

BRC SERVICE MANUAL
January 1, 1994

Revision 2.00

PREFACE

This document is intended to assist the service technician in the operation, maintenance and repair of the BRC master remote control. This unit represents one of the building blocks of the complete ADAT system. Together with the BRC Reference Manual, this document provides a complete description of the functionality and serviceability of the BRC. Any comments or suggestions you may have pertaining to the document are welcome and encouraged.

WARNINGS

TO REDUCE THE RISK OF ELECTRIC SHOCK OR FIRE, DO NOT EXPOSE THIS PRODUCT TO WATER OR MOISTURE.



The arrowhead symbol on a lightning flash inside a triangle is intended to alert the user to the presence of un-insulated "dangerous voltage" within the enclosed product which may be of sufficient magnitude to constitute a risk of electric shock to persons.



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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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.
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4. 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.
5. Foreign Objects and Liquids. Take care not to allow liquids to spill or objects to fall into any openings of the product.
6. Water or Moisture. The product should not be used near any water or in moisture.
7. Heat. Do not place the product near heat sources such as stoves, heat registers, radiators or other heat producing equipment.
8. 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.
9. 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.
10. Cleaning. The product should only be cleaned as the manufacturer recommends.
11. 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.
12. 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.

DOCUMENT REVISIONS

Revision 1	4/5/93	Original Issue
Revision 1.02a	6/3/93	Added information pertaining to troubleshooting as well as additional hardware modifications to the Main PCB.
Revision 1.04	8/6/93	Added further information pertaining to troubleshooting as well as additional hardware modifications to the Main PCB. Updated BRC Software History
Revision 2.0	1/1/94	Revised entire manual. Added BRC QC Test Procedure. Added BRC System Exclusive information.

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1.0 INTRODUCTION

1.1 Scope

This service manual is intended to serve as a primer to assist repair technicians in isolating and correcting problems associated with the BRC Master Remote Control. This service manual includes PCB schematics, PCB comp. IDs., top side pin diagrams for the FPGA and Processor sockets, socket diagrams for the 2 different types of EPROMs (see section 3.6 for explanation), System Exclusive information and a description of the hardware operation of the BRC from a servicing point of view.

1.1.1 Document Conventions

Throughout this service manual, certain conventions are followed in order to make this manual more coherent. LEDs and signal mnemonics are spelled with all capital letters (such as RECORD LED and SLAVECLK) while BRC functions to be performed by the operator are spelled in bold capital letters (such as **PLAY** or **REWIND**).

1.2 BRC Reference Manual

The BRC Reference Manual (Alesis P/N 7-51-1066) is included with every BRC sold. This manual explains the basic operation, features, and applications of the BRC. The manual contains diagrams of both the BRC front panel controls and the rear panel interface. Moreover, the manual contains several connection diagrams for a variety of recording situations. Please refer to this manual when information on the operation or connectivity of the BRC is required.

1.3 BRC Error Messages

Although the BRC's LCD display will indicate various erroneous conditions which may be encountered during normal operation (see section 3.5), the BRC's LED display does not indicate any BRC related error messages during normal operation. However, occasionally the BRC LED display will indicate the message "Er On xx". In these cases, "xx" is the ID number of the ADAT where the error is occurring. When this message is displayed, it is simply informing the operator that the ADAT in question is performing error correction of the data being read off tape. This is a normal condition of the BRC and should not be misconstrued as a problem with the BRC itself.

In situations where the above error message is consistently displayed, it may indicate a problem with either the tape or the ADAT playing the tape. Making a copy of the tape in question may help in identifying the exact cause of the error message. Refer to the BRC reference manual for more details on making digital copies of ADAT tapes.

The BRC includes a self test mode of operation which is intended to aid the service technician in the troubleshooting of BRC related problems as well as the verification of the units various functions. Refer to section 4.2 for details on the self test mode of operation for the BRC.

Finally, BRC software version 1.04 contains a toggle which will deactivate the error message indication on the BRC's LED display. Refer to the latest BRC reference manual for information on this function.

1.4 BRC Sync Cable Requirements

The BRC was initially shipped with a 30 Ft sync cable which connected the BRC to the master ADAT. However, this cable sometimes caused sync problems between the BRC and the master ADAT. It was found that due to the cable's long length, its small wire gauge, and its lack of proper grounding and shielding, "glitches" in the sync signal were being mis-interpreted by the ADAT. To remedy this problem, Alesis now ships every BRC with a more robust sync cable.

The type of sync cable required for proper operation over long lengths must be a 9 wire cable which is shielded and grounded at both ends. The 9 pin D-shell male connector pins at each end of the cable are wired to the same signal. The wire gauge of these new sync cables is 24 AWG. To determine which type of sync cable is the correct one, look at the cable's 9 pin connectors. If the word "Alesis" is stamped on each side of both connectors, then it is of the correct variety. Moreover, if the cable is gray in color and contains the "Alesis" stamp on the connector, it is also of the correct variety. However, if the cable is black in color with no markings on the connector, or if the word "Alesis" is stamped on only one side of each connector, then this cable must be replaced with the current cable (Alesis P/N 4-71-0002).

For cable lengths less than 6 ft. (2 meters), any off-the-shelf 9 pin cable is acceptable for connection between ADATs in a multiple ADAT system.

1.5 List Of Abbreviations

The following is a list of abbreviations to terms used throughout this service manual.

Abbreviation	Definition	Abbreviation	Definition
A	Amps (unit of current)	LED	Light Emitting Diode
AC	Alternating Current	LRC	Little Remote Control
ADAT	Alesis Digital Audio Tape	MHz	Mega Hertz (1,000,000 Hz)
ASIC	Application Specific Integrated Circuit	MIDI	Musical Instrument Digital Interface
AWG	American Wire Gauge	MMC	MIDI Machine Code
BRC	Big Remote Control	MTC	MIDI Time Code
CD	Compact Disc	OSC	Oscillator
DAT	Digital Audio Tape	PCB	Printed Circuit Board
dB	Decibel	PLCC	Plastic Leaded Chip Carrier
DC	Direct Current	QC	Quality Control
DRAM	Dynamic Random Access Memory	RAM	Random Access Memory
EMI	Electromagnetic Interference	RMB	Remote Meter Bridge
EQ	Equalization	ROM	Read Only Memory
EPROM	Erasable Programmable Read Only Memory	SMPTE	Society of Motion Picture and Television Engineers
ESD	Electrostatic Sensitive Device	SRAM	Static Random Access Memory
FPGA	Field Programmable Gate Array	S/W	Software
GND	Ground	µs	Microseconds (1/1,000,000 sec)
H/W	Hardware	V	Volt (unit of voltage)
Hz	Hertz (unit of Frequency)	VCO	Voltage Controlled Oscillator
IC	Integrated Circuit	W	Watt (unit of power)

2.0 BRC BUILDING BLOCKS

Within the BRC is a power supply, the Main PCB, and four Front Panel PCBs. The Main PCB connects to the various Front Panel PCBs via ribbon cables. Each front panel PCB has its own name and schematic (see Appendix A). The front panel PCBs are identified as follows: Left PCB, Right PCB, Keypad PCB and 7-Segment PCB. A description of each BRC building block is presented in the following sections

2.1 BRC Power Supply

The power supply is a switching power supply that outputs 5 VDC to the main PCB. A copy of the schematic is provided in Appendix A. However, there are no serviceable parts within this supply. Alesis purchases this supply off-the-shelf from an outside vendor. If there is a problem with the power supply, it is usually less time consuming to replace the whole power supply.

CAUTION: HIGH VOLTAGE. AVOID TOUCHING THE POWER SUPPLY WHEN THE UNIT IS ON.

2.2 Front Panel PCBs

The four front panel PCBs are essentially a series of LEDs and switches. The controller for the Front Panel PCBs is on the Main PCB and all of the LEDs, diodes, and switches are shown on the front panel PCB schematics. Refer to section 3.4 for details on troubleshooting these PCBs. Refer to Appendix A for schematic information on these PCBs.

2.3 Main PCB

The Main PCB contains all of the connectors and electronics needed to operate the BRC. At the heart of the BRC are the three software chips: the Hitachi H8/534 microprocessor (U10), the Field Programmable Gate Array (U11), and the EPROM (U9). Refer to Appendix A more information on the wiring of these chips.

The Hitachi H8/534 microprocessor controls all the functions of the BRC including communication to and from the ADATs, LED multiplexing, switch scanning, and user software interface. It stores, receives, and generates the functions for BRC operation and uses the FPGA to execute all required logic. Additionally, the Field Programmable Gate Array (FPGA) replaces several logic chips with one customized logic chip. It is programmed once to control the logic within the BRC. Finally the EPROM provides the software for the operation of the BRC.

The basis for the BRC's synchronization is its 4.8 MHz VCO which goes straight into the FPGA. Most frequencies generated by the BRC are achieved by frequency division of the VCO by the FPGA with the functions defined by the microprocessor.

2.3.1 VCO Circuit

The VCO, which can be found by probing the FPGA at pin 43, is a 4.8 MHz square wave generator from which other frequencies are produced within the BRC by division within the FPGA. A 250 Hz pulse, routed through the control logic, biases the gate of an FET that prescribes a control voltage which sets the VCO's frequency. This creates a 4.8 MHz sinusoid at the anode of the varicap, D12, in the tank circuit to drive the HCU04 amplifiers.

The 4053's in the VCO are used to lock the VCO to internal and external clock sources, thus syncing all the other clocks. With the FPGA affecting the timing of the signal SLAVECLK (one of the 4053's controls) and with the H8/534 microprocessor affecting the signal FAST/SLOW (the other 4053's control), the timing of the signal PCOUT, which pulses the gate of the FET, can be affected. This allows the BRC to quickly lock its VCO to the incoming SMPTE clock.

2.3.2 10 MHZ Timer

The 10 MHZ timer (pin 3 of the H8/534 microprocessor) is used to help read the SMPTE data. The basis for this clock is the 20 MHz crystal across pins 1 and 84 of the microprocessor. If there is a problem in reading the SMPTE data, verify the 10 MHz's frequency. If the frequency is 10 MHZ, then check the VCO circuit.

2.3.3 ADAT Synchronization

All ADAT syncing is done through the SYNC OUT circuit. The ADAT interfaces to the BRC via the 9 pin Sync Out connector. Synchronization is achieved when the ADAT locks onto the 48 KHZ signal being fed from the BRC through pin 26 of U11. The signal TCOUT provides all time code information to the ADAT via pin 8 of J10. All communication from the ADAT, as well as information about the ADAT's current location and mode of operation, is received through the signal line RXD2, which runs from pins 2 and 6 of J10, through opto-isolator U12, to pin 78 on U10. Finally, all information to the ADAT, with the exception of the time code information, is transmitted through the signal line TXD2, which runs from pin 77 of U10, through 2 inverters (U15E and U14F), and finally out through pin 9 of J10.

Since the ADATs also uses opto-isolators as part of its sync input circuit, the BRC sends out three 5V DC references through connector J10, pins 3, 4, and 5. These voltages feed the opto-isolators within the ADAT for the signals 48 KHZ, TCOUT, and TXD2, respectively.

2.3.4 SMPTE Interface

Everything related to SMPTE time code within the BRC is processed by the H8/534 microprocessor using the FPGA. There are only direct traces between the FPGA and the H8/534. If a problem with SMPTE is suspected within the BRC, and an input SMPTE signal is being fed into pin 50 of the FPGA, and if the SMPTE circuitry appears to work, then problem is either in the FPGA, H8/534, the traces between the two devices, and/or the VCO circuit.

There are three signals associated with the SMPTE circuit: SMPTE LEV, SMPTE OUT, and SMPTE ON/OFF. The signal SMPTE LEV, which can be monitored from pin 5 of U10, sets the level of the SMPTE OUT. When utilizing the +4 dBu mode, the signal SMPTE LEV is a tri-state signal, whose output level is 2.5V peak to peak. If the -10 dBV mode is being implemented, the output of SMPTE LEV is 633 mV peak to peak. The signal SMPTE OUT can be found on pin 9 of U11 and represents all SMPTE output data. Finally, the signal SMPTE ON/OFF, which is found on pin 76 of U10, will turn the SMPTE output off by going low.

For more information on setting up SMPTE within the BRC, consult the latest version of the BRC Reference Manual.

2.3.5 Video Interface

Video synchronization is achieved through BNC connector J13. The signal fed into the BRC from this connector is called VIDEO IN. This signal then feeds a circuit which is used to extract a vertical sync signal. The output of this circuit is the signal VIDEO, which then is fed into the FPGA at pin 29.

2.3.6 48 KHZ Interface

In order to sync the BRC to an external 48 KHZ source, BNC connector J15 is utilized. The signal input to the BRC is called EXT CLK* and is fed into the FPGA through pin 44.

2.3.7 MIDI Interface

MIDI Input and Output circuitry is similar to that of ADAT syncing. The MIDI signal is input to the BRC at MIDI connector J12, fed through opto-isolator U13, and in to the microprocessor via pin 81. Likewise, MIDI out is transmitted from pin 80 of U10, through 2 inverters (U15C and U14C), to the MIDI connector J11.

2.3.8 Main PCB Component Orientation

There is a uniform orientation of most components on the main PCB. Additionally, the orientation for each component is outlined on the PCB itself, within the silk screen, Therefore, in addition to having all the transistors facing the same direction, their outline is also silk screened on the PCB.

3.0 BRC REPAIR

The following paragraphs represent some of the more common BRC related problems as well as recommended solutions. To assist the service technician in the troubleshooting and repair of the BRC, the pinout information for the EPROM, Processor and FPGA is depicted in figures 3-4, 3-5 and 3-6. Furthermore, schematics and comp ID's for all of the PCBs within the BRC are provided in Appendix A of this service manual.

3.1 BRC Assembly and Disassembly

The BRC is made up of a bottom case which houses the Main PCB and a front panel assembly which houses all of the buttons, switches and front panel PCBs. When assembling or disassembling the BRC, refer to figure 3-1 for a pictorial representation of the text that follows. Note that prior to opening the BRC, you may first have to remove the Alesis Remote Meter Bridge (RMB) which attaches to the BRC via 4 screws. These screws are located on the sides of the BRC and are used to fasten a sheet metal piece from the RMB to the BRC.

If the BRC is fully assembled, you need to remove the black plastic panels which are mounted around the perimeter of the BRC. To do this, you will need a size 10-24 hex driver. Note that the hex screws which mount the top and bottom plastic panels to the BRC are shorter than those used to mount the side panels. When re-assembling these pieces, pay attention to insert the correct size screw into the correct panel. If the longer screws are used to mount the top or bottom plastic panels, there is a chance that damage to the Main PCB will be incurred.

After the plastic panels are removed, the rack ears mounted to each side of the BRC will have to be removed. A simple Phillips head screwdriver will do the job. Finally, remove the 12 Phillips head screws from the front and back of the unit. These screws are located under the front panel assembly at each end of the unit.

To open the BRC, grab the front panel in the back of the unit and slightly separate it from the bottom case. You can then open the unit by lifting the front panel from the rear while pivoting the front panel against the bottom case in the front as depicted in Figure 3-1. Once the unit is open, you will notice the seven ribbon cables which connect the various front panel PCBs to the Main PCB. Whenever possible, disconnect these cables from the Main PCB and then remove the front panel assembly away from the unit.

