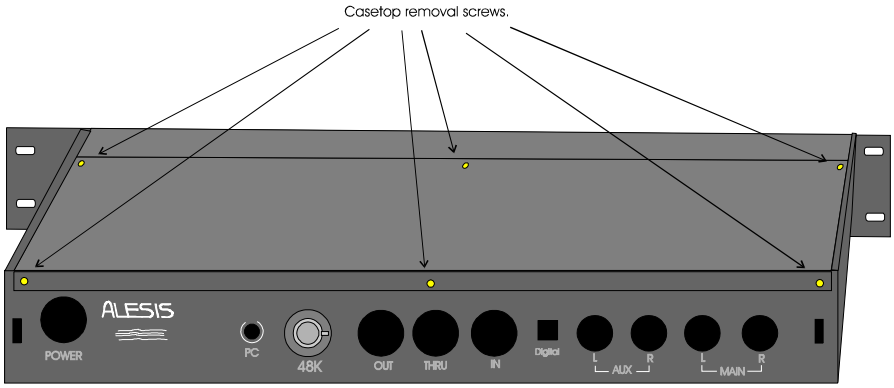


Figure 12 - QSR Case Screw Locations

4.30 Replacing A Whole Keyboard

This is the most extensive task that will ever need to be performed to a QS Series keyboard. Fortunately this is a fairly rare occurrence.

First the casetop should be removed completely from the unit as described in Section 4.00. Once all of the cables to the casetop have been unplugged, it can be set aside until reassembly and testing. Next all aftertouch and keyswitch cables from the keyboard should be unplugged from the main PCB. Now the case bottom can be turned upside down and the keyboard removal screws unscrewed. Once all of the screws are out, the case bottom can be lifted away from the old keyboard. Installing the new keyboard is the reverse process. Note that cables that were originally hot glued should be re-glued to prevent their coming loose during shipping.

4.40 Replacing Individual Keys

Broken keys are an unfortunate consequence of the tough life that most professional keyboards are required to undergo. So easy key replacement was a design requirement. Figures 13 and 14 show the location of the key clip. A flat blade screwdriver inserted into the slot in the key and then rotated will release the key. Note that it may be necessary to loosen (but not necessarily remove) the keyboard assembly from the case bottom.

4.51 Replacing QS6 And QS7 Keys

Figure 13 shows the location of the spring which must be removed before removing the key itself. It also shows the location of the key clip release catch. Insert a flat blade screwdriver into the slot. While turning the screwdriver to release the catch, lift carefully at the rear of the key. **DO NOT** force the key off or it's possible to break the key clip itself, and ruining the entire keyboard. Once the back end on the key is loose, slide it towards the front on the keyboard (range of motion stops are built into the key and encircle part of the frame).

Putting the new key in is essentially the reverse process with one small exception. Instead of using a screwdriver when putting the rear end of the key back, just push the rear end of the key down until it snaps into place.

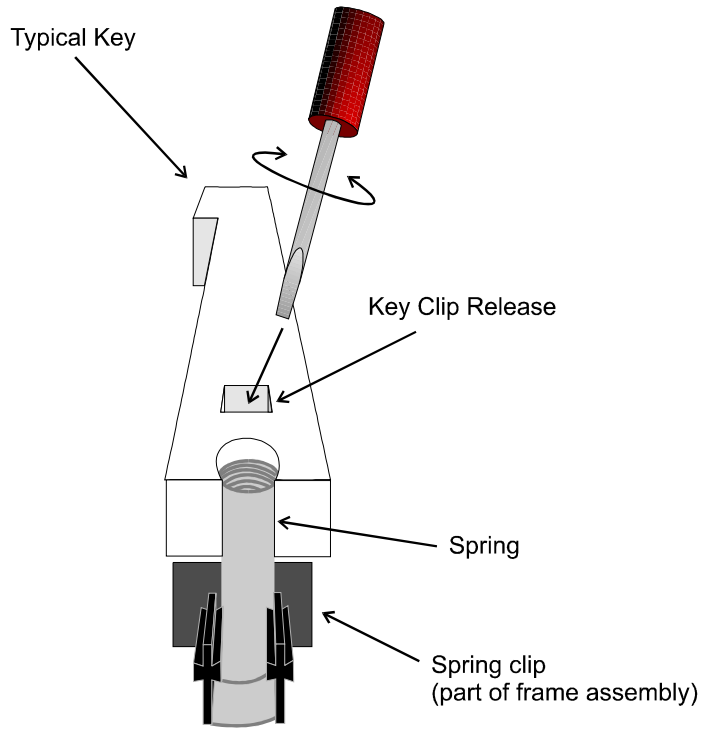


Figure 13 - QS6 Key Release Location

4.52 Replacing QS8 Keys

Figure 14 shows the location of the key clip release catch. Insert a flat blade screwdriver into the slot. While turning the screwdriver to release the catch, lift carefully at the rear of the key. **DO NOT** force the key off or it's possible to break the key clip itself, thus ruining the entire keyboard. Once the rear end on the key is loose, lift it slightly, then slide it towards the front on the keyboard (range of motion stops are built into the key and encircle part of the frame). **Note**: This must be done carefully due to the spring located under the key (See Figure 5). It is very easy to loose this spring into the mechanism, where it could fall out at a later time and cause major damage to the electronics.

Putting the new key in is essentially the reverse process with one small exception. Instead of using a screwdriver when putting the rear end of the key back, just push the rear end of the key down until it snaps into place. Note that it may be necessary to remove the first row (nearest the front of the unit) of keyboard mounting screws so that the keyboard can be lifted enough to allow the key to clear the bottom panel assembly.

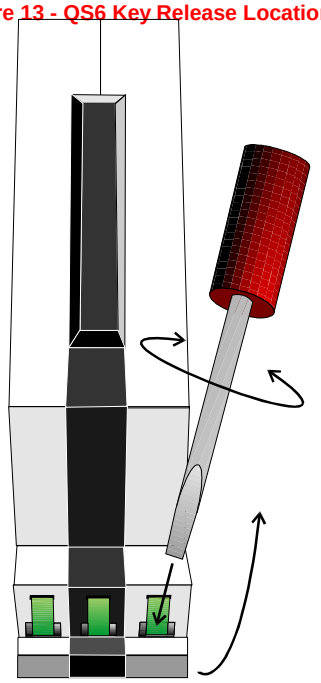


Figure 14 - Key Release Catch Location

4.60 General Troubleshooting

The following table was generated from previous troubleshooting cases. The cause section does not guaranteed a solution. The purpose of this table is to assist a technician in understanding why certain problems occur.

PROBLEM	CAUSE
LCD Blank except for one cursor.	Pin 61 of the F/X ASIC unsoldered.
LCD fully light.	LCD ribbon cable is backwards.
No numbers are displayed in MIX mode.	Edit buffers are empty. Select a new mix to establish the edit buffers. This should ,be done any time that the main board is replaced, or battery backup is serviced.
No Audio..	1. U4 not properly biased (+/- 5V). 2. Disconnected jumper wire in output section (REV A boards only).
All audio "Cuts Out" intermittently.	Faulty F/X ASIC.
Individual sounds seem wrong even though Sound ROMs pass self test.	Faulty SG ASIC.
Two adjacent notes (e.g., C1 and C#1) play simultaneously when one of the notes are played.	A short exists between two pins on **J23-J26** *J12 or J13*.
Half of keyboard not working.	1 Ribbon cable (**J23-J26** *J12 or J13*) is disconnected at the main PCB.
LCD reads "ADDRESS ERROR".	SRAM or USER memory is corrupted. Reload via DATA DISK or SOUND CARD. Check Battery backup circuit.
Resetting/Intermittent audio.	Transformer PCB may have unsoldered/broken connections.
Programs or editing parameters increment by themselves.	Header J19 is disconnected or loose.
No MIDI OUT or THRU.	Faulty Hex Inverter 74HC04 (**U7** *U9* U19).
No MIDI IN.	Faulty Opto-Isolator (**U4** *U7* U14)
No PC Serial	Incorrect configuration of host computer.
	Faulty PC/MAC Switch.
	Faulty Serial Cable.
	Faulty H8 microprocessor.
	Fault in I/O circuitry (See Section 2.50).
	Fault in Baud rate circuitry (See Section 2.54)
Sound Card Not Working	Faulty Sound Card
	Bent Connector pins
	Faulty SG ASIC
QS7/QS8 Is Completely Locked Up	Incorrect value of C15 (Replace with a 1000µF Electrolytic Capacitor)

5.00 Appendix A Pinout Diagrams

5.10 SG ASIC

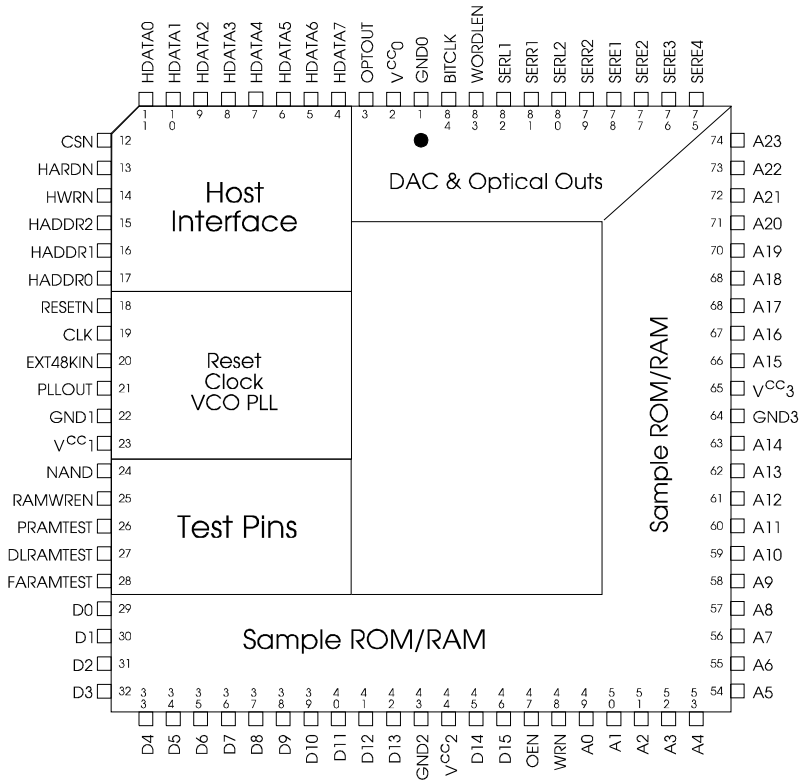


Figure 15 - SG ASIC Pinout

5.11 FX ASIC

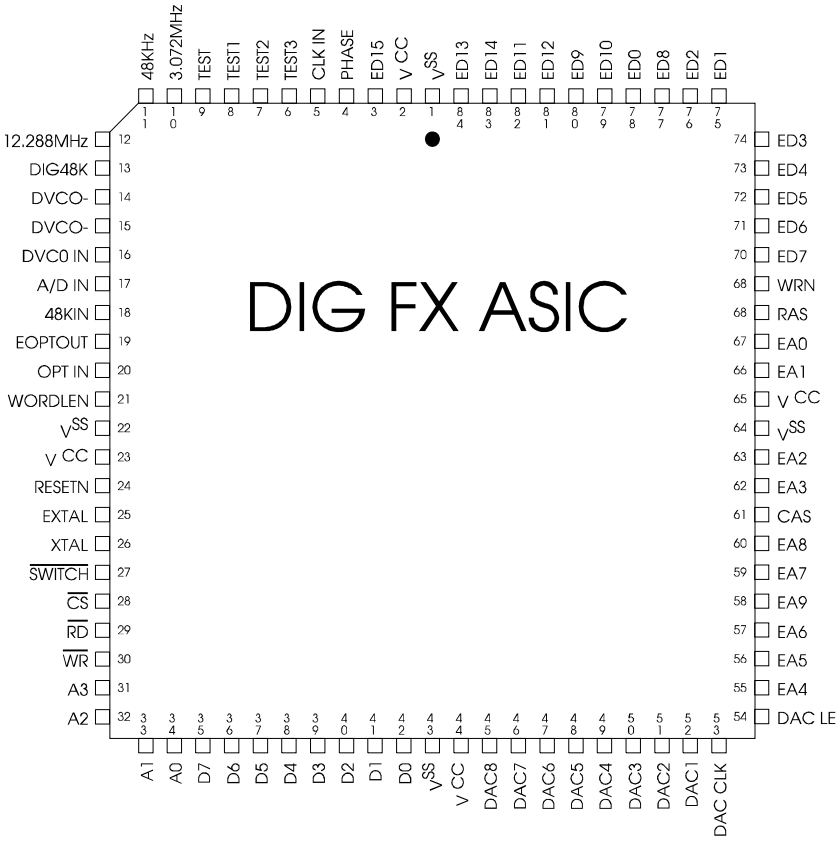


Figure 16 - FX ASIC Pinout

5.12 KEYSCAN ASIC

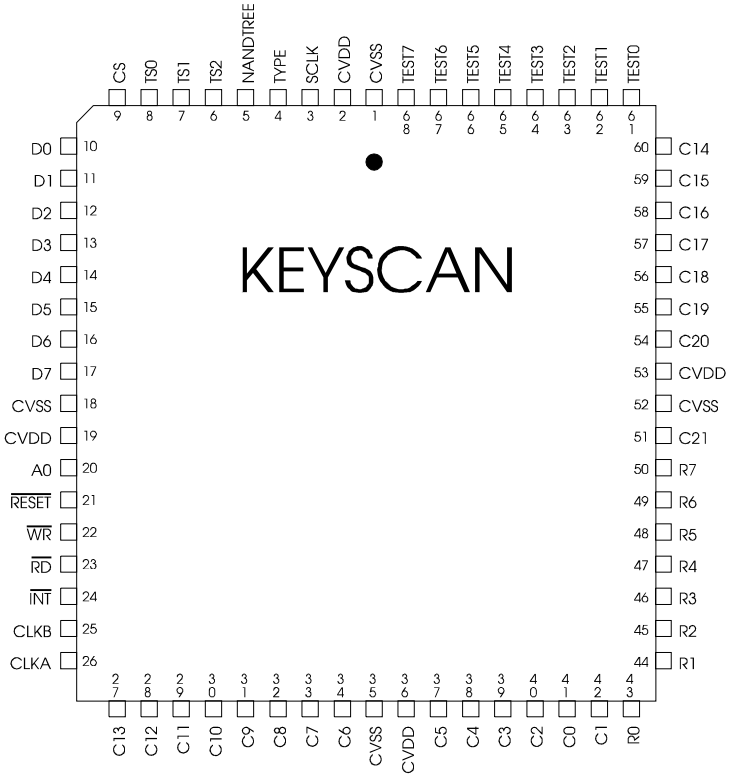


Figure 17 - Keyscan ASIC Pinout

5.13 MICRO CONTROLLER

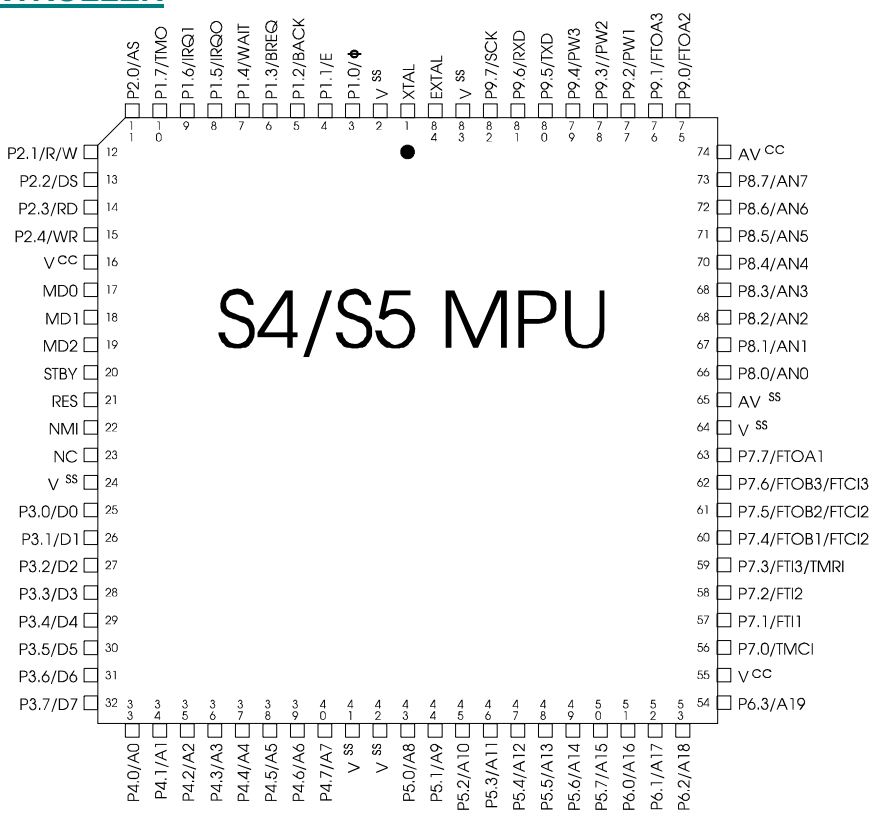


Figure 18 - H8 Processor Pinout

5.14 SRAM

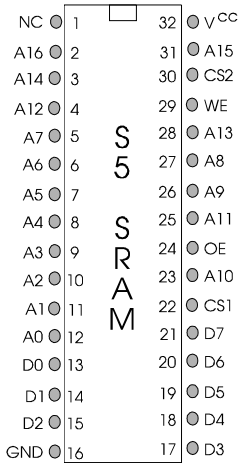


Figure 19 - FX SRAM Pinout

5.15 EPROM

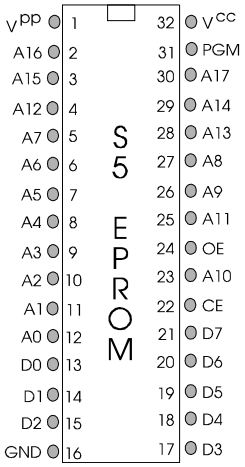


Figure 20 - EPROM Pinout

5.16 SOUND ROM

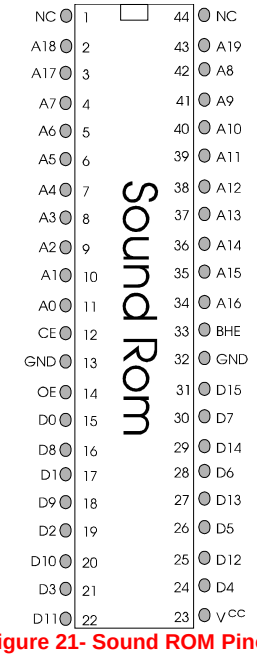


Figure 21- Sound ROM Pinout

5.19 GAL

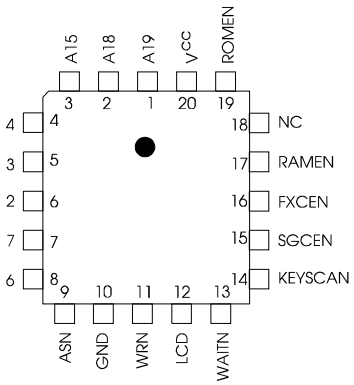


Figure 22 - GAL Pinout

5.20 DAC

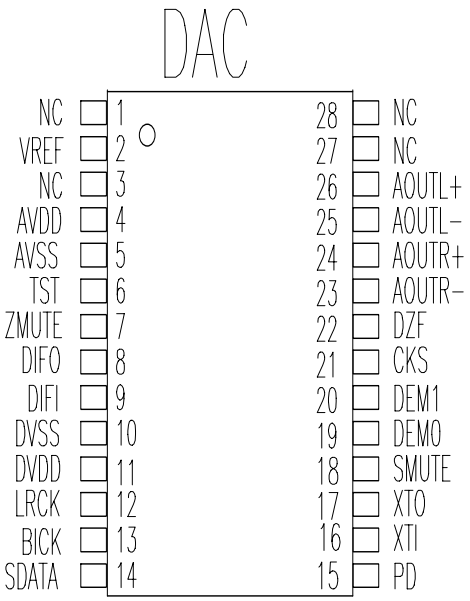


Figure 23 - DAC Pinout

6.00 Appendix A Updates And Corrections

6.10 QS6

The QS6 has undergone numerous changes in order to improve it's performance. Each new revision incorporates all hardware modifications necessary from previous versions. The fact that this unit has been around for a while has also allowed for the creation of more extensive documentation than is available for more recent units. This comes in the form of precise engineering notes of all main P.C. Board changes. Any major circuit changes are treated separately following the PCB's Revision Change Table. All other changes are layout only and do not affect the electrical operation of the PCB. The reasons for these minor changes range from improved R.F.I. characteristics to simplified assembly.

