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CETEC BROADCAST GROUP

SERIES 7000 AUTOMATION SYSTEM

Cetec Broadcast Group
1110 Mark Avenue
Carpinteria, California 93013

049-7000 REV. B

SERIES 7000 AUTOMATION SYSTEM

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Cetec Broadcast Group

Cetec Corporation
1110 Mark Avenue, Carpinteria, California 93013

SYSTEM 7000 AUTOMATION LEVEL II SUPPLEMENT

SIZE	DRAWING NUMBER	REV
A	049 7002	

SCALE | SHEET 1 OF

1.0 INTRODUCTION--This supplement deals with programming a Level II Series 7000 Automation System. The Level II features deal primarily with editing the Event Memory, however this supplement also reviews the manual controls and the hard copy print out features of the Level II LOCAL mode. A review of Page 1, which gives the main paragraph headings, will determine whether this supplement is applicable to the reader's question.

2.0 OPERATION

2.1 GENERAL--Operating controls for the system center in two locations; the Local Status Panel and the Video Terminal. The Local Status Panel is used solely for monitoring audio and system status as discussed in paragraph 2.2.1 while the Video Terminal is used to input the station program, monitor current and future program events, and manually control the Automation System (START, STOP, FADE, etc.).

2.2 MANUAL CONTROLS

2.2.1 LOCAL STATUS PANEL--Figure 1 illustrates the Local Status Panel control switches and indicator meters, lamps, and LED's (light emitting diodes). The following discusses the function of the switches and indicators:

2.2.1.1 AUDIO MONITOR SWITCHES AND METERS

VU METERS--There are two VU meters. The one on the left monitors A channel audio level, while the one on the right measures B channel audio level (assuming the MODE switch is in NORMAL).

MODE SWITCH--used to select one of three (3) audio display modes.

1. L + R--combines A and B channel audio in phase and displays results on VU meters and monitor speakers.

2. L - R--combines A and B channel audio 180° out of phase and displays results on A channel (left) VU meter and speaker. Note that the right VU meter will deflect, but it does not indicate true L - R condition.

3. NORMAL--Displays A channel audio on left VU meter and B channel audio on right VU meter.

SOURCE SWITCH--Used to select one of six (6) source types for monitoring.

1. PROGRAM--Audio source which is "ON AIR". Monitored prior to 25Hz reject filter in final output stage to allow 25Hz switching tones to be monitored.

NOTE: The following switch positions are used to monitor audio sources which are not "ON AIR"

2. CUE--Selected to monitor any source which does not fit into the following categories (3 through 6). If selected, any source which is started (manually or by preroll command) will be displayed on VU meters and heard on the monitor speakers.

3. TIME--Selects audio clock for monitoring.

4. NETWORK--Selects Network and/or Studio audio sources for monitoring.

5. AUX 1--Selects audio source connected to Aux 1 inputs of Monitor Interface Terminal board (TB1) for monitoring.

6. AUX 2--Selects audio source connected to Aux 2 inputs of Monitor Interface Terminal board (TB2) for monitoring. Normally used to monitor the Transmitter "AIR" signal.

VOLUME SWITCH--Adjusts volume level to monitor speakers.

2.2.1.2 INDICATOR LAMPS AND LED's

ALARM SWITCH AND LAMP--Lamp comes ON in the event of a Silence Sense or Close Loop malfunction. Press to reset lamp.

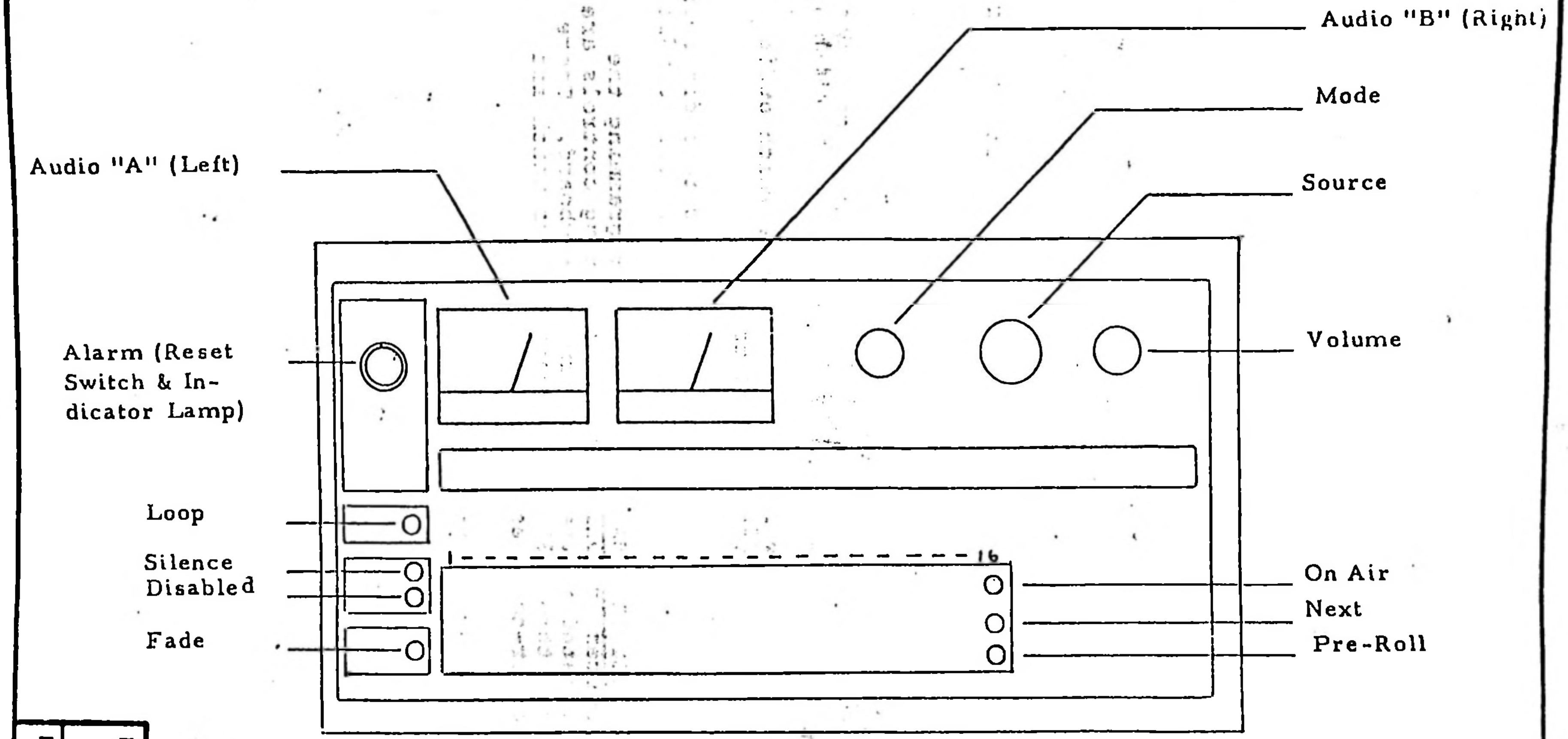

FIGURE 1 LOCAL STATUS PANEL

LOOP--Lights in event of Closed Loop malfunction (source does not start and go "ON AIR"). Reset by resetting ALARM indicator.