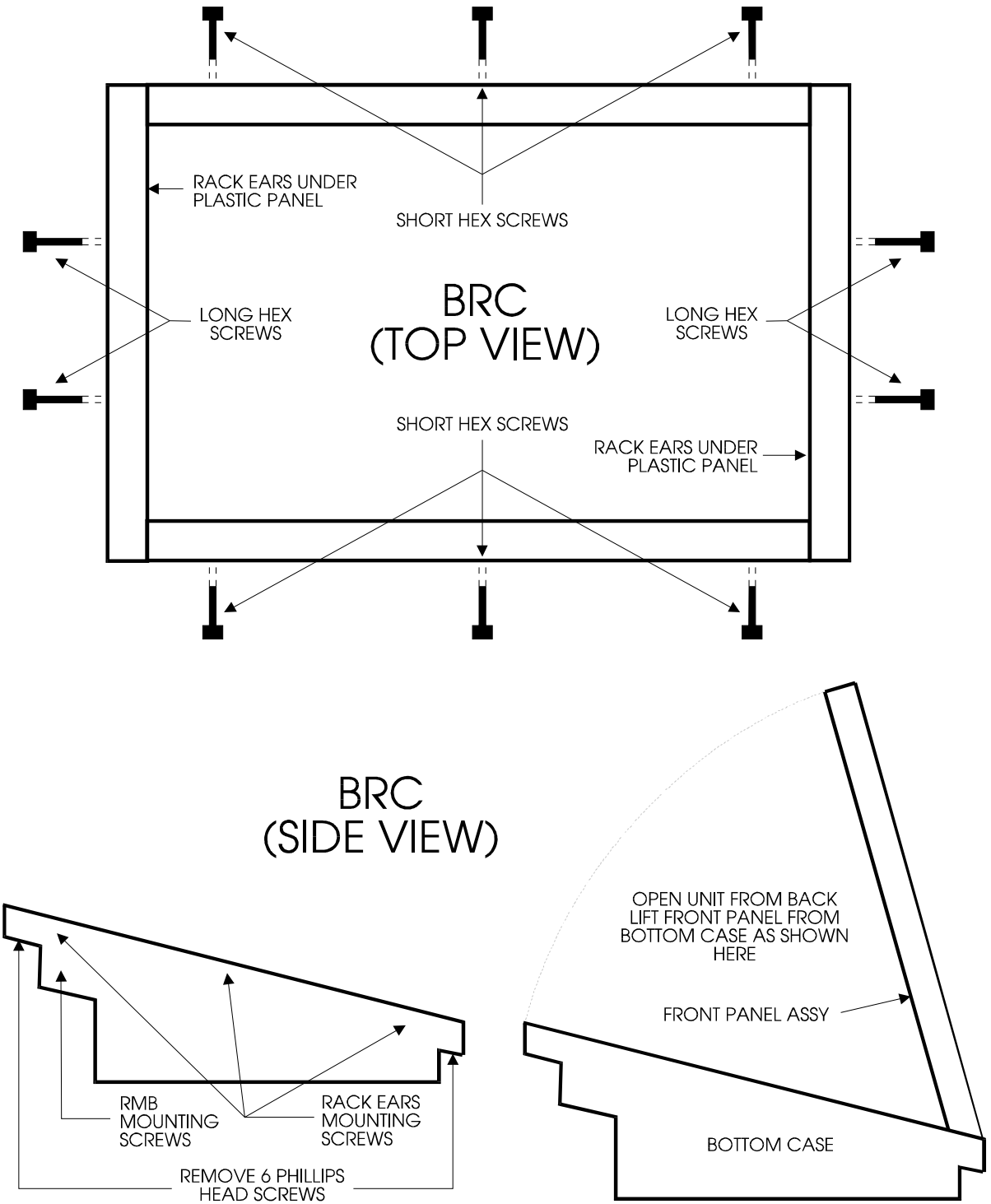
3.2 Removal of the Front Panel PCBs

To gain access to the various front panel PCBs, simply unscrew the 8 Phillips head screws on the front and back of the front panel assembly. Then turn the front panel assembly over so the buttons and switches are facing down. Finally, remove the back plate to expose the PCBs.

All of the front panel PCBs are placed in the front panel assembly either by thread forming screws (as is the case with the Switch PCB), snapping in, or a combination of both (as is the case with the LCD Display PCB). If any one of the front panel PCBs that snaps in needs to be removed, perform the steps listed below to accomplish this task.

1. Disconnect the appropriate ribbon cable from the PCB requiring removal.
2. Remove any buttons, switches, and/or light pipes that may be in the way.
3. Pull the PCB up off the positioning tabs. These are the tabs without hooks.
4. Push the lower edge of the PCB towards the top edge of the PCB and snap the PCB out.
5. Reverse the procedure to re-install the PCB.

Figure 3-1 - BRC Assembly and Disassembly



DRAWINGS NOT TO SCALE

3.3 BRC Internal Cabling

All the of the PCBs connect to the Main PCB with ribbon cables. The number of wires in each cable depends on the PCB. For all ribbon cables except the one which connect the LCD PCB to the Main PCB, the red striped wire corresponds to pin 1 of the associated connector. Table 3.1 depicts the interconnectivity between the various Front Panel PCBs and the Main PCB.

TABLE 3.1 - BRC RIBBON CABLE INTERCONNECTION

FROM		TO		CONNECTOR
CONNECTOR	PCB	CONNECTOR	PCB	TYPE
J1	Main	J101	Left PCB (LEDs)	24 Pin DIL
J2	Main	J102	7-Segment PCB	20 Pin DIL
J3	Main	J103	Right PCB (LEDs)	14 Pin DIL
J4	Main	J104	Left PCB (Switches)	16 Pin DIL
J5	Main	J105	Keypad PCB	10 Pin DIL
J6	Main	J106	Right PCB (Switches)	12 Pin DIL
J7	Main	J107	Switch PCB	12 Pin DIL
J9	Main	None	LCD PCB	14 Pin DIL
Note 1: For LCD PCB, Align red stripe of ribbon cable toward the top of the Sub Panel				
Note 2: On some units, the ribbon cables connecting to the main PCB at J6 and J7 were mounted in the reverse orientation (red wire of the ribbon cable going to pin 12 instead of pin 1). For these units, the ribbon cables must be connected to J106 and J107 in the reverse orientation as well.				

3.4 Front Panel Troubleshooting

The most common problems related to the front panels are bad diodes and LEDs. If a switch doesn't work, check its diode, the traces for that row and column, as well as the connections. When replacing a diode and/or LED, check the orientation of the other diodes and/or LEDs in the appropriate rows and columns to ensure proper installation.

3.4.1 Front Panel PCB LEDs

All of the LEDs used in the BRC Front Panel PCBs are arrayed in a 13 column x 16 row matrix. When the BRC enables a specific column, it will send a signal to flip flops U3 and/or U4 to turn on the transistor of the specific column desired. The enabling of the transistor pulls up that specific column from ground to 5V, which is the anode of each of the LEDs in that column.

Likewise, when the BRC enables a specific row, it will send a signal to flip flops U1 and/or U2 to turn on the transistor of the specific row desired. The enabling of the transistor pulls down that specific row from 5V to ground, which is the cathode of each of the LEDs in that row.

By enabling a specific row and column in the manner described above, a specific LED will be selected and turned on. Note that the service technician must enable both a row and a column simultaneously in order to light a specific LED.

The matrix has been divided on the schematics by PCB to better represent the actual layout. If there is a problem with the matrix, the problem will either show up as multiple LEDs not lighting on one board, or more likely, on several boards. By determining which column or row is affected on one of the Front Panel PCBs, this column or row can be found on other front panel PCBs as well as the Main PCB.

3.4.2 Front Panel PCB Switches


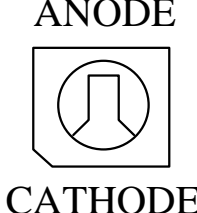
The switches are arrayed in a 14 column x 8 row matrix. In a similar manner to the method described for the LEDs, the processor uses U5 and U7 (both HC574 flip flops) to scan each of the columns for a depressed switch by pulling a low on one column at a time. When a switch is pressed in a column that is low, it creates a current on that specific row, causing that row (normally high) to pull low. By sensing which row and column are both low, the processor determines which switch has been depressed.

As an example, Pin 19 of U5 is low. The **RECORD 1** switch is depressed which causes current to flow through the 4.7K resistor which pulls the voltage on that row down (approximately 0.7V), which is pin 9 of U6. Since the processor senses that pin 19 of U5 is low (the specific column) and it just sensed that pin 9 of U6 is low (the specific row), the processor determines that the **RECORD 1** switch was depressed.

As is the case with the LEDs, the service technician must enable both a row and a column simultaneously in order to activate a specific switch. Moreover, the switch matrix has been divided on the schematics by PCB. By determining which column or row is effected on one front panel PCB, this column or row can be found on other front panel PCBs as well as the main PCB.

3.4.3 Orientation of the Diodes and the LEDs

All the diodes are oriented the same on each of the front panel PCBs: Anode on the left and cathode on the right as shown in Figure 3-2. Likewise, all the surface mount LEDs are oriented the same on each of the front panel PCBs: Anode on top and cathode on the bottom as depicted in Figure 3-3.

 <p>Figure 3-2 - Diode Orientation Within the BRC</p>	 <p>Figure 3-3 - LED Orientation Within the BRC</p>
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3.5 Main PCB Troubleshooting

Aside from improperly programmed ICs, most of the problems incurred with the BRC electronics have been related to workmanship. Prior to beginning any in depth troubleshooting of the Main PCB, check for loose or improperly connected cables. Next, check the workmanship of the soldered components. Finally, check the affected part of the PCB for improper contacts, excess solder or flux, and the like. If none of these steps renders a solution to the current problem, replace ICs U10, U11 and U9, one at a time to verify that the chips have been programmed properly.

During the course of development of the BRC, Alesis has found two types of symptoms which indicate specific problems. These are listed below:

1. Basic functions are not working properly: In this scenario, the first things that should be checked are the voltage of the battery and the voltage at U8, pin 32. Check both of these voltages with power off. If the RAM chip U8 isn't supplied with enough voltage when the unit off, then the BRC could lose some of the data stored in RAM relating to the basic operating functions. This problem would also manifest itself as losing memory, or parts of memory, when the unit is powered off.
2. ADATs improperly ID: This would normally manifest itself in two ways: either the ADATs ID themselves with incorrect ID numbers, or the ADATs constantly re-ID themselves. Both of these conditions indicate that the ADATs are having problems locking onto the 48 KHZ sync clock signal coming from the BRC. Whenever this scenario occurs, check the four areas listed below for potential problems.
 1. VCO: This is the clock that the 48 KHZ clock is derived from. From hardware mods described in Appendix B, C57 has been added to the Revision 1 BRC Main PCB. Because of this modification, the 5V DC leg of this newly installed cap is in close proximity to pin 13 of U18, which is the input to one of the output inverters for the VCO. Excess solder or improperly cut leads could short this pin to 5V, effectively killing the VCO and the 48 KHZ line as well. Likewise, if C57 is improperly soldered, it could come loose and make temporary contact with pin 13 of U18, which will result in distortion of the VCO. Finally, if C57 is bent over U18, it could also cause distortion of the output of the VCO. If any of the items mentioned above appear on the Main PCB in question, re-solder C57 in accordance with Appendix B, clean away any excess solder, visually inspect the C57 lead proximity to U18, and orient C57 away from U18. This modification has been incorporated onto the new Revision 2 BRC Main PCB layout.
 2. 48 KHZ output to ADAT: This problem deals with the 48 KHz output at pin 7 of connector J10. R84 is 48 KHz and R83 is its 5V reference to the ADAT's optoisolator circuit (see section 2.3.3). With an ADAT connected, check for a slight voltage drop across R83, and check R84 for the proper signal. Verify that both resistors are properly inserted and soldered on the board. Also, verify that there isn't continuity between the resistors.
 3. DB9 output connector J10: Check for improper connections, pins not soldered, damage to the connector, and the like.
 4. Cable between BRC and first ADAT: If this isn't an Alesis approved cable (see section 1.4), problems could result. Alesis Product Support should have verified with the customer the type of cable being used prior to issuing the Repair Authorization (RA), and therefore it is unlikely that the cable is the problem. However, if this is in question, contact Alesis Product Support.

Finally, there is the problem of BRCs intermittently resetting. The symptoms of this problem are similar to those relating to BRCs improperly IDing. However, in this case, the BRC will continue to cycle power every so often. That is, the BRC LCD back light will dim momentarily. If the LCD display does not dim, then the problem is probably related to one of the above items.

For BRCs that intermittently reset, there is no concrete solution other than replacing the power supply. However, this solution does not always work. If you have a unit which is exhibiting this symptom and it cannot be resolved with a new power supply, contact Alesis Product Support so that this unit can be replaced.

3.5.1 VCO Circuit Troubleshooting

If this circuit doesn't work properly, the VCO might be slightly off. This will result in syncing problems, especially when trying to sync to SMPTE. Since the VCO is the basis for all the clocks in the BRC, which, in turn, is the basis for all the syncing, this is the first place to look for a problem. Note: If there are problems with syncing to SMPTE and the VCO is suspected, check the components and solder connections to make sure that they are all in good working order.

3.6 BRC Software Upgrades

Note that when the BRC software is to be upgraded, it is necessary to verify the microprocessor, FPGA and EPROM compatibility prior to the upgrade. Refer to Table 3.2 for the compatibility chart of the various software versions of these devices. To determine which version of software is currently installed in the BRC, press the MIDI\UTIL button repeatedly until the LCD displays the software version.

Furthermore, the microprocessor and EPROM chips can be re-programmed for re-use in the BRC. Therefore, when old versions of these devices are removed from the BRC, they should be returned to Alesis for updating. However, the FPGA chip is programmed only once and cannot be re-programmed. If the FPGA requires upgrading, the older version is no longer useful and can be thrown away.

Finally, note that earlier versions of BRC software utilized a 28 pin 27C512 EPROM. Installation of this chip in the 32 pin socket for U9 was accomplished by seating the EPROM in the lower 28 pins of the socket. With the current software, however, the required EPROM is a 1 Meg, 32 pin 27C010 device.

3.7 Error Messages

Error messages from the LCD display are typically a result of memory problems. In these cases, the SRAM chip U8 is not holding some of the basic operating instructions that were stored during the last reset. If this problem occurs:

1. Check the battery.
2. Check U8, pin 32 with unit off. Voltage should be equal to or greater than 2.5V DC.
3. Check D2

If the voltage at pin 32 of U8 is less than the value listed in step 2, the battery will need to be replaced. However, if the battery is replaced and the voltage at U8 pin 32 is still less than 2.5V DC, check diode D2. A bad diode D2 will drain the battery prematurely.

Note that if the LED displays the message "Er on xx" where xx is the ID number of the ADAT where the error is occurring, refer to section 1.3 for more information on this type of error message.

TABLE 3.2 - SOFTWARE COMPATIBILITY CHART

Software Revision	EPROM (U9)	FPGA (U10)	Processor (U11)
1.00	27C512	Rev 0 (1.00)	1.00
1.01	27C512	Rev 1 (1.01)	1.00
1.02	27C512	Rev 2 (1.02)	1.01
1.03	27C010	Rev 2 (1.02)	1.01
1.04	27C010	Rev 3	1.02

FPGA Version 1.02 adds a one-shot to the video input circuit to filter out possible multiple transitions from the video sync separator when the video input signal is less than perfect. This version of the FPGA can be replaced in any BRC independent of other hardware or software changes for improvement in video synchronization.

