Date Received:_____

Software Revision:_____

AEC-BOX-50
AMPEX TO SONY SERIAL PROTOCOL CONVERTER
INSTRUCTION MANUAL

ADRIENNE ELECTRONICS
CORPORATION

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*** FCC NOTICE ***

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

*** COPYRIGHT NOTICES ***

Also, due to copyright restrictions, we cannot provide you with either the Sony or Ampex serial protocol descriptions. Such information must be obtained directly from the VTR manufacturers.

*** BOX VERSION NOTICE ***

This manual documents AEC-BOX-50's which have revision "B" circuit boards, including the 8K x 8 EEPROM chip, released for manufacture in June 1993, and may not accurately describe previous hardware and software designs.

*** TRADEMARK NOTICES ***

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INTRODUCTION

Adrienne Electronics Corporation (AEC) developed the AEC-BOX-50 Ampex-to-Sony Serial Protocol Converter in order to enable the use of Ampex protocol VTR's in systems which were designed to work only with the more standard Sony protocol VTR's.

Specifically, the AEC-BOX-50 makes Ampex VPR-3, VPR-6, VPR-80, and VPR-300 VTR's "look like" the Sony BVH-2000 VTR, at least from a serial control standpoint. This serial protocol is essentially the same one used on all Sony Betacam and U-matic broadcast quality VTR's.

The AEC-BOX-50 automatically adapts itself to, and works equally well with, both the NTSC/SMPTE and PAL/EBU operating environments.

NOMENCLATURE

The word "controller" will be used to refer to whatever device is sending commands to the AEC-BOX-50.

GETTING STARTED QUICKLY

If you want to use your AEC-BOX-50 right away, without reading the whole manual, just do the following:

1) Plug the AC power cord into a suitable voltage AC outlet.
2) Connect the same composite video sync signal which the Ampex VTR is using to the AEC-BOX-50's "SYNC IN" BNC's.
3) Use ESbus (RS422) cables to connect the AEC-BOX-50 to the VTR and to the controller.

The green LED on the front of the box will blink if the video sync input is missing or if communications cannot be established with the Ampex VTR. If something doesn't work, you will have to carefully read the "INSTALLATION", "TROUBLESHOOTING", and/or "LED OPERATIONS" sections of this manual.

AEC-BOX-50 HARDWARE DESCRIPTION

Throughout the following discussion you may want to refer to the AEC-BOX-50 schematics which are in the back of this manual. If your box has been customized in any way for your application, then the descriptions below may not be entirely accurate.

The power supply primary side comprises power transformer T1 and thermal "fuse" device F1. Of special note is the fact that this "fuse" does not burn out. If it trips, turn the power off for one minute to let it cool/reset, then turn the power back on.

The power supply secondary side starts with full wave rectifiers DB1 and DB2, plus large filter capacitors C72, C73, C82, and C83. The resulting unregulated DC supplies are then passed through voltage regulators U70(+5V), U72(+12V), and U73(-12V).

The video sync input signal first passes through 3-pole low pass filter R17,C44,L1,C45, then is buffered by U8A. Transistor Q5 is turned on by each sync tip, and thus generates horizontal sync pulses which are fed to U4 pin 1. Low pass filter RN10B,C40 only exceeds the threshold of comparator U6B during vertical reset pulses. The vertical sync output of U6B then goes to U4 pin 2.

Microcomputer U4 contains its own program EPROM, and thus forms a completely self contained computer system. Address latch U51 and EEPROM U1 allow many operational changes and software upgrades to be performed in the field. DIP switch SW1 allows easy modification of box operating modes, edit offsets, and other features. "Watch dog" timer U5 resets the microcomputer chip, and thus the entire box, if the supply voltage drops too low or if the software crashes for some reason.

Serial data from Dual UART (DUART) U52 is translated to RS232 levels by U7, and is translated to RS422 levels by U14. U14 also translates received RS232 and RS422 data for use by DUART U52. Nine pin "D" connector J3 contains the RS232 and RS422 transmit and receive data lines which go to the VTR controller. Nine pin "D" connector J4 contains the RS232 and RS422 transmit and receive data lines which go to the VTR being controlled.