SILENCE--Lights in event of Silence Sense malfunction (loss of audio for typically more than 3 seconds). Reset by resetting ALARM indicator.

DISABLE--Lights whenever:

1. Audio is present.
2. ALARM switch is pressed.
3. Silence Sense is disabled by program.
4. System is in STOP mode.

FADE--Lights whenever audio is being faded by FADE command.

NOTE: The following LED's are on each Universal Source Board and light only for the appropriate source board for which the indicator applies as determined by the source numbers above the LED's.

ON AIR--Lights to indicate which audio source in "ON THE AIR".

NEXT--Lights to indicate which audio source is NEXT to play.

PRE-ROLL--Lights to indicate audio source is in a PRE-ROLL (or deal roll) condition.

2.2.2 VIDEO TERMINAL--Keys used in programming the system as well as manual operating controls are located in the Video Terminal keyboard. There are three (3) major groups of keys which are color-coded as follows:

RED--SYSTEM CONTROL KEYS

BLUE--PROGRAM EDIT AND FUNCTION KEYS

GREEN--TIME EDIT KEYS

The System Control Keys (red) will be discussed in this paragraph, while the Program Edit and Function Keys are discussed in paragraph 2.3. Time Function Keys are discussed in paragraph 3.4 in the main manual. Figure 2 outlines the System Control Keys. Their function is as follows:

OPER--(Operate) When pressed, all other red keys are enabled. Additionally, the CRT displays the current system status as illustrated in Figure 3. Edit functions are also disabled.

START--When pressed, system is placed in a START (running) condition.

STOP--When pressed, system is placed in a STOP REQUEST condition. The CRT displays the "STOP REQ" in upper right corner. When the current source is completed, the system goes to a full STOP condition, removing "ON AIR" and "STOP REQ" from upper right corner of the CRT. Pressing STEP or FADE prior to the end of the "ON AIR" source will cause the system to go to a full STOP condition if STOP has been pressed first. Pressing START will cancel STOP request.

STEP--When pressed, causes system to immediately step to the next scheduled source and immediately remove the audio from the current source from the PROGRAM bus.

FADE--When pressed, causes audio from the current "ON AIR" source to fade. At end of fade time out (typically 2-4 seconds), system steps to next scheduled source. Note that fade cannot be monitored by selecting PROGRAM, but must be heard on final audio output. Tying final output to Aux 1 or Aux 2 input allows monitoring final output in these positions (see paragraph 2.4 in INSTALLATION Section 2 of the main manual for connection information).

INSRT--(Insert) When pressed, causes system to schedule audio source programmed in the last event (shown just ahead of Event 0000 in EDIT mode) next.

Additionally, "INSERT NEXT" plus the audio source number to be inserted, will display on the right side of the CRT. When the Insert source is complete, the program continues from where it left off. If the program is in a LINK condition, the insert must wait until all linked events in the cluster are played. If in INSERT mode, pressing INSRT will cancel Insert.

ALARM--Used to turn off audio beeper in Video Terminal and reset ALARM, LOOP, and SILENCE indicators on Local Status Panel in the event of a Close Loop or Silence Sense malfunction. Note that pressing the ALARM key once stops the Video Terminal beeper. Pressing ALARM again cancels the alarm condition indicators ("TA DISABLE", etc.).

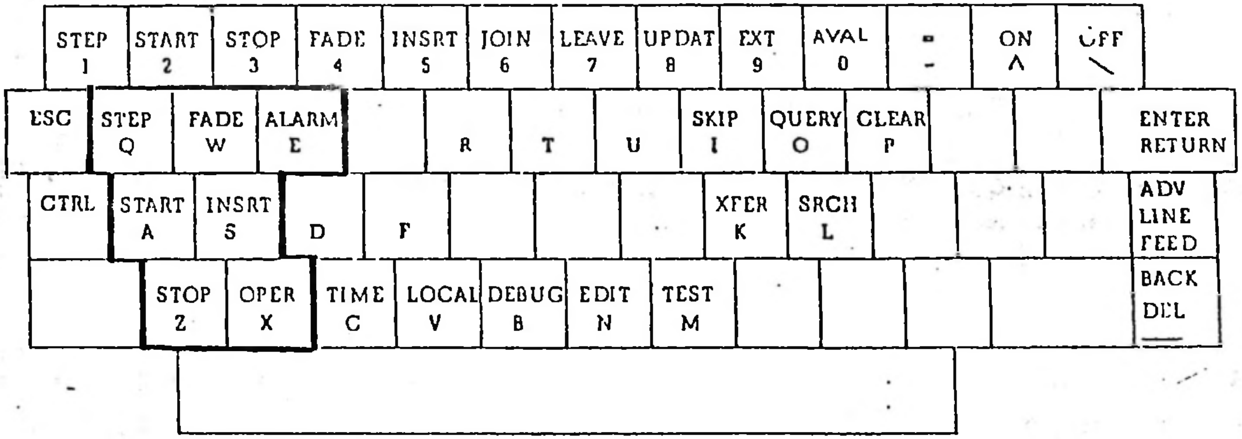

FIGURE 2 SYST CONTROL KEYS (RED)

```
EVENT SEQUENCE                                   ERRORS                STATUS


0000      PLAY 11      M 100 <AIR                                      ON AIR
0001      PLAY 12      M 200 <NEXT
0002      PLAY 13      M 300
0003      *RTN
0125      PLAY 01-03 C CHE
0126      PLAY 01-27 C MCD
0127      *SUB 0004
0004      PLAY 12      M 200
0005      PLAY 11      M 100
0006      *RTN
0128      PLAY 01-46 C FDI
0129      LINK 01-02 C LOC
0130      *SUB 0007
0007      PLAY 13      M 300
0008      PLAY 06      I 1D1
0009      LINK 14      M 400
0010      *RTN
0131      PLAY 01-10 C SWZ
0132      PLAY 02-04 L PSA
                                                                       SS 00
0124      *SUB 0000        <SUB
                                                                       CL 01
```

FIGURE 3 TYPICAL OPERATE MODE DISPLAY
(Without Time Functions)

2.2.3 MANUALLY MOVING TO NEW EVENT LOCATION--When a system is initially powered, or following a power outage, or, in some cases, at the beginning of each program day, it may be necessary to transfer the system NEXT pointer to a specific event number. The procedure involves the use of some of the Program Edit and Function keys whose functions are detailed in paragraph 2.3. The following is the procedure for transferring the system NEXT pointer to a specific event number (reference Figure 4).