Figure 3-4 - Pinout Diagram of EPROM Chip (U9)

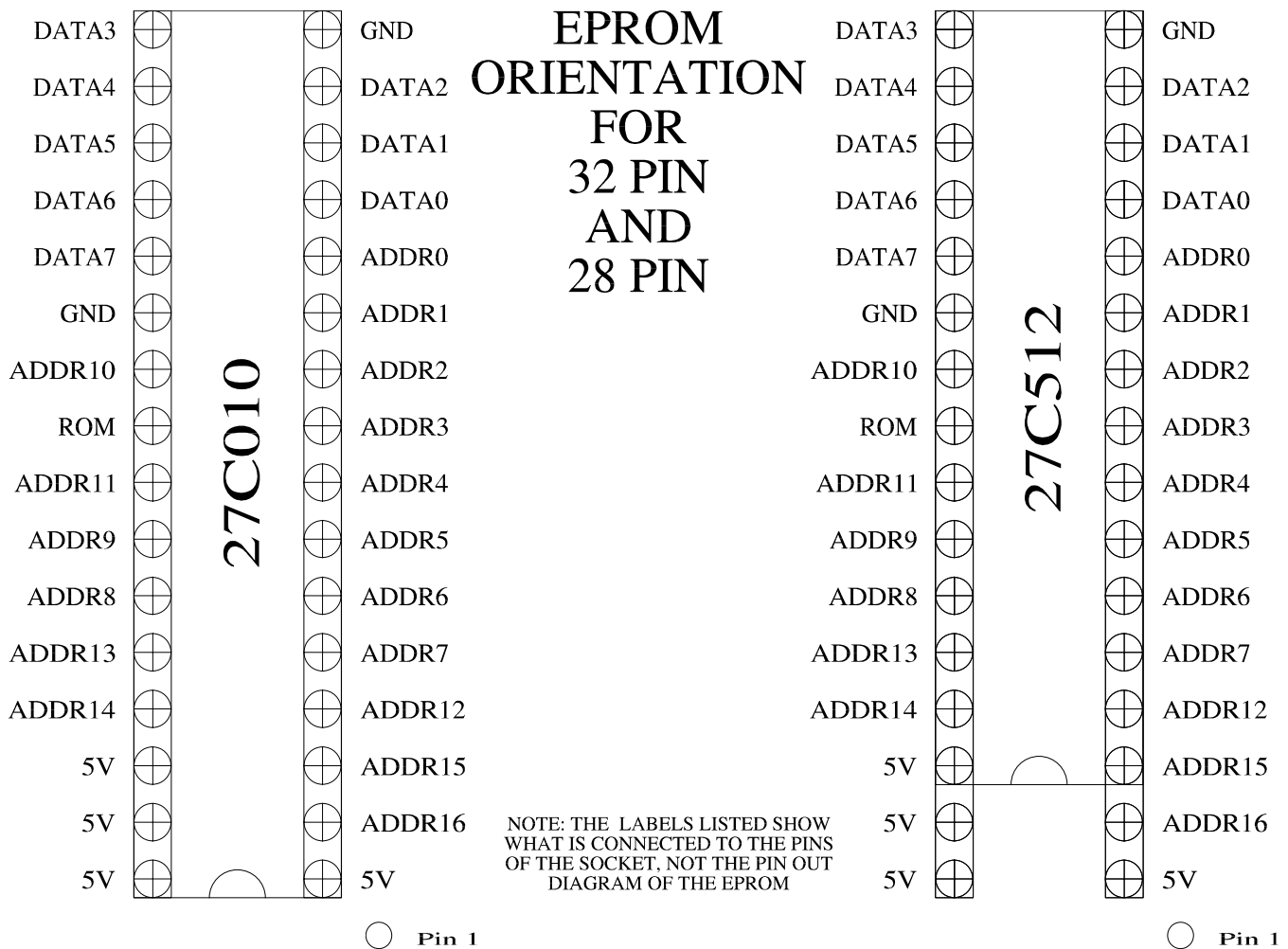


Figure 3-5 - Pinout Diagram of Processor Chip (U10)

	D7 P3.7 32	D5 P3.5 30	D3 P3.3 28	D1 P3.1 26	GND 24	+5V NMI 22	+5V STBY 20	MD1 18	+5V Vcc 16	RDN P2.3 14	NC P2.1 12	
A0 P4.0 33	A1 P4.1 34	D6 P3.6 31	D4 P3.4 29	D2 P3.2 27	D0 P3.0 25	NC NC 23	RESETN RST 21	+5V MD2 19	MD0 17	WRN P2.4 15	NC P2.2 13	ASN P2.0 11
A2 P4.2 35	A3 P4.3 36	<p style="text-align: center;">BRC PROCESSOR</p> <p style="text-align: center;">HD6475348CP</p> <p style="text-align: center;">05-17-93</p>									SMPTE GATE P1.7 10	SMPTE IN INT P1.6 9
A4 P4.4 37	A5 P4.5 38										TINT P1.5 8	WAITN P1.4 7
A6 P4.6 39	A7 P4.7 40										SDATA P1.3 6	SMPTE LEV P1.2 5
GND 41	GND 42										NC P1.1 4	10MHz P1.0 3
A8 P5.0 43	A9 P5.1 44										GND 2	20MHz XTAL 1
A10 P5.2 45	A11 P5.3 46										20MHz EXTAL 84	GND 83
A12 P5.4 47	A13 P5.5 48										NC P9.7 82	RXD1 P9.6 81
A14 P5.6 49	A15 P5.7 50										TXD1 P9.5 80	LCD ANGLE P9.4 79
A16 P6.0 51	A17 P6.1 52										RXD2 P9.3 78	TXD2 P9.2 77
A18 P6.2 53	+5V Vcc 55										SMPTE CLK P7.1 57	SMPTE RES P7.3 59
	SMPTE OUT INT P6.3 54	MASTCLK P7.0 56	48KHz P7.2 58	FAST SLOW P7.4 60	VCO TRACK P7.6 62	GND 64	LOCATE An0 66	NC An2 68	NC An4 70	NC An6 72	An+5V AnVcc 74	

Figure 3-6 - Pinout Diagram of FPGA Chip (U11)

		48KHz	SDATA	SWC0	WRN	A1	SMPTE OUT INT	14	LEDC0	A0	
		26	24	22	20	18	16		12	10	
RDN	NC	+5V	48KHz	+5V	LEDRI	LEDC1			LEDRO	TINT	SMPTE OUT
27	28	25	23	21	19	17	15	13	11	9	
VIDEO	D7	BRC FPGA TPC1010AFN-068C ► 10-19-92								TCOUT	D6
29	30									8	7
A2										D1	SWC1
31	32									6	5
NC	D4									+5V	D0
33	34									4	3
D3	A14									D5	SLAVE CLK
35	36									2	1
INT CLK	+5V	D2	MASTCLK								
37	38	68	67								
A18	A17		LCD								
39	40	66	65								
SWTCHS	SMPTE GATE	SMPTE CLK	SMPTE IN INT								
41	42	64	63								
VCO	NC	NC		10MHz	WAITN	+5V		NC	SMPTE RES	RAM	
43	45	47	49	51	53	55	57	59	62	61	
	EXT CLK	NC	PCout	SMPTE	ASN			NC	ROM		
	44	46	48	50	52	54	56	58	60		

4.0 BRC TESTING

Every BRC under repair must be fully tested prior to its shipment back to the customer. Appendix E contains the test procedure which should be conducted on every BRC serviced. Furthermore, within the BRC software are a number of self test routines which can be implemented to aid in determining various problems with the unit. A description of these test routines is listed in the following sections.

4.1 BRC Initialization

Prior to testing, the BRC must set up its RAM. This is accomplished by resetting the unit. Pressing **PLAY** and **RECORD** simultaneously during power up performs a reset of the BRC. For software versions equal to or greater than V1.04, the message "**Initialization in Progress**" will be shown on the LCD display to inform the operator that the BRC is resetting. During initialization, the BRC will reset all song and locate points to their default names and time references.

After initialization is complete, this set up is stored in RAM and these default settings will remain in RAM even after power off due to a 3V battery supplying power to the chip. All BRCs should be reset whenever software is upgraded, and it is also a good method of removing unwanted song and location data after this data has been saved to the ADAT tape. Refer to the BRC reference manual for information on loading and storing BRC data from/to ADAT tapes.

4.2 BRC Self Test Routines

There are two ways to execute the BRC self test routines. Pressing **RECORD ENABLE 1** and **RECORD ENABLE 7** simultaneously during power up will put the service technician into the manual self test mode. While in this mode, the operator can skip to any test by pressing the appropriate test number on the keypad. The test number and the test name will be displayed on the LCD display. To execute the test, simply press **AUTO PLAY**. To exit the test, if it does not do so automatically, press **PITCH ♪** and **PITCH ♫** simultaneously.

On the other hand, pressing **RECORD ENABLE 1** and **RECORD ENABLE 8** simultaneously during power up will put the service technician into the automatic self test mode. While in this mode, the BRC will automatically execute each test sequentially, starting with test 0. As soon as it exits the present test, it will move on to the next one. However, for some tests (such as the "Switches" test), the operator will be required to press both **PITCH ♪** and **PITCH ♫** simultaneously in order to have the BRC continue to the next test routine in the sequence.

A description of each self test routine within the BRC is listed in Table 4.1.

TABLE 4.1 - BRC SELF TESTS

Test No.	Test Name	Description of Test
0	ROM Test	Tests BRC ROM integrity. If this test passes, the LCD will display PASSED and it will exit this test automatically. However, if the unit fails this test, the LCD will display FAILED and won't exit the test until the operator presses both PITCH ♪ and PITCH ♫ simultaneously.
1	RAM Test	Tests BRC RAM integrity. If this test passes, the LCD will display PASSED and it will exit this test automatically. However, if the unit fails this test, the LCD will display FAILED and won't exit the test until the operator presses both PITCH ♪ and PITCH ♫ simultaneously.
2	LEDs (Block)	Tests BRC LEDs. During this test, the BRC will light up all the LEDs in groups. After each group of LEDs has been lit, the BRC will exit this test automatically.
3	LEDs (Cycle)	Tests BRC LEDs. During this test, the BRC will light up each LED individually. After each individual LED has been lit, the BRC will exit this test automatically.
4	Switches	Tests BRC Switches and Buttons. During this test, each button pressed will cause the LCD to display the appropriate switch name. All of the switches should be pressed prior to exiting this test. If not, the LCD will display the message NOT ALL TESTED and the operator will then need to press the missed button (it might be easier to just try and press them all again). To exit this test at any time, press both PITCH ♪ and PITCH ♫ simultaneously. Note that this test can be exited even if all of the buttons have not been pressed. Simply press PITCH ♪ and PITCH ♫ simultaneously, and when the LCD displays NOT ALL TESTED , press PITCH ♪ and PITCH ♫ simultaneously a second time to exit the test.
5	LRC	Tests BRC interface to LRC. This test requires the operator to plug an LRC into either one of the footswitch jacks on the back of the BRC. If the LRC is not plugged in, the LCD will display UNPLUGGED . If the LRC is plugged into the LOCATE/PLAY jack on the back of the BRC, the LCD will display Footswitch 1: 01 . Likewise, if the LRC is plugged into the PUNCH IN/OUT jack on the back of the BRC, the LCD will display Footswitch 2: 01 . To exit this test at any time, press PITCH ♪ and PITCH ♫ simultaneously.
6	MIDI In/Out	Tests BRC MIDI functionality. To conduct this test, the operator must connect a MIDI cable from the MIDI input jack to the MIDI output jack on the back of the BRC. During this test, the BRC will send a MIDI signal from the MIDI output jack while checking for a MIDI signal on the MIDI input jack. If the unit passes this test, the LCD will display PASSED and the BRC will exit this test automatically. However, if the unit fails this test, the LCD will display FAILED and the operator will have to press PITCH ♪ and PITCH ♫ simultaneously to exit this test.

TABLE 4.1 - BRC SELF TESTS (Cont'd)

Test No.	Test Name	Description of Test
7	48 KHz In/Out	Tests BRC 48 KHz functionality. To conduct this test, the operator must connect a BNC cable from the 48 KHz input jack to the 48 KHz output jack on the back of the BRC. During this test, the BRC will send a 48 KHz signal from the 48 KHz output jack while checking for a 48 KHz signal on the 48 KHz input jack. If the unit passes this test, the LCD will display PASSED and the BRC will exit this test automatically. However, if the unit fails this test, the LCD will display FAILED and the operator will have to press PITCH Ⓢ and PITCH Ⓡ simultaneously to exit this test.
8	Video Input	Tests BRC Video Input Port. To conduct this test, the operator must connect a VCR to the BRC via the VIDEO SYNC IN jack on the back of the BRC. During this test, the BRC is checking for the presence of a video signal on the VIDEO SYNC IN jack. Some VCRs constantly output a video signal. However, if this is not the case with the VCR being used during this test, simply insert a tape with a video signal into the VCR and press PLAY . Depending on the type of video signal present, the LCD will display the appropriate message. For NTSC video signals, the LCD displays NTSC Input . For PAL or SECAM video signals, the LCD will display PAL/SECAM input . To exit this test at any time, press PITCH Ⓢ and PITCH Ⓡ simultaneously.
9	SMPTE In/Out	Tests BRC SMPTE functionality. To conduct this test, the operator must connect a 1/4 inch cable from the SMPTE input jack to the SMPTE output jack on the back of the BRC. During this test, the BRC will send SMPTE time code from the SMPTE output jack while checking for SMPTE time code on the SMPTE input jack. If the LED display is counting time code, the BRC passes this test. However, if no time code is displayed, the BRC fails this test. To exit this test at any time, press PITCH Ⓢ and PITCH Ⓡ simultaneously.

4.3 QC Test Procedure

Appendix E contains the test procedure which must be performed on every BRC serviced in the field. This test allows the service technician to verify that the unit is working to the highest level of quality. The test includes a check of the sync interface to the ADAT, as well as all of the major functions of the BRC. This test procedure should be conducted only after all repairs on the unit have been completed.

The QC Test Procedure is written in a step by step, comprehensive manner. It should be conducted in the order written. All test equipment requirements, hook up and settings are described in the text. If there are no severe difficulties with the BRC, then this test should take the service technician approximately 15 to complete. If problems occur with the unit during the conduct of this test, please consult section 3 of this service manual for assistance in resolving said problems.

5.0 BRC SYSTEM EXCLUSIVE INFORMATION

The first release of the BRC System Exclusive information is dated August 31, 1993. This document has been reprinted here for service center personnel to assist in helping BRC users with MIDI and System Exclusive problems and questions.

5.1 Alesis BRC System Exclusive

In addition to MIDI Machine Control (MMC) commands, the BRC also responds to and sends out Alesis system exclusive commands to access functions that are not addressed by MMC commands. The BRC has the following MIDI System Exclusive format:

F0H	Start-of-Exclusive
00H 00H 0EH	Alesis manufacturer ID
09H	BRC product ID
aaH	Device id# (0..7EH, 7FH=all)
bbH	Opcode (0..7FH)
data	Data
F7H	End-of-Exclusive

5.1.1 Opcodes

The following opcodes are used in this document:

- Items in parentheses { } can be repeated multiple times.
- Items in square brackets [] are optional, depending upon preceding info.