Note that even though AEC-BOX-50's normally use only the RS422 data lines, the RS232 data lines were included to allow control of the AEC-BOX-50 (and thus the VTR) using standard personal computer RS232 ports (a nonstandard RS232 cable is required). In addition, external RS232 modems can be used for diagnostic and software upgrade purposes, when needed.

AC INPUT VOLTAGE RANGE SELECTION

Normally all AEC-BOX's are shipped with the transformer primary wired for 100-130VAC. Your box will bear a special marking if it has been wired for 200-260VAC instead. For your own safety, PLEASE do not proceed unless the line cord has been unplugged! Just turning off a power switch somewhere is not sufficient!

*** WARNING ***

NEVER OPEN UP THE BOX unless the line cord has been unplugged from its AC power source! To do otherwise risks damage to your AEC-BOX, and could even KILL you! We cannot assume responsibility for such careless behavior.

Box Cover Removal:
First you must UNPLUG the AC power cord, remove all other cables, then remove the bottom cover as follows:

1) Use a small (#1) Phillips screwdriver to remove the two small black screws which are on each side of the box.
2) Slide off the front and back black plastic bezels.
3) Turn the box over, then lift off the BOTTOM cover.

Note that you are now exposing yourself to a severe (FATAL) shock hazard if the box is still plugged in to an AC power source!

Voltage Strap Modification for 200-260VAC:
In the area underneath power transformer T1, you will find four large holes in a row, with "115V" and "230V" markings adjacent. Using sharp nosed cutters, or some other appropriate tool, cut out at least 2mm of the narrow trace next to each of the "115V" markings. Then solder a short wire between the two holes closest to the "230V" marking, being careful not to poke the ends of the wire too far into the holes (could damage power transformer T1). Also make sure that the wire you added is flush with the bottom of the board, and will not even come close to touching to bottom of the box.

Voltage Strap Modification for 100-130VAC:
In the area underneath power transformer T1, you will find four large holes in a row, with "115V" and "230V" markings adjacent. Remove the wire between the two holes closest to the "230V" marking. Then solder a short wire between each pair of holes closest to the "115V" markings, being careful not to poke the ends of the wire too far into the holes (could damage power transformer T1). Also make sure that the two wires you added are flush with the bottom of the board, and will not even come close to touching to bottom of the box.

AC POWER INPUT VOLTAGE RANGE SELECTION
(continued)

Box Cover Replacement:
Basically, just follow the earlier instructions in reverse order (power to the box must be OFF):

1) Put the bottom cover back in place.
2) Slide a black plastic bezel onto each end of the unit. The box looks better if the two small molding marks are facing towards the bottom of the unit.
3) Reattach the bezels to the chassis with the four small black screws you removed earlier. Be careful not to strip the threads in the aluminum side extrusions!

Label The Line Cord:
Attach a small label to the plug end of the line cord, so that the next person to use this AEC-BOX will know what AC power input voltage range it expects to see.

Test Your Work:
BEFORE connecting any cables to the box, plug it in to the appropriate AC power source and make sure it works (no smoke).

INSTALLING YOUR OWN AC POWER LINE PLUG

If the plug on the end of the AC line cord is not suitable, you can cut it off and put on your own. Where possible, please wire the new plug as follows:

1) Green = Ground (Chassis)
2) Blue = Neutral
3) Brown = Hot

In no case should the green wire be connected to anything but ground! Use a continuity tester to verify that the ground lug on your new power cord is connected directly to the AEC-BOX chassis.

SERIAL CONNECTION "TO AMPEX VTR":
This 9-pin D connector has the same pinout as is found on most VTR controllers. Thus a standard 9-pin cable with no crossed lines will make the proper connection to the VTR. If you are making your own cable, the following chart indicates the pinout of this connector:

Pin #	Function
1	Chassis GND
2	RX422-
3	TX422+
4	Transmit GND
5	reserved
6	Receive GND
7	RX422+
8	TX422-
9	Chassis GND

Notes:
1) Tiny pin numbers are molded into the connector face.
   Be careful not to be "off by one".
2) The pinout is that of an ESbus CONTROLLER.