6.11 QS6 Main Revision B

Table 4 - QS6 Main PCB Revision B Changes

PART NUMBER:	**9-40-1241**
CHANGES FROM REV:	**A TO REV: B**
DATE:	**4/15/96**
CHANGE:	
Change all text from Rev A to B	
Reroute 3.072Mhz signal	
Add GND bar along back panel	
Put GND vias under DACs	
Update power diode part	
Remove redundant REV.A labels	
Move A.T. BLACK silk screen away from edge	
Bump up trace below PCMCIA	
Move 88 UPPER and 76 UPPER silk screen away from edge	
Move D10 and D11 silk screen away from edge	
<45 degree angle between J7 and C38	
No solder paste for Heat Sink (Use V6 for CAM toppaste)***	
Teardrop J21 traces	
Adjust C53	
Use C4 fiducials	
Adjust C46	
Add thermals to Heat Sink	
Clean up logic	
Add 470Ω in series for 3.072Mhz and 12.288Mhz	
Plate mounting holes, and completely connect to GND plane	
Move 20Mhz crystal closer to uP	
Reroute VCO asic area	
Move 0.1uF caps closer to power on FX and SG asics	
Use 96 mil drill bit instead of 100mil	

6.12 QS6 Main Revision C

Table 5 - QS6 Main PCB Revision C Changes

PART NUMBER: 9-40-1241 QS7/QS8 MAIN
CHANGES FROM REV: B TO REV: C
DATE: 5-7-96
CHANGE:
Change all text from Rev B to C
Move R88, R92, & C88 farther above central mounting hole
Tie both A.T. lines together before the CD4052 (U24)
Increase inner diameter of mounting holes to 160mil
Connect MIDI OUT/THRU barrels to chassis GND
Reroute \RD \WR \AS away from back panel jacks
Shrink inner diameter of PCMCIA mounting holes to 120mil
Change R2 & R3 to 120Ω
Connect MIDI IN barrel to chassis GND thru a 0.1uF cap
Connect LPF caps (C28, C31, C35, C36) in the MAIN/AUX OUT to chassis GND
Drop C74 and R75 (redundant to C70 and R73)
Edit text for first 4 ROMs by adding "A" to end of part number
Suppress U6 paste by renaming it V6 and suppressing in CAM
Add hole in bottom right corner to accommodate screw for mounting keyboard
Short thru R49 and U25D (connect input to GND) to EXT_IN

6.13 QS6 Main Revision D

Table 6 - QS6 Main PCB Revision D Changes

PART NUMBER: 9-40-1241
CHANGES FROM REV: C TO REV: D
DATE: 6-13-96
CHANGE:
Change all text from Rev C to D
Add 2200uF cap in parallel with C8
Change R37 into 1.2K 1206 5%
Separate Aftertouch lines into U24 Pin 4 & 5
Change R25, R24, R28, R27, R6, R7, R9, R10 into 15K
"U-connect" all tight pitch pads on uP and DACs
Lower R64 silk screen
Use New & Improved Fiducials
Connect all mounting holes to GND (on the Fly command)

6.14 QS6 Main Revision E

Table 7 - QS6 Main PCB Revision E Changes

PART NUMBER: 9-40-1241
CHANGES FROM REV: D TO REV: E
DATE: 7-1-96
CHANGE:
Change all text from Rev D to E
Change R25, R24, R28, R27, R6, R7, R9, R10 into 12K
Reroute and GND isolate MIDI IN connects
Add assy file

6.15 QS6 Main Revision F

Table 8 - QS6 Main PCB Revision F Changes

PART NUMBER: 9-40-1241
CHANGES FROM REV: E TO REV: F
DATE: 7-22-96
Borders added to PCB at production's request. Now, many back panel parts become waveable. Because of new waving technology, the audio jacks can be waved without harm or corrosion. Rev.E and Rev.F are electrically the same.
CHANGE:
Change all text from Rev E to F
Move via from beneath the BNC jack
Straighten trace into headphone jack
Straighten trace above M3
Remove SMK from heatsink
Lower MIDI THRU text
Add .4" border with breakaway tabs on jack side of PCB
Add .15" border with breakaway tabs on keyboard side of PCB
Add fiducials on breakaway borders
Shrink optojack mounting holes to original size
Move the extra hole center to the same level as the bottom right mounting hole

6.20 QS7/8

6.21 QS7/8 Main Revision B

Table 9 - QS7/8 Main PCB Revision B Changes

PART NUMBER: 9-40-1241
CHANGES FROM REV: A TO REV: B
DATE: 4/15/96
CHANGE:
Change all text from Rev A to B
Reroute 3.072Mhz signal
Add GND bar along back panel
Put GND vias under DACs
Update power diode part
Remove redundant REV.A labels
Move A.T. BLACK silk screen away from edge
Bump up trace below PCMCIA
Move 88 UPPER and 76 UPPER silk screen away from edge
Move D10 and D11 silk screen away from edge
<45 degree angle between J7 and C38
No solder paste for Heat Sink (Use V6 for CAM toppaste)***
Teardrop J21 traces
Adjust C53
Use C4 fiducials
Adjust C46
Add thermals to Heat Sink
Clean up logic
Add 470Ω in series for 3.072Mhz and 12.288Mhz
Plate mounting holes, and completely connect to GND plane
Move 20Mhz crystal closer to uP
Reroute VCO asic area
Move 0.1uF caps closer to power on FX and SG asics
Use 96 mil drill bit instead of 100mil

6.22 QS7/8 Main Revision C

Table 10 - QS7/8 Main PCB Revision C Changes

PART NUMBER: 9-40-1241 QS7/QS8 MAIN
CHANGES FROM REV: B TO REV: C
DATE: 5-7-96
CHANGE:
Change all text from Rev B to C
Move R88, R92, & C88 farther above central mounting hole
Tie both A.T. lines together before the CD4052 (U24)
Increase inner diameter of mounting holes to 160mil
Connect MIDI OUT/THRU barrels to chassis GND
Reroute \RD \WR \AS away from back panel jacks
Shrink inner diameter of PCMCIA mounting holes to 120mil
Change R2 & R3 to 120Ω
Connect MIDI IN barrel to chassis GND thru a 0.1uF cap
Connect LPF caps (C28, C31, C35, C36) in the MAIN/AUX OUT to chassis GND
Drop C74 and R75 (redundant to C70 and R73)
Edit text for first 4 ROMs by adding "A" to end of part number
Suppress U6 paste by renaming it V6 and suppressing in CAM
Add hole in bottom right corner to accommodate screw for mounting keyboard
Short thru R49 and U25D (connect input to GND) to EXT_IN

6.23 QS7/8 Main Revision D

Table 11 - QS7/8 Main PCB Revision D Changes

PART NUMBER: 9-40-1241
CHANGES FROM REV: C TO REV: D
DATE: 6-13-96
CHANGE:
Change all text from Rev C to D
Add 2200uF cap in parallel with C8
Change R37 into 1.2K 1206 5%
Separate Aftertouch lines into U24 Pin 4 & 5
Change R25, R24, R28, R27, R6, R7, R9, R10 into 15K
"U-connect" all tight pitch pads on uP and DACs
Lower R64 silk screen
Use New & Improved Fiducials
Connect all mounting holes to GND (on the Fly command)

6.24 QS7/8 Main Revision E

Table 12 - QS7/8 Main PCB Revision E Changes

PART NUMBER: 9-40-1241
CHANGES FROM REV: D TO REV: E
DATE: 7-1-96
CHANGE:
Change all text from Rev D to E
Change R25, R24, R28, R27, R6, R7, R9, R10 into 12K
Reroute and GND isolate MIDI IN connects
Add assy file

6.25 QS7/8 Main Revision F

Table 13 - QS7/8 Main PCB Revision F Changes

PART NUMBER: 9-40-1241
CHANGES FROM REV: E TO REV: F
DATE: 7-22-96
Borders added to PCB at production's request. Now, many back panel parts become waveable. Because of new waving technology, the audio jacks can be waved without harm or corrosion. Rev.E and Rev.F are electrically the same.
CHANGE:
Change all text from Rev E to F
Move via from beneath the BNC jack
Straighten trace into headphone jack
Straighten trace above M3
Remove SMK from heatsink
Lower MIDI THRU text
Add .4" border with breakaway tabs on jack side of PCB
Add .15" border with breakaway tabs on keyboard side of PCB
Add fiducials on breakaway borders
Shrink optojack mounting holes to original size
Move the extra hole center to the same level as the bottom right mounting hole

6.25 Changes To QS7/QS8 VCO Circuit (All Main PCB Revisions)

It was found that the Digital VCO could lock up if a slight negative voltage was present on the +5V line prior to power up. While this sounds unusual, it happens!

Unfortunately, it wasn't our first guess. Originally it was thought that reducing the amount of negative voltage at the control voltage input was enough. This was done by soldering a 120K bleeder resistor in parallel with C43. While this seemed to be the "fix" for a while, it ultimately failed to fix all keyboards, and a further investigation was conducted. All units exhibiting this fault should be checked that they not only have the smaller supply capacitor, but this resistor has not been installed previously. If it found, it should be removed.

The drain on the +5V rail is sufficient to lower the charge across raw supply filter capacitor very rapidly, but the -5V rail powers very few components, and consequently, the it's raw supply filter capacitor holds a significant charge. Once the +5V supply is fully discharged the conditions are perfect for the negative rail to "leak" to the positive rail via all of the devices common to both rails. Eventually this charge will leak to ground too, and if power is cycled quickly it can be significant enough to stop the VCO. The solution is to reduce the size of the negative raw supply filter capacitor from 2200µF to 1000µF, hence reducing the amount of charge it can retain on power down.

6.30 QSR

There are currently no changes this product.

7.00 Appendix B Software Histories

7.10 QS6

V1.00 September 11th, 1995 Checksum: BB68H

1. First Production Release version 1.00!

V1.10 October 25th, 1995 Checksum: D3A4H

1. Changed program changing so that the DAC is muted on program changes which use the distortion algorithm, program changes with different configurations, and program changes with the same algorithm but with different reverb types.
2. Changed version number and date for official 1.10 release.

##
V E R S I O N 2 . 0 0
##

V2.00 Sep. 30, 1996 Checksum: F010h

1. Fixed FX config 5 bug in which if the leslie input was reverb, a potentially random RAM value would be cleared.
2. Fixed MIDI Bank Select bug where S6 card banks could not be called up through MIDI.
3. Changed Controller A Default Number to 12. Changed Controller B Default Number to 13.
4. Controller 11 (MIDI Expression) is now implemented as another volume scaler like Controller 7 (MIDI Volume). This affected VOICE.SRC, DATA3, MIDISUBS.SRC and PAGESUBS.SRC. Fixed bug where Controller A value was not being sent out the Computer Interface port correctly. It was, however, going out the regular MIDI OUT port correctly. This fix changed the file CONVS.SRC at the very end in the routine CTL_MIDI. Fixed bug (also in S8, S9) that kept drum sounds that were gated from being cut off when another note in the same mute group was played.
5. Added Card Sequencer from QS7/8. Only sequence numbers 00-49 are allowed.
6. Added QS7/8 -> QS6 Sample remapping.
7. Fixed various display anomalies in the FX configuration editing: a) FX Config #1: colon after Send 3 CHORUS DEPTH. b) FX Configs #1,3,4: changed Send 1 DEL_IN to DEL-IN. c) FX Config #5: Send 1: changed LEZLIE pg 3 from LEZ_IN to LEZ-IN.
8. Added Audio Test (like QS7/8) as the new last test in the Self Tests.
9. Added direct access to the Self-Tests as done in the QS7/8. In addition to selecting the tests using the VALUE UP and VALUE DOWN buttons, the tests can also be directly selected using the program select buttons 0-8.
10. Added new checksum for Sound ROM 0 in the SROM test. The SROM test will now pass with either the new or old SROM 0. If one of the SROM checksums does not pass, pressing the VALUE UP button will advance to test the next SROM instead of aborting the test.
11. Changed NORMAL Keyboard mode so that in MIX mode, PROGRAM ENABLE (per Mix Channel) now overrides MIDI OUT ENABLE (per Mix Channel).
12. Fixed bug where COMPARE and GLOBAL would interact to defile the edit buffer.
13. Fixed Mix UnCompare bug where when going out of compare in Mix mode all voices playing should be stopped, but they weren't.
14. Fixed Mix MIDI Dots bug where when leaving Edit mode by hitting the <MIX> button, no new MIDI Dots would light when a new key was pressed until all keys were first released.
15. Changed Program and Mix Channel RANGE when using keyboard note presses to set the range so that the Global Keyboard Transpose is taken into account.
16. Modified portamento routine so that each sound retains the last note played in that sound, and glides from the last note to the new note played. Other sounds or channels will no longer cause portamento interaction.
17. Put HIMOM back in.
18. New Presets.
19. Fixed QS7/8 -> QS6 sample remapping lookup table for QS7/8 Ethnic group entries 11-16.
20. Fixed bug where COMPARE and GLOBAL interact to defile Mixes (but not programs in PROGRAM mode).
21. Added Baud Rate NACK sysex message (18h). The QS6 cannot change Baud Rates on its computer port like the QS7/8 can. Now, if the QS6 receives a "Change Baud Rate" message, it responds with the new Baud Rate NACK message (#18h). Before, it was sending a Baud Rate ACK message (#17h).
22. Fixed Card Sequence Overrun bug.

7.20 QS7/QS8

1.00 June 28, 1996

1. First Production Release.

1.01 July 3, 1996

1. Lowered test sine wave amplitude by 2dB.

V1.10 Sep. 11th, 1996

1. Fixed Mix UnCompare bug where when going out of compare in Mix mode all voices playing should be stopped, but they weren't.
2. Fixed Mix MIDI Dots bug where when leaving Edit mode by hitting the <MIX> button, no new MIDI Dots would light when a new key was pressed until all keys were first released.
3. Changed Program and Mix Channel RANGE when using keyboard note presses to set the range so that the Global Keyboard Transpose is taken into account.
4. Modified portamento routine so that each sound retains the last note played in that sound, and glides from the last note to the new note played. Other sounds or channels will no longer cause portamento interaction.
5. Put HIMOM back in.
6. Changed QS7 Software so that its aftertouch would work with both REV C and REV E boards. This change resulted in a new source file PANEL7.SRC where the black aftertouched value is forced to the value H'FFFF.
7. New presets. Final Release of version 1.10.

V1.02 Sep. 12th, 1996

1. Changed version from 1.10 to 1.02 for Manufacturing.

7.40 QSR

1.00 Dec. 3, 1996 Checksum = 528Ah

1. First Production Release

1.01 Dec. 3, 1996 Checksum = 528Ah

1. First Production Release

1.02 Mar. 21, 1996 Checksum = 528Ah

1. Fixed bug which did not allow the use of the MIDI Port and the PC Serial interface simultaneously. Now the QSR can be used to translate back and forth between Serial I/O and the rest of a MIDI Studio.
2. ROM Cards (Q Cards) no longer respond to the MIDI Sequence Start Command.(with the exception of AMD flash cards). Note that whether or not an SRAM Card responds to the MIDI Sequence Start Command depends on the Card manufacturer, although the majority do not.
3. Fixed Bug in which Mix Program assignments were changed if the data was stored to Card B.
4. Fixed bug in which pressing EDIT would crash the unit (and likely the PC) if the Mix Channel Program Bank or the MIX Channel Program Number was already being edited in UNISYN.
5. Fixed bug which caused ROM Card demo sequences to be played incorrectly from Card slot B.
6. Fixed bugs in which the Card Bank pointers and the Card Bank Designators would change when the Card was removed from the card slot.
7. Fixed bug which caused the Global Out/Thru parameter to default to Out at the end of any Card Demo Sequence.
8. Fixed bug which allowed the user to continue past the maximum allowable value (99) when storing an individual mix. Note that the display did not reflect these “hidden” values. These values would go up to 128 .
9. Fixed “display anomalies” which required that 2 button presses were necessary to change values for :

   Config 2 Send 2: REVERB
   Config 2 Send 3: MIX
   Config 2 Send 4: REVERB
   Config 1 Send 4: MIX
   Config 3 Send 4: MIX

10. To reduce confusion the “DEL-IN:SND<nnPCH” Parameter in the FX Config 2 pitch function has been changed to “DelayIn Lev:nn”
11. Fixed bug in which an incoming Sys-ex Global dump (in particular from a QS8 “SEND ALL DATA TO MIDI”) would alter the Global MIDI In/Out/Thru parameter.
12. Fixed bug in which the Store/Copy option for Effects did absolutely nothing when the source and destination were both set to Effects . Now, the source has priority so that if the source is set to EFFECT, then the destination is forced to be a PROGRAM XXX. Conversely, if the source was set to a PROGRAM XXX then the destination is forced to be EFFECT.
13. Fixed bug in which Mono Mode programs would “stick” if the QSR’s MIDI channel was changed while it was playing.

8.00 Appendix C Sys-Ex Implementations

8.10 S6 Sys-Ex

SYSTEM EXCLUSIVE FORMAT 4/15/95

The QS6 MIDI System Exclusive message format is as follows:

F0	System exclusive status
00 00 0E	Alesis manufacturer id#
0E	QS id#
cc	Opcode
dd	Data
:	:
:	:
F7	End-Of-Exclusive

OPCODES:

00-MIDI User Program Dump F0 00 00 0E 0E 00 <program#> <data> F7

<program#>= 0..127 selects individual user programs

<data> is in a packed format in order to optimize data transfer. Eight MIDI bytes are used to transmit each block of 7 QS6 data bytes. If the 7 data bytes are looked at as one 56-bit word, the format for transmission is eight 7-bit words beginning with the most significant bit of the first byte, as follows:

SEVEN QS BYTES:

0:	A7	A6	A5	A4	A3	A2	A1	A0
1:	B7	B6	B5	B4	B3	B2	B1	B0
2:	C7	C6	C5	C4	C3	C2	C1	C0
3:	D7	D6	D5	D4	D3	D2	D1	D0
4:	E7	E6	E5	E4	E3	E2	E1	E0
5:	F7	F6	F5	F4	F3	F2	F1	F0
6:	G7	G6	G5	G4	G3	G2	G1	G0

TRANSMITTED AS

0:	0	A6	A5	A4	A3	A2	A1	A0
1:	0	B5	B4	B3	B2	B1	B0	A7
2:	0	C4	C3	C2	C1	C0	B7	B6
3:	0	D3	D2	D1	D0	C7	C6	C5
4:	0	E2	E1	E0	D7	D6	D5	D4
5:	0	F1	F0	E7	E6	E5	E4	E3
6:	0	G0	F7	F6	F5	F4	F3	F2
7:	0	G7	G6	G5	G4	G3	G2	G1

There are 400 data bytes sent for a single program dump, which corresponds to 350 bytes of program data. With the header, the total number of bytes transmitted with a

program dump is 408. The location of each parameter within a program dump is shown in the next section.

01-MIDI User Program Dump Request F0 00 00 0E 0E 01 <program#> F7

<program#>= 0..127 selects individual user programs

When received, the QS6 will respond to this message with a MIDI user program dump (00) of the program number selected.

02-MIDI Edit Program Dump F0 00 00 0E 0E 02 <edit#> <data> F7

<edit#> = 0=program mode edit; 1-16=Mix program edits 1-16

<data> is in the same format as described in 00. Loading a program into the QS6 program edit buffer will not change the current effect edit buffer, even if the program's effect number is different than the current effect number.

03-MIDI Edit Program Dump Request F0 00 00 0E 0E 03 <edit#> F7

<edit#> = 0=program mode edit; 1-16=Mix program edits 1-16

When received, the QS6 will respond to this message with a MIDI edit program dump (02) of the edit program selected.

04-MIDI Old User Mix Dump F0 00 00 0E 0E 04 <mix#> <data> F7

<mix#> = 0..99 selects individual user mixes; 100=mix edit buffer

<data> is in the same format as described in 00, but with a different number of bytes due to the difference in the mix parameters. As shown later, this command (and the following one) exists to accommodate QSs with software versions below 2.00. The total number of data bytes sent for a single mix dump is 141, which corresponds to 123 bytes of mix data. With the header, the total number of bytes transmitted with a program dump is 149. When loading a mix into the mix edit buffer, none of the 16 program edit buffers or the effect buffer will be changed, even if the new mix buffer contains program numbers different than what is currently selected.

05-MIDI Old Mix Dump Request F0 00 00 0E 0E 05 <mix#> F7

<mix#> = 0..99 selects individual user mixes; 100=mix edit buffer

When received, the QS6 will respond to this message with a MIDI Old Mix dump (04) of the mix selected. It is recommended that the New Mix Dump Request be used instead (0F), since it adds additional Mix parameters into its format.

06-MIDI User Effects Dump F0 00 00 0E 0E 06 <effect#> <data> F7

<effect#> = 0..127 selects individual user effects

<data> is in the same format as described in 00, but with a different number of bytes due to the difference in the effects parameters. The total number of data bytes sent for a single effects dump is 75, which corresponds to 65 bytes of mix data. With the header, the total number of bytes transmitted with a program dump is 83. Although a Program is stored along with its Effects, they are dealt with independently via MIDI.

07-MIDI User Effects Dump Request F0 00 00 0E 0E 07 <effect#> F7

<effect#> = 0..127 selects individual user effects

When received, the QS6 will respond to this message with a MIDI user effects dump (06) of the user effect selected.

08-MIDI Edit Effects Dump F0 00 00 0E 0E 08 <edit#> <data> F7

<edit#> = 0=program mode effect edit; 1=mix mode effect edit

<data> is in the same format as described in 06.

09-MIDI Edit Effects Dump Request F0 00 00 0E 0E 09 <edit#> F7

<edit#> = 0=program mode effect edit; 1=mix mode effect edit

When received, the QS6 will respond to this message with a MIDI edit effects dump (08) of the edit effect selected.

0A-MIDI Global Data Dump F0 00 00 0E 0E 0A 00 <data> F7

<data> is in the same format as described in 00, but with a different number of bytes due to the difference in the global parameter size. The total number of data bytes sent for a global data dump is 23, which corresponds to 20 bytes of global data. With the header, the total number of bytes transmitted with a program dump is 31. Note that with version prior to 2.00, the last three bytes of the global data will not be transmitted, since they did not exist in previous versions.

0B-MIDI Global Data Dump Request F0 00 00 0E 0E 0B F7

When received, the QS6 will respond to this message with a MIDI global data dump (0A).

0C-MIDI All Dump Request F0 00 00 0E 0E 0C F7

When received, the QS6 will respond to this message with a 128 MIDI User Program dumps (00), 100 MIDI New User Mix dumps (0E), and 128 User Effects dumps (06), and a Global data dump (0A), for a total of 79,478 MIDI bytes. A delay of 4.25 milliseconds will be placed between each dump, resulting in a total transfer time of about 27 seconds. When receiving a complete dump, the QS6 does not require any delay between dumps.