1. Press EDIT. Display will switch from "operate" to "edit" display.
2. The CRT will request "PROGRAM CODES DESIRED "
3. Press the Space Bar.
4. Press QUERY. Display curser will move to far left of event section allowing a new event number to be keyed in.
5. Using number keys at right side of terminal, key in desired event. Upon pressing the fourth key, the display will shift, showing the keyed-in event number at the center of the CRT with adjacent events above and below it.
6. Press XFER. The CRT will display "XFER TO NEXT?" near the center of the CRT. Press XFER again, and the CRT switches to OPERATE mode, displaying the keyed-in event number as the "next" event.

2.3 PROGRAMMING THE BASIC FORMAT--The following paragraphs outline the steps to entering and changing the program in memory as well as examples of actual programs to aid in understanding how to take your program and convert it to a form that can be programmed into the memory. This suppliment deals with programming the Level II system.

2.3.1 FORMAT EDIT AND FUNCTION KEYS--The blue keys on the Video Terminal are used in editing the system program. Figure 5 outlines the keys used. Note that the group of eleven (11) keys to the right of the main terminal group serves as FUNCTION entry keys and NUMBER entry keys. Based on where in the entry procedure the switch is pressed, a determination is made by the system as to whether a "function" or "number" is intended. The numbers are self-explanatory, so only the functions are defined.

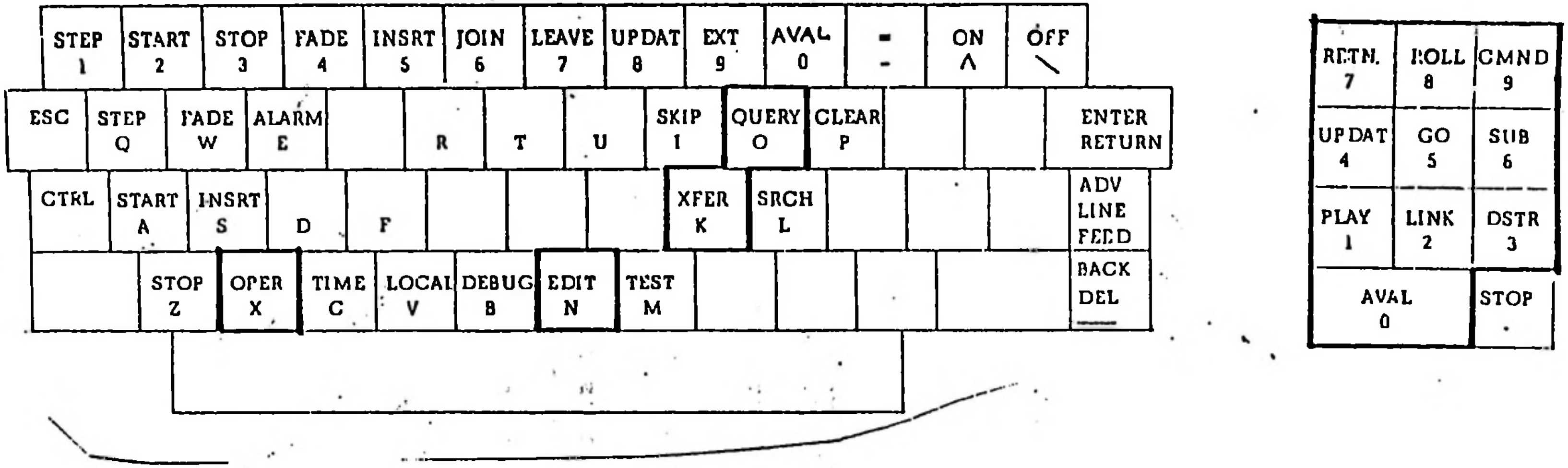

FIGURE 4 KEYS USED IN "MANUAL" TRANSFER

The three groups of blue keys in the main keyboard section are used in controlling the Video Monitor for editing purposes. Their functions are as follows:

EDIT--When pressed, enables all other blue keys and causes display to switch to "edit" display (see Figure 6). Note that the event number to be edited is always the center event on the display (the EDIT arrow remains fixed while the events shift). Additionally, after the Program Codes have been entered, the area of memory displayed is always the area last edited. In other words, the system remembers where it left off from the previous editing session. EDIT may be pressed any time new Program Codes are desired.

TEST--Allows the CRT to display 66 events at a time (starting at any desired event number) in exactly the order they will occur. This allows the program to be previewed prior to going "on the air".

XFER--(Transfer) Used to transfer NEXT pointer to a new EVENT number. See paragraph 2.2.3 for operating procedure.

SRCH--(Search) Used to locate events containing specific desired parameters (e.g. all events containing Source 01 or all events with a Program Code of "C", etc). Refer to paragraph 2.4.3 for actual operating procedures.

SKIP--Used when advancing edit display. Will cause display to skip over any AVAIL events and stop only at events containing data.

QUERY--Shifts display curser to extreme left of event number allowing new Event to be keyed in.

CLEAR--Shifts display curser to FUNCTION section of display. Used primarily when an error is made in changing data in memory. Does not clear memory, only allows new data to be keyed in.

ENTER--When pressed, enters data in event number to left of EDIT arrow. Note that this key has no effect unless "PGM CODE?", "DESCRIPTOR", or "ENTER?" is displayed to right of EDIT arrow (reference Figure 6).