SERIAL CONNECTION "TO CONTROLLER":
This 9-pin D connector has the same pinout as is found on the VTR itself. Thus a standard 9-pin cable with no crossed lines will make the proper connection to the controller. If you are making your own cable, the following chart indicates the pinout of this connector:

Pin #	Function
1	Chassis GND
2	TX422-
3	RX422+
4	Receive GND
5	reserved
6	Transmit GND
7	TX422+
8	RX422-
9	Chassis GND

Notes:
1) Tiny pin numbers are molded into the connector face.
   Be careful not to be "off by one".
2) The pinout is that of an ESbus TRIBUTARY.

VIDEO SYNC INPUT CONNECTION:

The two "SYNC IN" BNC connectors are hard wired together. The composite video sync signal going to the VTR must be looped through the AEC-BOX-50 so that commands can be sent to the Ampex VTR at the proper times (otherwise operation will be unreliable). The nominal video sync input level is 1Vpp, but the input amplifier will adjust to other input levels, including the unterminated input condition. For best results, the video sync signal should be properly terminated.

DIP SWITCH ALTERATIONS

Via DIP switch SW1, you can alter several box operating modes and parameters. Since each AEC-BOX-50 is set up with the proper default values at the factory, in most cases you will not need to make any changes.

Box Cover Removal:
First you must UNPLUG the AC power cord, remove all other cables, then remove the top cover as follows:

1) Use a small (#1) Phillips screwdriver to remove the two small black screws which are on each side of the box.
2) Slide off the front and back black plastic bezels.
3) Lift off the top cover.

Note that the bottom cover will fall off easily at this point, exposing you to a severe (FATAL) shock hazard if the box is still plugged in to an AC power source!

*** WARNING ***

NEVER OPEN UP THE BOX unless the line cord has been unplugged from its AC power source! To do otherwise risks damage to your AEC-BOX, and could even KILL you! We cannot assume responsibility for such careless behavior.

Changing DIP Switch (SW1) Settings:
Note that the switches are numbered 1 through 8. Also note the small "1" and "0" numbers down on the PCB next to both ends of SW1. To set a switch to be a "1", simply press down on the "1" (OPEN) end of that switch. Conversely, to set a switch to be a "0", simply press down on the "0" end of that switch. All done!

DIP Switch Functionality:

Switch	Function
1	reserved
2	reserved
3	reserved
4	reserved
5	reserved
6	Edit Delay Frames Bit 2 (most significant bit)
7	Edit Delay Frames Bit 1
8	Edit Delay Frames Bit 0 (least significant bit)

Edit Delay Selection:
Switches 6-8 form a binary code which represents the number of frames to delay Edit On/Off commands from the controller before sending them to the Ampex VTR. The AEC-BOX-50 always adds one frame delay in addition to whatever you select. If the edits are happening too early, simply increase the delay code. If the edits are happening too late, decrease the delay code.

Factory Default Setting:
Unless you requested otherwise, the factory default setting is 1 frame Edit On/Off delay, so SW1 will normally be 00000000 for switches 1-8, respectively (the AEC-BOX-50 adds 1 count to the 000 binary code of switches 6-8).

Box Cover Replacement:
Basically, just follow the earlier instructions in reverse order (power to the box must be OFF):

1) Put the top cover back in place.
2) Slide a black plastic bezel onto each end of the unit. The box looks better if the two small molding marks are facing towards the bottom of the unit.
3) Reattach the bezels to the chassis with the four small black screws you removed earlier. Be careful not to strip the threads in the aluminum side extrusions!

AEC-BOX-50 PERFORMANCE LIMITATIONS

Due to the inherent time delays and other difficulties when translating between two very different software protocols, you may run in to the following AEC-BOX-50 limitations:

1) There will be command response timing differences between the AEC-BOX-50 and a real BVH-2000 VTR. Sometimes the AEC-BOX-50 is faster, and sometimes it is slower.