0D-MIDI Mode Select F0 00 00 0E 0E 0D <mode> F7

<mode> = 0 = Program mode; 1 = Mix mode

When received, the QS6 will change to the mode that was selected. The settings will be retained from the last time that mode was exited.

0E-MIDI New User Mix Dump F0 00 00 0E 0E 0E <mix#> <data> F7

<mix#> = 0..99 selects individual user mixes; 100=mix edit buffer

<data> is in the same format as described in 00, but with a different number of bytes due to the difference in the mix parameters. This command (and the following one) exists only in QSs with software versions 2.00 and above. The total number of data bytes sent for a single mix dump is 158, which corresponds to 138 bytes of mix data. With the header, the total number of bytes transmitted with a program dump is 166. When loading a mix into the mix edit buffer, none of the 16 program edit buffers or the effect buffer will be changed, even if the new mix buffer contains program numbers different than what is currently selected.

0F-MIDI New Mix Dump Request F0 00 00 0E 0E 0F <mix#> F7

<mix#> = 0..99 selects individual user mixes; 100=mix edit buffer

When received, the QS6 will respond to this message with a MIDI New Mix dump (0E) of the mix selected.

10-MIDI Editing F0 00 00 0E 0E 10 <0mmfffff><0sspppppp><0ccccddv><0vvvvvvv>F7

<mm> = 0=Global, 1=Mix, 2=Program, 3=Effects
<fffff> = Function number 0 through 16, depending on mode
<ss> = Sound 1-4 (0-3) when <mm>=2, effect bus 1-4 (0-3) when <mm>=3
<ppppp> = Page 0 through 23, depending on mode and function
<cccc> = Channel 1 through 16 (0-15); Ignored unless in mix mode & <mm>=1 or 2
<dd> = Data entry pot number 1-4 (0-3)
<vvvvvvvv>= Parameter value, 8 bit 2's compliment

All parameters to be edited must be sent in this format (12 MIDI bytes), regardless of the number of bits required to transmit the value of the parameter. When the QS6 receives this message, it will edit the specified parameter to the new value and display it. If the function and page selected does not exist in the current configuration, the command will cause the nearest legal function, page, and parameter to be selected, but no edit will occur. If a Mix edit is sent while in program mode, it will be ignored. If this command is received while in compare, it will be ignored. If a program edit command is received, it will place the QS6 in Edit mode. If the value received is out of range for the parameter selected, the range will be limited to the nearest legal value. The function and page numbers for each parameter are shown in the next section.

11-Sector Erase Command F0 00 00 0E 0E 11 <sector#> F7

<sector#>= 0..63 selects 128K byte sector number to be erased in FLASH PCMCIA card

The erase command sets all bytes of a sector to FFH. There can be up to 64 sectors of 128K bytes in a FLASH card, which allows for up to 8 megabytes of FLASH memory. Additional commands should not be sent until receiving an ACK or NACK (described below) from the QS6. As much as 10 seconds must be allowed before aborting if no ACK or NACK is received.

12- Sector Write Command F0 00 00 0E 0E 12 <sector#> <block#> <data> <sum> F7

<sector#>= 0..63 selects 128K byte sector number to be written in FLASH PCMCIA card
<block#>= 0..127 selects 1024 byte block of data to be written in FLASH PCMCIA card
<sum>= 0..127 seven bit checksum of previous 1173 bytes.

<data> is in a packed format in order to optimize data transfer. Eight MIDI bytes are used to transmit each block of 7 FLASH card data bytes. Like with program dumps, if the 7 data bytes are looked at as one 56-bit word, the format for transmission is eight 7-bit words beginning with the most significant bit of the first byte, as follows:

SEVEN FLASH CARD BYTES:

0:	A7	A6	A5	A4	A3	A2	A1	A0
1:	B7	B6	B5	B4	B3	B2	B1	B0
2:	C7	C6	C5	C4	C3	C2	C1	C0
3:	D7	D6	D5	D4	D3	D2	D1	D0
4:	E7	E6	E5	E4	E3	E2	E1	E0
5:	F7	F6	F5	F4	F3	F2	F1	F0
6:	G7	G6	G5	G4	G3	G2	G1	G0

TRANSMITTED AS:

0:	0	A6	A5	A4	A3	A2	A1	A0
1:	0	B5	B4	B3	B2	B1	B0	A7
2:	0	C4	C3	C2	C1	C0	B7	B6
3:	0	D3	D2	D1	D0	C7	C6	C5
4:	0	E2	E1	E0	D7	D6	D5	D4
5:	0	F1	F0	E7	E6	E5	E4	E3
6:	0	G0	F7	F6	F5	F4	F3	F2
7:	0	G7	G6	G5	G4	G3	G2	G1

There are 1171 data bytes sent for a single block of a FLASH card sector, which corresponds to 1024 bytes of FLASH card data. With the header, the total number of bytes transmitted with a program dump is 1181. This will take a minimum of 377.92 milliseconds to transmit. Additional commands should not be sent until receiving an ACK or NACK (described below) from the QS6. Writes should only be performed on sector blocks known to contain all FFH data. This can be verified by reading the block first (with the next command), or sending an erase command first.

13-Sector Request Command F0 00 00 0E 0E 13 <sector#> <block#> F7

<sector#>= 0..63 selects 128K byte sector number to be written in FLASH PCMCIA card
<block#>= 0..127 selects 1024 byte block of data to be written in FLASH PCMCIA card

This command will cause the QS6 to respond with an opcode 12H (sector write command), with the contents of the sector block that was requested. If there is no card present, the QS6 will respond with an opcode 15H.

14-FLASH Command ACK Response F0 00 00 0E 0E 14 F7

This command is ignored if received by the QS6. It is sent out by the QS6 after completing an erase command, or receiving a complete sector block write command.

15-FLASH Command NACK Response F0 00 00 0E 0E 15 <error> F7

<error>= 0..4 as follows:
0 = No card present / Not a FLASH card
1 = Card write protected
2 = Erase failed (FLASH chip timeout error)
3 = Checksum didn't match
4 = Programming failed (usually because block was not erased first)

This command is ignored if received by the QS6. It is sent out by the QS6 after receiving an erase command that could not be completed, or receiving a complete sector block write command that could not be programmed or whose checksum was invalid. In the case of invalid checksum, the sending device is expected to resend the data at least once before aborting.

NOTES ON FLASH CARDS:

- Best case programming time for each megabyte in a FLASH card will be 7 minutes, 45 seconds, assuming a typical FLASH programming time of 65 milliseconds per sector block, and a typical erase time of 1.5 seconds per sector. This results in a transfer rate of approximately 43 times slower than real time, assuming the samples are at 48KHz.

- The burden is placed on the sending device to avoid possible errors that can occur if a sector above the total memory of a card is erased or written to (due to possible address aliasing). It is not possible for the QS6 to determine the amount of memory in the card.

- The FLASH card must be a 5 volt only card (no 12 volt required for programming), must have 64K byte sectors, must have 150 nanosecond or better chip enable read access time, and must be compatible with the programming commands and Manufacturer's ID codes of an Am29F040 4-Megabit FLASH memory from AMD.

DEVICE INQUIRY

The QS6 responds to the Universal Device Inquiry message < F0 7E 7F 06 01 F7 >
Upon receiving this message the QS6 will respond with the following:

F0 7E 7F 06 02	Universal Device Reply
00 00 0E	Alesis Manufacturer ID
0E 00	QS Family ID, LSB first
03 00	QS6 Family Member, LSB first
xx xx xx xx	Software revision, ASCI (ex. 30 31 30 30 = '0100' = 1.00)
F7	End-Of-Exclusive

PARAMETER FORMAT

The following specific parameter information shows the locations in which each parameter resides after unpacking the data from its 7 bit MIDI format into the 8 bit format as described in opcode 00, program data dump.

GLOBAL DATA FORMAT

The Global parameters are comprised of 19 bytes of data. Unlike the Program, Mix, and Effects parameters, the Global parameters are not packed into each available bit, so that each parameter occupies its own byte. This results in unused bits for most of the parameter's bytes. These bits must remain at 0. In addition, the signed parameters are kept in 2's compliment format, so no offset adjustment is necessary. For direct parameter editing (sysex command 10H), the function, page, and data pot number are shown. The Mode should be set to 0 (=Global), and the Sound and Channel parameters are ignored.

#	Parameter name	Func	Page	Pot	LoLim	HiLim	bits	bit address
0.	Global spare (deleted parameter)						7	0:6-0:0
1.	Pitch transpose*	0	0	2	-12	12	8	1:7-1:0
2.	Pitch fine tune*	0	0	3	-99	99	8	2:7-2:0
3.	Keyboard scaling	0	1	0	0	99	7	3:6-3:0
4.	Keyboard curve	0	1	1	0	2	2	4:1-4:0
5.	Keyboard Transpose	0	1	2	-12	12	8	5:7-5:0
6.	Keyboard mode	0	1	3	0	17	5	6:4-6:0
7.	Controller A number	0	2	0	0	120	7	7:6-7:0
8.	Controller B number	0	2	1	0	120	7	8:6-8:0
9.	Controller C number	0	2	2	0	120	7	9:6-9:0
10.	Controller D number	0	2	3	0	120	7	10:6-10:0
11.	Pedal 1 controller number	0	4	0	0	120	7	11:6-11:0
12.	Pedal 2 controller number	0	4	2	0	120	7	12:6-12:0
13.	MIDI program select	0	5	0	0	17	5	13:4-13:0
14.	Global spare (deleted parameter)	0	5	2	0	1	1	14:0
15.	Global spare (deleted parameter)	0	6	0	0	1	1	15:0
16.	Global spare (deleted parameter)	0	1	1	0	16	5	16:4-16:0
17.	General MIDI	0	0	1	0	1	1	17:0
18.	A-D controller reset	0	3	1	0	1	1	18:0
19.	A-D controller mode	0	3	3	0	2	2	19:1-19:0

* These parameters are transmitted, but are ignored when received as part of a Global data dump (opcode 0A).

NEW MIX DATA FORMAT

Mixes contain 138 bytes of packed parameter data. The first 10 bytes are common parameters for all 16 MIDI channels. The next 16 sets of 8 bytes contain each of the channel's parameters. The bit addresses shown are from most significant bit to least significant bit for each parameter, with the byte number first, followed by a colon (:), followed by the bit number. Each parameter should never exceed the limit shown in the table. For bipolar parameters, the limits shown are offset binary, since this is the format that the parameters are stored in. To view the parameters as two's complement numbers, add the value shown in the Offset column. For direct parameter editing (sysex command 10H), the function, page, and data pot number are shown. The Mode should be set to 1 (=Mix), the Sound parameter is ignored, and the Channel parameter should be set to 0 through 15, for channels 1 through 16, respectively. Signed parameters should be sent in 2's complement format.

#	Parameter name	Func	Page	Pot	Offset	Limit	bits	bit address
0.	Mix effect MIDI program change	5	0	2	0	1	1	0:0
1.	Mix effect chan	5	0	3	0	15	4	0:4-0:1
2.	Mix name digit 0	6	0	0	0	95	7	1:3-0:5
3.	Mix name digit 1	6	1	0	0	95	7	2:2-1:4
4.	Mix name digit 2	6	2	0	0	95	7	3:1-2:3
5.	Mix name digit 3	6	3	0	0	95	7	4:0-3:2
6.	Mix name digit 4	6	4	0	0	95	7	4:7-4:1
7.	Mix name digit 5	6	5	0	0	95	7	5:6-5:0
8.	Mix name digit 6	6	6	0	0	95	7	6:5-5:7
9.	Mix name digit 7	6	7	0	0	95	7	7:4-6:6
10.	Mix name digit 8	6	8	0	0	95	7	8:3-7:5
11.	Mix name digit 9	6	9	0	0	95	7	9:2-8:4
12.	Mix spare						5	9:7-9:3
13.	Channel 1 program number	0	0	0	0	127	7	10:6-10:0
14.	Channel 1 program type	0	0	2	0	1	4	11:2-10:7
15.	Channel 1 enable	0	0	3	0	1	1	11:3
16.	Channel 1 volume	1	0	0	0	99	7	12:2-11:4
17.	Channel 1 pan	1	0	1	0	7	3	12:5-12:3
18.	Channel 1 output	1	0	2	0	3	2	12:7-12:6
19.	Channel 1 effect level	2	0	0	0	100	7	13:6-13:0
20.	Channel 1 effect bus	2	0	1	0	4	3	14:1-13:7
21.	Channel 1 pitch octave	3	0	0	-2	5	3	14:4-14:2
22.	Channel 1 pitch semitone	3	0	2	-12	25	5	15:1-14:5
23.	Channel 1 keyboard low note	4	0	0	0	127	7	16:0-15:2
24.	Channel 1 keyboard high note	4	0	1	0	127	7	16:7-16:1
25.	Channel 1 midi in on/off	4	1	0	0	1	1	17:0
26.	Channel 1 midi out on/off	4	1	2	0	1	1	17:1
27.	Channel 1 keyboard on/off	4	1	3	0	1	1	17:2
28.	Channel 1 wheels on/off	4	2	0	0	1	1	17:3
29.	Channel 1 Aftertouch on/off	4	2	1	0	1	1	17:4
30.	Channel 1 Sustain pedal on/off	4	2	2	0	1	1	17:5
31.	Channel 1 Pedals/controllers on/off	4	2	3	0	1	1	17:6
32.	Channel 1 Spare						1	17:7
33-52.	Channel 2 parameters		(see above)					25:7-18:0
53-72.	Channel 3 parameters		(see above)					33:7-26:0
73-92.	Channel 4 parameters		(see above)					41:7-34:0
93-112.	Channel 5 parameters		(see above)					49:7-42:0
113-132.	Channel 6 parameters		(see above)					57:7-50:0
133-152.	Channel 7 parameters		(see above)					65:7-58:0
153-172.	Channel 8 parameters		(see above)					73:7-66:0
173-192.	Channel 9 parameters		(see above)					81:7-74:0
193-212.	Channel 10 parameters		(see above)					89:7-82:0
213-232.	Channel 11 parameters		(see above)					97:7-90:0
233-252.	Channel 12 parameters		(see above)					105:7-98:0
253-272.	Channel 13 parameters		(see above)					113:7-106:0
273-292.	Channel 14 parameters		(see above)					121:7-114:0
293-312.	Channel 15 parameters		(see above)					129:7-122:0
240-332.	Channel 16 parameters		(see above)					137:7-130:0

OLD MIX DATA FORMAT

This format exists for compatibility with QSs having software prior to version 2.00. It is presented here for reference, and can only be used for old mix data dumps or requests (no direct editing). When receiving this data Old Mixes contain 123 bytes of packed parameter data. The first 11 bytes are common parameters for all 16 MIDI channels. The next 16 sets of 7 bytes contain each of the channel's parameters. The bit addresses shown are from most significant bit to least significant bit for each parameter, with the byte number first, followed by a colon (:), followed by the bit number. Each parameter should never exceed the limit shown in the table. For bipolar parameters, the limits shown are offset binary, since this is the format that the parameters are stored in. To view the parameters as two's complement numbers, add the value shown in the Offset column.

#	Parameter name	Offset	Limit	bits	bit address
0.	Mix spare (deleted parameter)			7	0:6-0:0
1.	Mix spare (deleted parameter)			1	0:7
2.	Mix spare (deleted parameter)			1	1:0
3.	Mix effect chan	0	15	4	1:4-1:1
4.	Mix name digit 0	0	95	7	2:3-1:5
5.	Mix name digit 1	0	95	7	3:2-2:4
6.	Mix name digit 2	0	95	7	4:1-3:3
7.	Mix name digit 3	0	95	7	5:0-4:2
8.	Mix name digit 4	0	95	7	5:7-5:1
9.	Mix name digit 5	0	95	7	6:6-6:0
10.	Mix name digit 6	0	95	7	7:5-6:7
11.	Mix name digit 7	0	95	7	8:4-7:6
12.	Mix name digit 8	0	95	7	9:3-8:5
13.	Mix name digit 9	0	95	7	10:2-9:4
14.	Mix spare			5	10:7-10:3
15.	Channel 1 program number	0	127	7	11:6-11:0
16.	Channel 1 program type	0	1	1	11:7
17.	Channel 1 enable	0	1	1	12:0
18.	Channel 1 volume	0	99	7	12:7-12:1
19.	Channel 1 pan	0	7	3	13:2-13:0
20.	Channel 1 output	0	3	2	13:4-13:3
21.	Channel 1 effect level	0	100	7	14:3-13:5
22.	Channel 1 effect bus	0	4	3	14:6-14:4
23.	Channel 1 pitch octave	-2	5	3	15:1-14:7
24.	Channel 1 pitch semitone	-12	25	5	15:6-15:2
25.	Channel 1 keyboard low note	0	127	7	16:5-15:7
26.	Channel 1 keyboard high note	0	127	7	17:4-16:6
27.	Channel 1 midi in	0	1	1	17:5
28.	Channel 1 midi out	0	1	1	17:6
29.	Channel 1 keyboard on/off	0	1	1	17:7
30-44.	Channel 2 parameters	(see above)			24:7-18:0
45-59.	Channel 3 parameters	(see above)			31:7-25:0
60-74.	Channel 4 parameters	(see above)			38:7-32:0
75-89.	Channel 5 parameters	(see above)			45:7-39:0
90-104.	Channel 6 parameters	(see above)			52:7-46:0
105-119.	Channel 7 parameters	(see above)			59:7-53:0
120-134.	Channel 8 parameters	(see above)			66:7-60:0
135-149.	Channel 9 parameters	(see above)			73:7-67:0
150-164.	Channel 10 parameters	(see above)			80:7-74:0
165-179.	Channel 11 parameters	(see above)			87:7-81:0
180-194.	Channel 12 parameters	(see above)			94:7-88:0
195-209.	Channel 13 parameters	(see above)			101:7-95:0
210-224.	Channel 14 parameters	(see above)			108:7-102:0
225-239.	Channel 15 parameters	(see above)			115:7-107:0
240-254.	Channel 16 parameters	(see above)			122:7-114:0

PROGRAM DATA FORMAT

Programs contain 350 bytes of packed parameter data. The first 10 bytes are common parameters for all four sounds. The next four sets of 85 bytes contain each of the four sound's parameters. The least significant bit of the first byte of each sound determines if it is a keyboard sound or a drum sound. The parameter definitions of the remaining bits of the first byte as well as the remaining 84 bytes of the sound are determined by this bit. Only one keyboard sound and one drum sound are shown below. Each of the four sounds can be either a keyboard sound or a drum sound. The bit addresses must have the correct offset added to them in order to address the correct sound relative to the beginning of the program. Sound 1's address begins at 10, Sound 2 at 95, Sound 3 at 180, and Sound 4 at 265. The bit addresses shown are from most significant bit to least significant bit for each parameter, with the byte number first, followed by a colon (:), followed by the bit number. Each parameter should never exceed the limit shown in the table. For bipolar parameters, the limits shown are offset binary, since this is the format that the parameters are stored in. To view them as two's complement numbers, add the value shown in the Offset column. For direct parameter editing (sysex command 10H), the function, page, and data pot number are shown. The Mode should be set to 2 (=Program), the Sound parameter set to 0 through 3 for sounds 1 through 4, respectively, and the Channel parameter should be set to 0 through 15, for channels 1 through 16, respectively, when used in Mix mode. Signed parameters should be sent in 2's complement format.

#Parameter name	Func	Page	Pot	Offset	Limit	bits	bit address
0.Program spare (deleted parameter)						7	0:6-0:0
1.Program spare (deleted parameter)						1	0:7
2.Program name digit 0	8*	0	0	0	95	7	1:6-1:0
3.Program name digit 1	8*	1	0	0	95	7	2:5-1:7
4.Program name digit 2	8*	2	0	0	95	7	3:4-2:6
5.Program name digit 3	8*	3	0	0	95	7	4:3-3:5
6.Program name digit 4	8*	4	0	0	95	7	5:2-4:4
7.Program name digit 5	8*	5	0	0	95	7	6:1-5:3
8.Program name digit 6	8*	6	0	0	95	7	7:0-6:2
9.Program name digit 7	8*	7	0	0	95	7	7:7-7:1
10.Program name digit 8	8*	8	0	0	95	7	8:6-8:0
11.Program name digit 9	8*	9	0	0	95	7	9:5-8:7
12.ROM Identifier**						2	9:7-9:6

*If the current sound is a drum, this function number for program name must be 7.
*These 2 bits are used to identify the machine ROM where a program was written.
possible values:

0 = QuadraSynth Plus / S4 Plus
1 = QS6
2 = Reserved for future use
3 = Reserved for future use

If a QS6 receives a program with a ROM Identifier of 0, the QS6 will assume the program originated in a QuadraSynth Plus or S4 Plus. The QS6 will then re-map the ROM addresses for this program to be compatible with the QS6.