5.1.2 Global Parameter Edit Commands

50H - TOGGLE GLOBAL PARAMETER

F0H 00H 00H 0EH 09H <dev#> **50H** {<param> <data>} F7H

<data> - 0=Off, 7FH=On for all parameters

Parameters:

- 00 Auto Punch**
- 01 Pre Roll**
- 02 Post Roll**
- 03 Digital I/O**
- 04 Auto Play**
- 05 Rehearse**
- 06 Auto Input**
- 07 All Safe**
- 08 All Input**

51H - EDIT GLOBAL PARAMETER

F0H 00H 00H 0EH 09H <dev#> **51H** {<param> <data>} F7H

Parameters:

- 01 Pre Roll Time**
<data> - 0..200 (0..C8H) cents represented as 2 bytes*
0000000a 0bbbbbbb a=bit7, 0bbbbbbb=bit6..0
- 02 Post Roll Time**

- <data> - 0..200 (0..C8H) cents represented as 2 bytes*
 0000000a 0bbbbbbb a=bit7, 0bbbbbbb=bit6..0
 * Pre/post-roll time is in tenths of a second (range = 0.0 to 20.0 seconds)
- 03 Display Type**
 <data> - 0000bsna
 (b=bars, s=SMPTE, n=normal, a=absolute/relative)
- 04 SMPTE Type**
 <data> - 0=24 fps, 1=25 fps, 2=29.97 fps, 3=29.97DF, 4=30 fps, 5=30DF
- 05 AI-1 Dest/Clock**
 <data> - 0000 baaa
 aaaa = AI-1 destination (0=ADAT, 1=AES/EBU, 2=SPDIF)
 b=AI-1 clock (0=44.1K, 1=48K)
- 06 Crossfade Select**
 <data> - 0=10.67ms, 1=21.33ms, 2=16.00ms, 3=42.67ms
- 07 Zero Location**
 <data> - <timecode>
 <timecode> - 32-bit timecode transferred as 5 bytes (a=msb, d=lsb)
 a7 a6 a5 a4 a3 a2 a1 a0 transfer as 00 a6 a5 a4 a3 a2 a1 a0
 b7 b6 b5 b4 b3 b2 b1 b0 00 b5 b4 b3 b2 b1 b0 a7
 c7 c6 c5 c4 c3 c2 c1 c0 00 c4 c3 c2 c1 c0 b7 b6
 d7 d6 d5 d4 d3 d2 d1 d0 00 d3 d2 d1 d0 c7 c6 c5
 00 00 00 00 d7 d6 d5 d4
- 08 Digital Source**
 <data> - 0=ADAT, 1=AES/EBU, 2=SPDIF
- 09 Digital Source ADAT Tracks**
 <data> - <data1> <data2>
 <data1> - 0 t8 0 aaaaa [aaaaa = ADAT# = 0(none),1..16]
 <data2> - 0 t7 t6 t5 t4 t3 t2 t1
 where t1=track1...t8=track8 (bit=1=selected source track)
- 0A Digital Output ADAT (tracks output to AI-1)**
 <data> - <data1> <data2>
 <data1> - 0 t8 0 aaaaa [aaaaa = ADAT# = 0(none),1..16]
 <data2> - 0 t7 t6 t5 t4 t3 t2 t1
 where t1=track1...t8=track8 (bit=1=selected source track)
- 0B LCD Contrast**
 <data> - 0..9
- 0C Continuous Tape Offset**
 <data> - 20..40

0D Options

<data> - 0 gfedcba

- a = Group Buttons 0=enabled, 1=disabled
- b = CopyTape 0=norm, 1=copy to L00
- c = Tape Error 0=enabled, 1=disabled
- d = Rew/FF SMPTE output 0=enabled, 1=disabled
- e = Sysex output (exclude dump) 0=enabled, 1=disabled
- fg = 000

0E Manual Locate Address

<data> - <timecode>

<timecode> - 32-bit timecode transferred as 5 bytes (a=msb,d=lsb)

a7 a6 a5 a4 a3 a2 a1 a0	transfer as	00 a6 a5 a4 a3 a2 a1 a0
b7 b6 b5 b4 b3 b2 b1 b0		00 b5 b4 b3 b2 b1 b0 a7
c7 c6 c5 c4 c3 c2 c1 c0		00 c4 c3 c2 c1 c0 b7 b6
d7 d6 d5 d4 d3 d2 d1 d0		00 d3 d2 d1 d0 c7 c6 c5
		00 00 00 00 d7 d6 d5 d4

0F MIDI Echo

<data> - 0(off), 1(on)

52H - READ GLOBAL PARAMETER

F0H 00H 00H 0EH 09H <dev#> **52H** <param#> [<sub-param>] F7H

<param> - 0 = toggle parameter to follow

Response:

F0 00 00 0E 09 <dev#> **4A** <param#> [<sub-param>] <data> F7

5.1.3 Song Parameter Edit Commands

53H - TOGGLE SONG PARAMETER

F0H 00H 00H 0EH 09H <dev#> **53H** {<param> <data>} F7H

<data> - 0=Off, 7FH=On for all parameters except where noted.

Parameters:

- 00 Loop**
- 01 Tape Offset**
- 02 Track Delay**
- 03 Vari-pitch** (<data> - 0 = fixed, 1 = variable)
- 04 Gen Sync**
- 05 Ext Sync**
- 06 SMPTE Level** (<data> - 0 = -10dB, 1 = +4dB)
- 07 Ext Sync Mode** (<data> - 0 = norm, 1 = lock & release)

54H - EDIT SONG PARAMETER

F0H 00H 00H 0EH 09H <dev#> **54H** {<param> [<sub-param>] <data>} F7H

Parameters:

- 01 Song Name**
<data> - <10 ASCII characters>
<ASCII character> - 20H..7AH
- 02 Song Start**

<data> - <timecode>
 <timecode> - 32-bit timecode transferred as 5 bytes (a=msb, d=lsb)
 a7 a6 a5 a4 a3 a2 a1 a0 transfer as 00 a6 a5 a4 a3 a2 a1 a0
 b7 b6 b5 b4 b3 b2 b1 b0 00 b5 b4 b3 b2 b1 b0 a7
 c7 c6 c5 c4 c3 c2 c1 c0 00 c4 c3 c2 c1 c0 b7 b6
 d7 d6 d5 d4 d3 d2 d1 d0 00 d3 d2 d1 d0 c7 c6 c5
 00 00 00 00 d7 d6 d5 d4

03 SMPTE Start Time

<data> --> <hr> <min> <sec> <frm>
 <hr> - 0..23, <min> - 0..59, <sec> - 0..59, <frm> - 0..29

04 Pitch

<data> - <deltaH> <deltaL>
 <deltaH> - 00000 s bb s = sign bit (0=pos, 1=neg)
 bb = pitch cents <8..7>
 <deltaL> - 0 aaaaaaa aaaaaaa = pitch cents <6..0>

05 Sync Type

<data> - <data1> <data2>
 <data1> - 0000 baaa
 aaa=GenSync MIDI status (0=Off, 1=MIDI clock, 2=MTC)
 b=GenSync SMPTE status (0=Off, 1=On)
 <data2> - 0000 dcccc
 ccc=ExtSync Clock Reference (0=Int, 1=48K, 2=Video, 3=SMPTE)
 d=ExtSync Locate Reference (0=Int, 1=SMPTE)

06 Auto Group

<data> - 0=All, 1..8

07 Tape Offset Mode

<data> - 0=time, 1=locate pts, 2=continuous

08 Locate Name

<sub-param> = locate number (1..20)
 <data> - <8 ASCII characters>
 <ASCII character> - 20H..7AH

09 Locate Address

<sub-param> = locate number (1..22)
 <data> - <timecode>
 <timecode> - 32-bit timecode transferred as 5 bytes (a=msb, d=lsb)
 a7 a6 a5 a4 a3 a2 a1 a0 transfer as 00 a6 a5 a4 a3 a2 a1 a0
 b7 b6 b5 b4 b3 b2 b1 b0 00 b5 b4 b3 b2 b1 b0 a7
 c7 c6 c5 c4 c3 c2 c1 c0 00 c4 c3 c2 c1 c0 b7 b6
 d7 d6 d5 d4 d3 d2 d1 d0 00 d3 d2 d1 d0 c7 c6 c5
 00 00 00 00 d7 d6 d5 d4

0A Auto Punch-In Locate Num

<data> - 1..22

0B Auto Punch-Out Locate Num

<data> - 0..22 (0=disable out point)

0C Loop Start Locate Num

<data> - 1..22

- 0D Loop End Locate Num**
<data> - 1..22
- 0E Group**
<sub-param> = group number (0..3)
<data> - <track bitmap>
<track bitmap> -MMC track status format
- 0F Tape Offset by Time**
<sub-param> - machine number (0..15)
<data> - <timecode>
<timecode> - 32-bit timecode transferred as 5 bytes (a=msb, d=lsb)

a7 a6 a5 a4 a3 a2 a1 a0	transfer as	00 a6 a5 a4 a3 a2 a1 a0
b7 b6 b5 b4 b3 b2 b1 b0		00 b5 b4 b3 b2 b1 b0 a7
c7 c6 c5 c4 c3 c2 c1 c0		00 c4 c3 c2 c1 c0 b7 b6
d7 d6 d5 d4 d3 d2 d1 d0		00 d3 d2 d1 d0 c7 c6 c5
sn=sign (0=positive,1=negative)		00 00 00 sn d7 d6 d5 d4
- 10 Tape Offset by Locate**
<subparam> - machine number (0..15)
<data> - <start loc#> <end loc#>
<start loc#> - 1..22
<end loc#> - 1..22
- 11 Track Delay**
<sub-param> - track number (0..127)
<data> - <samples H> <samples L>
<samples H> - 0000 aaaa where aaaa=samples<10..7>,
<samples L> - 0ccccccc where dddddddd=samples<6..0>
Range = 0 thru 8160 samples

55H - READ SONG PARAMETER

Read Toggle Parameter:

F0H 00H 00H 0EH 09H <dev#> **55H 00H** <param> <data> F7H

Response:

F0 00 00 0E 09 <dev#> **4B 00** <param> <data> F7

Read Edit Parameter:

F0H 00H 00H 0EH 09H <dev#> **55H** <param> [sub-param] <data> F7H

Response:

F0 00 00 0E 09 <dev#> **4B** <param#> [<sub-param>] <data> F7

56H - Undefined

57H - SLAVE QUERY (request number of ADATs connected)

F0H 00H 00H 0EH 09H <dev#> **57H** F7H

Response: F0 00 00 0E 09 00 **4C** <# of ADATs> F7

<# of ADATs> - 0..16

5.1.4 Action Commands

58H - Select Bank

F0H 00H 00H 0EH 09H <dev#> **58H** <data> F7H

<data> - 0..3

59H - Recall Group

F0H 00H 00H 0EH 09H <dev#> **59H** <group#> F7H

<group#> - 0..3

5AH - Select Song

F0H 00H 00H 0EH 09H <dev#> **5AH** <song#> F7H

<song#> - 1..20

5BH - Locate Song

F0H 00H 00H 0EH 09H <dev#> **5BH** F7H

5CH - Copy Tape Location (simulates CopyTapeLoc button press)

F0H 00H 00H 0EH 09H <dev#> **5CH** F7H

5DH - MIDI Dump Request

F0H 00H 00H 0EH 09H <dev#> **5DH** <type> [<song#>] F7H

<type> - 0..19=song, 20=global, 21=tempo map

5EH - Clear Tempo Map

F0H 00H 00H 0EH 09H <dev#> **5EH** F7H

5FH - Format

F0H 00H 00H 0EH 09H <dev#> **5FH** <type> [<bitmap>] F7H

<type> - 0=disable, 1=all enable, 2=selective enable

<bitmap> - <dataH> <dataM> <dataL>

<dataH> - 0 0 0 0 0 0 m16 m15

<dataM> - 0 m14 m13 m12 m11 m10 m9 m8

<dataL> - 0 m7 m6 m5 m4 m3 m2 m1

where m1=ADAT #1 ... m16=ADAT#16 (value: 0=disabled, 1=enabled)

Note: Track Select and Transport Controls are accessed via MMC commands

00H - MIDI Dump (Singular song)**

F0H 00H 00H 0EH 09H <dev#> **00H** <type> <byte H> <byte L> F7H

<type> - 0..19=song

<byte H> - 0 xxxxxxxx

<byte L> - 0 yyyyyyyy

01H - MIDI Dump (All songs, global, tempo map)**

F0H 00H 00H 0EH 09H <dev#> **01H** <type> <size> <data> F7H

<type> - 0 thru 19=song, 20=global, 21=tempo map

<byte count> - <countH> <countL>

<countH> - 0xxxxxxx (xxxxxxx=count<7..13>)

<countL> - 0yyyyyyy (yyyyyyy=count<0..6>)

where global count = B0H = 01H 30H

tempo count = 2AEH = 05H 2EH

song count = 32CH = 06H 2CH

<data> - 8 MIDI data bytes output for every 7 data bytes

a7 a6 a5 a4 a3 a2 a1 a0	transfer as	00 a6 a5 a4 a3 a2 a1 a0
b7 b6 b5 b4 b3 b2 b1 b0		00 b5 b4 b3 b2 b1 b0 a7
c7 c6 c5 c4 c3 c2 c1 c0		00 c4 c3 c2 c1 c0 b7 b6
d7 d6 d5 d4 d3 d2 d1 d0		00 d3 d2 d1 d0 c7 c6 c5
e7 e6 e5 e4 e3 e2 e1 e0		0 e2 e1 e0 d7 d6 d5 d4
f7 f6 f5 f4 f3 f2 f1 f0		0 f1 f0 e7 e6 e5 e4 e3
g7 g6 g5 g4 g3 g2 g1 g0		0 g0 f7 f6 f5 f4 f3 f2
		0 g7 g6 g5 g4 g3 g2 g1

**See BRC Data Format Document

07H - Software Version Inquiry

F0H 00H 00H 0EH 09H <dev#> **07H** F7H

Response: I am using software version xx.xx

F0 00 00 0E 09 <dev> **44** <versionH> <versionL> F7

<versionH> - 0aaaaaaaa = integer part (0..99)

<versionL> - 0bbbbbbb = fractional part (0..99)

16H - Locate

F0H 00H 00H 0EH 09H <dev#> **16H** <loc#> F7H

assumes locate of current song

<loc#> - 0=Manual locate, 1..22=locate 1.. locate 22

5.2 MIDI Machine Control Commands

Whenever possible, a MMC command is used for ADAT operation in order to maintain a maximum of compatibility with MMC devices. For specific information on the use of MMC commands, please refer to the MIDI 1.0 Recommended Practice RP-103 document, available from the IMA.

MIDI Machine Control (MMC) Format:

F0 7F	Universal System Exclusive Real Time header
aa	Destination (00 thru 7E, 7F=all call)
06	Machine Control Command (mcc)sub-id
bb	Command string (see MMC document)
F7	End-of-Exclusive

The ADAT currently supports the following MMC commands/responses (MCS = Motion Control State, MCP = Motion Control Process):

01	STOP (MCS)	0A	EJECT (MCS)
02	PLAY (MCS)	0D	MMC RESET
03	DEFERRED PLAY (MCS)	40	WRITE
04	FAST FORWARD (MCS)	41	MASKED WRITE
05	REWIND (MCS)	42	READ
06	RECORD STROBE	44	LOCATE (MCP)
07	RECORD EXIT	46	SEARCH (MCS)
09	PAUSE (MCS)	4C	MOVE

MIDI Machine Control Information Fields:

01	Selected TimeCode	2C	GP4 (short form)
08	GP0/Locate Point	2D	GP5 (short form)
09	GP1	2E	GP6 (short form)
0A	GP2	2F	GP7 (short form)
0B	GP3	40	Signature*
0C	GP4	42	Response Error
0D	GP5	45	Time Standard
0E	GP6	48	Motion Control Tally
0F	GP7	4C	Record Mode
21	Selected TimeCode (short form)	4D	Record Status
28	GPO/Locate Point (short form)	4E	Track Record Status**
29	GP1 (short form)	4F	Track Record Ready**
2A	GP2 (short form)	50	Global Monitor
2B	GP3 (short form)	51	Record Monitor

*BRC Signature:
01 00 00 00
14
7E 4D 00 00 00 00 00 00 00 00
57 02 00 00 00 00 00 00 00 00
14
02 7E 03 00 00 02 7E 03 00 00
25 62 0F 00 00 00 00 00 00 00

** 19 bytes for the BRC

5.3 Universal System Exclusive MIDI Inquiry Message

This message is sent by one device to request the identity of the receiving device. The format of the message is as follows:

F0 7E <channel> 06 01 F7

F0 7E <channel>	Universal System Exclusive Non-realtime header
06	General Information (sub-ID #1)
01	Device Inquiry Message (sub-ID #2)
F7	EOX

where <channel> = 00..0F, 7F (all call)

The BRC never transmits this message, but is able to receive it. If this message is received at its MIDI Input port, the BRC will respond as follows out its MIDI Output port:

F0 7E <channel>	Universal System Exclusive Non-realtime header
06	General Information (sub-ID #1)
02	Device Id Message (sub-ID #2)
00 00 0E	Alesis manufacturer ID
09 00	Device family code (LSB first)
00 00	Device family member code (LSB first)
v0 v1	Software version (LSB first)
r0 r1	Software revision (LSB first)
F7	End-of-Exclusive

5.4 Software Level (v0 v1 r0 r1)

Each (7-bit) byte is the ASCII representation of a digit of the software version. e.g. 30H is the ASCII value for zero and 31H is the ASCII value for one, therefore, version 01.00 (vv.rr) would be represented as v1 = 30H, v0 = 31H, r1 = 30H, r0 = 30H

APPENDIX A
BRC SCHEMATICS

APPENDIX B
BRC HARDWARE UPGRADES

BRC Main PCB Upgrades

For all BRC main PCB's dated 11-5-92 (Revision 1), the following hardware modifications are required:

1. Add a 470 μ F electrolytic capacitor, 6.3 V minimum, across C56 with the + side connected to +5V. This provides better supply filtering for the VCO, which reduces jitter.
2. Add a jumper between J8 pin 1 (power supply connector +5V) and R121 connected to +5V. The jumper should be 18 gauge or larger (see figure B-1). This provides a more stable supply to the VCO when lamps or LEDs are flashing. Without this, the VCO phase changes each time a lamp turns on or off.
3. Cut the trace on C55 that connects to U11 pin 67. Add a jumper from the same side of C55 to U11 pin 1 (which is currently not connected to anything) (see figure B-1). Also, R126 from 10K to 1K and change resistor R127 from 100K to 10K. This causes the VCO to react much faster to speed changes in SMPTE when direct locked.
4. Change resistor R122 from 1K to 22K. Change resistor R123 from 3.3K to 7.5K. Change capacitor C53 from 220 μ F to 47 μ F. Remove resistor R124. These changes improve the VCO's synchronization to unstable SMPTE signals.
5. Check that R104 is 1K. Some earlier versions of the PCB incorrectly stuffed this component with a 10K resistor. Also check that R125 is 910K. This part was incorrectly stuffed with a 910 ohm resistor in earlier versions of the PCB.
6. Remove R128 if it has been installed.
7. Add a jumper between U10 pin 62 (microprocessor) (currently unconnected) and U19 pin 11 (4053) (see figure B-1). This improves the loop stability while in SMPTE indirect lock mode by allowing to change the time constant of the VCO's filter. It also improves the SMPTE direct lock mode by allowing the software to control the "VCO Fast Track" circuit.
8. When upgrading BRC software to V1.04, change the value of C39, located in the video input circuit, from its current value of 1nF to 2.2 nF. This mod can also consist of two 1nF caps in parallel. This improves the reliability of the video field detection.