2) There may be up to a 1 frame delay from when a command is sent to the AEC-BOX-50 to when the appropriate translated (corresponding) command is sent to the Ampex VTR.

3) Longitudinal time code must be sequential (no jumping around) in order for searches and prerolls to work properly.

4) For searches and prerolls, it is always assumed that the destination time code is within 11 hours of the current time.

5) LTC frames must be aligned closely with the video frames (a tolerance of +1/4 field is permitted).

6) There may be a 1 frame delay from when user bits change on a tape to when they are actually reported to the controller. This usually only matters if user bits are being used as a second time source, for control or editing purposes.

7) We are sometimes constrained by Ampex VTR capabilities. For instance, the VPR-80 has no slow reverse speeds, and none of the Ampex VTR's support Sony's LOCAL DISABLE command.

If you find any other limitations, please let us know so that we may either fix them or add them to this list. Thanks.

AMPEX VPR-3 SETUP AND LIMITATIONS

Options Required:
1) None.

Software Revisions Required:
1) Control software revision 7.1 or later.
2) Serial software revision 4.0 or later.
3) Use of other software revisions may or may not work.
   Please let us know of your findings.

Serial Control Setup:
1) Remove PWA #20 (the Control PWA).
2) Set rotary switches S4, S5, and S6 to "0".
3) Set rotary switch S3 to "1".
4) Reinsert PWA #20 into the card cage.
5) Select the "asmpte" protocol via the software setup menus.
6) Connect an ESbus (9-pin) cable from the AEC-BOX-50's VTR port
   to the "REMOTE 1" connector on the back of the VTR.
7) Activate the "REM 1" button on the VTR's front control panel.

Limitations:
1) None known at present.

Problems?
Please let us know immediately if you encounter any problems which you feel should be fixed and/or better documented.

AMPEX VPR-6 SETUP AND LIMITATIONS

Options Required:
1) None.

Software Revisions Required:
1) Control software revision 4.0 or later.
2) Serial software revision 4.0 or later.
3) Use of other software revisions may or may not work.
   Please let us know of your findings.

Serial Control Setup:
1) Enter "SETUP-1-3-ENTER" (setup mode 13).
2) Enter "1-ENTER" (sets VTR ID number to 1).
3) Enter "SETUP" (exits setup mode).
4) Connect an ESbus (9-pin) cable from the AEC-BOX-50's VTR port
   to the "REMOTE 1" connector on the back of the VTR.
5) Activate the "REMOTE 1" button on the VTR's front control
panel.

Limitations:
1) None known at present.

Problems?
Please let us know immediately if you encounter any problems
which you feel should be fixed and/or better documented.

AMPEX VPR-80 SETUP AND LIMITATIONS

Options Required:
1) Time Code Generator-Reader.
2) Serial Remote Control Interface.

Software Revisions Required:
1) Control software revision 3.0 or later.
2) Serial software revision 2.0 or later.
3) Use of other software revisions may or may not work.
   Please let us know of your findings.

Serial Control Setup:
1) Enter "SETUP-1-3-ENTER" (setup mode 13).
2) Enter "1-ENTER" (sets VTR ID number to 1).
3) Enter "SETUP" (exits setup mode).
4) Connect an ESbus (9-pin) cable from the AEC-BOX-50's VTR port
   to the "SERIAL CONTROL" connector on the back of the VTR.
5) Activate the "REM 1" button on the VTR's front control panel.

Limitations:
1) Has no reverse JOG or VARPLAY speeds.
2) Has no forward JOG or VARPLAY above 1.5x.

Problems?
Please let us know immediately if you encounter any problems which you feel should be fixed and/or better documented.

AMPEX VPR-300 SETUP AND LIMITATIONS

Options Required:
1) None.

Software Revisions Required:
1) Use VPR-300 software revision 4.0.0 or later.
2) Use of other software revisions may or may not work.
   Please let us know of your findings.