Keyboard Sound:

#	Parameter name	Func	Page	Pot	Offset	Limit	bits	bit address
0.	Keyboard / drum mode (=0)	16	0	0	0	1	1	0:0
1.	Sample group	0	0	0	0	47	6	0:6-0:1
2.	Sample number	0	0	2	0	127	7	1:5-0:7
3.	Sound volume	1	0	0	0	99	7	2:4-1:6
4.	Sound pan	1	0	1	0	6	3	2:7-2:5
5.	Sound output	1	0	2	0	2	2	3:1-3:0
6.	Sound effect level	2	0	0	0	99	7	4:0-3:2
7.	Sound effect bus	2	0	1	0	3	2	4:2-4:1
8.	Sound pitch semitone	3	0	0	-24	49	6	5:0-4:3
9.	Sound pitch detune	3	0	2	-99	199	8	6:0-5:1
10.	Sound pitch detune type	3	0	3	0	1	1	6:1
11.	Sound pitch wheel mod	3	1	0	0	12	4	6:5-6:2
12.	Sound pitch aftertouch mod	3	1	1	-99	199	8	7:5-6:6
13.	Sound pitch lfo mod	3	1	2	-99	199	8	8:5-7:6
14.	Sound pitch env mod	3	1	3	-99	199	8	9:5-8:6
15.	Sound portamento mode	3	2	0	0	2	2	9:7-9:6
16.	Sound portamento rate	3	2	2	0	99	7	10:6-10:0
17.	Sound key mode	3	2	3	0	2	2	11:0-10:7
18.	Sound filter frequency	4	0	0	0	99	7	11:7-11:1
19.	Sound filter keyboard track	4	0	1	0	1	1	12:0
20.	Sound filter velocity mod	4	0	3	-99	199	8	13:0-12:1
21.	Sound filter pitch wheel mod	4	1	0	-99	199	8	14:0-13:1
22.	Sound filter aftertouch mod	4	1	1	-99	199	8	15:0-14:1
23.	Sound filter lfo mod	4	1	2	-99	199	8	16:0-15:1
24.	Sound filter env mod	4	1	3	-99	199	8	17:0-16:1
25.	Sound amp velocity curve	5	0	0	0	12	4	17:4-17:1
26.	Sound amp aftertouch mod	5	0	1	-99	199	8	18:4-17:5
27.	Sound amp alfo mod	5	0	2	-99	199	8	19:4-18:5
28.	Sound low note limit	6	0	0	0	127	7	20:3-19:5
29.	Sound high note limit	6	0	1	0	127	7	21:2-20:4
30.	Sound overlap	6	0	2	0	99	7	22:1-21:3
31.	Sound mod 1 source	7	0	0	0	24	5	22:6-22:2
32.	Sound mod 1 destination	7	0	1	0	31	5	23:3-22:7
33.	Sound mod 1 amplitude	7	0	2	-99	199	8	24:3-23:4
34.	Sound mod 1 gate	7	0	3	0	1	1	24:4
35.	Sound mod 2 source	7	1	0	0	24	5	25:1-24:5
36.	Sound mod 2 destination	7	1	1	0	31	5	25:6-25:2
37.	Sound mod 2 amplitude	7	1	2	-99	199	8	26:6-25:7
38.	Sound mod 2 gate	7	1	3	0	1	1	26:7
39.	Sound mod 3 source	7	2	0	0	24	5	27:4-27:0
40.	Sound mod 3 destination	7	2	1	0	31	5	28:1-27:5
41.	Sound mod 3 amplitude	7	2	2	-99	199	8	29:1-28:2
42.	Sound mod 3 gate	7	2	3	0	1	1	29:2
43.	Sound mod 4 source	7	3	0	0	24	5	29:7-29:3
44.	Sound mod 4 destination	7	3	1	0	31	5	30:4-30:0
45.	Sound mod 4 amplitude	7	3	2	-99	199	8	31:4-30:5
46.	Sound mod 4 gate	7	3	3	0	1	1	31:5
#	Parameter name	Func	Page	Pot	Offset	Limit	bits	bit address
47.	Sound mod 5 source	7	4	0	0	24	5	32:2-31:6
48.	Sound mod 5 destination	7	4	1	0	31	5	32:7-32:3
49.	Sound mod 5 amplitude	7	4	2	-99	199	8	33:7-33:0
50.	Sound mod 5 gate	7	4	3	0	1	1	34:0
51.	Sound mod 6 source	7	5	0	0	24	5	34:5-34:1
52.	Sound mod 6 destination	7	5	1	0	31	5	35:2-34:6
53.	Sound mod 6 amplitude	7	5	2	-99	199	8	36:2-35:3

54.	Sound mod 6 gate	7	5	3	0	1	1	36:3
55.	Sound pitch lfo waveform	9	0	0	0	6	3	36:6-36:4
56.	Sound pitch lfo speed	9	0	1	0	99	7	37:5-36:7
57.	Sound pitch lfo delay	9	0	2	0	99	7	38:4-37:6
58.	Sound pitch lfo trigger	9	0	3	0	3	2	38:6-38:5
59.	Sound pitch lfo level	9	1	0	0	99	7	39:5-38:7
60.	Sound pitch lfo mod wheel mod	9	1	1	-99	199	8	40:5-39:6
61.	Sound pitch lfo aftertouch mod	9	1	2	-99	199	8	41:5-40:6
62.	Sound filter lfo waveform	10	0	0	0	6	3	42:0-41:6
63.	Sound filter lfo speed	10	0	1	0	99	7	42:7-42:1
64.	Sound filter lfo delay	10	0	2	0	99	7	43:6-43:0
65.	Sound filter lfo trigger	10	0	3	0	3	2	44:0-43:7
66.	Sound filter lfo level	10	1	0	0	99	7	44:7-44:1
67.	Sound filter lfo mod wheel mod	10	1	1	-99	199	8	45:7-45:0
68.	Sound filter lfo aftertouch mod	10	1	2	-99	199	8	46:7-46:0
69.	Sound amp lfo waveform	11	0	0	0	6	3	47:2-47:0
70.	Sound amp lfo speed	11	0	1	0	99	7	48:1-47:3
71.	Sound amp lfo delay	11	0	2	0	99	7	49:0-48:2
72.	Sound amp lfo trigger	11	0	3	0	3	2	49:2-49:1
73.	Sound amp lfo level	11	1	0	0	99	7	50:1-49:3
74.	Sound amp lfo mod wheel mod	11	1	1	-99	199	8	51:1-50:2
75.	Sound amp lfo aftertouch mod	11	1	2	-99	199	8	52:1-51:2
76.	Sound pitch env attack	12	0	0	0	99	7	53:0-52:2
77.	Sound pitch env decay	12	0	1	0	100	7	53:7-53:1
78.	Sound pitch env sustain	12	0	2	0	99	7	54:6-54:0
79.	Sound pitch env release	12	0	3	0	99	7	55:5-54:7
80.	Sound pitch env delay	12	1	0	0	99	7	56:4-55:6
81.	Sound pitch env sustain decay	12	1	1	0	99	7	57:3-56:5
82.	Sound pitch env trig type	12	1	3	0	3	2	57:5-57:4
83.	Sound pitch env time track	12	2	0	0	1	1	57:6
84.	Sound pitch env sustain pedal	12	2	1	0	1	1	57:7
85.	Sound pitch env level	12	2	2	0	99	7	58:6-58:0
86.	Sound pitch env velocity mod	12	2	3	-99	199	8	59:6-58:7
87.	Sound filter env attack	13	0	0	0	99	7	60:5-59:7
88.	Sound filter env decay	13	0	1	0	99	7	61:4-60:6
89.	Sound filter env sustain	13	0	2	0	99	7	62:3-61:5
90.	Sound filter env release	13	0	3	0	99	7	63:2-62:4
91.	Sound filter env delay	13	1	0	0	100	7	64:1-63:3
92.	Sound filter env sustain decay	13	1	1	0	99	7	65:0-64:2
93.	Sound filter env trig type	13	1	3	0	3	2	65:2-65:1
94.	Sound filter env time track	13	2	0	0	1	1	65:3
95.	Sound filter env sustain pedal	13	2	1	0	1	1	65:4
96.	Sound filter env level	13	2	2	0	99	7	66:3-65:5
97.	Sound filter env velocity mod	13	2	3	-99	199	8	67:3-66:4
98.	Sound amp env attack	14	0	0	0	99	7	68:2-67:4
99.	Sound amp env decay	14	0	1	0	99	7	69:1-68:3
100.	Sound amp env sustain	14	0	2	0	99	7	70:0-69:2
101.	Sound amp env release	14	0	3	0	99	7	70:7-70:1
#	Parameter name	Func	Page	Pot	Offset	Limit	bits	bit address
102.	Sound amp env delay	14	1	0	0	100	7	71:6-71:0
103.	Sound amp env sustain decay	14	1	1	0	99	7	72:5-71:7
104.	Sound amp env trig type	14	1	3	0	3	2	72:7-72:6
105.	Sound amp env time track	14	2	0	0	1	1	73:0
106.	Sound amp env sustain pedal	14	2	1	0	1	1	73:1
107.	Sound amp env level	14	2	2	0	99	7	74:0-73:2
108.	Sound tracking input	15	0	0	0	22	5	74:5-74:1
109.	Sound tracking point 0	15	0	1	0	100	7	75:4-74:6
110.	Sound tracking point 1	15	0	2	0	100	7	76:3-75:5
111.	Sound tracking point 2	15	0	3	0	100	7	77:2-76:4

112.	Sound tracking point 3	15	1	0	0	100	7	78:1-77:3
113.	Sound tracking point 4	15	1	1	0	100	7	79:0-78:2
114.	Sound tracking point 5	15	1	2	0	100	7	79:7-79:1
115.	Sound tracking point 6	15	1	3	0	100	7	80:6-80:0
116.	Sound tracking point 7	15	2	0	0	100	7	81:5-80:7
117.	Sound tracking point 8	15	2	1	0	100	7	82:4-81:6
118.	Sound tracking point 9	15	2	2	0	100	7	83:3-82:5
119.	Sound tracking point 10	15	2	3	0	100	7	84:2-83:4
120.	Sound enable	16	0	3	0	1	1	84:3
121.	Drum number	(cannot edit)			0	9	4	84:7-84:4

Drum Sound:

#	Parameter name	Func	Page	Pot	Offset	Limit	bits	bit address
0.	Keyboard / drum mode (=1)	9	0	0	0	1	1	0:0
1.	Spare				0	0	7	0:7-0:1
2.	Drum 1 sample group	0	0	0	0	15	4	1:3-1:0
3.	Drum 1 sample number	0	0	2	0	127	7	2:2-1:4
4.	Drum 1 volume	1	0	0	0	31	5	2:7-2:3
5.	Drum 1 pan	1	0	1	0	6	3	3:2-3:0
6.	Drum 1 output	1	0	2	0	2	2	3:4-3:3
7.	Drum 1 effect level	2	0	0	0	63	6	4:2-3:5
8.	Drum 1 effect bus	2	0	1	0	3	2	4:4-4:3
9.	Drum 1 pitch	3	0	0	-48	97	7	5:3-4:5
10.	Drum 1 pitch velocity mod	3	0	1	0	7	3	5:6-5:4
11.	Drum 1 filter velocity mod	4	0	0	0	3	2	6:0-5:7
12.	Drum 1 velocity curve	5	0	0	0	12	4	6:4-6:1
13.	Drum 1 note number	6	0	0	0	127	7	7:3-6:5
14.	Drum 1 amp envelope decay	8	0	0	0	127	7	8:2-7:4
15.	Drum 1 mute group	8	0	1	0	3	2	8:4-8:3
16.	Drum 1 note range	6	0	2	0	3	2	8:6-8:5
17.	Drum 1 spare				0	0	1	8:7
18-33.	Drum 2 parameters			(see above)				16:7-9:0
34-49.	Drum 3 parameters			(see above)				24:7-17:0
50-65.	Drum 4 parameters			(see above)				32:7-25:0
66-81.	Drum 5 parameters			(see above)				40:7-33:0
82-97.	Drum 6 parameters			(see above)				48:7-41:0
98-113.	Drum 7 parameters			(see above)				56:7-49:0
114-129.	Drum 8 parameters			(see above)				64:7-57:0
130-145.	Drum 9 parameters			(see above)				72:7-65:0
146-161.	Drum 10 parameters			(see above)				80:7-73:0
162.	Sound enable	9	0	3	0	1	1	81:0
163.	Spare				0	0	6	81:7-81:1
164.	Drum number	0-6,8	0	3	0	9	4	82:3-82:0
165.	Spare				0	0	20	84:7-82:4

EFFECT DATA FORMAT

Effects contain 64 bytes of packed parameter data. The first 11 bytes are common parameters for all three configurations. The first 10 exist for compatibility with older software, and are always sent as zeroes. The bit addresses shown are from most significant bit to least significant bit for each parameter, with the byte number first, followed by a colon (:), followed by the bit number. Each parameter should never exceed the limit shown in the table. For bipolar parameters, the limits shown are offset binary, since this is the format that the parameters are stored in. To view them as two's complement numbers, add the value shown in the Offset column. For direct parameter editing (sysex command 10H), the function, page, send, and data pot numbers are shown. The Mode should be set to 3 (=Effects), and the Channel parameter is not used. The Send parameter is not used where the Send parameter is shown as "x" below. Signed parameters should be sent in 2's complement format.

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
0.	Effect spare (deleted parameter)x 2	0	0	0	95	7			0:6-0:0
1.	Effect spare (deleted parameter)x 2	1	0	0	95	7			1:5-0:7
2.	Effect spare (deleted parameter)x 2	2	0	0	95	7			2:4-1:6
3.	Effect spare (deleted parameter)x 2	3	0	0	95	7			3:3-2:5
4.	Effect spare (deleted parameter)x 2	4	0	0	95	7			4:2-3:4
5.	Effect spare (deleted parameter)x 2	5	0	0	95	7			5:1-4:3
6.	Effect spare (deleted parameter)x 2	6	0	0	95	7			6:0-5:2
7.	Effect spare (deleted parameter)x 2	7	0	0	95	7			6:7-6:1
8.	Effect spare (deleted parameter)x 2	8	0	0	95	7			7:6-7:0
9.	Effect spare (deleted parameter)x 2	9	0	0	95	7			8:5-7:7
10.	Effect configuration	x	2	0	0	0	4	4	9:1-8:6

Configuration 0 (4-sends, 1 reverb):

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
PITCH SEND 1:									
11.	Send 1 pitch type	0	0	0	0	0	5	3	9:4-9:2
If 11= 0 thru 3 (chorus and flange):									
12.	Send 1 pitch speed	0	0	1	1	0	99	7	10:3-9:5
13.	Send 1 pitch shape	0	0	1	0	0	1	1	10:4
14.	Send 1 pitch depth	0	0	1	2	0	99	7	11:3-10:5
15.	Send 1 pitch feedback	0	0	1	3	0	99	7	12:2-11:4
16.	Send 1 pitch mix	0	5	0	0	0	99	7	13:1-12:3
If 11= 4 (pitch detune):									
12.	Send 1 pitch detune	0	0	1	0	-99	198	8	10:4-9:5
13.	Spare							0	
14.	Spare							7	11:3-10:5
15.	Spare							7	12:2-11:4
16.	Send 1 pitch mix	0	5	0	0	0	99	7	13:1-12:3
If 11= 5 (resonator):									
12.	Send 1 resonator tuning	0	0	1	0	0	99	7	10:3-9:5
13.	Spare							1	10:4
14.	Send 1 resonator decay	0	0	1	2	0	99	7	11:3-10:5
15.	Spare							7	12:2-11:4
16.	Send 1 pitch mix	0	5	0	0	0	99	7	13:1-12:3

DELAY SEND 1:

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
17.	Send 1 delay type	0	4	0	0	0	2	2	13:3-13:2
18.	Send 1 delay input	0	4	1	0	-99	198	8	14:3-13:4
If 17=0 (mono delay):									
19.	Send 1 delay 10ms	0	4	1	1	0	79	7	15:2-14:4
20.	Send 1 delay 1ms	0	4	1	2	0	9	4	15:6-15:3
21.	Spare							6	16:4-15:7
22.	Spare							4	17:0-16:5
23.	Send 1 delay feedback	0	4	1	3	0	99	7	17:7-17:1
24.	Spare							7	18:6-18:0
25.	Send 1 delay mix	0	5	0	1	0	99	7	19:5-18:7
If 17=1 (stereo delay):									
19.	Send 1 left delay 10ms	0	4	1	1	0	39	7	15:2-14:4
20.	Send 1 left delay 1ms	0	4	1	2	0	9	4	15:6-15:3
21.	Send 1 right delay 10ms	0	4	2	1	0	39	6	16:4-15:7
22.	Send 1 right delay 1ms	0	4	2	2	0	9	4	16:8-16:5
23.	Send 1 left delay feedback	0	4	1	3	0	99	7	17:7-17:1
24.	Send 1 right delay feedback	0	4	2	3	0	99	7	18:6-18:0
25.	Send 1 delay mix	0	5	0	1	0	99	7	19:5-18:7
If 17=2 (ping-pong delay):									
19.	Send 1 delay 10ms	0	4	1	1	0	39	7	15:2-14:4
20.	Send 1 delay 1ms	0	4	1	2	0	9	4	15:6-15:3
21.	Spare							6	16:4-15:7
22.	Spare							4	17:0-16:5
23.	Send 1 delay feedback	0	4	1	3	0	99	7	17:7-17:1
24.	Spare							7	18:6-18:0
25.	Send 1 delay mix	0	5	0	1	0	99	7	19:5-18:7

REVERB SEND 1:

26.	Reverb type	0	3	1	0	0	6	4	20:1-19:6
27.	Send 1 reverb input 1	0	3	0	0	0	1	1	20:2
28.	Send 1 reverb input 2	0	3	0	1	0	2	2	20:4-20:3
29.	Send 1 reverb balance	0	3	0	2	-99	198	8	21:4-20:5
30.	Send 1 reverb input level	0	3	0	3	0	99	7	22:3-21:5
31.	Send 1 reverb prdly 10ms	0	3	1	1	0	29	5	23:0-22:4
32.	Send 1 reverb prdly 1ms	0	3	1	2	0	9	4	23:4-23:1
33.	Send 1 reverb inut premix	0	3	1	3	-99	198	8	24:4-23:5
34.	Send 1 reverb input filter	0	3	2	0	0	99	7	25:3-24:5
35.	Send 1 reverb decay	0	3	2	1	0	99	7	26:2-25:4
36.	Send 1 reverb diffusion	0	3	3	2	0	99	7	27:1-26:3
37.	Send 1 reverb density	0	3	3	0	0	99	7	28:0-27:2
38.	Send 1 reverb low decay	0	3	2	2	0	99	7	28:7-28:1
39.	Send 1 reverb high decay	0	3	2	3	0	99	7	29:6-29:0
40.	Send 1 reverb mix	0	5	0	2	0	99	7	30:5-29:7

PITCH SEND 2:

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
41.	Send 2 pitch type	1	0	0	0	0	5	3	31:0-30:6
If 41= 0 thru 3 (chorus and flange):									
42.	Send 2 pitch speed	1	0	1	1	0	99	7	31:7-31:1
43.	Send 2 pitch shape	1	0	1	0	0	1	1	32:0
44.	Send 2 pitch depth	1	0	1	2	0	99	7	32:7-32:1
45.	Send 2 pitch feedback	1	0	1	3	0	99	7	33:6-33:0
46.	Send 2 pitch mix	1	5	0	0	0	99	7	34:5-33:7
If 41= 4 (pitch detune):									
42.	Send 2 pitch detune	0	0	1	0	-99	198	8	32:0-31:1
43.	Spare							0	
44.	Spare							7	32:7-32:1
45.	Spare							7	33:6-33:0
46.	Send 2 pitch mix	1	5	0	0	0	99	7	34:5-33:7
If 41= 5 (resonator):									
42.	Send 2 resonator tuning	1	0	1	0	0	60	7	31:7-31:1
43.	Spare							1	32:0
44.	Send 2 resonator decay	1	0	1	2	0	99	7	32:7-32:1
45.	Spare							7	33:6-33:0
46.	Send 2 pitch mix	1	5	0	0	0	99	7	34:5-33:7

DELAY SEND 2:

47.	Send 2 delay type	1	4	0	0	0	2	2	34:7-34:6
48.	Send 2 delay input	1	4	1	0	-99	198	8	35:7-35:0
If 47=0 (mono delay):									
49.	Send 2 delay 10ms	1	4	1	1	0	79	7	36:6-36:0
50.	Send 2 delay 1ms	1	4	1	2	0	9	4	37:2-36:7
51.	Spare							6	38:0-37:3
52.	Spare							4	38:4-38:1
53.	Send 2 delay feedback	1	4	1	3	0	99	7	39:3-38:5
54.	Spare							7	40:2-39:4
55.	Send 2 delay mix	1	5	0	1	0	99	7	41:1-40:3
If 47=1 (stereo delay):									
49.	Send 2 left delay 10ms	1	4	1	1	0	39	7	36:6-36:0
50.	Send 2 left delay 1ms	1	4	1	2	0	9	4	37:2-36:7
51.	Send 2 right delay 10ms	1	4	2	1	0	39	6	38:0-37:3
52.	Send 2 right delay 1ms	1	4	2	2	0	9	4	38:4-38:1
53.	Send 2 left delay feedback	1	4	1	3	0	99	7	39:3-38:5
54.	Send 2 right delay feedback	1	4	2	3	0	99	7	40:2-39:4
55.	Send 2 delay mix	1	5	0	1	0	99	7	41:1-40:3
If 47=2 (ping-pong delay):									
49.	Send 2 delay 10ms	1	4	1	1	0	39	7	36:6-36:0
50.	Send 2 delay 1ms	1	4	1	2	0	9	4	37:2-36:7
51.	Spare							6	38:0-37:3
52.	Spare							4	38:4-38:1
53.	Send 2 delay feedback	1	4	1	3	0	99	7	39:3-38:5
54.	Spare							7	40:2-39:4
55.	Send 2 delay mix	1	5	0	1	0	99	7	41:1-40:3
56.	unused								

REVERB SEND 2:

57.	Send 2 reverb input 1	1	3	0	0	0	1	1	41:2
58.	Send 2 reverb input 2	1	3	0	1	0	2	2	41:4-41:3
59.	Send 2 reverb balance	1	3	0	2	-99	198	8	42:4-41:5
60.	Send 2 reverb input level	1	3	0	3	0	99	7	43:3-42:5

PITCH SEND 3:

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address

61.	Send 3 pitch type	2	0	0	0	0	2	2	43:5-43:4
If 61 = 0 or 1 (chorus and flange):									
62.	Send 3 pitch speed	2	0	1	1	0	99	7	44:4-43:6
63.	Send 3 pitch shape	2	0	1	0	0	1	1	44:5
64.	Send 3 pitch depth	2	0	1	2	0	99	7	45:4-44:6
65.	Send 3 pitch feedback	2	0	1	3	0	99	7	46:3-45:5
66.	Send3 pitch mix	2	5	0	0	0	99	7	47:2-46:4
If 61 = 2 (resonator):									
62.	Send 3 resonator tuning	2	0	1	0	0	99	7	44:4-43:6
63.	Spare							1	44:5
64.	Send 3 resonator decay	2	0	1	2	0	99	7	45:4-44:6
65.	Spare							7	46:3-45:5
66.	Send 3 pitch mix	2	5	0	0	0	99	7	47:2-46:4
DELAY SEND 3:									
67.	Send 3 delay input	2	4	0	0	-99	198	8	48:2-47:3
68.	Send 3 delay 10ms	2	4	0	1	0	79	7	49:1-48:3
69.	Send 3 delay 1ms	2	4	0	2	0	9	4	49:5-49:2
70.	Send 3 delay feedback	2	4	0	3	0	99	7	50:4-49:6
71.	Send 3 delay mix	2	5	0	1	0	99	7	51:3-50:5
REVERB SEND 3:									
72.	Send 3 reverb input 1	2	3	0	0	0	1	1	51:4
73.	Send 3 reverb input 2	2	3	0	1	0	2	2	51:6-51:5
74.	Send 3 reverb balance	2	3	0	2	-99	198	8	52:6-51:7
75.	Send 3 reverb input level	2	3	0	3	0	99	7	53:5-52:7
DELAY SEND 4:									
76.	Send 4 delay 10ms	3	4	0	1	0	79	7	54:4-53:6
77.	Send 4 delay 1ms	3	4	0	2	0	9	4	55:0-54:5
78.	Send 4 delay feedback	3	4	0	3	0	99	7	55:7-55:1
79.	Send 4 delay mix	3	5	0	0	0	99	7	56:6-56:0
REVERB SEND 4:									
80.	Send 4 reverb balance	3	3	0	0	-99	198	8	57:6-56:7
81.	Send 4 reverb input level	3	3	0	2	0	99	7	58:5-57:7
MODULATION:									
82.	MIDImod source 1	x	1	0	0	0	10	4	59:1-58:6
83.	MIDImod destination 1	x	1	0	1	0	36	6	59:7-59:2
84.	MIDImod level 1	x	1	0	2	-99	198	8	60:7-60:0
85.	MIDImod source 2	x	1	1	0	0	10	4	61:3-61:0
86.	MIDImod destination 2	x	1	1	1	0	36	6	62:1-61:4
87.	MIDImod level 2	x	1	1	2	-99	198	8	63:1-62:2
88.	Spare								63:7-63:2

Configuration 1 (4-sends, 2 reverb):

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
DELAY SEND 1:									
11.	Send 1 delay 10ms	0	4	0	1	0	119	7	10:0-9:2
12.	Send 1 delay 1ms	0	4	0	2	0	9	4	10:4-10:1
13.	Send 1 delay feedback	0	4	0	3	0	99	7	11:3-10:5
14.	Send 1 delay mix	0	5	0	0	0	99	7	12:2-11:4
PITCH SEND 1:									
15.	Pitch input level	0	0	0	2	0	99	7	13:1-12:3
16.	Send 1 pitch type	0	0	0	0	0	1	1	13:2
17.	Send 1 pitch speed	0	0	1	1	0	99	7	14:1-13:3
18.	Send 1 pitch shape	0	0	1	0	0	1	1	14:2
19.	Send 1 pitch depth	0	0	1	2	0	99	7	15:1-14:3
20.	Send 1 pitch mix	0	5	0	1	0	99	7	16:0-15:2
REVERB SEND 1:									
21.	Reverb type	0	3	1	0	0	6	4	16:4-16:1
22.	Send 1 reverb input level	0	3	0	0	0	99	7	17:3-16:5
23.	Send 1 reverb prdly 10ms	0	3	1	1	0	29	5	18:0-17:4
24.	Send 1 reverb prdly 1ms	0	3	1	2	0	9	4	18:4-18:1
25.	Send 1 reverb inut premix	0	3	1	3	-99	198	8	19:4-18:5
26.	Send 1 reverb input filter	0	3	2	0	0	99	7	20:3-19:5
27.	Send 1 reverb decay	0	3	2	1	0	99	7	21:2-20:4
28.	Send 1 reverb diffusion	0	3	3	2	0	99	7	22:1-21:3
29.	Send 1 reverb density	0	3	3	0	0	99	7	23:0-22:2
30.	Send 1 reverb low decay	0	3	2	2	0	99	7	23:7-23:1
31.	Send 1 reverb high decay	0	3	2	3	0	99	7	24:6-24:0
32.	Send 1 reverb mix	0	5	0	2	0	99	7	25:5-24:7
REVERB SEND 2:									
33.	Send 2 reverb input level	1	3	0	0	0	99	7	26:4-25:6
PITCH SEND 3:									
34.	Send 2 pitch speed	2	0	0	1	0	99	7	27:3-26:5
35.	Send 2 pitch shape	2	0	0	0	0	1	1	27:4
36.	Send 2 pitch depth	2	0	0	2	0	99	7	28:3-27:5
REVERB SEND 3:									
37.	Reverb type	2	3	1	0	0	6	4	28:7-28:4
38.	Send 3 reverb input level	2	3	0	0	0	99	7	29:6-29:0
39.	Send 3 reverb prdly 10ms	2	3	1	1	0	29	5	30:3-29:7
40.	Send 3 reverb prdly 1ms	2	3	1	2	0	9	4	30:7-30:4
41.	Send 3 reverb inut premix	2	3	1	3	-99	198	8	31:7-31:0
42.	Send 3 reverb input filter	2	3	2	0	0	99	7	32:6-32:0
43.	Send 3 reverb decay	2	3	2	1	0	99	7	33:5-32:7
44.	Send 3 reverb diffusion	2	3	3	2	0	99	7	34:4-33:6
45.	Send 3 reverb density	2	3	3	0	0	99	7	35:3-34:5
46.	Send 3 reverb low decay	2	3	2	2	0	99	7	36:2-35:4
47.	Send 3 reverb high decay	2	3	2	3	0	99	7	37:1-36:3
48.	Send 3 reverb mix	2	5	0	0	0	99	7	38:0-37:2
REVERB SEND 4:									
49.	Send 4 reverb input level	3	3	0	0	0	99	7	38:7-38:1
50.	Spare								58:5-39:0

MODULATION:

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
51.	MIDImod source 1	x	1	0	0	0	10	4	59:1-58:6
52.	MIDImod destination 1	x	1	0	1	0	36	6	59:7-59:2
53.	MIDImod level 1	x	1	0	2	-99	198	8	60:7-60:0
54.	MIDImod source 2	x	1	1	0	0	10	4	61:3-61:0
55.	MIDImod destination 2	x	1	1	1	0	36	6	62:1-61:4
56.	MIDImod level 2	x	1	1	2	-99	198	8	63:1-62:2
57.	Spare								63:7-63:2

Configuration 2 (4-sends, 1 lezlie):

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
PITCH SEND 1:									
11.	Spare							3	9:4-9:2
12.	Send 1 lezlie speed	0	0	0	1	0	1	7	10:3-9:5
13.	Send 1 lezlie motor	0	0	0	0	0	1	1	10:4
14.	Send 1 lezlie horn	0	0	0	2	0	±6*	7	11:3-10:5
15.	Spare							7	12:2-11:4
16.	Send 1 lezlie mix	0	5	0	0	0	99	7	13:1-12:3
DELAY SEND 1:									
17.	Spare							2	13:3-13:2
18.	Send 1 delay input	0	4	0	0	0	99	8	14:3-13:4
19.	Send 1 delay 10ms	0	4	0	1	0	79	7	15:2-14:4
20.	Send 1 delay 1ms	0	4	0	2	0	9	4	15:6-15:3
21.	Spare							6	16:4-15:7
22.	Spare							4	17:0-16:5
23.	Send 1 delay feedback	0	4	0	3	0	99	7	17:7-17:1
24.	Spare							7	18:6-18:0
25.	Send 1 delay mix	0	5	0	1	0	99	7	19:5-18:7

Parameters 26 through 88 are identical to configuration 0.

* This parameter is stored as 7 bit 2's compliment, with 0 to 6 representing the positive values, and 127 to 122 representing -1 to -6, respectively.

Configuration 3 (2-sends, with EQ):

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
PITCH SEND 1:									
	Parameters 11 through 16 are identical to configuration 0.								
DELAY SEND 1:									
	Parameters 17 through 25 are identical to configuration 0.								
REVERB SEND 1:									
	Parameters 26 through 40 are identical to configuration 0.								
PITCH SEND 2:									
	Parameters 41 through 46 are identical to configuration 0.								
DELAY SEND 2:									
	Parameters 47 through 56 are identical to configuration 0.								
REVERB SEND 2:									
57.	Send 2 reverb input 1	1	3	0	0	0	1	1	41:2
58.	Send 2 reverb input 2	1	3	0	1	0	2	2	41:4-41:3
59.	Send 2 reverb balance	1	3	0	2	-99	198	8	42:4-41:5
60.	Send 2 reverb input level	1	3	0	3	0	99	7	43:3-42:5
61.	Spare								43:5-43:4
EQUALIZER:									
61.	Low EQ Frequency	x	6	0	0	0	5	3	44:0-43:6
62.	Spare								44:5-44:1
62.	Low EQ Gain	x	6	0	1	0	12	4	45:1-44:6
62.	Spare								45:4-45:2
63.	Hi EQ Frequency	x	6	0	2	0	7	3	45:7-45:5
62.	Spare								46:3-46:0
64.	Hi EQ Gain	x	6	0	3	0	9	4	46:7-46:4
65.	Spare								58:5-47:0
MODULATION:									
82.	MIDImod source 1	x	1	0	0	0	10	4	59:1-58:6
83.	MIDImod destination 1	x	1	0	1	0	36	6	59:7-59:2
84.	MIDImod level 1	x	1	0	2	-99	198	8	60:7-60:0
85.	MIDImod source 2	x	1	1	0	0	10	4	61:3-61:0
86.	MIDImod destination 2	x	1	1	1	0	36	6	62:1-61:4
87.	MIDImod level 2	x	1	1	2	-99	198	8	63:1-62:2
88.	Spare								63:7-63:2

Configuration 4 (Overdrive, Chorus, Delay, Reverb, Lezlie):

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
PITCH SEND 1:									
11.	Send 1 pitch type	0	0	0	0	0	2	2	9:3-9:2
12.	Spare							1	9:4
13.	Send 1 pitch input 2	0	0	0	1	0	3	2	20:4-20:3
14.	Send 1 pitch input balance	0	0	0	2	-99	198	8	35:7-35:0
If 11= 0 thru 1 (chorus and flange):									
13.	Send 1 pitch speed	0	0	1	1	0	99	7	10:3-9:5
14.	Send 1 pitch shape	0	0	1	0	0	1	1	10:4
15.	Send 1 pitch depth	0	0	1	2	0	99	7	11:3-10:5
16.	Send 1 pitch feedback	0	0	1	3	0	99	7	12:2-11:4
17.	Send 1 pitch mix	0	5	0	2	0	99	7	13:1-12:3
If 11= 2 (resonator):									
13.	Send 1 resonator tuning	0	0	1	0	0	60	6	10:2-9:5
14.	Spare							2	10:4-10:3
15.	Send 1 resonator decay	0	0	1	2	0	99	7	11:3-10:5
16.	Spare							7	12:2-11:4
17.	Send 1 pitch mix	0	5	0	2	0	99	7	13:1-12:3
LEZLIE SEND 1:									
18.	Send 1 lezlie input 1	0	0	2	0	0	1	1	41:3
19.	Send 1 lezlie input 2	0	0	2	1	0	8	4	40:6-40:3
20.	Send 1 lezlie input balance	0	0	2	2	-99	198	8	42:4-41:5
21.	Send 1 lezlie speed	0	0	3	1	0	1	1	38:5
22.	Send 1 lezlie motor	0	0	3	0	0	1	1	41:2
23.	Send 1 lezlie horn	0	0	3	2	0	±6*	7	40:2-39:4
24.	Send 1 lezlie mix	0	5	1	3	0	99	7	31:7-31:1

DELAY SEND 1:

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
25.	Send 1 delay type	0	4	0	0	0	2	2	13:3-13:2
26.	Send 1 delay input balance	0	4	0	2	-99	198	8	14:3-13:4
27.	Send 1 delay input 2	0	4	0	1	0	5	3	36:2-36:0
If 25=0 (mono delay):									
28.	Send 1 delay 10ms	0	4	1	1	0	79	7	15:2-14:4
29.	Send 1 delay 1ms	0	4	1	2	0	9	4	15:6-15:3
30.	Spare							6	16:4-15:7
31.	Spare							4	17:0-16:5
32.	Send 1 delay feedback	0	4	1	3	0	99	7	17:7-17:1
33.	Spare							7	18:6-18:0
34.	Send 1 delay mix	0	5	0	3	0	99	7	19:5-18:7
If 25=1 (stereo delay):									
28.	Send 1 left delay 10ms	0	4	1	1	0	39	7	15:2-14:4
29.	Send 1 left delay 1ms	0	4	1	2	0	9	4	15:6-15:3
30.	Send 1 right delay 10ms	0	4	2	1	0	39	6	16:4-15:7
31.	Send 1 right delay 1ms	0	4	2	2	0	9	4	16:8-16:5
32.	Send 1 left delay feedback	0	4	1	3	0	99	7	17:7-17:1
33.	Send 1 right delay feedback	0	4	2	3	0	99	7	18:6-18:0
34.	Send 1 delay mix	0	5	0	3	0	99	7	19:5-18:7
If 25=2 (ping-pong delay):									
28.	Send 1 delay 10ms	0	4	1	1	0	39	7	15:2-14:4
29.	Send 1 delay 1ms	0	4	1	2	0	9	4	15:6-15:3
30.	Spare							6	16:4-15:7
31.	Spare							4	17:0-16:5
32.	Send 1 delay feedback	0	4	1	3	0	99	7	17:7-17:1
33.	Spare							7	18:6-18:0
34.	Send 1 delay mix	0	5	0	3	0	99	7	19:5-18:7

REVERB SEND 1:

35.	Reverb type	0	3	1	0	0	6	4	20:1-19:6
36.	Send 1 reverb input 1	0	3	0	0	0	1	1	20:2
37.	Send 1 reverb input 2	0	3	0	1	0	5	3	31:0-30:6
38.	Send 1 reverb balance	0	3	0	2	-99	198	8	21:4-20:5
39.	Send 1 reverb input level	0	3	0	3	0	99	7	22:3-21:5
40.	Send 1 reverb prdly 10ms	0	3	1	1	0	29	5	23:0-22:4
41.	Send 1 reverb prdly 1ms	0	3	1	2	0	9	4	23:4-23:1
42.	Send 1 reverb inut premix	0	3	1	3	-99	198	8	24:4-23:5
43.	Send 1 reverb input filter	0	3	2	0	0	99	7	25:3-24:5
44.	Send 1 reverb decay	0	3	2	1	0	99	7	26:2-25:4
45.	Send 1 reverb diffusion	0	3	3	2	0	99	7	27:1-26:3
46.	Send 1 reverb density	0	3	3	0	0	99	7	28:0-27:2
47.	Send 1 reverb low decay	0	3	2	2	0	99	7	28:7-28:1
48.	Send 1 reverb high decay	0	3	2	3	0	99	7	29:6-29:0
49.	Send 1 reverb mix	0	5	1	0	0	99	7	30:5-29:7

OVERDRIVE SEND 1:

50.	Send 1 overdrive type	0	6	0	0	0	1	1	44:5
52.	Send 1 overdrive balance	0	6	1	2	-99	198	8	48:2-47:3
63.	Send 1 overdrive threshold	0	6	0	2	0	99	7	50:4-49:6
64.	Send 1 overdrive brightness	0	6	1	0	0	99	7	49:1-48:3
65.	Send 1 overdrive mix	0	6	0	0	0	99	7	31:7-31:1

EQUALIZER:

#	Parameter name	Send	Func	Page	Pot	Offset	Limit	bits	bit address
61.	Low EQ Frequency	x	6	0	0	0	5	3	44:0-43:6
62.	Low EQ Gain	x	6	0	1	0	12	4	45:1-44:6
63.	Hi EQ Frequency	x	6	0	2	0	7	3	45:7-45:5
64.	Hi EQ Gain	x	6	0	3	0	9	4	46:7-46:4
MODULATION:									
82.	MIDImod source 1	x	1	0	0	0	10	4	59:1-58:6
83.	MIDImod destination 1	x	1	0	1	0	22	6	59:7-59:2
84.	MIDImod level 1	x	1	0	2	-99	198	8	60:7-60:0
85.	MIDImod source 2	x	1	1	0	0	10	4	61:3-61:0
86.	MIDImod destination 2	x	1	1	1	0	22	6	62:1-61:4
87.	MIDImod level 2	x	1	1	2	-99	198	8	63:1-62:2
88.	Spare								63:7-63:2

* This parameter is stored as 7 bit 2's compliment, with 0 to 6 representing the positive values, and 127 to 122 representing -1 to -6, respectively.

8.20 QS7/QS8//QSR Sys-Ex

The Sys-Ex documentation was not available for these units as of this manual release. In most cases, the QS6 Sys-Ex will be the same. Known exceptions are in accessing PCMCIA Card slot 2 and aux audio outputs. This information will be included in future releases of this manual.

9.00 Appendix D Service Parts Lists

9.10 QS6 Service Parts List

Grp	AlPartNo	Description	Qnty	PCB	Ref.Designator	Comments
ASY	9-79-0090	ASSY PCB EDIT/SELECT KEYPAD S6	1			
ASY	9-79-0091	ASSY PCB SLIDER S6	1			
ASY	9-79-0092	ASSY PCB MAIN S6	1			
ASY	9-96-1220	ASSY WHEEL PITCH S6 (TOPFLY VERSION)	1			
ASY	9-96-1221	ASSY WHEEL MODULATION S6 (TOPFLY VERSION)	1			
CAB	4-18-0514	CABLE 16-PIN DIL 250MM RIBBON (MICRO to MICRO AMP CONN)	1	TOP ASSY		
CAB	4-18-0616	CABLE 16-PIN DIL 350MM RIBBON (MICRO to MICRO AMP CONN)	1			
CAB	4-18-0650	CABLE 6-PIN SIL 250MM SHIELDED PAIRS S6	1			
CAB	4-18-1020	CABLE DIL 20-PIN 350MM RIBBON	1			
CAB	4-18-1514	CABLE 14-PIN 250MM DIL RIBBON	1			
CAB	4-19-0002	CABLE AFTERTOUCH Q7/Q8	1			
CAB	4-19-1401	CABLE 5-PIN SIL (STAKED) 50MM	1			
CAB	4-19-1402	CABLE 6-PIN 2MM CTR (80mmX3; 160mmX3)	1		PLUG ON HEADER	
CAP	1-08-0101	CAP 10uF ELEC 16V	8	MAIN	C21,24,26,27,29,35,36,49	
CAP	1-08-2200	CAP 2200uF ELEC 16V 12x24mm	3	MAIN	C3,9,25	
CAP	1-11-0407	CAP 4.7uF ELEC 50V 20% 05x11	1	Main	C30	
CON	4-10-0009	CON 8-PIN DIN SERIAL (CIRCULAR-MINI) S6/Q7/Q8/QSR	1	MAIN	J9	
CON	7-10-0026	CON 68-PIN MEM CARD	1	MAIN	J17	
DIO	2-01-5400	DIODE POWER 1N5400	2	Main	D1,2	
DIO	2-02-5231	DIODE ZENER 1N5231B	1	Main	D6	
HDR	4-14-0014	HEADER 14-PIN 0.1 DIL	1	MAIN	J14	
HDR	4-14-0020	HEADER 20-PIN DIL 0.1 XR/CL	1	EDIT/SEL	FOR KEYPAD PCB	
HDR	4-14-0020	HEADER 20-PIN DIL 0.1 XR/CL	1	MAIN	J16	
HDR	4-14-2116	HEADER 16-PIN DIL "MICROMATCH" (AMP 1-215079-6)	2	MAIN	J12, J13	
HDR	4-15-0004	HEADER 4-PIN SIL O.1	1	MAIN	J15	
HDR	4-15-1006	HEADER 6-PIN SIL 2MM CTR (SHROUDED)	1	MAIN	J11	
HDR	4-15-2106	HEADER 6-PIN SIL 2MM CTR 90 deg.	1			
HDR	4-15-2106	HEADER 6-PIN SIL 2MM CTR 90 deg.	2	SLIDER		
HDW	5-00-0016	SCREW 6-32 x 1/4 PPZ	3			
HDW	5-00-0016	SCREW 6-32 x 1/4 PPZ	4	Main		
HDW	5-00-0023	SCREW 6-32 x 5/16 PPB	20			
HDW	5-00-1011	SCREW M3 x 8mm PPZ	8			
HDW	5-00-1020	SCREW M4 x 10mm PPB "BT" TAPTITE	2			
HDW	5-00-1632	SCREW 6-32 x 5/16 PPB W/LOCTITE	3		(2) WHEEL BRACKET, (1) WHEEL BEZEL	
HDW	5-02-6320	NUT KEP 6-32	1	Main		
HDW	5-04-1007	FASTENER SNAP RIVET	4			
IC	2-11-7805	REG 7805 +5V TO220 NATIONA	1	MAIN	U9	
IC	2-11-7905	REG 7905 -5V TO220 NATIONA	1	MAIN	U10	
IC	2-24-0138	IC 6N138 OPTO ISO HEWLETT	1	MAIN	U4	
IC	2-27-0021	ASIC KEY-SCAN 68-PIN PLCC	1	MAIN	U13	
Grp	**AlPartNo**	**Description**	**Qnty**	**PCB**	**Ref.Designator**	**Comments**