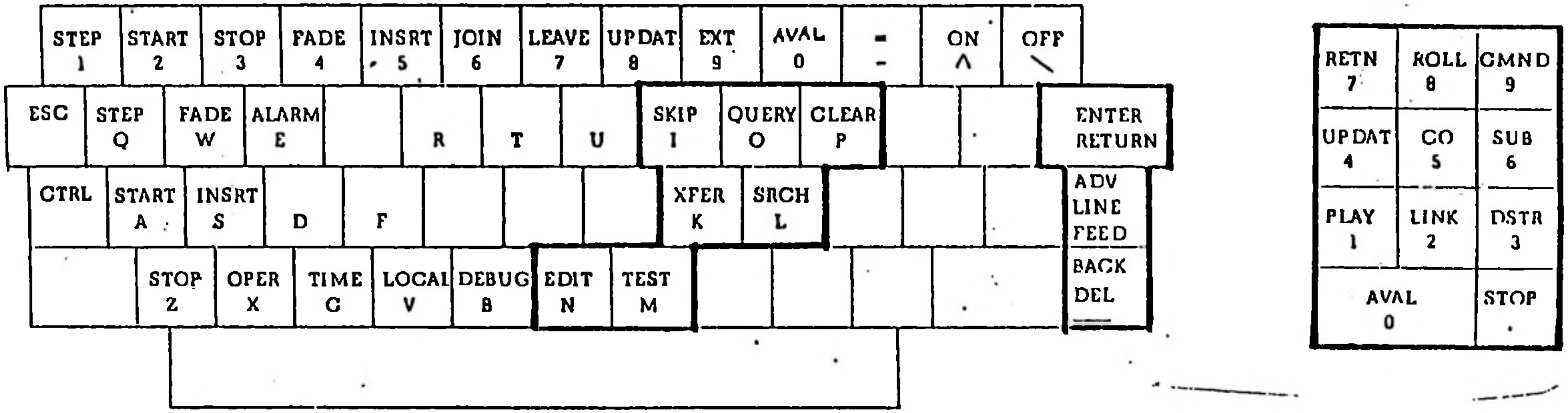

FIGURE 5 PROGRAM EDIT AND FUNCTION KEYS (BLUE)

```
SERIES 7000/2     EDIT

PROGRAM CODES DESIRED>   *




0047     PLAY 02-05    C 050
0048     PLAY 11       M
0049     *RTN
0050     PLAY 12       M
0051     LINK 16       L VT1  <EDIT FUNCTION?
0052     *SUB 0020
0053     PLAY 13       M
0054     PLAY 11       M
0055     PLAY 14       M
0056     LINK 09       L JIN
```

FIGURE 6   TYPICAL EDIT DISPLAY

ADV--Advances edit display by one event each time ADV is pressed.

BACK--Backs up edit display by one event each time BACK is pressed.

NOTE: If ADV or BACK is held for more than 1 second, the Repeat mode is activited allowing rapid advancement or backing through several event numbers.

The following keys are found in the key block just to the right of the main keyboard. If the display is requesting a "function" (FUNCTION? displayed to the right of the EDIT arrow), the keys are defined as "function" keys. If "SOURCE?", "TRAY", "EVENT?", "GO TO?", "COMMAND?" or "DESCRIPTOR" is displayed, the keys are defined as "number" keys.

AVAL--(Available) Used to clear data from specific event number. If ENTER is pressed following AVAL; FUNCTION, SOURCE, and TRAY are cleared and display will show "AVAL" for that Event. If Program Code and/or Descriptor are to be cleared, use Space Bar as required prior to pressing ENTER.

STOP--Used to load format STOP command allowing system to automatically go to STOP REQUEST mode when event number with STOP function is selected.

PLAY--Indicates normal audio source. This function is used when none of the other functions apply.

LINK--Used to insure that the audio source with a LINK function plays immediately after the previously scheduled audio source. Any "inserts" or "time updates" must wait until "linked" source plays

DSTR--(Double Start) Advises system that source with DSTR function and the following scheduled audio source are to start simultaneously. The system advance tone on the audio source scheduled first will be ignored.

UPDAT--(Update) Used as a flag to define the start of a new block to play after a "time update" command. Refer to program examples in the main manual for Real Time Events (paragraph 3.4) or External Clock Functions (paragraph 3.5) for examples of use.

GO--(Go To) Instructs system to go to specific event number shown to right of GO instruction (e.g. "0020 GO 0205" would cause system to go to event 0205 to schedule the next source when event 0020 is scheduled).

SUB--(Go to Subroutine) Similiar to GO except that with SUB instruction, system remembers the event number it left so that it can return to that location and schedule the next event when a RETN instruction is given. The system allows two (2) levels of subroutine. That is, it can go to a subroutine from a subroutine. It cannot, however, go to a third subroutine from the second subroutine.

RETN--(Return) Instructs system to return to event following the event number it left in main program due to SUB instruction. Is is always scheduled as the last function in a subroutine.

ROLL--(Pre-Roll) Identifies source as a dead roll source. When activated, source will start "off air" and roll to next stop tone. Does not schedule NEXT. Can be used randomly in format to create more varied music mix.

CMND--(Command) Identifies the data as a "format command" rather than a "Source" and "Tray" (see paragraph 2.3.2).

2.3.2 FORMAT COMMANDS--The following lists the Format Commands available in a basic system. Note that the CMND function must accompany the command code to distinguish it from a source and tray (e.g. "0010 +CMD 0001"=disable Silence Sense when event 0010 is scheduled).

COMMAND CODE	FUNCTION
0000	Silence Sense Enable
0001	Silence Sense Disable
0010	Real Time Clock Enable
0011	Real Time Clock Disable (System to ignore Real Time functions)
0020	Program Audio Fade
01XX	External Function XX

(XX = External Function 01 through 10).

2.3.3 PROGRAM ENTRY PROCEDURE--The following examples illustrate how to gain access to the memory for interrogation and/or editing purposes. Prior to discussing program entry, it is necessary to point out a few features relative to entering data.

1. In the "edit" mode, the display will ask for the data it needs by printing its request just to the right of the word "EDIT" in the center of the display. The request words used are:

FUNCTION?	-	Which Function?
SOURCE?	-	Which Source?
TRAY?	-	Which Tray?
PGM CODE?	-	Which Program Code? (Any letter "A" through "O"--see note below)
DESCRIPTOR?	-	What 3 digit special user designation is desired? (See note below)
ENTER?	-	OK to Enter
EVENT?	-	Which Event (Number)
COMMAND?	-	Which Command?
GO TO?	-	Go to which Event (Number)

NOTE: The PGM CODE and DESCRIPTOR are optional data not required in order to ENTER data into an Event number.

2. ID switches on Universal Source board indicate if source is Random Access device. If the source is not Random Access, the display does not ask for "TRAY?" but goes immediately to "PGM CODE?".

3. If RTN, AVAL, or STOP are keyed in, the display skips request for Source and Tray and goes immediately to "PGM CODE?".

4. If a non-existent source or tray is keyed in, the display bell will sound, the display will show "OUT OF RANGE", and the curser will move back to allow a legitimate source or tray to be keyed in.