Serial Control Setup:
1) Press "HOME" button until get back to the main menu.
2) Press "SYSTEM SETUP", then press "REMOTE".
3) Press "PORT SELECT" until "REMOTE 1" is displayed.
4) Press "PROTOCOL" until "asmpte" is displayed.
5) Select "INTERFACE" = "rs422".
6) Select "ADDRESS" = "1" (on keypad).
7) Connect an ESbus (9-pin) cable from the AEC-BOX-50's VTR port
   to the "RS422 1" connector on the back of the VTR.

AEC-BOX-50 Setup:
1) The default setting (DIP switch "1" = "0") selects PRE-READ
   whenever the edit controller sends an ASSEMBLE edit command.
   To use this properly, first set up a normal insert edit,
   then switch the edit controller to "ASSEMBLE" edit mode.
   The VPR-300 will then do a PRE-READ using the channel enables
   previously selected for the insert edit mode.
2) Set DIP switch "1" to "1" to use ASSEMBLE instead of PRE-READ.

Limitations:
1) None known at present.

Problems?
Please let us know immediately if you encounter any problems
which you feel should be fixed and/or better documented.

AEC-BOX-50 LED OPERATIONS

The so called "POWER" LED on the front of the box behaves in a variety of ways so that you can have some clues as to what is (or is not) going on inside the box.

When power is first turned on, a hardware reset circuit forces the LED to blink ON for a short (barely noticeable) time. If this fails to happen, there is something seriously wrong with the power supply or LED. Check the TROUBLESHOOTING section on page 19 for details.

If the LED blinks on initially, but then fails to come on any more, there must be some kind of serious hardware/software problem. Again, check the TROUBLESHOOTING section on page 19 for details.

Thereafter, if the LED blinks OFF occasionally (or constantly), the box hardware is working OK, but it is indicating that there is something unusual with the video sync and/or serial data signals which are coming into the box.

Failure to establish communications with an Ampex protocol VTR, or any other VTR port serial communications errors, will result in the LED being toggled quickly for about 500ms, after which it stays on for about 300ms. Continual VTR communication errors cause continual bursts of LED toggling, separated by about 300ms. This is the pattern that you will see if you turn on the AEC-BOX-50 while it is not connected to anything (besides AC power).

Any undefined messages or other serial communications errors from the controller will blink the LED off for about 250ms. Continual controller communication errors cause a 2Hz LED toggle rate.

Video sync errors cause the LED to blink off for about 500ms. Continual video sync errors will cause a 1Hz LED toggle rate.

No matter how many errors are detected, the LED will always come on at least once per second. This way you will know that the power supply is OK.

If the "POWER" LED stays on all of the time, everything must be running perfectly, and you can go read something else.

AEC-BOX-50 DIAGNOSTICS

When first turned on, the AEC-BOX-50 software begins a special power-up diagnostics sequence so that the box hardware, video sync source, Ampex VTR, and connecting cables may all be tested easily. Diagnostic results are indicated by the LED status. This diagnostic sequence ends as soon as communications are established with an Ampex VTR.

Hardware/Software Reset:

Whenever a hardware or software reset occurs, the LED will stay off for almost a full second. If this ever occurs during normal operations, something serious has gone wrong. This is however normal when power is first applied.

VTR Control Port Loopback Test:

Connect the VTR control port's transmit and receive data lines together, either right at the connector or at the far end of a cable. The LED will then toggle very quickly (7Hz) and continuously if the transmit and receive paths are OK.

Controller Port Loopback Test:

Connect an ESbus (9-pin) cable directly between the two serial ports on the AEC-BOX-50. The LED will then toggle as above (very quickly) if the cable and controller port are OK.

Ampex VTR Not Detected:

If no loopback is detected, and no response is received from an Ampex VTR, the LED will toggle quickly for about 500ms, then stay ON for about 300ms, to indicate that no Ampex VTR has been found. Perhaps the cable is bad or missing, the VTR power is off, or the VTR's serial remote port is missing or has not been enabled.