Power Supply Insulator Sheet

In order to prevent accidental short circuiting of the BRC power supply with the BRC chassis, an insulator sheet has been added underneath the power supply, between the power supply and the screw terminals on the bottom panel.

For all BRCs serviced, verify that this insulator sheet is installed. If it not, unscrew the power supply from the bottom case and insert the insulator sheet, P/N 7-07-0002, between the bottom case screw terminals and the power supply.

APPENDIX C
BRC SOFTWARE HISTORY

General Notes:

1. Every time there is a processor change, there must be an EPROM update, if only to modify the vector that points to the new processor code.
2. Consult Table 3.1 of this service manual for information on the software compatibility between the various version of software within the BRC.

Version 1.00

Date of Release: 03/30/93

Checksum (Processor: int=A969; ext=A87D - REV0)
(EPROM: int=9CF4; ext=9C86)

First Production Release

Version 1.01

Date of Release: 03/31/93

Checksum (Processor: int=4D2A; ext=4BA3 - REV1)
(EPROM: int=9E05; ext=9CAA)

A. Processor Changes/additions:

1. SMPTE output generation (29.97 drop and non-drop): Improved accuracy and consistency.

B. EPROM Changes/additions:

1. Allow toggling of auto-punch, pre-roll, and post-roll while recording.

Version 1.02

Date of Release: 04/28/93

Checksum (Processor: int=64EB; ext=643C - REV2)

(EPROM: int=78FD; ext=7874)

NOTE: This software coincides with a hardware change to the SMPTE input circuitry. Refer to Appendix B for details.

A. Processor Fixes:

1. Generation of MTC 29.97 non-drop and drop corrected.
2. Generation of SMPTE before the song start corrected.

B. EPROM Fixes:

1. MTC full message rate was indicating 30 non-drop for 29.97/30 drop and 30 drop for 29.97/30 non-drop. Now indicates 30 non-drop for 29.97/30 non-drop and 30 drop for 29.97/30 drop. (There is no specification for 29.97 in the MTC full message).
2. Fix sub-beat editing of locate point.
3. ExtSync freeze: Unit would eventually freeze if clock source=48K and ext. sync enabled. This has been fixed.
4. External sync improved (coincides with hardware mod). There is now more tolerance to incoming SMPTE (jitter, wow and flutter, etc.).
5. Fixed occasional MIDI Clock drop-out at tempo change.
6. If tape offset type was counter offset type, and then changed to locate offset type without editing the locate numbers, then when tape offset was enabled, units may have had incorrect offsets. This has been fixed.
7. If SMPTE rate was drop frame (29.97 or 30) and SMPTE Start Offset had non-zero min, sec, frames, then ADATs would drop out of sync (e.g. when passing through non-drop minute). This has been fixed.

C. EPROM Changes/additions:

1. Deferred record can now be initiated in indirect lock mode. It can also be initiated from the pre-audio (before absolute time 00:00:00:00) section if auto-punch is enabled with a punch-in point that is within the audio section of tape.
2. Shorten the pause that occurs before going into play after locating.
3. Make sure any pending record is terminated when a locate is initiated by the user.
4. If tape offset enabled while playing, re-issue play command
5. On power-up, the song that was selected when the unit was powered-down is remembered. (used to always power-on with Song01 selected)
6. When saving data to tape, disable Digital I/O. When digital input is enabled, no data (data=0) is written to tape.
7. Allow punch-in/out in continuous mode.

Version 1.03

Date of Release: 05/04/93

Checksum (Processor: int=64EB; ext=643C - REV2)
(EPROM: int=42D2; ext=41E8)

NOTE: This software coincides with an EPROM size change from 27C512 to 27C010A

A. EPROM Fixes:

1. If externally synced to SMPTE drop frame, then if the SMPTE input hour was greater than the SMPTE Start hour, external sync was lost each minute. This has been fixed.
2. Drop frame rollover corrected (locate address editing). Only skip frames 0 and 1 when on non-10 minute boundary.

B. EPROM Changes/additions:

1. Continuous Play/Record: Changed so that play or record commands are only sent to the active group of machines, except when within the window of 1:30 before through 0:30 after the crossover point.

Version 1.04

Date of Release: 08/31/93

Checksum (Processor: int=5E6A; ext=5D34 - REV3)
(EPROM: int=D062; ext=CF96)

A. Processor Fixes:

1. MIDI Clock dropout: In rare instances, a 1.3 second dropout could occur. This has been fixed.

B. Processor Changes/additions:

1. MTC Quarter Frame to include SMPTE type.

C. EPROM Fixes:

1. Continuous Record: All machines in second group now go into record at 00:00:00 (previously, only the first machine in the group was punching in).
2. AutoPunch:
 - Auto punching with loops longer than 3 minutes (causing tape to unthread to locate) would only auto-punch the first time. This has been fixed.
 - Auto-punching after tape load would correctly indicate the auto-punch on the BRC; however, ADATs would just continue to play. This is because auto-punch points were not being sent to the ADATs after tape load. This has been fixed.
 - With auto punch enabled, if punch-in occurred in-between the punch points, the punch-in was being updated. This is not desired and has been fixed.
3. Fixed "div 0" error when copying song with full tempo map.
4. If tape offset (type = locate pts) and auto punch (with one of the punch points the same as one of the tape offset locate pts) were both enabled and the common locate point was edited, the tape offset would be updated; however, the auto punch point would not be updated. This has been fixed.
5. Pressing Play/Rec immediately after initiating a unthreaded locate, would abort the locate and go into play. Now, the punch-in is correctly deferred.

Version 1.04 (Cont'd)

D. EPROM Changes/additions:

1. Allow Auto Input, All Safe, and All Input when editing track delays.
2. SMPTE Start Offset: Prevent user from selecting invalid start times when SMPTE drop frame is selected.
3. External Clock: Increase external video out-of-range tolerance and improve external 48K out-of-range sensing
4. Allow Auto Input toggle while recording
5. When formatting a tape, don't send stop command when first tape reaches the end-of-tape.
6. When change tape offset type from counter to locate pt with tape offset enabled, immediately change offset if locate offsets different from counter offset.
7. Syncing to 25 fps video improved.
8. Eliminate LED counter display delay when syncing to SMPTE.
9. Digital Pages: When connected to an AI-1 with the destination set to ADAT, only allow destination clock rate selection if input is AES/EBU or SPDIF @ 44.1K. Otherwise, the destination clock rate is not editable and is the same as the input clock rate. (In this case, the destination clock rate page displays "AI-1 Dest Rate same as input")
10. Added new MIDI/Util pages:
 - Page 7: Enable (default) and disable the tape error message.
 - Page 8: Enable (default) and disable SMPTE and MTC output while rewinding/forwarding when GenSync enabled.
 - Page 9: Enable (default) and disable MIDI Sysex and MMC command output. Note, however, that sysex dumps initiated from the MIDI/Util page will *always* be output.
 - Page 10: Select MIDI device number. This device number is used for sending and receiving MMC commands, sending MMC responses, and receiving and sending BRC sysex messages.
11. Add ExtSync page to select between continuous (default) and lock & release mode. Lock & Release mode only applies to the situation in which the locate reference is SMPTE. When in this mode, the BRC window of tolerance is expanded to 5 seconds after the machines have been locked to the incoming SMPTE signal. Also, if the clock source is internal, the pitch is fixed at its nominal value (48K) and any speed variation will not be reflected in the ADATs.
12. Sysex implementation (see BRC Sysex Document, Section 5.0)
13. First digital edit page terminology changed from "Digital input:" to "Digital source", to be consistent with AI-1 terminology.
14. ExtSync chasing: The BRC can recognize forward, rewind, and stop now even when receiving SMPTE at *play* speed.
15. While recording, if an ADAT falls out of record for any reason, the BRC will stop and display "Record aborted on ADAT xx" (where xx indicates which ADAT fell out of record)
16. When externally synced to SMPTE locate reference:
 - The tape is now forwarded 4 seconds before performing a timeout unthread.
 - When stopping in mode2, the ADAT will stop approximately 1 second ahead of last good SMPTE timecode.
17. Play LED now flashes until all units are in sync, before going solid (exception: continuous tape offset mode)

Version 1.04 (Cont'd)

D. EPROM Changes/additions: (Cont'd)

18. When performing a power-on reset, the display now reads "Initialization in progress."
19. If ADATs are stopped and the tape offset is changed (i.e. whenever tape offset is toggled on/off or whenever a tape offset value is changed while tape offset is enabled), a locate command is sent to all ADATs to position them correctly. Note that if ADATs are stopped with the tape unwrapped when the tape offset is change, all ADATs will wrap the tape when the locate command is executed.
20. Allow bar mode rollover in tape offset page.
21. Added +/- field to locate pages when in relative normal mode or bars mode (similar to tape offset counter pages)
22. Send a locate command to ADATs whenever stopping in mode2.
23. Default to Song01 after a tape load.
24. When chasing to external sync, the BRC now sends new "crude locate" commands to the ADATs and a "normal locate" command when it parks (see ADAT 3.05 software update). Adding this does not adversely affect functioning of BRC with pre-3.05 software ADATs.
25. Change "Continuous" External Sync option to "Frame Lock" (text change only - Marketing request)
26. The default pre-roll value was changed from 5 seconds to 8 seconds (Marketing request).
27. If a punch-in is initiated before the auto punch-in point when auto punch is enabled and all ADATs are not in sync by the time the punch-in point is reached, the display will read "Not in sync at auto punch-in pt". However, the punch-in *will* occur when all ADATs become in sync (as long as it is in-between the auto punch points).

APPENDIX D
BRC PARTS LIST

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GROUP	PART No.	DESCRIPTION	QTY	PCB	POSITION	NOTES
ASY	9-96-1126	ASSY, BR PCB F/P LEFT	1			
ASY	9-96-1127	ASSY, BR PCB MAIN PR	1			
ASY	9-96-1128	ASSY, BR PCB KEYPAD	1			
ASY	9-96-1129	ASSY, BR PCB F/P RIGHT	1			
ASY	9-96-1130	ASSY, BR PCB SWITCH	1			
ASY	9-96-1131	ASSY, BR PCB 7-SEG	1			
ASY	9-96-1190	ASSY, EMI FILTER MB,A1,BR	1		MOUNTS ON REAR PANEL	
CAB	4-18-1214	CABLE 14-PIN 11.5 DIL	1		J9,LCD	
CAB	4-18-1610	CABLE 10 PIN RIBBON 8"	1		J5,J105	
CAB	4-18-1611	CABLE 12 PIN RIBBON 6" PC MNT, ONE END ONLY	2	MAIN	J6 (TO J106), J7 (TO J107)	
CAB	4-18-1612	CABLE 14 PIN RIBBON 8"	1		J3,J103	
CAB	4-18-1613	CABLE 16 PIN RIBBON 10"	1		J4,J104	
CAB	4-18-1614	CABLE 20 PIN RIBBON 10"	1		J2,J102	
CAB	4-18-1615	CABLE 24 PIN RIBBON 6"	1		J1,J101	
CAB	4-19-1605	CABLE 3-PIN W/2 TERM SPADE LUG	1			
CAB	4-19-1607	CABLE 3P HOUSING TO 6P HOUSING	1			
CAB	4-19-1608	WIRE 1 TERM TO TINNED (BLUE)	1			
CAB	4-19-1609	WIRE 1 TERM TO TINNED (BROWN)	1			
CAB	4-71-0002	CABLE DB9 SYNC (30 ft.) 24 AWG BR	1			
CAP	1-07-0010	CAP 10 MF ELEC 35V	12	MAIN	C1,C3,C5,C7,C11,C22,C26,C28,C35,C45,C51,C54	
CAP	1-07-0101	CAP 100 MF ELEC 10V	1	MAIN	C13	
CAP	1-07-0330	CAP 0.33 MF ELEC 50V	1	MAIN	C31	
CAP	1-08-0476	CAP 47 MF ELEC 16V ULT	1	MAIN	C53	
CAP	1-08-0477	CAP 470 MF ELEC 10V	1	MAIN	ACROSS C56 (SEE APPENDIX B)	
CER	1-02-0100	CAP 10 PF CERDISC 10%	1	MAIN	C47	
CER	1-02-0102	CAP 1000 PF CERDISC 10%	1	MAIN	C55	
CER	1-02-0103	CAP 0.01 MF CERDISC 10%	4	MAIN	C18, C19, C33, C42	
CER	1-02-0104	CAP 0.1 MF CERDISC 10%	30	MAIN	C2,4,6,C8-10,C12,C14-17,C23-25,C27,C29,C30,C32,C34,C36,C37,C40,C41,C43,C44,C46 C49,C50,C52,C56	
CER	1-02-0200	CAP 20 PF CERDISC 10%	2	MAIN	C20, C21	
CER	1-02-0222	CAP 2200 PF CERDISC 10%	1	MAIN	C39	
CER	1-02-0330	CAP 33 PF CERDISC 10%	1	MAIN	C48	
CER	1-02-0471	CAP 470 PF CERDISC 10%	1	MAIN	C38	
CON	4-04-0001	CON BNC CONNECTOR 227161-1	3	MAIN	J13-J15	
CON	4-10-0002	CON DB9 9-PIN FOXCONN (METAL)	1	MAIN	J10	
HDR	4-14-0012	HEADER 12-PIN DIL XR	1	FPR	J106	
HDR	4-14-0012	HEADER 12-PIN DIL XR	1	SWT	J107	
HDR	4-14-0014	HEADER 14-PIN 0.1 DIL	2	MAIN	J3,J9	
HDR	4-14-0014	HEADER 14-PIN 0.1 DIL	1	FPR	J103	
HDR	4-14-0016	HEADER 16-PIN 0.1 DIL XR/M	1	MAIN	J104	
HDR	4-14-0016	HEADER 16-PIN 0.1 DIL XR/M	1	MAIN	J4	
HDR	4-14-0020	HEADER 20-PIN DIL XR/CL	1	MAIN	J2	
HDR	4-14-0020	HEADER 20-PIN DIL XR/CL	1	FP	J102	
HDR	4-14-0024	HEADER 24-PIN DIL XR	1	MAIN	J101	
HDR	4-14-0024	HEADER 24-PIN DIL XR	1	MAIN	J1	
HDR	4-15-0010	HEADER 10 PIN DIL	1	MAIN	J5	
HDR	4-15-0010	HEADER 10 PIN DIL	1	FP	J105	
HDR	4-15-1003	HEADER 3 PIN SIL 640445-3 (AMP) locking	1	MAIN	J8	
HDW	5-00-0016	SCREW 6-32 x 1/4 PP ZNC	7			
HDW	5-00-0030	SCREW 6-32 x 3/8 PPB 1WAY	3		IEC CONN	
HDW	5-00-1006	SCREW M3 X 10 PPB THREDFORM	21			
HDW	5-00-1007	SCREW M-3 x 10mm THREADFORMING PFB	8			
HDW	5-00-1008	SCREW 10-24 x 1" HEX SOCKET CAP (BLK)	6			
HDW	5-00-1009	SCREW 10-24 x 1 1/4" HEX SOCKET CAP (BLK)	4			
HDW	5-01-0002	WASHER STAR #6 INT	4			
HDW	5-01-0004	LOCKWASHER BNC CONN 1-329632-2	3		J13-J15	
HDW	5-02-0007	SCREW 4 x 40 JACK	2		DB9 CONN	
HDW	5-02-0008	NUT HEX BNC CONN 1-329631-2	3		J13-J15	
HDW	5-02-6320	NUT KEP 6-32	3			
HDW	9-03-1036	LUG SOLDER PCB MNT	4	MAIN	J16-J19	