5. If an operator attempts to program two Random Access carts back to back which cannot play back to back because they both reside in the same machine (such as two carts in the same Audiofile module (or row) or two carts in the same SMC Carousel)®, the display bell will sound, the display will show "ADJACENT TRAYS", and the curser will move back to allow a legitimate tray to be programmed.

6. If a GO or SUB command is programmed to go to its own Event number (e.g. 0550 GO 0550), the display will show "ILLEGAL ENTRY" and the curser will move back to allow a legal address to be keyed in.

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Example 1: [illegible]cial r[illegible] up, memory empty, key in first 4 events.

STEP	KEY IN	DISPLAY
1.	EDIT N	Series 7000/2 EDIT PROGRAM CODES DESIRED > ☐ <EDIT
2.	SPACE BAR*	0946 AVAL • • • • 0950 AVAL 0000 ☐AVAL <EDIT FUNCTION? 0001 AVAL • • • 0005 AVAL
3.	PLAY 1	0000 PLAY ☐ <EDIT SOURCE?
4.	PLAY 1 PLAY 1	0000 PLAY 11☐ <EDIT PGM CODE?
5.	ENTER RETURN NOTE: Keying ENTER at this point indicates that no Program Code or Descriptor is desired. They will be illustrated in later program examples	0947 AVAL • • • 0000 PLAY 11 0001 ☐AVAL <EDIT FUNCTION? 0002 AVAL • • • 0006 AVAL

*Pressing SPACE BAR (Step 2) indicates that no specific Program Codes are desired and thus all Events will be displayed and may be edited.

Example 1--Continued

STEP	KEY IN	DISPLAY
6.	PLAY 1	0001 PLAY ▯ <EDIT SOURCE?
7.	PLAY 1 LINK 2	0001 PLAY 12▯<EDIT PGM CODE?
8.	ENTER RETURN	0948 AVAL . . . 0000 PLAY 11 0001 PLAY 12 0002 AVAL <EDIT FUNCTION? 0003 AVAL . . . 0007 AVAL
9.	PLAY 1	0002 PLAY ▯ <EDIT SOURCE?
10.	PLAY 1 DSTR 3	0002 PLAY 13▯<EDIT PGM CODE?
11.	ENTER RETURN	0949 AVAL . . . 0000 PLAY 11 0001 PLAY 12 0002 PLAY 13 0003 AVAL <EDIT FUNCTION? . . . 0008 AVAL

Example 1--Continued

STEP	KEY IN	DISPLAY
12.	GO 5	0003 *GO ▯ <EDIT GO TO?
13.	AVAL 0 AVAL 0 AVAL 0 AVAL 0	0003 *GO 0000▯<EDIT PGM CODE?
14.	ENTER RETURN	0950 AVAL • • • 0000 PLAY 11 0001 PLAY 12 0002 PLAY 13 0003 *GO 0000 0004 ▯AVAL <EDIT FUNCTION? • • • 0009 AVAL

What has been created is a very simple program that will play source 11, followed by source 12, followed by source 13; and then repeat that same sequence indefinitely or until the system is stopped.

```
0000      PLAY 11
0001      PLAY 12
0002      PLAY 13
0003      *GO  0000
```

By pressing OPER X it can be shown how this simple format would appear in the operate mode display (see Figure 7).

```
        0000          PLAY 11          <AIR
        0000          PLAY 11          <NEXT
        0001          PLAY 12
        0002          PLAY 13
        0003          *GO  0000
        0000          PLAY 11
        0001          PLAY 12
        0002          PLAY 13
        0003          *GO  0000
        0000          PLAY 11
        0001          PLAY 12
        0002          PLAY 13
        0003          *GO  0000
        0000          PLAY 11
        0001          PLAY 12
        0002          PLAY 13
        0003          *GO  0000
        0000          PLAY 11
        0001          PLAY 12

                                       <SUB          SS 00
                                                     CL 00
```

FIGURE 7 OPERATE DISPLAY FOR EXAMPLE 1

Example 2: Go to new area of memory to program 5 events.

STEP	KEY IN	DISPLAY
1.	EDIT N	Series 7000/2 EDIT PROGRAM CODES DESIRED > ☐ <EDIT

Example 2: Continued

STEP	KEY IN	DISPLAY
2.	SPACE BAR	0950 AVAL • • • 0004 AVAL <EDIT FUNCTION? • • • 0009 AVAL
3.	QUERY	0004 AVAL <EDIT EVENT?
4.	0 0 5 0	0050 AVAL <EDIT FUNCTION?
5.	PLAY	0050 PLAY ▯ <EDIT SOURCE?
6.	0 1	0050 PLAY 01▯<EDIT TRAY?* *Assumes Source 01 is Random Access
7.	0 1	0050 PLAY 01-01▯<EDIT PGM CODE?

Lets continue to ignore Program Codes for now.

8.	ENTER	0050 PLAY 01-01 0051 AVAL <EDIT FUNCTION?
9.	PLAY	0051 PLAY ▯ <EDIT SOURCE?
10.	0 1	0051 PLAY 01 ▯ <EDIT TRAY?
11.	3 2	0051 PLAY 01-32▯<EDIT PGM CODE?

Example 2: Continued

STEP	KEY IN	DISPLAY
12.	ENTER	0051 PLAY 01-32 0052 AVAL <EDIT FUNCTION?
13.	PLAY	0052 PLAY ▯ <EDIT SOURCE?
14.	0 1	0052 PLAY 01 ▯ <EDIT TRAY?
15.	1 3	0052 PLAY 01-13 ▯ <EDIT PGM CODE?
16.	ENTER	0052 PLAY 01-13 0053 AVAL <EDIT FUNCTION?
17.	SUB	0053 *SUB ▯ <EDIT GO TO?
18.	0 0 0 0	0053 *SUB 0000 ▯ <EDIT PGM CODE?
19.	ENTER	0053 *SUB 0000 0054 AVAL <EDIT FUNCTION?
20.	PLAY	0054 PLAY ▯ <EDIT SOURCE?
21.	0 1	0054 PLAY 01 ▯ <EDIT TRAY?
22.	1 7	0054 PLAY 01-17 ▯ <EDIT PGM CODE?
23.	ENTER	0054 PLAY 01-17 0055 AVAL <EDIT FUNCTION?
24.	PLAY	0055 PLAY ▯ <EDIT SOURCE?

Example 2: Continued

STEP	KEY IN	DISPLAY
25.	0 1	0055 PLAY 01 ▯ <EDIT TRAY?
26.	4 6	0055 PLAY 01-46 ▯ <EDIT PGM CODE?
27.	ENTER	0055 PLAY 01-46 0056 AVAL <EDIT FUNCTION?
28.	SUB	0056 *SUB ▯ <EDIT GO TO?
29.	0 0 0 4	0056 *SUB 0004 ▯ <EDIT PGM CODE?
30.	ENTER	0056 *SUB 0004 0057 AVAL <EDIT FUNCTION?