IC	2-27-0022	ASIC DSP1 DIG-FX 84-PIN	1	MAIN	U11	
IC	2-31-0048	IC SOFTWARE EPROM S6 (V1.10)	1	MAIN	U19	
JAC	4-00-0001	JACK 5-PIN DIN (MIDI)	2	MAIN	J7, 8	
JAC	4-00-0004	JACK 4-PIN DIN (P4)	1	MAIN	J1	
JAC	4-02-0001	JACK 1/4 MONO CLIFF	4	MAIN	J3-6	
JAC	4-03-0001	JACK 1/4 STEREO	1	MAIN	J2	
LCD	9-44-1602	DISP LCD MODULE GRN STN GLASS S6	1			
LIT	7-51-1091	CHART QUICK SET-UP S6	1			
LIT	7-51-1092	MANUAL REFERENCE S6	1			
LIT	7-51-1173	CHART PROGRAM S6	1			
LIT	7-51-1174	CHART MIX S6	1			
ME	7-01-0005	CRYSTAL 20 mHz KDS	1	MAIN	M1	
ME	7-01-0007	CRYSTAL 24 MHZ (SMALL CAN)	0			
ME	7-01-0017	CRYSTAL 24.576 MHZ	1	MAIN	M2	
ME	7-05-0003	BATTERY 3V LITHIUM PANASONIC	1	MAIN	B1	
MIS	7-13-0084	ADHESIVE DIE-CUT (LCD/SIDES) S6	1	LCD		
MIS	7-51-1216	COMPACT-DISC SOFTWARE MIDI/PATCH S6/Q7/Q8/QSR	1			
MTL	9-01-1039	PANEL BOTTOM EXTRUDED S6	1			
MTL	9-01-1040	PANEL TOP/REAR EXTRUDED S6	1			
MTL	9-03-1126	BRACKET PITCH S6	1		PITCH WHEEL	
MTL	9-03-1127	BRACKET MODULATION WHEEL S6	1		MOD WHEEL	
MTL	9-03-1128	BRACKET RETAINER PCB S6	6			
MTL	9-03-1132	HEATSINK CD/S4/S6/S8/Q2/Q7/Q8/QR	1		U9	
MTL	9-03-1133	COVER PANEL LEFT S6	1			
MTL	9-03-1134	COVER PANEL RIGHT S6	1			
MTL	9-06-0008	SPRING TORSION PITCH S6	1		PITCH WHEEL	
OEM	7-10-0021	PEDAL SUSTAIN S5 (W/BOX)	1			
OEM	7-10-0022	KEYBOARD, FATAR S6 (TP/9S+AT)	1			
PLS	9-15-0076	FOOT ROUND	4			
PLS	9-15-1150	BEZEL CARD S6	1			
PLS	9-15-1151	BEZEL WHEEL S6	1	LCD		
PLS	9-15-1152	WHEEL PITCH & MOD S6	1		PITCH WHEEL	
PLS	9-15-1152	WHEEL PITCH & MOD S6	1		MOD WHEEL	
PLS	9-15-1154	BRACKET RETAINER LCD S6	1			
PLS	9-15-1155	PANEL LEFT S6	1			
PLS	9-15-1157	PANEL RIGHT S6	1			
PLS	9-15-1185	BEZEL SLIDER S6	1	LCD		
PLS	9-15-1199	SWITCH CAP, POWER, S6	1	TOP ASSY		
PLS	9-15-1200	BEZEL DISPLAY S6	1	LCD		
PLS	9-15-1206	CAP FADER BLACK (W/ WHITE STRIPE)	2			
POT	0-09-1034	POT 1KA STEREO SLIDE 45mm	1	SLIDER		
POT	0-09-1106	POT 10KB SINGLE CONTROL EYELT 18mm-SHFT	1		PITCH WHEEL	
POT	0-09-1124	POT 10KB DUAL CONTROL EYELET	1		MOD WHEEL	
REP	8-20-0087	KEY WEIGHTED ‘C’ LOW END WHITE S6/S9	1			
REP	8-20-0088	KEY WEIGHTED ‘B’ WHITE S6/S9	1			
REP	8-20-0089	KEY WEIGHTED ‘D’ WHITE S6/S9	1			
Grp	**AlPartNo**	**Description**	**Qnty**	**PCB**	**Ref.Designator**	**Comments**
REP	8-20-0090	KEY WEIGHTED ‘A’ WHITE S6/S9	1			
REP	8-20-0091	KEY WEIGHTED ‘G’ WHITE S6/S9	1			

REP	8-20-0092	KEY WEIGHTED 'B' WHITE S6/S9	1			
REP	8-20-0093	KEY WEIGHTED 'F' WHITE S6/S9	1			
REP	8-20-0094	KEY WEIGHTED BLACK S6/S9	1			
REP	8-20-0095	KEY WEIGHTED 'E' HIGH END WHITE S6/S9	1			
REP	8-20-0096	KEY WEIGHTED 'G' WHITE S6/S9	1			
RES	0-00-0102	RES 1K OHM 1/8W 5%	1	Main	Jump Resistor	
RES	0-09-1038	RES SLIDER 10KB 45mm MONO	1	Slider		
RUB	9-23-1028	KEYPAD EDIT S6	1			
RUB	9-23-1031	KEYPAD RUBBER SELECT (W/ S6 SILKSCREEN)	1			
SMC	1-55-0022	CAP 22PF XQSR 0805	4	Main	C42,46,56,57	
SMC	1-55-0220	CAP 220PF NPO 0805	4	MAIN	C11,12,14,19	
SMC	1-56-0562	CAP 5600PF XQSR 0805	2	MAIN	C5,6	
SMC	1-57-0104	CAP 0.1uF Z5U 0805	38	MAIN	C1,2,4,7,8,10,13,16-18,20,22,23,28,31-34,37-41,43-45,47,50-55,58-62	
SMI	2-27-0038	ASIC SOUND-GEN 84-PIN PLCC (REV.B) S8/S9/QSR	1	MAIN	U8	
SMI	2-32-0009	IC MPU HITACHI H8/510 SMT	1	MAIN	U16	
SMI	2-33-0005	GAL GAL16V8 20-PIN SMT	1	MAIN	U12	
SMI	2-64-1138	IC 74AC138 DEMUX/DEC SMD	1	MAIN	U1	
SMI	2-64-7405	IC 74HCU04 HEX INVERTER SM	1	MAIN	U18	
SMI	2-64-7414	IC 74HC14 HEX INVERTER	1	MAIN	U7	
SMI	2-64-7474	IC 74HC74 DUAL D FF SMD	1	Main	U20	
SMI	2-65-0390	IC 74HC390 DIVIDE BY 100 CTR 16-SOP	1	MAIN	U17	
SMI	2-66-5160	IC HM514260AJ-7 DRAM SMD	1	MAIN	U14	
SMI	2-67-6228	IC HM628128LFP-8 SRAM SMD	1	MAIN	U15	
SMI	2-71-0082	IC TL082 DUAL OPAMP SMD	1	MAIN	U6	
SMI	2-71-5532	IC NE5532 DUAL OPAMP SMD	1	MAIN	U5	
SMI	2-72-0339	IC LM339 ANALOG COMP SMD	1	MAIN	U2	
SMI	2-75-4319	IC AK4318A DUAL 18-BIT DAC	1	MAIN	U3	
SMI	2-77-0011	IC MASK ROM S6-1	1	MAIN	U24	
SMI	2-77-0012	IC MASK ROM S6-2	1	MAIN	U23	
SMI	2-77-0013	IC MASK ROM S6-3	1	MAIN	U22	
SMI	2-77-0014	IC MASK ROM S6-4	1	MAIN	U21	
SMM	2-50-4148	DIODE SIGNAL LS4148 SMD	12	Main	D3-5,7-15	
SMM	2-51-4401	TRANS 2N4401 NPN SMD	6	MAIN	Q1,4-8	
SMM	2-51-4403	TRANS 2N4403 PNP SMD	2	MAIN	Q2,3	
SMR	0-15-0202	RES 2K OHM 1/10W 5% 0805	5	MAIN	R9-10,50,52,67.	
SMR	0-15-0221	RES 220 OHM 1/10W 5% 0805	3	MAIN	R1-3	
SMR	0-15-0362	RES 3.6K OHM 1/10W 5% 0805	1	Main	R28	
SMR	0-15-1101	RES 100 OHM 1/10W 5% 0805	1	MAIN	R70	
SMR	0-15-1102	RES 1K OHM 1/10W 5% 0805	13	MAIN	R4,5,14,16,18,20,31,39,44,48,51,68,71,	
SMR	0-15-1103	RES 10K OHM 1/10W 5% 0805	15	MAIN	R21,32,42,43,49,63,66,74-79,15,45	
SMR	0-15-1105	RES 1M OHM 1/10W 5% 0805	3	MAIN	R27,41,6.	
SMR	0-15-1123	RES 12K OHM 1/10W 5% 0805	4	MAIN	R33,34,38,47	
SMR	0-15-1153	RES 15K OHM 1/10W 5% 0805	4	MAIN	R35-37,46	
SMR	0-15-1203	RES 20K OHM 1/10W 5% 0805	3	MAIN	R7,8,65	

Grp	AlPartNo	Description	Qnty	PCB	Ref.Designator	Comments
SMR	0-15-1332	RES 3.3K OHM 1/10W 5% 0805	3	Main	R25,26,30	
SMR	0-15-1470	RES 47 OHM 1/10W 5% 0805	2	MAIN	R12,13	
SMR	0-15-1471	RES 470 OHM 1/10W 5% 0805	4	MAIN	R6,22,24,29	
SMR	0-15-1472	RES 4.7K OHM 1/10W 5% 0805	16	MAIN	R11,17,19,23,40,53-62,64	

SWT	6-01-0002	SWITCH SLIDE DPDT	1	MAIN	SW1	
SWT	6-02-0003	SWITCH DPDT SHADOW ITT	1	MAIN	SW2	

9.20 QS7 Service Parts List

Grp	AlPartNo	Description	Qnty	PCB	Ref.Designator	Comment
ASY	9-79-0090-F	ASSY PCB EDIT/SELECT KEYPAD Q7	1	KEYPAD		
ASY	9-79-0180	ASSY PCB MAIN Q7	1	MAIN		
ASY	9-79-1163	ASSY PCB SLIDER Q7	1	SLIDER		
ASY	9-79-1247	ASSY PCB TRANSFORMER Q7	1	P/S		
ASY	9-96-1190-F	ASSY FILTER EMI Q7	1			
ASY	9-96-1220-F	ASSY WHEEL PITCH Q7 (FORTRON VERSION)	1			
ASY	9-96-1221-F	ASSY WHEEL MODULATION Q7 (FORTRON VERSION)	1			
ASY	9-96-1247	ASIC PCVCO CD (TESTED)	1	MAIN	U11	
CAB	4-19-2001	CABLE SLIDER-TO-MAIN Q7/Q8	1		(J2)	
CAB	4-18-0650	CABLE 6-PIN SIL 250MM SHIELDED PAIRS S6	1			
CAB	4-18-1020	CABLE DIL 20-PIN 350MM RIBBON	1			
CAB	4-18-1416	CABLE 16-PIN 550mm RIBBON DIL to M-F REV 0.1 SPC	1			
CAB	4-18-1421	CABLE DIL 20-PIN 550mm RIBBON M-F REV 0.1 SPC	1			
CAB	4-18-1514	CABLE 14-PIN 250MM DIL RIBBON	1			
CAB	4-19-1400	CABLE 6-PIN 100mmLG. 2mm SPC F-F	1		XFMR TO MAIN	
CAB	4-19-1608	WIRE 1 TERM TO TINNED (BLUE)	1		EMI FILTER	
CAB	4-19-1609	WIRE 1 TERM TO TINNED (BROWN)	1		EMI FILTER	
CAB	4-19-2000	CABLE SLIDER-TO-POT Q7/Q8	1			
CAB	4-19-2002	CABLE AFTERTOUCH Q7/Q8	1			
CAP	1-08-0101	CAP 10uF ELEC 16V	14	MAIN	C2-3, C13-14, C17-18, C22-23, C29, C32, C37-38, C43, C65	
CAP	1-08-2200	CAP 2200uF ELEC 16V 12x24mm	3	MAIN	C8, C15, C96	
CON	4-04-0003	CON BNC (WAKA)	1	MAIN	J11	
CON	4-10-0009	CON 8-PIN DIN SERIAL (CIRCULAR-MINI) S6/Q7/Q8/QSR	1	MAIN	J19	
CON	4-11-0003	CON DIG OPTICAL TRANSMITTER	1	MAIN	J10	
CON	7-10-0041	CON 136-PIN STACKED ROM CARD PCMCIA	1	MAIN	J22	
DIO	2-01-4003	DIODE POWER 1N4003	4	MAIN	D1-2, D4-5	
DIO	2-02-5231	DIODE ZENER 1N5231B	1	MAIN	D9	
HDR	4-14-0008	HEADER 8-PIN DIL XR/QS	1	MAIN	J20	
HDR	4-14-0014	HEADER 14-PIN 0.1 DIL	1	MAIN	J21	
HDR	4-14-0016	HEADER DIL 16-PIN 0.1 MALE	1	MAIN	J23	
HDR	4-14-0020	HEADER 20-PIN DIL 0.1 XR/CL	1	EDIT/SEL	FOR KEYPAD PCB	
HDR	4-14-0020	HEADER 20-PIN DIL 0.1 XR/CL	2	MAIN	J17, J25	
HDR	4-15-0004	HEADER 4-PIN SIL O.1	1	MAIN	J6	
HDR	4-15-1006	HEADER 6-PIN SIL 2MM CTR (SHROUDED)	2	MAIN	J2, J4	
HDR	4-15-1006	HEADER 6-PIN SIL 2MM CTR (SHROUDED)	1	P/S		
HDR	4-15-1206	HEADER 6-PIN SIL 0.2" SPC	1	P/S		
HDR	4-15-2106	HEADER 6-PIN SIL 2MM CTR 90 deg.	2	SLIDER	J1 (POT), J3 (VOL)	
HDW	5-00-0016	SCREW 6-32 x 1/4 PPZ	8		(4) MAIN PCB, (4) TRANSFORMER PCB	
HDW	5-00-0016	SCREW 6-32 x 1/4 PPZ	1	MAIN	(U6)	
HDW	5-00-0023	SCREW 6-32 x 5/16 PPB	39		(5) KEYPAD PCB, (2) LCD PCB, (2) SLIDER BEZEL, (2) SLIDER PCB, (2) SIDE PANELS, (5) REAR PANEL, (4) BOTTOM PANEL, (16) MOUNTS KEYBOARD TO BOT.PNL	
HDW	5-00-0030	SCREW 6-32 x 3/8 PPB 1WAY	3		(3) EMI FILTER	
HDW	5-00-1020	SCREW M4 x 10mm PPB "BT" TAPTITE	2		(2) SIDE BRACKETS	
HDW	5-00-1021	SCREW M3 x 8mm PPB "BT" TAPTITE	6		(6) SIDE COVERS	
Grp	**AlPartNo**	**Description**	**Qnty**	**PCB**	**Ref.Designator**	**Comment**

HDW	5-00-1632	SCREW 6-32 x 5/16 PPB W/LOCTITE	3		(2) WHEEL BRACKET, (1) WHEEL BEZEL	
HDW	5-02-6320	NUT KEP 6-32	3		(3) EMI FILTER	
HDW	5-02-6320	NUT KEP 6-32	1	MAIN	(U6)	
HDW	5-04-1007	FASTENER SNAP RIVET	4			
HDW	5-05-1001	CLIP FUSE	2	P/S		
HDW	5-10-1004	TIE WRAP 4in LOCKING WHITE	1		BUNDLES ALL SIX WIRES FOR PITCH & MOD WHEELS	
IC	2-11-7805	REG 7805 +5V TO220 NATIONA	1	MAIN	U6	
IC	2-11-7905	REG 7905 -5V TO220 NATIONA	1	MAIN	U4	
IC	2-24-0138	IC 6N138 OPTO ISO HEWLETT	1	MAIN	U7	
IC	2-27-0021	ASIC KEY-SCAN 68-PIN PLCC	1	MAIN	U32	
IC	2-27-0022	ASIC DSP1 DIG-FX 84-PIN	1	MAIN	U10	
IC	2-31-0069	IC SOFTWARE EPROM (v1.02) Q7	1	MAIN	U18	
JAC	4-00-0001	JACK 5-PIN DIN (MIDI)	3	MAIN	J12-J14	
JAC	4-02-0001	JACK 1/4 MONO CLIFF	7	MAIN	J3, J5, J8-9, J15-16, J18	
JAC	4-03-0001	JACK 1/4 STEREO	1	MAIN	J1	
LCD	9-44-1602	DISP LCD MODULE GRN STN GLASS S6	1			
LIT	7-51-1198	MANUAL REFERENCE Q7/Q8	1			
LIT	7-52-0009	CHART QUICK SET-UP Q7/Q8	1			
LIT	7-52-0010	CHART PROGRAM Q7/Q8	1			
LIT	7-52-0011	CHART MIX Q7/Q8	1			
ME	4-09-0006	FILTER EMI-DELTA	1		EMI FILTER	
ME	7-01-0005	CRYSTAL 20 mHz KDS	1	MAIN	M2	
ME	7-01-0020	CRYSTAL 7.056 MHZ	1	MAIN	M1	
ME	7-01-0021	CRYSTAL 14.7456 MHZ	1	MAIN	M3	
ME	7-05-0003	BATTERY 3V LITHIUM PANASONIC	1	MAIN	B1	
ME	7-40-2700	TRANSFORMER 115/230V 18VAC 15W S5	1	P/S		
MIS	7-07-0017	INSULATOR SHEET Q7/Q8	1		BETWEEN XFMR AND BOTTOM PNL.	
MIS	7-13-0001	TUBE HEATSHRINK .25D x 1.0L	3		EMI FILTER	
MIS	7-13-0084	ADHESIVE DIE-CUT (LCD/SIDES) S6	1			
MIS	7-50-0074	BARCODE S/N Q7	1			
MIS	7-51-1216	COMPACT-DISC SOFTWARE MIDI/PATCH S6/Q7/Q8/QSR	1			
MIS	7-53-0018	STICKER QC W/ MFR DATE (UL APPROVED)	1			
MIS	7-53-0090	LABEL GND-TERM SYMBOL Q7/Q8/QSR	1			
MTL	9-03-1036	LUG SOLDER PCB MNT	8	MAIN	(J1, J3, J5, J8-9, J15-16, J18)	
MTL	9-03-1126	BRACKET PITCH S6	1		PITCH WHEEL	
MTL	9-03-1127	BRACKET MODULATION WHEEL S6	1		MOD WHEEL	
MTL	9-03-1128	BRACKET RETAINER PCB S6	5			
MTL	9-03-1132	HEATSINK CD/S4/S6/S8/Q2/Q7/Q8/QR	1	MAIN		
MTL	9-03-1133	COVER PANEL LEFT S6	1			
MTL	9-03-1134	COVER PANEL RIGHT S6	1			
MTL	9-03-1173	CASE BOTTOM Q7	1			
MTL	9-03-1174	EXTRUSION TOP Q7	1			
MTL	9-06-0008	SPRING TORSION PITCH S6	1		PITCH WHEEL	
OEM	7-10-0007	KEYBOARD 76 KEYS FATAR S9 WEIGHTED	1			
OEM	7-10-0021	PEDAL SUSTAIN S5 (W/BOX)	1			
OEM	7-10-0137	GUIDE CARD PCMCIA Q7/Q8/QSR	2	MAIN		
PLS	9-10-0015	BEZEL SLIDER Q7	1			
Grp	**AlPartNo**	**Description**	**Qnty**	**PCB**	**Ref.Designator**	**Comment**
PLS	9-15-0076	FOOT ROUND	4			
PLS	9-15-1151	BEZEL WHEEL S6	1			