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GROUP	PART No.	DESCRIPTION	QTY	PCB	POSITION	NOTES
IC	2-14-0541	IC 74HC541 OCTAL BUFFER TE	1	MAIN	U6	
IC	2-14-0574	IC 74HC574 OCTAL FF TEXAS	6	MAIN	U1-U5, U7	
IC	2-14-7403	IC 74HCU04 HEX INVERTER TE	1	MAIN	U18	
IC	2-14-7404	IC 74HC04 HEX INVERTER TEX	2	MAIN	U14,U15	
IC	2-14-7440	IC 74S140 DUAL 4-INPUT NAND	1	MAIN	U16	
IC	2-17-6228	IC HM628128LP-12 SRAM	1	MAIN	U8	
IC	2-22-0339	IC LM339 QUAD COMP NATIONA	1	MAIN	U17	
IC	2-23-4053	IC CD4053 ANALOG SWITCH SI	1	MAIN	U19	
IC	2-24-0138	IC 6N138 OPTO ISO HEWLETT	1	MAIN	U13	
IC	2-24-2601	IC HCPL2601 OPTOCOUPLER	1	MAIN	U12	
IC	2-31-0002	IC SOFTWARE EPROM BR	1	MAIN	U9 (V1.04)	
IC	2-32-0002	IC MPU (PROGRAMED) BR	1	MAIN	U10 (V3)	
IC	2-33-0001	IC GATE ARRAY (PROGRAMED) BR	1	MAIN	U11 (V1.02)	
JAC	4-00-0001	JACK 5-PIN DIN (MIDI)	2	MAIN	J11,J12	
JAC	4-02-0001	JACK 1/4 MONO CLIFF	4	MAIN	J16-J19	
LCD	9-44-1000	DISP LCD MODULE DMT	1			
LED	3-04-0002	DISP 7-SEG GRN/BLK LITE-ON	13	LED	U101-U113	
LED	3-20-0001	LED (RED) SMD LS (T670-HO)	32	FPL	D100-D131	
LED	3-20-0001	LED (RED) SMD LS (T670-HO)	2	FPR	D132,D133	
LED	3-20-0002	LED (GREEN) SMD LG (T670-HO)	65	FPL	D200-D262	
LED	3-20-0002	LED (GREEN) SMD LG (T670-HO)	21	FPR	D263-D283	
LIT	7-51-1066	MANUAL REFERENCE BR	1		LIT	
LIT	7-51-1067	MANUAL QUICK REFERENCE BR	1		LIT	
LIT	7-51-1068	CHART SET-UP BR	1		LIT	
LIT	7-51-1078	SHEET MULTI AD QUICK START-UP	1		LIT	
LIT	7-51-1090	GUIDE, QUICK SYNC BR	1			
ME	1-92-0001	VARACTOR MVAM108 (MOT)	1	MAIN	D12	
ME	2-00-4148	DIODE SIGNAL 1N4148	10	MAINPR	D1,D3-11	
ME	2-00-5082	DIODE HP5082-2810	1	MAIN	D2	
ME	2-03-4401	TRANS 2N4401 NPN NATIONAL	23	MAIN	Q1-Q16, Q30-Q36	
ME	2-04-6725	TRANS 2N6725 NPN MOTOROLA	13	MAIN	Q17-29	
ME	2-05-5457	TRANS 2N5457 FET	1	MAIN	Q37	
ME	4-09-0006	FILTER EMI-DELTA	1			
ME	7-01-0005	XTAL 20 MHz KDS	1	MAIN	Z1	
ME	7-05-0003	BATTERY LITH PANA 3V	1	MAIN	B1	
ME	7-20-0009	INDUCTOR 4.7 uH	1	MAIN	L1	
MIS	7-07-0002	INSULATOR SHEET LOWER	1		UNDER P/S	
MIS	7-10-0009	WRENCH ALLEN 4mm BRC	1			
MIS	7-13-0001	TUBE, HEATSHRINK .25Dx2"L	1			
MIS	7-50-0030	BARCODE S/N BR	1			
MIS	7-53-0018	STICKER QC W/ MFR DATE (UL APPROVED)	1			
MIS	7-53-0039	STICKER FRENCH FUSE WARNING (INT)	1		BESIDE P/S	
MTL	9-03-1064	PANEL FRONT BRC	1			
MTL	9-03-1066	CASE, BOTTOM BRC	1			
MTL	9-03-1069	RACK EARS BRC	2			
MTL	9-03-1102	PANEL SUB BRC	1			
OEM	7-10-0008	SWITCHING P/SUPPLY (PSA-4005)	1			
PCB	9-40-1070	PCB, BR MAIN	1	MAIN		
PCB	9-40-1071	PCB, BR PANEL & (FRONT LEFT)	0.2		PCB 9-40-1071	
PCB	9-40-1071	PCB, BR PANEL & (FRONT LEFT)	0.2		PCB 9-40-1074	
PCB	9-40-1071	PCB, BR PANEL & (FRONT LEFT)	0.2		PCB 9-40-1072	
PCB	9-40-1071	PCB, BR PANEL & (FRONT LEFT)	0.2		PCB 9-40-1075	
PCB	9-40-1071	PCB, BR PANEL & (FRONT LEFT)	0.2		PCB 9-40-1073	
PLS	9-13-1020	BEZEL DISPLAY BRC	1			
PLS	9-13-1027	OVERLAY TRACK SELECT BR	1			
PLS	9-13-1030	BEZEL TRACK SELECT BR (REV B)	1			
PLS	9-15-0026	BUTTON PUSH AD/A2	59			
PLS	9-15-1062	BUTTON TREE W/LENSE 1x4	8			
PLS	9-15-1063	BUTTON MATRIX (3x3)	6			
PLS	9-15-1064	LIGHT PIPE HOLDER 1x4	9			

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GROUP	PART No.	DESCRIPTION	QTY	PCB	POSITION	NOTES
PLS	9-15-1065	BUTTON WITH LIGHT PIPE	24			
PLS	9-15-1067	PANEL, SIDE BR	2			
PLS	9-15-1068	PANEL, TOP/BOTTOM	2			
PLS	9-96-1200	ASSY TRACK SELECT BEZEL BR	1			
RES	0-00-0101	RES 100 OHM 1/8W 5%	23	MAIN	R49-R61,R65,R66,R70-R77	
RES	0-00-0102	RES 1K OHM 1/8W 5%	26	MAIN	R17-R32,R78,R91,R92,R100,R104,R106,R112,R114,R115,R126	
RES	0-00-0103	RES 10K OHM 1/8W 5%	5	MAIN	R63,R90,R103,R105,R127	
RES	0-00-0104	RES 100K OHM 1/8W 5%	6	MAIN	R93,R95,R96,R111,R118,R119	
RES	0-00-0105	RES 1M OHM 1/8W 5%	2	MAIN	R99,R113	
RES	0-00-0150	RES 15 OHM 1/8W 5%	2	MAIN	R69,R121	
RES	0-00-0151	RES 150 OHM 1/8W 5%	1	MAIN	R101	
RES	0-00-0153	RES 15K OHM 1/8W 5%	1	MAIN	R110	
RES	0-00-0201	RES 200 OHM 1/8w 5%	1	MAIN	R108	
RES	0-00-0202	RES 2K OHM 1/8W 5%	1	MAIN	R117	
RES	0-00-0221	RES 220 OHM 1/8W 5%	9	MAIN	R79-R86,R88	
RES	0-00-0223	RES 22K OHM 1/8W 5%	2	MAIN	R116,R122	
RES	0-00-0331	RES 330 OHM 1/8W 5%	17	MAIN	R9-R16,R41-R48,R87	
RES	0-00-0332	RES 3.3K OHM 1/8W 5%	1	MAIN	R109	
RES	0-00-0471	RES 470 OHM 1/8W 5%	1	MAIN	R89	
RES	0-00-0472	RES 4.7K OHM 1/8W 5%	2	MAIN	R107,R120	
RES	0-00-0473	RES 47K OHM 1/8W 5%	2	MAIN	R94,R98	
RES	0-00-0501	RES 5.1 OHM 1/8W 5%	16	MAIN	R1-R8,R33-R40	
RES	0-00-0681	RES 680 OHM 1/8W 5%	1	MAIN	R102	
RES	0-00-0752	RES 7.5K OHM 1/8W 5%	2	MAIN	R97,R123	
RES	0-00-9104	RES 910K OHM 1/8W 5%	1	MAIN	R125	
RES	0-01-0142	RES 1.40K OHM 1/8W 1%	2	MAIN	R67,R68	
RES	0-06-9472	RES 4.7K OHM 9 PIN SIP	1	MAIN	R62	
RUB	9-21-1008	KEYPAD RUBBER (3x7)	1			
RUB	9-21-1009	KEYPAD RUBBER (3x3)	4			
RUB	9-21-1010	KEYPAD RUBBER (1x8)	4			
RUB	9-21-1011	KEYPAD, RUBBER (NUMERIC)	1			
RUB	9-23-1033	RUBBER FEET RICHCO (SFF-023)	4			
SMM	2-50-0914	DIODE 1N914 SOD-80 (SMD)	62	FPL	D300-D361	
SMM	2-50-0914	DIODE 1N914 SOD-80 (SMD)	12	KEY	D362-D373	
SMM	2-50-0914	DIODE 1N914 SOD-80 (SMD)	21	FPR	D374-D394	
SMM	2-50-0914	DIODE 1N914 SOD-80 (SMD)	5	SWT	D395-D399	
SOC	4-06-0032	SOCKET 32-PIN DIP 0.6	2	MAIN	U8,U9	
SOC	4-12-0068	SOCKET 68-PIN PLCC	1	MAIN	U11	
SOC	4-12-0084	SOCKET 84-PIN PLCC	1	MAIN	U10	
SWT	6-01-0008	SWITCH PUSH (RED/REC) NKK-YB15NK0105C	1	SWT	SW5	
SWT	6-01-0009	SWITCH PUSH (WHT/FF-REW) NKK-YB15NKW0105B	2	SWT	SW1,SW2	
SWT	6-02-0006	SWITCH PUSH (YEL/STOP) NKK-YB15NKW0105E	1	SWT	SW3	
SWT	6-02-0007	SWITCH PUSH (GRN/PLAY) NKK-YB15NKW0105F	1	SWT	SW4	
SWT	6-03-0001	SWITCH DPST POWER 16A MARQ	1			
WIR	4-19-1318	WIRE 1-PIN 120mm TINNED STRIPPED	1			

APPENDIX E
BRC QC TEST PROCEDURE

BRC QC TEST PROCEDURE

This test will verify the proper operation of the BRC within a studio configuration. This test should be performed on every BRC serviced. Furthermore, this test should be conducted only after all modifications and/or repairs on the unit have been completed (See Appendix B).

All of the BRC's basic functions will be tested; including loading and saving data to the ADAT tape, Tape Offset, Auto Punch, Auto Loop, Pre Roll and Post Roll. Finally, all of the BRC's self test routines will be verified.

This test procedure has been divided into two parts. The first part contains those tests which must be completed for all BRCs serviced. Part 2 contains tests which can only be conducted with the use of two ADATs. If two ADATs are not available, the tests in part 2 may be omitted. However, understand that the only way to be confident that the BRC is functioning properly is by completing all of the tests described in this procedure. At the very least, all of the tests described in part 1 should be conducted.

When conducting this test, use the data sheet provided to record the results of the test.

PART 1

These tests require the use of only 1 ADAT and should be conducted on every BRC serviced.

1.0 Equipment Requirements

In order to conduct all of tests described in this procedure, the following equipment is required.

- (1) ADAT Digital Multitrack Recorder
- (1) ADAT Sync cable
- (1) Formatted ADAT SVHS cassette
- (1) LRC
- (1) Video Cassette Recorder
- (1) Video tape with program material (for use in VCR)
- (1) BNC to BNC cable (for hookup between VCR and BRC)
- (1) BNC patch cord (1 foot minimum length)
- (1) 1/4 inch patch cord (1 foot minimum length)
- (1) MIDI cable
- BRC under test

2.0 Visual Inspection

This test is used to verify that the BRC has not incurred any cosmetic damage during its repair.

- 2.1. Visually inspect the BRC under test for scratches, loose parts, or other obvious defects.
- 2.2. Verify that all screws have been installed correctly (See Figure 3-1).
- 2.3. Plug the BRC into the appropriate AC outlet.
- 2.4. Power on the BRC.
- 2.5. Record the results on the data sheet.

3.0 BRC Connections and Setup

This step will setup the BRC for the tests to follow as well as detailing those connections which must be made to conduct said tests. Refer to figure E-1 for a block diagram of the connections required for this test. Step 3.1 details the steps required to set up a loop, an auto punch, a pre-roll time and a post roll time. For all of these setups, it is important that you enter different information than that entered for the previous BRC under test. This will enable the operator to verify that the BRC has stored and loaded the current information to/from the ADAT tape (see test 4).

A typical setup would include a loop of about 45 seconds, an auto punch set up within the loop for about 25 seconds, and pre roll and post roll times between 2 and 8 seconds. The diagram below depicts the loop requirements on a time line.



TIMELINE NOT TO SCALE
TIMES DENOTED HERE ARE USED FOR EXAMPLE ONLY

Note that if any of the connections in step 3.2 are made prior to achieving the setup detailed in step 3.1, the BRC will not perform in the manner described in the text and the test conductor may have problems entering the data.

3.1. BRC Setup

3.1.1. Re-initialize the BRC by pressing **RECORD** and **PLAY** simultaneously while applying power to the BRC. Verify that the LCD displays the message "Initialization in progress".

3.1.2. Press the **EDIT** button. Verify that its LED illuminates.

3.1.3. Press the **LOOP** button. Verify that its LED illuminates.

3.1.4. Verify that the LCD displays the message

St 01 "LocNam01" 00:00:00

3.1.5. Use the **CURSOR** buttons to move the cursor under the display of zeros on the LCD.

3.1.6. Use the keypad's numeric buttons to enter a new start time for the loop. Note: The start time selected here has to be different from the start time entered for the previous BRC under test. Record this time on the data sheet.