Video Sync Input Test:

After communications with the Ampex VTR have been established, the LED will blink on and off about once per second (1Hz) if the video sync input is missing or unstable.

AEC-BOX-50 TROUBLESHOOTING GUIDE

This guide lists anticipated problems and their solutions. If you really get stuck, call our Service Department.

Problem #1: Power LED does not blink ON when power is applied:
Solutions :
a) Check for presence of external AC power source.
b) Make sure AC voltage agrees with box wiring.
c) Turn OFF for 1 minute, then turn back on. Thermal "fuse" will then be cooled and reset.
d) Fix broken LED wiring.
e) Return AEC-BOX for power supply repairs.

Problem #2: Power LED blinks ON initially, then stays off:
Solutions :
a) Return AEC-BOX for repairs.

Problem #3: Power LED blinks ON twice per second ("heartbeat"):
Solutions :
a) Reprogram the EEPROM (call factory).

Problem #4: Power LED blinks OFF during normal operations:
Solutions :
a) See the LED OPERATIONS section of this manual. Something is wrong with the video sync input, the Ampex VTR, or some controller messages.

Problem #5: AEC-BOX-50 indicates no connection to the VTR:
Solutions :
a) Turn on power to the VTR.
b) Enable the VTR's serial remote control port.
c) Check the cable for shorts, opens, crossed wires.
d) Check box and/or cables by installing TX/RX line shorts, then turn on the box. LED will flash quickly if this loopback test is OK.

Problem #6: AEC-BOX-50 is not talking to the controller:
Solutions :
a) Turn on power to the box (check LED).
b) Check the cable for shorts, opens, crossed wires.
c) Make sure controller UART parameters (38400 baud, eight data bits, ODD parity) are set properly.

Problem #7: Messages from AEC-BOX-50 are incomplete:
Solutions :
a) The controller must be able to receive ALL bytes in a message without any OVERRUN errors, even if interrupts occur during reception. Change interrupt priorities, disable some, etc.
b) Inspect the cable for intermittent problems.

Problem #8: Some time code counts are missing:
Solutions :
a) Poll the box more frequently so you don't miss any. At high tape speeds, may be impossible.
b) SMPTE drop frame counting eliminates some counts.
c) Use a higher quality tape and/or VTR which does not have any dropouts, bit errors, etc..

Problem #9: Edits do not happen in exactly the right place:
Solutions :
a) Adjust edit offsets via DIP switch (see page 10).

WARRANTY REGISTRATION

We no longer have a formal warranty registration procedure, but do like to keep in touch with our end users. If you did not purchase this product directly from us, please copy the User Feedback Request form in the back of this manual, fill it out, then fax or mail it back to us. This way we will know who and where you are and be able to provide you with the following:

1) product upgrade and and bug reports,
2) manual updates and application notes,
3) safety/recall notices, and
4) better service in many other ways.

OUR WARRANTY

For the first two years following the shipment of an AEC product, we will repair or replace, at our option, any such product which is found to be inoperative due to defects in materials or workmanship. Not covered is damage due to unusual electrical and/or physical abuse. Altered hardware, software, labels, or other identifying marks may also void the warranty.

GENERAL GUIDELINES

Before sending a product back to us for service, please do the following (we've found over 90% of returned items work fine):

1) Check the "Troubleshooting Guide" in this manual.
2) Call our Service Department for assistance if needed.
3) Obtain our current return address, and possibly an RMA number, before shipping anything back to us.
4) Package the unit carefully before shipping it (it's yours).

WARRANTY SERVICE PROCEDURES

All you have to do is call our Service Department and describe the nature of the problem. We will attempt to fix it over the phone, but if that doesn't work we will give you an RMA number and you can ship the defective product back to us. We will repair or replace the product and return it to you as soon as possible.

OUT-OF-WARRANTY SERVICE PROCEDURES

If the two year warranty period has expired, or if the product has been altered or damaged, we will repair the product for a charge to be agreed upon before the repairs are begun. Call our Service Department for assistance. We have the test equipment, parts, and experience to quickly find and fix any problems.