PLS	9-15-1152	WHEEL PITCH & MOD S6	1		PITCH WHEEL	
PLS	9-15-1152	WHEEL PITCH & MOD S6	1		MOD WHEEL	
PLS	9-15-1154	BRACKET RETAINER LCD S6	1			
PLS	9-15-1155	PANEL LEFT S6	1			
PLS	9-15-1157	PANEL RIGHT S6	1			
PLS	9-15-1179	CAP FADER BLACK (NO STRIPE)	5			
PLS	9-15-1227	BEZEL LCD Q7/Q8	1			
POT	0-09-1034	POT 1KA STEREO SLIDE 45mm	1	SLIDER		
POT	0-09-1106	POT 10KB SINGLE CONTROL EYELT 18mm-SHFT	1		PITCH WHEEL	
POT	0-09-1124	POT 10KB DUAL CONTROL EYELET	1		MOD WHEEL	
REP	8-20-0087	KEY WEIGHTED 'C' LOW END WHITE S6/S9	1			
REP	8-20-0088	KEY WEIGHTED 'B' WHITE S6/S9	1			
REP	8-20-0089	KEY WEIGHTED 'D' WHITE S6/S9	1			
REP	8-20-0090	KEY WEIGHTED 'A' WHITE S6/S9	1			
REP	8-20-0091	KEY WEIGHTED 'G' WHITE S6/S9	1			
REP	8-20-0092	KEY WEIGHTED 'B' WHITE S6/S9	1			
REP	8-20-0093	KEY WEIGHTED 'F' WHITE S6/S9	1			
REP	8-20-0094	KEY WEIGHTED BLACK S6/S9	1			
REP	8-20-0095	KEY WEIGHTED 'E' HIGH END WHITE S6/S9	1			
REP	8-20-0096	KEY WEIGHTED 'G' WHITE S6/S9	1			
RES	0-00-0000	RES 0 OHM 1/8W 5%	1	SLIDER		
RES	0-09-1038	RES SLIDER 10KB 45mm MONO	4	SLIDER		
RUB	9-23-1028	KEYPAD EDIT S6	1			
RUB	9-23-1031	KEYPAD RUBBER SELECT (W/ S6 SILKSCREEN)	1			
SMC	1-50-0104	CAP 0.1uF NPO 1206	60	MAIN	C4, C6-7, C9, C11, C16, C20, C24-27, C34, C39-42, C44-48, C51-63, C67-70, C73-94	
SMC	1-50-0220	CAP 22PF NPO 1206	6	MAIN	C49-50, C64, C66, C71-72	
SMC	1-50-0221	CAP 220PF NPO 1206	8	MAIN	C1, C5, C10, C12, C19, C21, C30, C33	
SMC	1-50-0562	CAP 5600PF NPO 1206	4	MAIN	C28, C31, C35-36	
SMI	2-27-0038	ASIC SOUND-GEN 84-PIN PLCC (REV.B) S8/S9/QSR	1	MAIN	U16	
SMI	2-32-0009	IC MPU HITACHI H8/510 SMT	1	MAIN	U21	
SMI	2-33-0005	GAL GAL16V8 20-PIN SMT	1	MAIN	U13	
SMI	2-64-0161	IC 74HC161 SYNC 4-BIT COUNTER	1	MAIN	U26	
SMI	2-64-1000	IC 74AC00 QUAD 2-IN NAND SMD	1	MAIN	U12	
SMI	2-64-1138	IC 74AC138 DEMUX/DEC SMD	1	MAIN	U14	
SMI	2-64-7402	IC 74HC02 QUAD 2-IN NOR	1	MAIN	U28	
SMI	2-64-7405	IC 74HCU04 HEX INVERTER SM	1	MAIN	U25	
SMI	2-64-7414	IC 74HC14 HEX INVERTER	1	MAIN	U9	
SMI	2-64-7474	IC 74HC74 DUAL D FF SMD	1	MAIN	U29	
SMI	2-66-5160	IC HM514260AJ-7 DRAM SMD	1	MAIN	U8	
SMI	2-67-6228	IC HM628128LFP-8 SRAM SMD	1	MAIN	U15	
SMI	2-71-0084	IC TL084 QUAD OPAMP SMD	1	MAIN	U3	
SMI	2-71-5532	IC NE5532 DUAL OPAMP SMD	1	MAIN	U2	
SMI	2-72-0339	IC LM339 ANALOG COMP SMD	1	MAIN	U31	
SMI	2-73-4052	IC CD4052 ANALOG MUX SMD	1	MAIN	U24	
Grp	**AlPartNo**	**Description**	**Qnty**	**PCB**	**Ref.Designator**	**Comment**
SMI	2-76-4319	IC AKM4319 DAC	2	MAIN	U1, U5	
SMI	2-77-0044	IC MASK ROM 1 Q7/Q8	1	MAIN	U17	
SMI	2-77-0045	IC MASK ROM 2 Q7/Q8	1	MAIN	U19	
SMI	2-77-0046	IC MASK ROM 3 Q7/Q8	1	MAIN	U20	

SMI	2-77-0047	IC MASK ROM 4 Q7/Q8	1	MAIN	U22	
SMI	2-77-0048	IC MASK ROM 5 Q7/Q8	1	MAIN	U23	
SMI	2-77-0049	IC MASK ROM 6 Q7/Q8	1	MAIN	U27	
SMI	2-77-0050	IC MASK ROM 7 Q7/Q8	1	MAIN	U30	
SMI	2-77-0051	IC MASK ROM 8 Q7/Q8	1	MAIN	U33	
SMM	2-50-4148	DIODE SIGNAL LS4148 SMD	12	MAIN	D3, D6-8, D10-17	
SMM	2-51-4401	TRANS 2N4401 NPN SMD	4	MAIN	Q3-6	
SMM	2-51-4403	TRANS 2N4403 PNP SMD	2	MAIN	Q1-2	
SMR	0-10-0101	RES 100 OHM 1/8W 5% 1206	1	MAIN	R74	
SMR	0-10-0102	RES 1K OHM 1/8W 5% 1206	21	MAIN	R13-14, R17-18, R29-32, R59, R61, R68, R70, R76-79, R83-84, R88, R90-91	
SMR	0-10-0103	RES 10K OHM 1/8W 5% 1206	13	MAIN	R15-16, R20, R34, R40, R46, R62-67, R92	
SMR	0-10-0105	RES 1M OHM 1/8W 5% 1206	4	MAIN	R39, R57, R72, R94	
SMR	0-10-0121	RES 120 OHM 1/8W 5% 1206	2	MAIN	R2-3	
SMR	0-10-0122	RES 1.2K OHM 1/8W 5% 1206	1	MAIN	R37	
SMR	0-10-0123	RES 12K OHM 1/8W 5% 1206	8	MAIN	R6-7, R9-10, R24-25, R27-28	
SMR	0-10-0150	RES 15 OHM 1/8W 5% 1206	1	MAIN	R58	
SMR	0-10-0153	RES 15K OHM 1/8W 5% 1206	8	MAIN	R5, R8, R11-12, R21-23, R26	
SMR	0-10-0202	RES 2K OHM 1/8W 5% 1206	4	MAIN	R19, R36, R93, R95	
SMR	0-10-0203	RES 20K OHM 1/8W 5% 1206	3	MAIN	R33, R96-97	
SMR	0-10-0221	RES 220 OHM 1/8W 5% 1206	6	MAIN	R35, R42-45, R47	
SMR	0-10-0332	RES 3.3K OHM 1/8W 5% 1206	5	MAIN	R1, R4, R81-82, R86	
SMR	0-10-0362	RES 3.6K OHM 1/8W 5% 1206	1	MAIN	R87	
SMR	0-10-0471	RES 470 OHM 1/8W 5% 1206	6	MAIN	R41, R80, R85, R100, R103 - R104	
SMR	0-10-0472	RES 4.7K OHM 1/8W 5% 1206	18	MAIN	R38, R50-56, R60, R69, R71, R73, R75, R89, R98-99, R101-102	
SMR	0-10-0821	RES 820 OHM 1/8W 5% 1206	1	MAIN	R48	
SOC	4-06-0040	SOCKET 40-PIN DIP 0.6	1	MAIN	(U18)	
SWT	6-01-0002	SWITCH SLIDE DPDT	1	MAIN	SW1	
SWT	6-03-0001	SWITCH DPST POWER 10A MARQ	1			

9.30 QSR Service Parts List

Grp	AlPartNo	Description	Qnty	PCB	Ref.Designator	Comment
ASY	9-79-1287	ASSY PCB LCD QSR	1	LCD		
ASY	9-79-1289	ASSY PCB MAIN QSR	1	MAIN		
ASY	9-79-1304	ASSY PCB FRONT-PANEL QSR	1	F/P		
ASY	9-96-1247	ASIC PCVCO CD (TESTED)	1	MAIN	U7	
ASY	9-96-1284	ASSY PANEL FRONT QSR	1			
CAB	4-19-1331	CABLE SIL 8-PIN 225MM 2MM F-F (REV B)	1		AUDIO CABLE	
CAB	4-70-0003	CABLE RIBBON DIL 16-PIN 68mm F-M QSR	1		KEYPAD CABLE	
CAB	4-70-0004	CABLE RIBBON DIL 16-PIN 280mm F-M QSR	1		LCD CABLE	
CAP	1-08-0101	CAP 10uF ELEC 16V	14	MAIN	C2-3, C12-13, C15, C19-20, C23, C27, C32, C37, C62, C77, C82	
CAP	1-08-2200	CAP 2200uF ELEC 16V 12x24mm	4	MAIN	C80-81, C84, C86	
CON	4-04-0003	CON BNC (WAKA)	1	MAIN	J7	
CON	4-10-0009	CON 8-PIN DIN SERIAL (CIRCULAR-MINI) S6/Q7/Q8/QSR	1	MAIN	J11	
CON	4-11-0003	CON DIG OPTICAL TRANSMITTER	1	MAIN	J6	
CON	7-10-0041	CON 136-PIN STACKED ROM CARD PCMCIA	1	MAIN	J14	
DIO	2-01-5400	DIODE POWER 1N5400	2	MAIN	D11-12	
DIO	2-02-5231	DIODE ZENER 1N5231B	1	MAIN	D10	
HDR	4-14-0016	HEADER DIL 16-PIN 0.1 MALE	1	F/P	J3	
HDR	4-15-1008	HEADER 8-PIN SIL 2MM CTR (SHROUDED)	1	MAIN	J1	
HDR	4-15-1008	HEADER 8-PIN SIL 2MM CTR (SHROUDED)	1			
HDW	5-00-0016	SCREW 6-32 x 1/4 PPZ	6		(6) MAIN PCB	
HDW	5-00-0016	SCREW 6-32 x 1/4 PPZ	2		(2) HEATSINK	
HDW	5-00-0020	SCREW M3 x 7mm PPZ	9		(9) CASE	
HDW	5-00-1005	SCREW 3 x 6MM KEYPAD	1		OPTIC JACK	
HDW	5-02-0009	HEATSINK M3x20 D4	1	MAIN		
HDW	5-02-6320	NUT KEP 6-32	1		(1) HEATSINK	
IC	2-11-7805	REG 7805 +5V TO220 NATIONA	1	MAIN	U31	
IC	2-11-7905	REG 7905 -5V TO220 NATIONA	1	MAIN	U32	
IC	2-24-0138	IC 6N138 OPTO ISO HEWLETT	1	MAIN	U14	
IC	2-27-0022	ASIC DSP1 DIG-FX 84-PIN	1	MAIN	U6	
IC	2-31-0074	IC SOFTWARE EPROM QSR (v1.0)	1	MAIN	U17	USES 2-19-4240 UN-PROGRAMMED EPROM (4MEG)
JAC	4-00-0001	JACK 5-PIN DIN (MIDI)	3	MAIN	J8-10	
JAC	4-00-0004	JACK 4-PIN DIN (P4)	1	MAIN	J15	
JAC	4-02-0001	JACK 1/4 MONO CLIFF	4	MAIN	J2-5	
JAC	4-02-0005	JACK CLIFF STEREO (J/SKT S2/BBB BLK PC -A/S 12.5mm)	1			
LED	3-02-0010	LED HIGH INTENSITY (GL3UR8)	4	F/P	D1-4	
LIT	7-51-1228	MANUAL REFERENCE QSR	1			
LIT	7-51-1229	CHART QUICK-SETUP QSR	1			
ME	7-01-0005	CRYSTAL 20 mHz KDS	1	MAIN	M2	
ME	7-01-0020	CRYSTAL 7.056 MHZ	1	MAIN	M1	
ME	7-01-0021	CRYSTAL 14.7456 MHZ	1	MAIN	M3	
ME	7-05-0003	BATTERY 3V LITHIUM PANASONIC	1	MAIN	B1	
MIS	7-50-0088	BARCODE S/N QSR	1			
Grp	**AlPartNo**	**Description**	**Qnty**	**PCB**	**Ref.Designator**	**Comment**

MIS	7-51-1216	COMPACT-DISC SOFTWARE MIDI/PATCH S6/Q7/Q8/QSR	1			
MIS	7-53-0018	STICKER QC W/ MFR DATE (UL APPROVED)	1			
MIS	9-00-1011	ENCODER DATA 15mm (ALPS EC11B w/o SWITCH)	1	F/P	SW2	
MIS	9-23-1014	STRIP FOAM (F/P) 7 x 185mm	4			
MIS	9-23-1017	STRIP FOAM (SIDE) 7x95mm C4/D4/D5/M4/Q2/S4/S8/QSR	1			
MTL	9-03-1036	LUG SOLDER PCB MNT	4			
MTL	9-03-1100	CASE TOP Q2	1			
MTL	9-03-1132	HEATSINK CD/S4/S6/S8/Q2/Q7/Q8/QR	1	MAIN		
MTL	9-03-1165	CLIP STRIP RETAINER	8			
MTL	9-03-1181	PANEL FRONT EXTRUSION QSR	1			
MTL	9-03-1182	PANEL BOTTOM QSR	1			
MTL	9-58-1007	PANEL SIDE/RACK EAR 150mm D5/M4/D4/QSR	2		ROUNDED EDGES	
OEM	7-10-0137	GUIDE CARD PCMCIA Q7/Q8/QSR	2	MAIN	J14	
PLS	9-10-0003	BEZEL FRONT PANEL A D5/QSR	1			
PLS	9-13-0020	STRIP RETAINER 6.35x20mm D5	4			
PLS	9-13-0130	STRIP RETAINER 130mm D5/QSR	2			
PLS	9-15-0087	KNOB DATA M4/D5/C4/QSR	1			
PLS	9-15-1078	BUTTON POWER D5/M4/Q2/S4/S8/QSR	1			
PLS	9-15-1112	KNOB STANDARD Q2/D5/S4/S8/QSR	1			
PLS	9-15-1117	EXTENDER SWITCH D5/M4/Q2/S4/S8/QSR	1			
PLS	9-15-1311	BEZEL KEYPAD (BEZEL-B) QSR	1			
PLS	9-15-1312	KEYPAD RUBBER QSR	1			
PLS	9-15-1316	BEZEL LCD QSR	1			
POT	0-09-1022	POT 10KA DUAL CONTROL	1			
RES	0-00-0221	RES 220 OHM 1/8W 5%	1	F/P	R1	
RES	0-05-0200	RES 2 OHM 1/2W 5%	1		R87	
SMC	1-50-0104	CAP 0.1uF NPO 1206	50	MAIN	C4, C6-8, C10, C14, C16, C21, C25-26, C30-31, C35-36, C38, C41-47, C48-59, C63-65, C66, C69-76, C78-79, C83, C85	
SMC	1-50-0220	CAP 22PF NPO 1206	6	MAIN	C39-40, C60-61, C67-68	
SMC	1-50-0221	CAP 220PF NPO 1206	8	MAIN	C1, C5, C9, C11, C17-18, C24, C28	
SMC	1-50-0562	CAP 5600PF NPO 1206	4	MAIN	C22, C29, C33-34	
SMI	2-27-0038	ASIC SOUND-GEN 84-PIN PLCC (REV.B) S8/S9/QSR	1	MAIN	U8	
SMI	2-32-0009	IC MPU HITACHI H8/510 SMT	1	MAIN	U20	
SMI	2-33-0005	GAL GAL16V8 20-PIN SMT	1	MAIN	U9	
SMI	2-64-0161	IC 74HC161 SYNC 4-BIT COUNTER	1	MAIN	U27	
SMI	2-64-1000	IC 74AC00 QUAD 2-IN NAND SMD	1	MAIN	U10	
SMI	2-64-1138	IC 74AC138 DEMUX/DEC SMD	1	MAIN	U11	
SMI	2-64-7402	IC 74HC02 QUAD 2-IN NOR	1	MAIN	U28	
SMI	2-64-7405	IC 74HCU04 HEX INVERTER SM	1	MAIN	U26	
SMI	2-64-7414	IC 74HC14 HEX INVERTER	2	MAIN	U19, U21	
SMI	2-64-7474	IC 74HC74 DUAL D FF SMD	1	MAIN	U29	
SMI	2-66-5160	IC HM514260AJ-7 DRAM SMD	1	MAIN	U5	
SMI	2-67-6228	IC HM628128LFP-8 SRAM SMD	1	MAIN	U12	
SMI	2-71-0084	IC TL084 QUAD OPAMP SMD	1	MAIN	U3	
SMI	2-71-5532	IC NE5532 DUAL OPAMP SMD	1	MAIN	U1	
SMI	2-72-0339	IC LM339 ANALOG COMP SMD	1	MAIN	U24	
SMI	2-76-4319	IC AKM4319 DAC	1	MAIN	U2, U4	
Grp	**AlPartNo**	**Description**	**Qnty**	**PCB**	**Ref.Designator**	**Comment**
SMI	2-77-0044	IC MASK ROM 1 Q7/Q8	1	MAIN	U13	
SMI	2-77-0045	IC MASK ROM 2 Q7/Q8	1	MAIN	U15	

SMI	2-77-0046	IC MASK ROM 3 Q7/Q8	1	MAIN	U16	
SMI	2-77-0047	IC MASK ROM 4 Q7/Q8	1	MAIN	U18	
SMI	2-77-0048	IC MASK ROM 5 Q7/Q8	1	MAIN	U22	
SMI	2-77-0049	IC MASK ROM 6 Q7/Q8	1	MAIN	U23	
SMI	2-77-0050	IC MASK ROM 7 Q7/Q8	1	MAIN	U25	
SMI	2-77-0051	IC MASK ROM 8 Q7/Q8	1	MAIN	U30	
SMM	2-50-4148	DIODE SIGNAL LS4148 SMD	9	MAIN	D1-9	
SMM	2-51-4401	TRANS 2N4401 NPN SMD	4	MAIN	Q3-6	
SMM	2-51-4403	TRANS 2N4403 PNP SMD	3	MAIN	Q1-2, Q7	
SMR	0-10-0000	RES 0 OHM 1/8W 5% 1206	1	MAIN	R64	
SMR	0-10-0101	RES 100 OHM 1/8W 5% 1206	1	MAIN	R80	
SMR	0-10-0102	RES 1K OHM 1/8W 5% 1206	13	MAIN	R13-14, R17, R19, R24, R30-32, R42, R60, R75-76, R79	
SMR	0-10-0103	RES 10K OHM 1/8W 5% 1206	11	MAIN	R15-16, R21, R35, R41, R51, R56-59, R69	
SMR	0-10-0105	RES 1M OHM 1/8W 5% 1206	4	MAIN	R38, R63, R70, R82	
SMR	0-10-0121	RES 120 OHM 1/8W 5% 1206	2	MAIN	R1-2	
SMR	0-10-0123	RES 12K OHM 1/8W 5% 1206	8	MAIN	R5-7, R11, R23, R26-27, R29	
SMR	0-10-0150	RES 15 OHM 1/8W 5% 1206	1	MAIN	R37	
SMR	0-10-0153	RES 15K OHM 1/8W 5% 1206	8	MAIN	R3-4, R10, R12, R18, R22, R25, R28	
SMR	0-10-0202	RES 2K OHM 1/8W 5% 1206	5	MAIN	R20, R61, R78, R83-84	
SMR	0-10-0203	RES 20K OHM 1/8W 5% 1206	3	MAIN	R40, R85-86	
SMR	0-10-0221	RES 220 OHM 1/8W 5% 1206	6	MAIN	R34, R49, R52-55	
SMR	0-10-0332	RES 3.3K OHM 1/8W 5% 1206	5	MAIN	R8-9, R67-68, R73	
SMR	0-10-0333	RES 33K OHM 1/8W 5% 1206	2	MAIN	R65-66	
SMR	0-10-0362	RES 3.6K OHM 1/8W 5% 1206	1	MAIN	R74	
SMR	0-10-0471	RES 470 OHM 1/8W 5% 1206	7	MAIN	R36, R39, R50, R71-72, R77, R81	
SMR	0-10-0472	RES 4.7K OHM 1/8W 5% 1206	11	MAIN	R43-48, R62, R88-91	
SMR	0-10-0821	RES 820 OHM 1/8W 5% 1206	1	MAIN	R33	
SOC	4-06-0040	SOCKET 40-PIN DIP 0.6	1	MAIN	U17	
SWT	6-02-0002	SWITCH DPDT	1	MAIN	S1	