3.1.7. Press the **LOOP** button again. Verify that the LCD displays the message

En 02 "LocNam02" 00:00:00

3.1.8. Use the **CURSOR** buttons to move the cursor under the display of zeros on the LCD.

3.1.9. Use the keypad's numeric buttons to enter a new end time for the loop. Note: The end time selected here has to be different from the end time entered for the previous BRC under test. Record this time on the data sheet.

3.1.10. Press the **AUTO-PUNCH** button. Verify that its LED illuminates.

3.1.11. Verify that the LCD displays the message

In 21 "PunchIn "
00:00:00

3.1.12. Use the **CURSOR** buttons to move the cursor under the display of zeros on the LCD.

3.1.13. Use the keypad's numeric buttons to enter a new Punch In point. Note: The Punch In point selected here has to be different from the Punch In point entered for the previous BRC under test. Record this time on the data sheet.

3.1.14. Press the **AUTO-PUNCH** button again. Verify that the LCD displays the message

Ot 22 "PunchOut"
00:00:00

3.1.15. Use the **CURSOR** buttons to move the cursor under the display of zeros on the LCD.

3.1.16. Use the keypad's numeric buttons to enter a new Punch Out point. Note: The Punch Out point selected here has to be different from the Punch Out point entered for the previous BRC under test. Record this time on the data sheet.

3.1.17. Press the **PRE-ROLL** button. Verify that its LED illuminates.

3.1.18. Verify that the LCD displays the message

Pre-roll Time
08.0 seconds

3.1.19. Use the keypad's numeric buttons to enter a new Pre Roll time. Note: The Pre Roll time selected here has to be different from the Pre Roll time entered for the previous BRC under test. Record this time on the data sheet.

3.1.20. Press the **POST-ROLL** button. Verify that its LED illuminates.

3.1.21. Verify that the LCD displays the message

Post-roll Time
05.0 seconds

3.1.22. Use the keypad's numeric buttons to enter a new Post Roll time. Note: The Post Roll time selected here has to be different from the Post Roll time entered for the previous BRC under test. Record this time on the data sheet.

3.1.23. Press the **EDIT** button. Verify that none of the LEDs are lit.

3.1.24. Power off the BRC.

3.1.25. Subtract the time entered in step 3.1.19 from the time entered in step 3.1.6. Record the result on the data sheet.

3.1.26. Add the time entered in step 3.1.22 to the time entered in step 3.1.9. Record the result on the data sheet.

3.2. BRC Connections (See Figure E-1)

3.2.1. Connect the 1/4 patch cord from the BRCs SMPTE OUT connector to the BRCs SMPTE IN connector.

3.2.2. Connect the MIDI cable from the BRCs MIDI OUT connector to the BRCs MIDI IN connector.



3.2.3. Connect the BNC cable from the VCRs VIDEO OUT connector to the BRCs VIDEO IN connector.

3.2.4. Connect the BNC patch cord from the BRCs 48 KHZ OUT connector to the BRCs 48 KHZ IN connector.

3.2.5. Connect the LRC to the BRCs LOCATE/PLAY Connector.

3.2.6. Connect the ADAT Sync cable from the BRCs REMOTE OUT TO ADAT connector to the ADATs Sync In connector.

4.0 BRC Self Tests

This test will verify the proper operation of all BRC interfaces as well as the BRC software, LEDs and switches. Note that if any of the self tests fail, the operator will need to press **PITCH**  and **PITCH**  simultaneously in order to continue with the remainder of the self tests.

4.1. BRC ROM Test

4.1.1. Press **TRACK 1 RECORD ENABLE** and **TRACK 7 RECORD ENABLE** simultaneously while applying power to the BRC.

4.1.2. Verify that the LCD displays the message

Select Test 0: ROM

4.1.3. If this message is not displayed, power off the BRC and repeat step 4.1 until the appropriate message is displayed.

4.1.4. Press **AUTOPLAY**.

4.1.5. Verify that the LCD displays the message "Test Passed" momentarily.

4.1.6. If the LCD displays the message "Test Failed", then the BRC has failed its ROM test.

4.1.7. Record the results of this test on the data sheet.

4.2. BRC RAM Test

4.2.1. Press **KEYPAD NUMBER 1**.

4.2.2. Verify that the LCD displays the message

Select Test 1: RAM

4.2.3. If this message is not displayed, repeat step 4.2.1 until the appropriate message is displayed.

4.2.4. Press **AUTOPLAY**.

4.2.5. Verify that the LCD displays the message "Test Passed" momentarily.

4.2.6. If the LCD displays the message "Test Failed", then the BRC has failed its RAM test.

4.2.7. Record the results of this test on the data sheet.

4.3. LED (Block) Test

4.3.1. Press **KEYPAD NUMBER 2**.

4.3.2. Verify that the LCD displays the message

Select Test 2: LEDS (block)

4.3.3. If this message is not displayed, repeat step 4.3.1 until the appropriate message is displayed.

4.3.4. Press **AUTOPLAY**.

4.3.5. As each LED block is displayed, verify that all of the BRC LEDs illuminate and that each LED is free of dust, dirt and/or other contaminants.

4.3.6. If any of the LED blocks do not light, then the BRC has failed its LED (block) test.

4.3.7. Record the results of this test on the data sheet.

4.4. LED (Cycle) Test

4.4.1. Press **KEYPAD NUMBER 3**.

4.4.2. Verify that the LCD displays the message

Select Test 3: LEDS (cycle)

4.4.3. If this message is not displayed, repeat step 4.4.1 until the appropriate message is displayed.

4.4.4. Press **AUTOPLAY**.

4.4.5. As each LED is illuminated, verify that it is free of dust, dirt and/or other contaminants.

4.4.6. If any of the LEDs do not light, then the BRC has failed its LED (cycle) test.

4.4.7. Record the results of this test on the data sheet.

4.5. Switches Test

4.5.1. Press **KEYPAD NUMBER 4**.

4.5.2. Verify that the LCD displays the message

Select Test 4: SWITCHES



4.5.3. If this message is not displayed, repeat step 4.5.1 until the appropriate message is displayed.

4.5.4. Press **AUTOPLAY**.

4.5.5. Press each switch (button) on the BRC front panel.

4.5.6. For every button pressed, verify that the LCD displays the appropriate function.

4.5.7. If any of the buttons pressed does not cause the LCD to display the appropriate function, then the BRC has failed its switch test.

4.5.8. Press **PITCH**  and **PITCH**  simultaneously. Verify that the LCD displays the message shown in step 4.5.2.

4.5.9. If the LCD displays the message "NOT ALL TESTED", repeat step 4.5.5 until all buttons and switches have been pressed.

4.5.10. Repeat steps 4.5.8 and 4.5.9 until the LCD displays the message shown in step 4.5.2.

4.5.11. Record the results of this test on the data sheet.

4.6. LRC Interface Test

4.6.1. Press **KEYPAD NUMBER 5**.

4.6.2. Verify that the LCD displays the message

Select Test 5: LRC

4.6.3. If this message is not displayed, repeat step 4.6.1 until the appropriate message is displayed.

4.6.4. Press **AUTOPLAY**.

4.6.5. Verify that the LCD displays the message

LCD TEST Footswitch1: 01

4.6.6. Press each button on the LRC.

4.6.7. For every button pressed, verify that the LCD displays a corresponding number next to the line reading "Footswitch1:". For example, pressing the **PLAY** button on the LRC will cause the LCD to display "Footswitch1: 06"

4.6.8. If any of the buttons pressed does not cause the LCD to display a corresponding number, then the BRC has failed its LRC test.

4.6.9. Record the results on the data sheet.

4.6.10. Remove the LRC from the LOCATE/PLAY connector on the back of the BRC.

4.6.11. Verify that the LCD displays the message

LCD TEST Unplugged

4.6.12. Plug the LRC into the PUNCH IN/OUT connector on the back of the BRC.



4.6.13. Verify that the LCD displays the message

LCD TEST Footswitch2: 01

4.6.14. Press each button on the LRC.

4.6.15. For every button pressed, verify that the LCD displays a corresponding number next to the line reading "Footswitch2:". For example, pressing the **PLAY** button on the LRC will cause the LCD to display "Footswitch1: 06"

4.6.16. If any of the buttons pressed does not cause the LCD to display a corresponding number, then the BRC has failed its LRC test.

4.6.17. Press **PITCH**  and **PITCH**  simultaneously. Verify that the LCD displays the message shown in step 4.6.2.

4.6.18. Record the results of this test on the data sheet.

4.7. MIDI Interface Test

4.7.1. Press **KEYPAD NUMBER 6**.

4.7.2. Verify that the LCD displays the message

Select Test 6: MIDI IN/OUT

4.7.3. If this message is not displayed, repeat step 4.7.1 until the appropriate message is displayed.

4.7.4. Press **AUTOPLAY**.

4.7.5. Verify that the MIDI IN LED flashes momentarily.

4.7.6. Verify that the LCD displays the message "Test Passed" momentarily.

4.7.7. If the LCD displays the message "Test Failed", then the BRC has failed its MIDI interface test.

4.7.8. Record the results of this test on the data sheet.

4.8. 48 KHZ Interface Test

4.8.1. Press **KEYPAD NUMBER 7**.

4.8.2. Verify that the LCD displays the message

Select Test
7: 48K IN/OUT

4.8.3. If this message is not displayed, repeat step 4.8.1 until the appropriate message is displayed.

4.8.4. Press **AUTOPLAY**.

4.8.5. Verify that the LCD displays the message "Test Passed" momentarily.

4.8.6. If the LCD displays the message "Test Failed", then the BRC has failed its 48 KHZ interface test.

4.8.7. Record the results of this test on the data sheet.

4.9. Video Interface Test

4.9.1. Press **KEYPAD NUMBER 8**.

4.9.2. Verify that the LCD displays the message

Select Test
8: VIDEO INPUT

4.9.3. If this message is not displayed, repeat step 4.9.1 until the appropriate message is displayed.

4.9.4. Press **AUTOPLAY**.



4.9.5. Insert a video tape into the VCR and press **PLAY** on the VCR. Note, this video tape must have valid program material recorded onto it.

4.9.6. Verify that the LCD displays the message

VIDEO CLOCK TEST
XXXX Input

where XXXX = NTSC or PAL/SECAM depending on the video source input to the BRC.

4.9.7. If the LCD fails to display the appropriate video input, then the BRC has failed its video interface test.

4.9.8. Press **PITCH**  and **PITCH**  simultaneously. Verify that the LCD displays the message shown in step 4.9.2.

4.9.9. Eject the tape from the VCR.

4.9.10. Record the results of this test on the data sheet.

4.10. SMPTE Interface Test

4.10.1. Press **KEYPAD NUMBER 9**.

4.10.2. Verify that the LCD displays the message

Select Test
9: SMPTE IN/OUT



4.10.3. If this message is not displayed, repeat step 4.10.1 until the appropriate message is displayed.

4.10.4. Press **AUTOPLAY**.

4.10.5. Verify that the LCD displays the message

SMPTE TEST
Connect In <-> Out

4.10.6. Verify that the BRC LED counter is displaying running time code.

- 4.10.7. If the LED does not display running time code, then the BRC has failed its SMPTE interface test.
- 4.10.8. Press **PITCH**  and **PITCH**  simultaneously. Verify that the LCD displays the message shown in step 4.10.2.
- 4.10.9. Record the results of this test on the data sheet.
- 4.10.10. Power off the BRC.
- 4.10.11. Remove the 1/4 inch patch cord from the SMPTE connectors.
- 4.10.12. Remove the MIDI patch cord from the MIDI connectors.
- 4.10.13. Remove the BNC patch cord from the 48 KHZ connectors.
- 4.10.14. Remove the BNC cable from the VIDEO INPUT connector.
- 4.10.15. Remove the LRC from the PUNCH IN/OUT connector.

5.0 Save Setup to Tape Test

This test will verify that the BRC can successfully save its current data to the ADAT tape. Note that the ADAT will store this information in the "dAtA" section of the ADAT tape.

- 5.1. Power on the ADAT and then the BRC. Verify that the LCD displays the message

ALESIS BRC 01 ADAT Slaves

- 5.2. Insert a formatted tape into the ADAT.
- 5.3. Press the **LOOP** button. Verify that its LED as well as the AUTOPLAY LED illuminates.
- 5.4. Press the **AUTO PUNCH** button. Verify that its LED illuminates.
- 5.5. Press the **PRE-ROLL** button. Verify that its LED illuminates.
- 5.6. Press the **POST-ROLL** button. Verify that its LED illuminates.
- 5.7. Press the **SAVE SETUP TO TAPE** button.
- 5.8. Verify that the LCD displays the message

Save to tape? (Press RECORD)

- 5.9. Press **RECORD**. Verify that the ADAT rewinds to the start of the "dAtA" section and then goes into Record mode. The BRC is now saving the BRCs current setup to the ADAT tape.
- 5.10. Verify the LCD displays the message "Save to tape Completed" when the ADAT stops recording.
- 5.11. Power off the BRC
- 5.12. Re-initialize the BRC by pressing **RECORD** and **PLAY** simultaneously while applying power to the BRC. Verify that the LCD displays the message "Initialization in progress." momentarily followed by the number of ADAT slaves connected.
- 5.13. Verify that the EDIT, LOOP, PRE-ROLL, POST-ROLL, AUTOPLAY and AUTO PUNCH LEDs are no longer lit.
- 5.14. Record the results of this test on the data sheet.

6.0 Load Setup from Tape Test

This test will verify that the BRC successfully loads the BRC setup which was just saved to the ADAT tape in step 5.0.

6.1. Press the **LOAD SETUP FROM TAPE** button.

6.2. Verify that the LCD displays the message

Load from tape? (Press PLAY)

6.3. Press **PLAY**. Verify that the ADAT rewinds to the start of the "dAtA" section and then goes into Play mode. The BRC is now loading the stored setup from the ADAT tape to the BRC.

6.4. Verify the LCD displays the message "Load from tape Completed" when the ADAT stops recording.

6.5. Verify that the LOOP, AUTO PUNCH, AUTOPLAY, PRE-ROLL and POST-ROLL LEDs are lit.

6.6. Press the **EDIT** button. Verify that its LED illuminates.

6.7. Press the **LOOP** button. Verify that its LED illuminates.

6.8. Verify that the loop time input in step 3.1.6 is displayed.

6.9. Press the **LOOP** button again. Verify that the loop time input in step 3.1.9 is displayed.

6.10. Press the **AUTO PUNCH** button. Verify that its LED illuminates.

6.11. Verify that the punch in time input in step 3.1.13 is displayed here.

6.12. Press the **AUTO PUNCH** button again. Verify that the punch out time input in step 3.1.16 is displayed.

6.13. Press the **PRE-ROLL** button. Verify that its LED illuminates.

6.14. Verify that the pre-roll time input in step 3.1.19 is displayed.

6.15. Press the **POST-ROLL** button. Verify that its LED illuminates.

6.16. Verify that the post-roll time input in step 3.1.22 is displayed.

6.17. Press the **EDIT** button. Verify that its LED is not lit.

6.18. Record the results of this test on the data sheet.

7.0 BRC Loop Test

This test will verify that the BRC can successfully set up a tape loop between two locate points. This test will also verify that the Pre-Roll and Post-Roll functions are working correctly.

7.1. Press **PRE-ROLL**. Verify that its LED is not lit.


7.2. Press **POST-ROLL**. Verify that its LED is not lit.

7.3. Press **LOCATE**.

7.4. Verify that the LCD displays the message

L01 "LocNam01" xx:xx:xx

where xx:xx:xx is the time input in step 3.1.6.

7.5. If this message is not displayed, use the **KEYPAD**  or  keys to scroll through the locate points until the LCD display resembles that shown in step 7.5.

7.6. Press **LOCATE**. Verify that the BRC locates to the time input in step 3.1.6 and then goes into Play mode.

7.7. When the BRC LED counter displays the time input in step 3.1.9, verify that the BRC goes into Rewind mode and then into Play mode when it reaches the time input in step 3.1.6.