Example 2 should have added the following to the program:

```
0050     PLAY 01-01
0051     PLAY 01-32
0052     PLAY 01-13
0053     *SUB 0000
0054     PLAY 01-17
0055     PLAY 01-46
0056     *SUB 0000
```

To verify the seven events, key in QUERY 0 and 0 0 5 3 to display all the events.

The following example shows how to edit an event which was previously programmed.

Example 3: Editing a previously programmed event.

STEP	KEY IN	DISPLAY	
1.	QUERY	0053 SUB 0000	<EDIT EVENT?
2.	0 0 0 3	0003 *GO 0000	<EDIT FUNCTION?
3.	RETN	0003 *RTN ▯	<EDIT PGM CODE?
4.	ENTER	0003 *RTN 0004 AVAL	<EDIT FUNCTION?

Continue to add to the program as shown in the following exercise:

STEP	KEY IN	DISPLAY	
1.	PLAY	0004 PLAY ▯	<EDIT SOURCE?
2.	0 1	0004 PLAY 01 ▯	<EDIT TRAY?
3.	2 2	0004 PLAY 01-22 ▯	<EDIT PGM CODE?

Now let's talk about Program Codes.

WHAT IS A PROGRAM CODE? It is any of 15 letters from A to O that you the user wish to assign to a particular Event. Typically it would relate to the Audio Source type or Function (i.e. "C" for Commercial Audio Sources, "M" for Music, etc.).

WHY USE PROGRAM CODES? By assigning a unique Program Code to each Event, you may later request a listing on the CRT of only Events with desired codes. Thus if Commercial Sources are being edited, all Music, PSA, Time, etc. will not display. Only Events with the selected Program Codes and Events with no Program Code will be displayed. And thus Events with other Program Codes cannot be accidentally changed.

HOW DO YOU DECIDE WHAT PROGRAM CODE TO USE? You are totally free to develop a system of Program Codes that is meaningful to your unique programming needs. For example you may choose to use an "A" for commercials which run 7 days a week and a "B" for ones which only run on weekends. Or you may wish to use different codes to denote different billing rates. You need only know what each Program Code letter relates to.

Now, let's continue with our example by programming in a Program Code. For our example we'll use a Program Code of "C".

STEP	KEY IN	DISPLAY
4.	C	0004 PLAY 01-22 C ▯<EDIT DESCRIPTOR

WHAT IS A DESCRIPTOR? It is any abbreviation up to three (3) digits consisting of letters and/or number and some punctuation (e.g.".", "/", ":", and "SPACE") which helps you to identify the source. For example, let's assume that Source 01 Tray 22 contains a spot for McDonald's. You could use a Descriptor of "MCD". Or perhaps McDonald's has a billing or client number "023" and thus a Descriptor of "023" might be used. Thus step 5 would be:

Note: If a DESCRIPTOR is desired but no PROGRAM CODE is desired, press SPACE BAR when CRT requests "PGM CODE?".

5.	0 2 3	0004 PLAY 01-22 C 023 <EDIT ENTER? ▯
6.	ENTER	0004 PLAY 01-22 C 023 0005 AVAL <EDIT FUNCTION?
7.	PLAY	0005 PLAY ▯ <EDIT SOURCE?

STEP	KEY IN	DISPLAY
8.	1 2	0005 PLAY 12 ▯ <EDIT PGM CODE?
9.	M	0005 PLAY 12 M ▯ <EDIT DESCRIPTOR

This time we will not put in a Descriptor and instead just press ENTER.

10.	ENTER	0005 PLAY 12 M 0006 AVAL <EDIT FUNCTION?
11.	PLAY	0006 PLAY ▯ <EDIT SOURCE?
12.	1 3	0006 PLAY 13 ▯ <EDIT PGM CODE?
13.	M	0006 PLAY 13 M ▯ <EDIT DESCRIPTOR
14.	ENTER	0006 PLAY 13 M 0007 AVAL <EDIT FUNCTION?
15.	STOP	0007 STOP ▯ <EDIT PGM CODE?
16.	ENTER	0007 STOP 0008 AVAL <EDIT FUNCTION?
17.	GO	0008 *GO ▯ <EDIT GO TO?
18.	0 0 0 4	0008 *GO 0004 ▯ <EDIT PGM CODE?

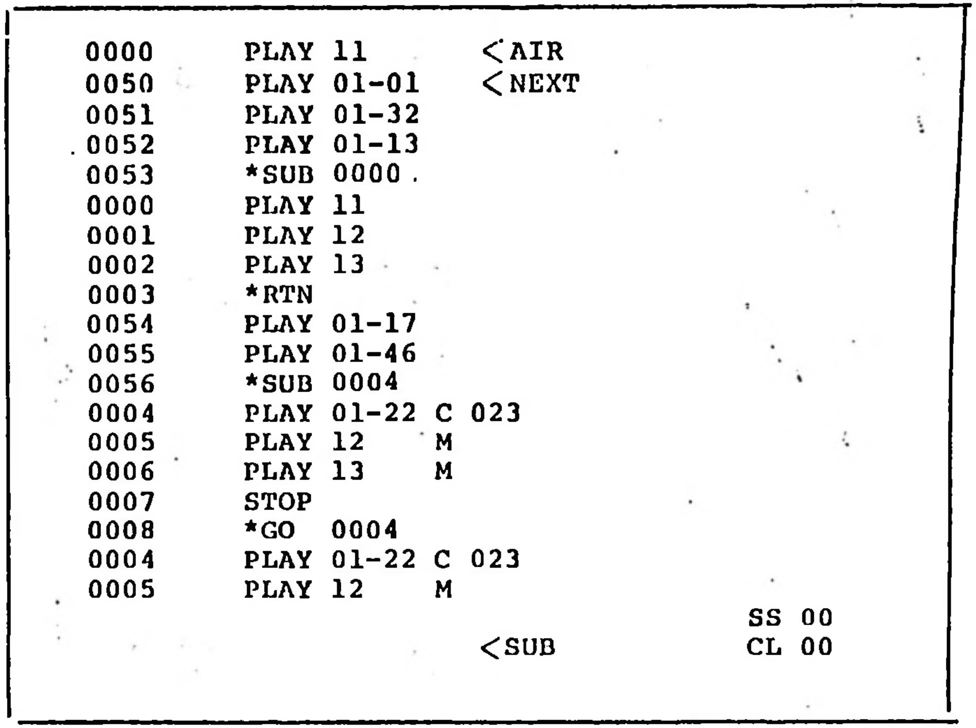
ST	IN	DISPLAY
19.	ENTER	0008 *GO 0004 0009 AVAL <EDIT FUNCTION?