9.40 QS8 Service Parts List

Grp	AlPartNo	Description	Qnty	PCB	Ref.Designator	Comment
ASY	9-79-0090-D	ASSY PCB EDIT/SELECT KEYPAD Q8	1	KEYPAD		
ASY	9-79-0190	ASSY PCB MAIN Q8	1	MAIN	PCB	
ASY	9-79-1163-D	ASSY PCB SLIDER Q8	1	SLIDER		
ASY	9-79-1247-D	ASSY PCB TRANSFORMER Q8	1	XFMR		
ASY	9-96-1190	ASSY FILTER EMI MB,A1,BR,S9,Q8	1			
ASY	9-96-1220-D	ASSY BRACKET (PITCH WHEEL) Q8	1			
ASY	9-96-1221-D	ASSY BRACKET (MOD WHEEL) Q8	1			
ASY	9-96-1247	ASIC PCVCO CD (TESTED)	1	MAIN	U11	
CAB	4-18-0650	CABLE 6-PIN SIL 250MM SHIELDED PAIRS S6	1		J2 TO (SLIDER) TO J4 (MAIN)	
CAB	4-18-1020	CABLE DIL 20-PIN 350MM RIBBON	1		J17 (MAIN) TO KEYPAD PCB	
CAB	4-18-1421	CABLE DIL 20-PIN 550mm RIBBON M-F REV 0.1 SPC	2		KEYS (HIGH) TO J26 ON MAIN, KEYS (LOW) TO J24 ON MAIN	
CAB	4-18-1514	CABLE 14-PIN 250MM DIL RIBBON	1		J21 ON MAIN TO LCD MODULE	
CAB	4-19-0002	CABLE AFTERTOUCH Q7/Q8	2		FATAR A/T CABLE TO J6(WHITE) J7(BLACK) ON MAIN	
CAB	4-19-1400	CABLE 6-PIN 100mmLG. 2mm SPC F-F	1		XFMR TO MAIN	
CAB	4-19-1608	WIRE 1 TERM TO TINNED (BLUE)	1		EMI FILTER	
CAB	4-19-1609	WIRE 1 TERM TO TINNED (BROWN)	1		EMI FILTER	
CAB	4-19-2000	CABLE SLIDER-TO-POT Q7/Q8	1		SLIDER PCB TO POTS	
CAB	4-19-2001	CABLE SLIDER-TO-MAIN Q7/Q8	1		(J2)	
CAP	1-08-0101	CAP 10uF ELEC 16V	14	MAIN	C2-3, C13-14, C17-18, C22-23, C29, C32, C37-38, C43, C65	
CAP	1-08-2200	CAP 2200uF ELEC 16V 12x24mm	3	MAIN	C8, C15, C96	
CON	4-04-0003	CON BNC (WAKA)	1	MAIN	J11	
CON	4-10-0009	CON 8-PIN DIN SERIAL (CIRCULAR-MINI) S6/Q7/Q8/QSR	1	MAIN	J19	
CON	4-11-0003	CON DIG OPTICAL TRANSMITTER	1	MAIN	J10	
CON	7-10-0041	CON 136-PIN STACKED ROM CARD PCMCIA	1	MAIN	J22	
DIO	2-01-4003	DIODE POWER 1N4003	4	MAIN	D1-2, D4-5	
DIO	2-02-5231	DIODE ZENER 1N5231B	1	MAIN	D9	
HDR	4-14-0008	HEADER 8-PIN DIL XR/QS	1	MAIN	J20	
HDR	4-14-0014	HEADER 14-PIN 0.1 DIL	1	MAIN	J21	
HDR	4-14-0020	HEADER 20-PIN DIL 0.1 XR/CL	3	MAIN	J17, J24, J26	
HDR	4-14-0020	HEADER 20-PIN DIL 0.1 XR/CL	1	EDIT/SEL	FOR KEYPAD PCB	
HDR	4-15-0004	HEADER 4-PIN SIL O.1	2	MAIN	J6-7	
HDR	4-15-1006	HEADER 6-PIN SIL 2MM CTR (SHROUDED)	2	MAIN	J2, J4	
HDR	4-15-1006	HEADER 6-PIN SIL 2MM CTR (SHROUDED)	1	P/S		
HDR	4-15-1206	HEADER 6-PIN SIL 0.2" SPC	1	P/S		
HDR	4-15-2106	HEADER 6-PIN SIL 2MM CTR 90 deg.	2	SLIDER	J1 (POT), J3 (VOL)	
HDW	5-00-0003	SCREW 6-32 x 1/4 PPB	11		(5) REAR PANEL, (6) SIDE BRACKETS	
HDW	5-00-0016	SCREW 6-32 x 1/4 PPZ	1	MAIN	(U6)	
HDW	5-00-0016	SCREW 6-32 x 1/4 PPZ	39		(4) MAIN PCB, (4) XFMR PCB, (12) KEYPAD, (6) SIDE BRACKETS, (4) WHEEL ASSY, (6) SLIDER PCB, (3) LCD	
HDW	5-00-0030	SCREW 6-32 x 3/8 PPB 1WAY	3		(3) EMI FILTER & GND	
HDW	5-00-0100	SCREW 6-20 x 1/2 PPB TYPE-A SELF-TAPPING	12		(6)LEFT WOODEN SIDES, (6) RIGHT WOODEN SIDES	
HDW	5-00-0512	SCREW M5 x 12mm PPB	11		(11) MOUNTS FATAR KEYBOARD	
HDW	5-02-6320	NUT KEP 6-32	1	MAIN	(U6)	
Grp	**AlPartNo**	**Description**	**Qnty**	**PCB**	**Ref.Designator**	**Comment**
HDW	5-02-6320	NUT KEP 6-32	3		(3) EMI FILTER & GND	

HDW	5-04-1007	FASTENER SNAP RIVET	5		(FOR RUBBER FEET)	
HDW	5-05-1001	CLIP FUSE	2	P/S		
HDW	5-10-1004	TIE WRAP 4in LOCKING WHITE	1		BUNDLES ALL SIX WIRES FOR PITCH & MOD WHEELS	
HDW	9-04-0004	PANEL WOODEN LEFT-SIDE COVER Q8	1			
HDW	9-04-0005	PANEL WOODEN RIGHT-SIDE COVER Q8	1			
IC	2-11-7805	REG 7805 +5V TO220 NATIONA	1	MAIN	U6	
IC	2-11-7905	REG 7905 -5V TO220 NATIONA	1	MAIN	U4	
IC	2-24-0138	IC 6N138 OPTO ISO HEWLETT	1	MAIN	U7	
IC	2-27-0021	ASIC KEY-SCAN 68-PIN PLCC	1	MAIN	U32	
IC	2-27-0022	ASIC DSP1 DIG-FX 84-PIN	1	MAIN	U10	
IC	2-31-0071	IC SOFTWARE EPROM (v1.02) Q8	1	MAIN	U18	
JAC	4-00-0001	JACK 5-PIN DIN (MIDI)	3	MAIN	J12-J14	
JAC	4-02-0001	JACK 1/4 MONO CLIFF	7	MAIN	J3, J5, J8-9, J15-16, J18	
JAC	4-03-0001	JACK 1/4 STEREO	1	MAIN	J1	
LCD	9-44-1602	DISP LCD MODULE GRN STN GLASS S6	1			
LIT	7-51-1198	MANUAL REFERENCE Q7/Q8	1			
LIT	7-52-0009	CHART QUICK SET-UP Q7/Q8	1			
LIT	7-52-0010	CHART PROGRAM Q7/Q8	1			
LIT	7-52-0011	CHART MIX Q7/Q8	1			
ME	4-09-0006	FILTER EMI-DELTA	1		EMI FILTER	
ME	7-01-0005	CRYSTAL 20 mHz KDS	1	MAIN	M2	
ME	7-01-0020	CRYSTAL 7.056 MHZ	1	MAIN	M1	
ME	7-01-0021	CRYSTAL 14.7456 MHZ	1	MAIN	M3	
ME	7-05-0003	BATTERY 3V LITHIUM PANASONIC	1	MAIN	B1	
ME	7-40-2700	TRANSFORMER 115/230V 18VAC 15W S5	1	P/S		
MIS	7-07-0017	INSULATOR SHEET Q7/Q8	1		BETWEEN XFMR AND BOTTOM PNL.	
MIS	7-07-0027	SPACER FELT Q8	11		(11) BOTTOM OF KEYS (16mm x 20mm x 7mm)	
MIS	7-13-0084	ADHESIVE DIE-CUT (LCD/SIDES) S6	1			
MTL	9-03-1126	BRACKET PITCH S6	1			
MTL	9-03-1127	BRACKET MODULATION WHEEL S6	1			
MTL	9-03-1132	HEATSINK CD/S4/S6/S8/Q2/Q7/Q8/QR	1	MAIN		
MTL	9-03-1220	PANEL BOTTOM Q8 (W/OUT SLKSCRN)	1			
MTL	9-03-1221	PANEL TOP Q8 (W/OUT SLKSCRN)	1			
MTL	9-03-1222	BRACKET WHEEL 1 Q8	1			
MTL	9-03-1223	BRACKET WHEEL 2 Q8	1			
MTL	9-03-1224	BRACKET SLIDER 1 Q8	1			
MTL	9-03-1225	BRACKET SLIDER 2 Q8	2			
MTL	9-03-1226	BRACKET SIDE-PANEL LEFT Q8	1			
MTL	9-03-1227	BRACKET SIDE-PANEL RIGHT Q8	1			
MTL	9-03-1228	BRACKET LCD-RETAINING Q8	1			
MTL	9-03-1229	BRACKET KEYPAD RETAINER (18ga.-JET COAT) Q8	2			
MTL	9-06-0008	SPRING TORSION PITCH S6	1			
MTL	9-96-1281	ASSY PANEL TOP Q8 (W/SLKSCRN)	1			
MTL	9-96-1282	ASSY PANEL BOTTOM Q8 (W/SLKSCRN)	1			
OEM	7-10-0021	PEDAL SUSTAIN S5 (W/BOX)	1			
OEM	7-10-0037	KEYBOARD 88-KEY TP-20 WEIGHTED FATAR	1			

Grp	AlPartNo	Description	Qnty	PCB	Ref.Designator	Comment
OEM	7-10-0137	GUIDE CARD PCMCIA Q7/Q8/QSR	2	MAIN		
PLS	7-81-0069	FOAM BOTTOM LEFT Q8	1			
PLS	9-10-0015	BEZEL SLIDER Q7	1			

PLS	9-15-0076	FOOT ROUND	5			
PLS	9-15-1151	BEZEL WHEEL S6	1			
PLS	9-15-1152	WHEEL PITCH & MOD S6	1			
PLS	9-15-1154	BRACKET RETAINER LCD S6	1			
PLS	9-15-1179	CAP FADER BLACK (NO STRIPE)	5			
PLS	9-15-1227	BEZEL LCD Q7/Q8	1			
POT	0-09-1034	POT 1KA STEREO SLIDE 45mm	1	SLIDER		
POT	0-09-1106	POT 10KB SINGLE CONTROL EYELT 18mm-SHFT	1		PITCH WHEEL	
POT	0-09-1124	POT 10KB DUAL CONTROL EYELET	1		MOD WHEEL	
REP	8-20-0099	KEY WEIGHTED 'C' WHITE Q8	1		INDIVIDUAL KEY	
REP	8-20-0102	KEY WEIGHTED 'D' WHITE Q8	1		INDIVIDUAL KEY	
REP	8-20-0103	KEY WEIGHTED 'E' WHITE Q8	1		INDIVIDUAL KEY	
REP	8-20-0104	KEY WEIGHTED 'F' WHITE Q8	1		INDIVIDUAL KEY	
REP	8-20-0105	KEY WEIGHTED 'G' WHITE Q8	1		INDIVIDUAL KEY	
REP	8-20-0106	KEY WEIGHTED 'A' WHITE Q8	1		INDIVIDUAL KEY	
REP	8-20-0107	KEY WEIGHTED 'B' WHITE Q8	1		INDIVIDUAL KEY	
REP	8-20-0108	KEY WEIGHTED BLACK Q8	1		INDIVIDUAL KEY	
REP	8-20-0109	KEY WEIGHTED 'A'LOW END WHITE Q8	1		INDIVIDUAL KEY	
REP	8-20-0110	KEY WEIGHTED 'C'HIGH END WHITE Q8	1		INDIVIDUAL KEY	
RES	0-00-0000	RES 0 OHM 1/8W 5%	1	SLIDER		
RES	0-09-1038	RES SLIDER 10KB 45mm MONO	4	SLIDER		
RUB	9-23-1028	KEYPAD EDIT S6	1			
RUB	9-23-1031	KEYPAD RUBBER SELECT (W/ S6 SILKSCREEN)	1			
RUB	9-23-1072	FOAM STRIP 5.5x3x1219mm Q8	1			
SMC	1-50-0104	CAP 0.1uF NPO 1206	61	MAIN	C4, C6-7, C9, C11, C16, C20, C24-27, C34, C39-42, C44-48, C51-63, C67-70, C73-94	
SMC	1-50-0220	CAP 22PF NPO 1206	6	MAIN	C49-50, C64, C66, C71-72	
SMC	1-50-0221	CAP 220PF NPO 1206	8	MAIN	C1, C5, C10, C12, C19, C21, C30, C33	
SMC	1-50-0562	CAP 5600PF NPO 1206	4	MAIN	C28, C31, C35-36	
SMI	2-27-0038	ASIC SOUND-GEN 84-PIN PLCC (REV.B) S8/S9/QSR	1	MAIN	U16	
SMI	2-32-0009	IC MPU HITACHI H8/510 SMT	1	MAIN	U21	
SMI	2-33-0005	GAL GAL16V8 20-PIN SMT	1	MAIN	U13	
SMI	2-64-0161	IC 74HC161 SYNC 4-BIT COUNTER	1	MAIN	U26	
SMI	2-64-1000	IC 74AC00 QUAD 2-IN NAND SMD	1	MAIN	U12	
SMI	2-64-1138	IC 74AC138 DEMUX/DEC SMD	1	MAIN	U14	
SMI	2-64-7402	IC 74HC02 QUAD 2-IN NOR	1	MAIN	U28	
SMI	2-64-7405	IC 74HCU04 HEX INVERTER SM	1	MAIN	U25	
SMI	2-64-7414	IC 74HC14 HEX INVERTER	1	MAIN	U9	
SMI	2-64-7474	IC 74HC74 DUAL D FF SMD	1	MAIN	U29	
SMI	2-66-5160	IC HM514260AJ-7 DRAM SMD	1	MAIN	U8	
SMI	2-67-6228	IC HM628128LFP-8 SRAM SMD	1	MAIN	U15	
SMI	2-71-0084	IC TL084 QUAD OPAMP SMD	1	MAIN	U3	
SMI	2-71-5532	IC NE5532 DUAL OPAMP SMD	1	MAIN	U2	
SMI	2-72-0339	IC LM339 ANALOG COMP SMD	1	MAIN	U31	

Grp	AlPartNo	Description	Qnty	PCB	Ref.Designator	Comment
SMI	2-73-4052	IC CD4052 ANALOG MUX SMD	1	MAIN	U24	
SMI	2-76-4319	IC AKM4319 DAC	2	MAIN	U1, U5	
SMI	2-77-0044	IC MASK ROM 1 Q7/Q8	1	MAIN	U17	
SMI	2-77-0045	IC MASK ROM 2 Q7/Q8	1	MAIN	U19	
SMI	2-77-0046	IC MASK ROM 3 Q7/Q8	1	MAIN	U20	

SMI	2-77-0047	IC MASK ROM 4 Q7/Q8	1	MAIN	U22	
SMI	2-77-0048	IC MASK ROM 5 Q7/Q8	1	MAIN	U23	
SMI	2-77-0049	IC MASK ROM 6 Q7/Q8	1	MAIN	U27	
SMI	2-77-0050	IC MASK ROM 7 Q7/Q8	1	MAIN	U30	
SMI	2-77-0051	IC MASK ROM 8 Q7/Q8	1	MAIN	U33	
SMM	2-50-4148	DIODE SIGNAL LS4148 SMD	12	MAIN	D3, D6-8, D10-17	
SMM	2-51-4401	TRANS 2N4401 NPN SMD	4	MAIN	Q3-6	
SMM	2-51-4403	TRANS 2N4403 PNP SMD	2	MAIN	Q1-2	
SMR	0-10-0101	RES 100 OHM 1/8W 5% 1206	1	MAIN	R74	
SMR	0-10-0102	RES 1K OHM 1/8W 5% 1206	21	MAIN	R13-14, R17-18, R29-32, R59, R61, R68, R70, R76-79, R83-84, R88, R90-91	
SMR	0-10-0103	RES 10K OHM 1/8W 5% 1206	13	MAIN	R15-16, R20, R34, R40, R46, R62-67, R92	
SMR	0-10-0105	RES 1M OHM 1/8W 5% 1206	4	MAIN	R39, R57, R72, R94	
SMR	0-10-0121	RES 120 OHM 1/8W 5% 1206	2	MAIN	R2-3	
SMR	0-10-0122	RES 1.2K OHM 1/8W 5% 1206	1	MAIN	R37	
SMR	0-10-0123	RES 12K OHM 1/8W 5% 1206	8	MAIN	R6-7, R9-10, R24-25, R27-28	
SMR	0-10-0150	RES 15 OHM 1/8W 5% 1206	1	MAIN	R58	
SMR	0-10-0153	RES 15K OHM 1/8W 5% 1206	8	MAIN	R5, R8, R11-12, R21-23, R26	
SMR	0-10-0202	RES 2K OHM 1/8W 5% 1206	4	MAIN	R19, R36, R93, R95	
SMR	0-10-0203	RES 20K OHM 1/8W 5% 1206	3	MAIN	R33, R96-97	
SMR	0-10-0221	RES 220 OHM 1/8W 5% 1206	6	MAIN	R35, R42-45, R47	
SMR	0-10-0332	RES 3.3K OHM 1/8W 5% 1206	5	MAIN	R1, R4, R81-82, R86	
SMR	0-10-0362	RES 3.6K OHM 1/8W 5% 1206	1	MAIN	R87	
SMR	0-10-0471	RES 470 OHM 1/8W 5% 1206	6	MAIN	R41, R80, R85, R100, R103 - R104	
SMR	0-10-0472	RES 4.7K OHM 1/8W 5% 1206	18	MAIN	R38, R50-56, R60, R69, R71, R73, R75, R89, R98-99, R101-102	
SMR	0-10-0821	RES 820 OHM 1/8W 5% 1206	1	MAIN	R48	
SOC	4-06-0040	SOCKET 40-PIN DIP 0.6	1	MAIN	(U18)	
SWT	6-01-0002	SWITCH SLIDE DPDT	1	MAIN	SW1	
SWT	6-03-0001	SWITCH DPST POWER 10A MARQ	1			

10.00 Appendix E Dictionary Of Selected Terms

48KHz	Normally running at 48Khz, however, this usually is in reference to the system sample rate clock and may change to accommodate variable pitch..
A.K.A.	Also Known As
Alias	An unwanted byproduct of digital audio, aliasing really describes two separate phenomenon. Amplitude aliasing occurs due to the fact that digital audio is not smooth, but stored as a series of quantized values. Without output filtering the signal, each subsequent change to a new quantized level (which occurs very rapidly) would in itself add an unwanted component to the original audio material. The second type of aliasing is frequency aliasing. While the reasons for this (Nyquist Theory) is beyond the scope of this manual, it is sufficient to say that care is also taken to ensure that digital signals from the system don't leak out through the audio output.. While not audible, these signals could play havoc with other digital devices further along in the audio chain..
ASIC	Application Specific Integrated Circuit
Aux	Auxiliary Output
Crash	An unfortunate consequence of the digital age, it is a complete system shutdown. This can be due either incorrect software values or faulty hardware. This can be one of the most difficult types of problems to troubleshoot.
D-A	Digital to Analog conversion.
DAC	Digital .to Analog Converter
DRAM	Dynamic Random Access Memory
EPROM	Erasable Programmable Read Only Memory
FX	Effects Generator
GAL	Gate Array Logic
H8	The Hitachi H8/510 microprocessor.
I/O	Input/Output
LFO	Low Frequency Oscillator
MAC	Macintosh computer.
Mapped I/O	A digital circuit type that allows a microprocessor to access external hardware functions through unused memory locations.
MIDI	Musical Instruments Digital Interface. A manufacturer's standard for data communications between different musical instruments types, as well as providing an interface between instruments and computers.
Optical	In this case it is a reference to the Alesis ADAT fiber optic buss. Designed by Alesis for the ADAT Recording System, this interface allows multiple channels of digital audio to be transmitted and received for unparalleled sonic quality. Note that as audio sources, the QS Series only uses a digital optical out.
P4	The current generation of Alesis 35 Watt in line transformers.

PC	Personal Computer generically. IBM style specifically as used here.
PCMCIA	Personal Computer Multi Card Interface Adapter. A manufacturer's standard for computer interfaces. Used by the QS series for RAM and ROM sound cards.
PUP	Power UP
PUP Mute	A circuit which eliminates noise during the power up/down cycle when transients of the outputs can cause damage to equipment further along in the audio chain.
Q8	The latest generation of Alesis Keyboard Synths with an improved PC Serial interface and piano weighted keys
R.F.I.	Radio Frequency Interference
Rail	A positive or negative regulated power supply line.
RAM	Random Access Memory
ROM	Read Only Memory
S4	Alesis' original Rack Mount Version of the QuadraSynth.
S5	Alesis' original QuadraSynth Keyboard.
S6	Alesis' 2nd generation QS Keyboard. Smaller than the S5, it featured better key action and the first direct PC serial connector.
S7	The latest generation of Alesis Keyboard Synths with an improved PC Serial interface.
S8	Also known as the S4+, this significant upgrade added a more extensive sound library, an improved user interface, as well as improved and expanded effects.
S9	Also known as the QuadraSynth+ or S5+, this significant upgrade added a more extensive sound library, an improved user interface, as well as improved and expanded effects.
SG	Sound Generator
SRAM	Static Random Access Memory
Strain Gauge	A method of using changing resistance to electrically measure changing physical pressure.
Sys-Ex	System Exclusive. A method in MIDI for allowing instrument specific information to be stored, manipulated, and retrieved by computer.
VCO	Voltage Controlled Oscillator.
Velocity	A measure of the force used to press a key. Also used to describe the volume of a sound.

11.00 INDEX

V

W

X

12.00 Schematics

Note that some revisions are electrically identical to previous versions. In these cases only the pertinent schematics are provided. Any other changes to the PCBs are outlined in Section 6.00. Component I.D.s immediately follow each schematic.

Table 14 - Schematic Set

Schematic	Revision	# of Pages	Comp I.D.?
S6 Main PCB/A	A	3	Y
S6 Main PCB/B	B	3	Y
QS7/QS8 Main PCB	A	3	Y
QS7/QS8 Main PCB	B	3	Y
QS7/QS8 Main PCB	C	3	N
QS7/QS8 Main PCB	D	3	Y
QS7/QS8 Main PCB	E	3	Y
QS7/QS8 Main PCB	F	3	Y
QSR Main	A	3	Y
S6 Keypad	A	1	Y
S6 Keypad	B	1	N
QS6/7/8 Keypad	C	1	N
QSR Front Panel	X2	1	Y
S6 Slider	A	1	N
S6 Slider	B	1	N
QS7/QS8 Slider	A	1	N
QSR LCD Module	X2	1	Y
QS7/QS8 XFormer	A	1	N
QS7/QS8 XFormer	B	1	N
QS7/QS8 XFormer	C	1	N