7.8. Record the results on the data sheet.

7.9. Press **PRE-ROLL**. Verify that its LED illuminates

- 7.10. Press **POST-ROLL**. Verify that its LED illuminates.
- 7.11. When the BRC LED counter displays the time input in step 3.1.26, verify that the BRC goes into Rewind mode and then into Play mode when it reaches the time input in step 3.1.25.
- 7.12. Press **STOP**. Verify that the ADAT stops playing.
- 7.13. Record the results of this test on the data sheet.

8.0 BRC Auto Punch Test

This test will verify that the BRC can successfully execute an auto-punch in and an auto-punch out between two locate points.

- 8.1. Press **TRACK 7 RECORD READY**. Verify that its corresponding green LED is lit steady and its red LED is blinking.
- 8.2. Press **TRACK 8 RECORD READY**. Verify that its corresponding green LED is lit steady and its red LED is blinking.
- 8.3. Press **LOCATE**. Verify that the BRC rewinds to the time input in step 3.1.25 and then goes into Play mode.
- 8.4. When the PLAY light stops blinking (an indication that the ADAT is synced to the BRC), Press **RECORD** and **PLAY** simultaneously.
- 8.5. Verify that the RECORD light continues to blink until it reaches the time input in step 3.1.13. Once this time is reached, verify that the ADAT goes into Record mode and the red LEDs corresponding to tracks 7 and 8 are lit solidly.
- 8.6. Verify that the BRC continues in Record mode until it reaches the time input in step 3.1.16. Once this time is reached, verify that the BRC "punches out", the RECORD light goes out and the red LEDs corresponding to tracks 7 and 8 begin to blink.
- 8.7. Press **EJECT**. Verify that the ADAT ejects the tape.
- 8.8. Press **TRACK 7 RECORD READY**. Verify that its corresponding LEDs are not lit.
- 8.9. Press **TRACK 8 RECORD READY**. Verify that its corresponding LEDs are not lit.
- 8.10. Power down the BRC.
- 8.11. Record the results of this test on the data sheet.
- 8.12. If two ADATs are not available for test, skip to step 12 of this procedure (located in Part 2).

PART 2

These tests require the use of 2 ADATs and therefore are optional tests. However, if 2 ADATs are available, these tests must be conducted.

9.0 Additional Test Requirements

In order to conduct all of tests described herein, the following additional equipment, connections and setup is required. Note that the BRC setup detailed in step 3.1 must also be completed in order to conduct the tests described below. However, if you are continuing the test from step 8, this setup should already be completed.

9.1. Additional Equipment Requirements

- (1) ADAT Digital Multitrack Recorder (for a total of 2 ADATs)
- (1) ADAT Sync cable (for a total of two Sync cables)
- (1) Formatted ADAT SVHS cassette with audio recorded on tracks 1 and 2. Use this tape in ADAT No. 2.
- (2) ADAT Fiber Optic cables

9.2. Additional Connection Requirements (see figure E-1)

9.2.1. Connect an ADAT sync cable between ADAT No. 1 Sync Out Connector to ADAT No. 2 Sync In Connector.

9.2.2. Connect an ADAT Fiber Optic cable from ADAT No. 1 Optical Out connector to ADAT No. 2 Optical In connector.

9.2.3. Connect an ADAT Fiber Optic cable from ADAT No. 2 Optical Out connector to ADAT No. 1 Optical In connector.

9.3. Additional Setup Requirements

9.3.1. Power on the BRC. Verify that the LCD displays the message

ALESIS BRC
02 ADAT Slaves

9.3.2. Press the **EDIT** button. Verify that its LED illuminates

9.3.3. Press the **DIGITAL I/O** button. Verify that its LED illuminates.

9.3.4. Verify that the LCD displays the message

Digital Source
ADAT

9.3.5. Press the **DIGITAL I/O** button again. Verify that the LCD displays the message

Select source
with trk buttons

9.3.6. Press **TRACK 9 RECORD READY**. Verify that its green LED illuminates.

9.3.7. Press **TRACK 10 RECORD READY**. Verify that its green LED illuminates.


9.3.8. Press the **TAPE OFFSET** button. Verify that its LED illuminates.

9.3.9. Verify that the LCD displays the message

Offset mode:
Counter Offset

9.3.10. Press the **TAPE OFFSET** button again. Verify that the LCD displays the message

Offset Tape 01
+ 00:00:00

9.3.11. Press the **KEYPAD**  button to select Tape 02.

9.3.12. Use the **CURSOR** buttons to move the cursor under the display of zeros on the LCD.

9.3.13. Use the keypad's numeric buttons to enter a new Offset point. Note: The Offset point selected here has to be different from the Offset point entered for the previous BRC under test. Record the results on the data sheet.

9.3.14. Press the **EDIT** button. Verify that its LED is no longer lit.

9.3.15. Press **TRACK 1 RECORD READY**. Verify that its corresponding green LED is lit steady and its red LED is blinking.

9.3.16. Press **TRACK 2 RECORD READY**. Verify that its corresponding green LED is lit steady and its red LED is blinking.

9.3.17. Press **DIGITAL I/O**. Verify that its LED illuminates.

9.3.18. Press **AUTO PUNCH**. Verify that its LED illuminates.

9.3.19. Press **AUTO INPUT**. Verify that its LED illuminates.

If all of the steps have been accomplished properly, the following LEDs should be lit: DIGITAL I/O, LOOP, AUTO PUNCH, PRE-ROLL, POST-ROLL, AUTO PLAY, AUTO INPUT, TRACK 1 RECORD READY, and TRACK 2 RECORD READY. If not all of these LEDs are lit, press the appropriate button to illuminate the LED.

10.0 Digital I/O Test

This test will verify that the BRC can set up the ADATs to record individual tracks using the ADATs fiber optic digital link.

10.1. Insert an ADAT tape into ADAT No. 1.

10.2. Insert the ADAT tape with pre-recorded audio into ADAT No. 2.

10.3. Press **LOCATE** and verify that the BRC goes into Play mode when it reaches the time input in step 3.1.25.

10.4. When the PLAY light stops flashing, press **PLAY** and **RECORD** simultaneously. The RECORD light should be flashing at this point.

10.5. When the BRC reaches the time input in step 3.1.13, verify that the RECORD light is lit solidly and that ADAT No. 1 is in Record mode.

10.6. Verify that tracks 1 and 2 of ADAT No. 1 show the same metering activity as tracks 9 and 10 of ADAT No. 2.

10.7. When the BRC reaches the time input in step 3.1.16, verify that the RECORD light starts flashing and that ADAT No. 1 is no longer recording.

10.8. Press the **AUTO PUNCH** button. Verify that its LED is no longer lit.

10.9. Press the **DIGITAL I/O** button. Verify that its LED is no longer lit

10.10. When the BRC LED counter displays the time input in step 3.1.26, verify that the BRC goes into Rewind mode and then into Play mode when it reaches the time input in step 3.1.25.

10.11. After the PLAY light stops flashing, verify that tracks 1 and 2 of ADAT No. 1 show metering activity at the time input in step 3.1.16.

10.12. When the BRC LED counter displays the time input in step 3.1.26, verify that the BRC goes into Rewind mode and then into Play mode when it reaches the time input in step 3.1.25.

10.13. When the PLAY light stops flashing, press **PLAY** and **RECORD** simultaneously.

10.14. Verify that the RECORD light is lit solid and that ADAT No. 1 is in Record mode.

10.15. Verify that tracks 1 and 2 of ADAT No. 1 show no metering activity.

10.16. When the BRC LED counter displays the time input in step 3.1.26, verify that the BRC goes into Rewind mode and then into Play mode when it reaches the time input in step 3.1.25.

- 10.17. Press **STOP** once the PLAY light stops flashing.
- 10.18. Press **TRACK 1 RECORD READY**. Verify that its corresponding LEDs are not lit.
- 10.19. Press **TRACK 2 RECORD READY**. Verify that its corresponding LEDs are not lit.
- 10.20. Record the results on the data sheet.

11.0 Tape Offset Test

This test will verify that the BRC can properly setup an offset between the two ADATs and that both ADATs will play in sync but will be offset by a certain amount of time.

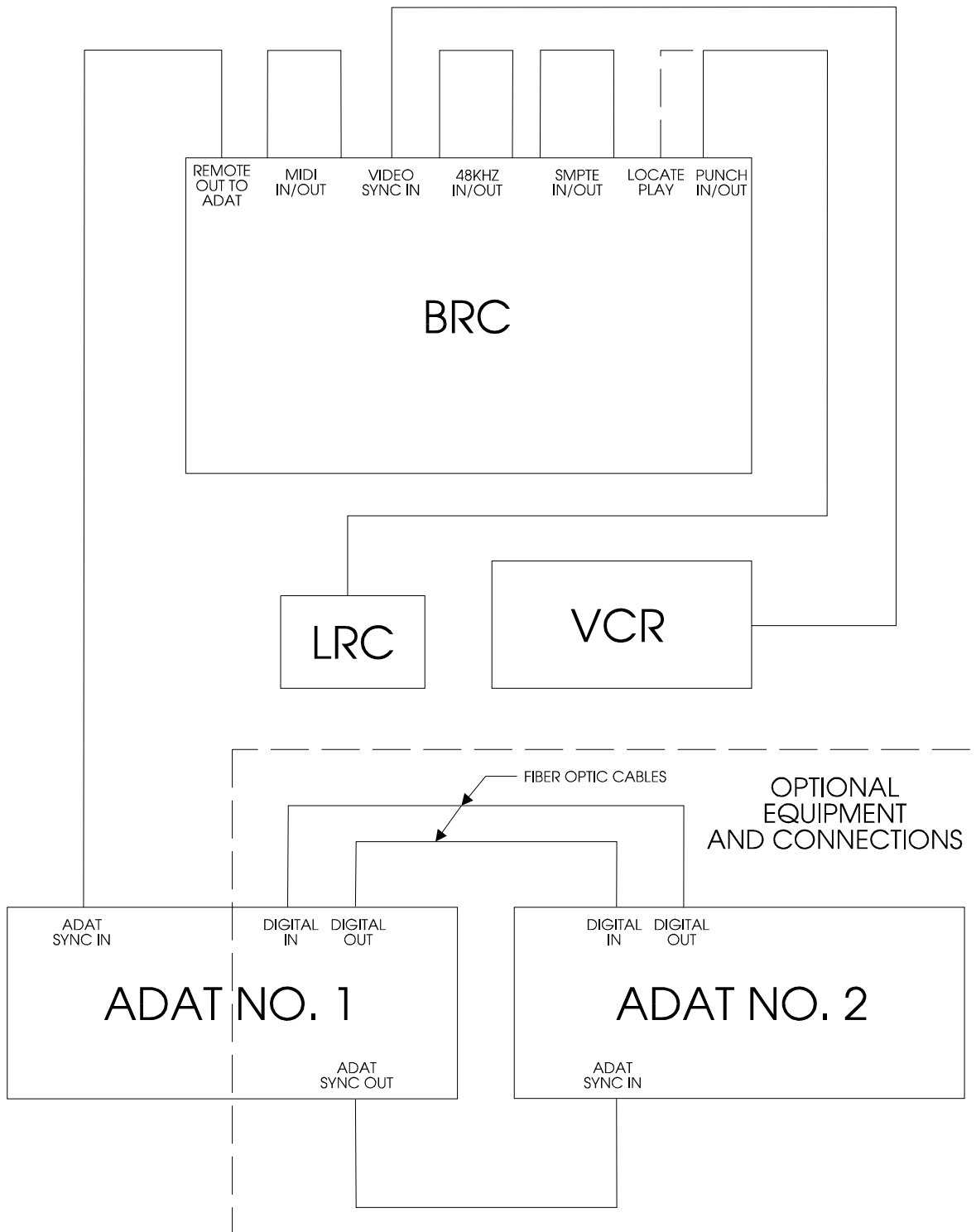
- 11.1. Press the **TAPE OFFSET** button. Verify that its LED illuminates.
- 11.2. Press **AUTOPLAY**. Verify that its LED is not lit.
- 11.3. Press **LOCATE**. Verify that ADAT No. 1 locates to the time input in step 3.1.25 but ADAT No. 2 is offset by the amount of time input in step 9.3.12.
- 11.4. Press **PLAY**. Verify that the PLAY light is lit solid after a few seconds.
- 11.5. Verify that the LED display on ADAT No. 1 indicates the same time as the BRCs LED display.
- 11.6. Verify that the LED display on ADAT No. 2 is offset by the amount of time input in step 9.3.12 and is playing in sync with ADAT No. 1.
- 11.7. Press **STOP**.
- 11.8. Press the **TAPE OFFSET** button. Verify that its LED is not lit.
- 11.9. Press **LOCATE**. Verify that both ADAT LED displays indicate the same time as the BRCs LED display.
- 11.10. Press **EJECT**.
- 11.11. Record the results on the data sheet.

12.0 Preparation For Delivery

Prepare the BRC for shipping.

- 12.1. Power off the BRC.
- 12.2. Re-initialize the BRC by pressing **RECORD** and **PLAY** simultaneously while applying power to the BRC. Verify that the LCD displays the message "Initialization in progress."
- 12.3. Verify that the PRE-ROLL, POST ROLL, and LOOP LEDs are not lit.
- 12.4. Record the results on the data sheet.
- 12.5. Power off the BRC. Remove all connected cables. The BRC is now ready for shipment.

Figure E-1 - BRC QC Test Connection Diagram



BRC REPAIR SHEET

Rev -12/22/93 JWS

UNIT S/N: BR22	MFG DATE: [___ / ___ / ___]	DATE REPAIRED: [___ / ___ / ___]
RA NUMBER:		SERVICE TECH:
S/W RECEIVED:	S/W INSTALLED:	LABOR HRS:

UPDATES (Check for each unit serviced)
MAIN PCB HARDWARE MODS: INSTALLED ___ REQUIRED ___
POWER SUPPLY INSULATOR: INSTALLED ___ REQUIRED ___

COMPLAINT COMMENTS
DEFECT COMMENTS
REPAIR COMMENTS
NOTES/COMMENTS/REWORK:

QC TEST PROCEDURE (Complete for each unit)		
2.5 VISUAL INSPECTION	PASS	FAIL
3.1.6 LOOP START TIME		
3.1.9 LOOP END TIME		
3.1.13 PUNCH IN TIME		
3.1.16 PUNCH OUT TIME		
3.1.19 PRE ROLL TIME		
3.1.22 POST ROLL TIME		
3.1.25 LOOP - PRE ROLL TIME		
3.1.26 LOOP + POST ROLL TIME		
4.1.7 ROM SELF TEST	PASS	FAIL
4.2.7 RAM SELF TEST	PASS	FAIL
4.3.7 LEDS (BLOCK) SELF TEST	PASS	FAIL
4.4.7 LEDS (CYCLE) SELF TEST	PASS	FAIL
4.5.11 SWITCHES SELF TEST	PASS	FAIL
4.6.9 FOOTSWITCH 1 SELF TEST	PASS	FAIL
4.6.18 FOOTSWITCH 2 SELF TEST	PASS	FAIL
4.7.8 MIDI SELF TEST	PASS	FAIL
4.8.7 48KHZ SELF TEST	PASS	FAIL
4.9.10 VIDEO INPUT SELF TEST	PASS	FAIL
4.10.10 SMPTE SELF TEST	PASS	FAIL
5.14 SAVE TO TAPE TEST	PASS	FAIL
6.18 LOAD FROM TAPE TEST	PASS	FAIL
7.8 LOOP TEST	PASS	FAIL
7.13 PRE ROLL/POST ROLL TEST	PASS	FAIL
8.11 AUTO PUNCH TEST	PASS	FAIL
9.3.13 TAPE OFFSET TIME		
10.20 DIGITAL I/O TEST	PASS	FAIL
11.11 TAPE OFFSET TEST	PASS	FAIL
12.4 BRC PREP FOR DELIVERY	PASS	FAIL

PARTS/COMPONENTS REPLACED		
PART NUMBER	PART DESCRIPTION	QTY