Now move the program NEXT pointer to event number 0050 as shown in example 4:

Example 4: Moving program NEXT pointer (assumes display is in EDIT Mode).

STEP	KEY IN	DISPLAY
1.	QUERY	0009 AVAL <EDIT EVENT?
2.	0 0 5 0	0050 PLAY 01-01 <EDIT FUNCTION?
3.	XFER	0050 PLAY 01-01 XFER TO NEXT? <EDIT FUNCTION?
4.	XFER	See Figure 8

Thus a short program has been created which would play exactly as shown in Figure 8.



```
0000     PLAY 11      <AIR
0050     PLAY 01-01   <NEXT
0051     PLAY 01-32
0052     PLAY 01-13
0053     *SUB 0000
0000     PLAY 11
0001     PLAY 12
0002     PLAY 13
0003     *RTN
0054     PLAY 01-17
0055     PLAY 01-46
0056     *SUB 0004
0004     PLAY 01-22 C 023
0005     PLAY 12    M
0006     PLAY 13    M
0007     STOP
0008     *GO  0004
0004     PLAY 01-22 C 023
0005     PLAY 12    M
                                    SS 00
                        <SUB        CL 00
```

FIGURE 8 OPERATE DISPLAY FOR EXAMPLE 4

2.4 MAKING CHANGES TO AN EXISTING PROGRAM. Once the memory has been programmed, it may be necessary to make changes other than the normal changes required to update the Commercial Load. There are four (4) basic EDIT functions and three (3) LOCAL mode functions to aid in this task.

EDIT Functions:

INSERT--Allows inserting an event between existing events. Pushes all other events down in memory and corrects all SUB (Subroutine) and GO (Go To) instructions. This should not be confused with the Operate mode INSERT function which causes the Source in the last Event location to be scheduled next.

DELETE--Allows removing an event. Pushes all other events up in memory to fill the void and corrects all SUB and GO instructions.

SRCH--(Search) Allows for a Search of memory and display of only events containing the desired parameters. For example, you may wish to display only events containing Source "01" Tray "22" with Program Code "C".

TEST--Allows the display of 66 events from the requested start address in exactly the order they will "air".

LOCAL MODE Functions:

CHANGE--Allows any particular parameter or parameters in a desired block of memory to be changed. For example, let's assume Music Source 11 develops a malfunction so the decision is made to run all Source 11 tapes on Source 15. The system could be requested to change all Source 11's to backup Source 15. When Source 11 is repaired, all Source 15's could be changed back to Source 11.

MOVE--This allows a block of events to be copied in another area of memory. It does not destroy the area being copied.

LOAD--Allows the memory to be loaded from a TI SILENT 700. The data to be loaded is typed in English in the normal EDIT format.

Note that with the addition of an optional printer, it is possible to list a block of memory, list the events in the order of play, and search for and print all events in a block of memory which contain the desired parameters. These functions are discussed in Paragraph 2.5.

2.4.1 INSERTING AN EVENT--Let's assume it is desired to insert an additional event between Event 0051 and 0052. Procede as follows:

1. Press EDIT
2. Press SPACE BAR
3. Press QUERY
4. Key in 0052 (Note: The new event will be stored at Event 0052 while the data previously at 0052 will move to Event 0053).
5. Press CLEAR followed by ENTER to get into INSERT mode. The display will show:
   ```
   0052▯                                      <INSERT FUNCTION?
   ```
6. Let's assume it is desired to insert:
   ```
   PLAY 01-20 C 024
   ```
7. Press PLAY
8. Key in 01, 20, C, 024 as the CRT requests SOURCE?, TRAY?, PGM CODE?, and DESCRIPTOR respectively

CAUTION: When inserting a Random Access source, be sure to check Tray numbers to verify no conflicts with two trays which cannot play back to back.

9. Press ENTER.

The CRT will now display:

```
                   0048  AVAL
                   0049  AVAL
                   0050  PLAY 01-01
                   0051  PLAY 01-32
Inserted Event --> 0052  PLAY 01-20    C 024
                   0053  PLAY 01-13             <EDIT FUNCTION?
                   0054  *SUB 0000
                   0055  PLAY 01-17
                   0056  PLAY 01-46
                   0057  *SUB 0004
                   0058  AVAL
```

Figure 9

NOTE: To cancel the INSERT function, press any "Command" key (ADV, BACK, etc.).

2.4.2 DELETING AN EVENT--Assume it is desired to delete Event 0052.

1. Press EDIT
2. Press SPACE BAR
3. Press QUERY
4. Key in 0052
5. Press QUERY followed by ENTER to delete the Event

The "PLAY 01-20 C 024"at Event 0052 will be eliminated and replaced with the "PLAY 01-13" that was in Event 0053, see Figure 9. Additionally all other Events will be pushed up one Event as shown below:

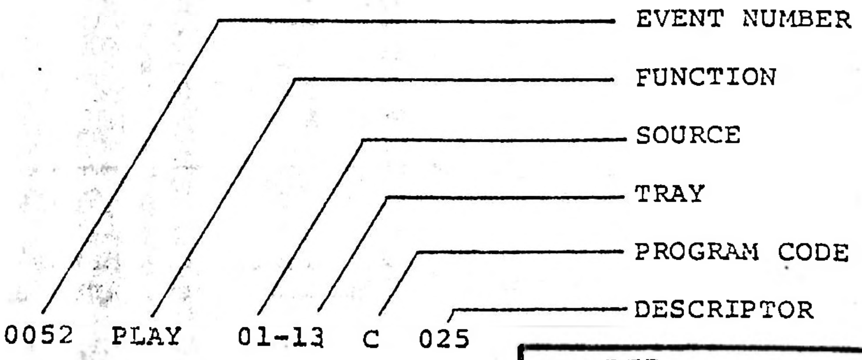
0047	AVAL
0048	AVAL
0049	AVAL
0050	PLAY 01-01
0051	PLAY 01-32
0052	PLAY 01-13
0053	*SUB 0000
0054	PLAY 01-17
0055	PLAY 01-46
0056	*SUB 0004
0057	AVAL

2.4.3 SEARCHING FOR SPECIFIC PARAMETERS--The Search mode allows the programmer to seek out and display events which contain specific parameters desired. For example, assume only events containing Source 01 are desired.

1. Press EDIT
2. Press SPACE BAR
3. Press SRCH to access Search mode. The display will show:

```
0052 ▯                    <SEARCH
```

4. At this point the desired parameters should be keyed in. The following chart will aid in locating these parameters.



NOTE: 1. Any desired event number may be used as a starting point by pressing QUERY followed by the desired event number.

2. If a parameter is unimportant, the ADV/LINE FEED key may be pressed to advise that you "don't care" what that parameter is.

EXAMPLE 1: ADV/LINE FEED pressed

0052 **** 01-**** * *** (Search for all Events containing Source 01)

EXAMPLE 2: 0052 **** 01-**** C 025 (Search for all Events containing Source "01" Program Code "C", and Descriptor "025")

5. Press ENTER. The CRT should display up to 5 events before and after the starting event number which contain the desired parameters, in the case of example 2, to this point we have not programmed any event with all those specific parameters so the CRT will print "NO MATCH FOUND".

Note that the following keys are active and function as noted in the SEARCH mode:

CLEAR - RE-ENTER FROM FUNCTION POSITION

ENTER - ENTER SEARCH PARAMETERS

ADV,BACK - MOVE TO NEXT MATCHING EVENT

SKIP - SKIP FORWARD TO NEXT MATCHING EVENT

QUERY - DISPLAY EVENT QUERIED IF MATCHING. IF NOT, SKIP FORWARD TO FIRST MATCHING EVENT FROM EVENT QUERIED

XFER - TRANSFER EVENT IN EDIT POINTER TO "NEXT"

EDIT - ENTER NEW PROGRAMMING CODES

SRCH - TO DEACTIVATE SEARCH MODE OR TO CHANGE THE SEARCH PARAMETERS

NOTE: SEARCH mode will remain active and displayed on the upper section of the CRT even if the operator changes modes until deactivated by pressing SRCH.

2.4.4 TEST MODE--The TEST mode allows for a listing of 66 events exactly as they will "air". To access TEST mode:

1. Press EDIT
2. Press SPACE BAR
3. Press TEST. The display will show:

```
▯                    TEST FROM EVENT?
```

4. Key in the starting event number (e.g. 0050). The CRT will now display 66 events.

NOTE:
1. Pressing ADV will cause the next 66 events to display.
2. Pressing QUERY allows a new starting event number to be keyed in.
3. Press TEST to go back to normal EDIT mode.

2.4.5 LOCAL MODE--Local mode command allows for changing specific parameters in a block of memory, copying data from one block of data to another, and loading the memory from a TI SILENT 700 teleprinter. The addition of an optional printer allows for listing a block of events, listing events as they would air, and searching for and listing events containing specific desired parameters. Also the printer status can be determined in LOCAL mode.

2.4.5.1 CHANGING A PARAMETER OR PARAMETERS IN A BLOCK OF EVENTS--Any Function, Source, Tray, Program Code, or Descriptor within a desired block of events may be changed in LOCAL mode. For example, assume it is desired to change all Source 11's from event 0000 through 0005 to Source 15. This would be accomplished as follows:

1. Press the black LOCAL key. (Note that the system must be in OPERATE display mode to go to LOCAL mode). The display will show:

```
 LOCAL MODE
 % ▯
```

2. Key in CHANGE. Note that only the "C" key is required; the rest of the letters are optional.

3. Press SPACE BAR. The CRT will print "FROM-".

4. Key in the starting EVENT (e.g. 0000).

5. Press SPACE BAR. The CRT will print "TO-".

6. Key in the ending EVENT (e.g. 0005).

7. Press ENTER. The CRT will print "NOW".

8. Key in the current parameters using the ADV/LINE FEED key for parameters which will not change (i.e. have no bearing on the change).

```
EXAMPLE:  a.  NOW      PLAY 11
          b.  KEY IN   ADV, 11, ADV, ADV, ADV
          c.  DISPLAY  **** 11- **** *  ***
```

9. Press ENTER. The CRT will print "BECOMES".

10. Key in the changes.

```
EXAMPLE:  a.  KEY IN   ADV, 15, ADV, ADV, ADV
          b.  DISPLAY  **** 15- **** *  ***
```

11. Press ENTER. The CRT will print "&" indicating the changes are made.

To verify changes, go to OPERATE mode (press OPER) and then to EDIT mode (press EDIT) or go to LOCAL mode (press LOCAL) and use SEARCH mode (Ref. paragraph 2.5.4).

2.4.5.2. MOVING A BLOCK OF EVENTS FROM ONE LOCATION TO ANOTHER--It may be desired when making changes to the program to move a block of memory to a new location. Note that the block of memory is only copied and thus the original data remains intact. The following illustrates the steps in moving a block of data.

1. Press LOCAL (remember, you must be in OPERATE display mode).

2. Key in MOVE (or simply M if desired).

3. Press SPACE BAR. The CRT will print "FROM-".

4. Key in first Event number of the block to be moved (e.g. 0000).

5. Press SPACE BAR. CRT will print "TO-".

6. Key in the last Event number in the block to be moved (e.g. 0050).

7. Press SPACE BAR. The CRT will print "DEST-".

8. Key in the first Event number in the location the data is to be moved to (e.g. 0100).

9. Press ENTER. The CRT will print "%" indicating the move has been made. To verify:

   a. Press OPER
   b. Press EDIT
   c. Press SPACE BAR
   d. Press QUERY
   e. Key in first Event number in new block (e.g. 0100)

   Or refer to paragraph 2.5.2 showing how to list a block of Events in LOCAL mode.

2.4.5.3 LOADING MEMORY FROM A TI SILENT 700

2.4.5.3.1 PREPARATION OF THE PRE-log and TAPE--Prior to loading the memory it is necessary to prepare a tape. While making the tape, the pre-log is also made.

Prior to actually making a tape, the following should be noted:

1. Do not use colons (:) in the log heading as a colon following a RETURN is a flag to tell the system that the Event number should follow. Once the Event number is keyed in, colons may be used prior to activating the ENTER key (see Figure 10).

2. Any desired information may be typed in following DESCRIPTOR (see Figure 10). The system will ignore this during the load cycle.

3. Some functions have a character (i.e. :, *, +) as their first digit. It is imperative that the correct character be keyed in for these functions as shown below:

   :UPD
   * GO (note space between
      * and G)
   *SUB
   *RTN
   +CMD

The following procedure may be used as a guide to preparing the pre-log and tape. Refer to the TI 700 Operator's Manual for detailed operation information.

1. Load the tape into the desired cassette holder 1 or 2.

2. Press the REWIND switch for the appropriate cassette.

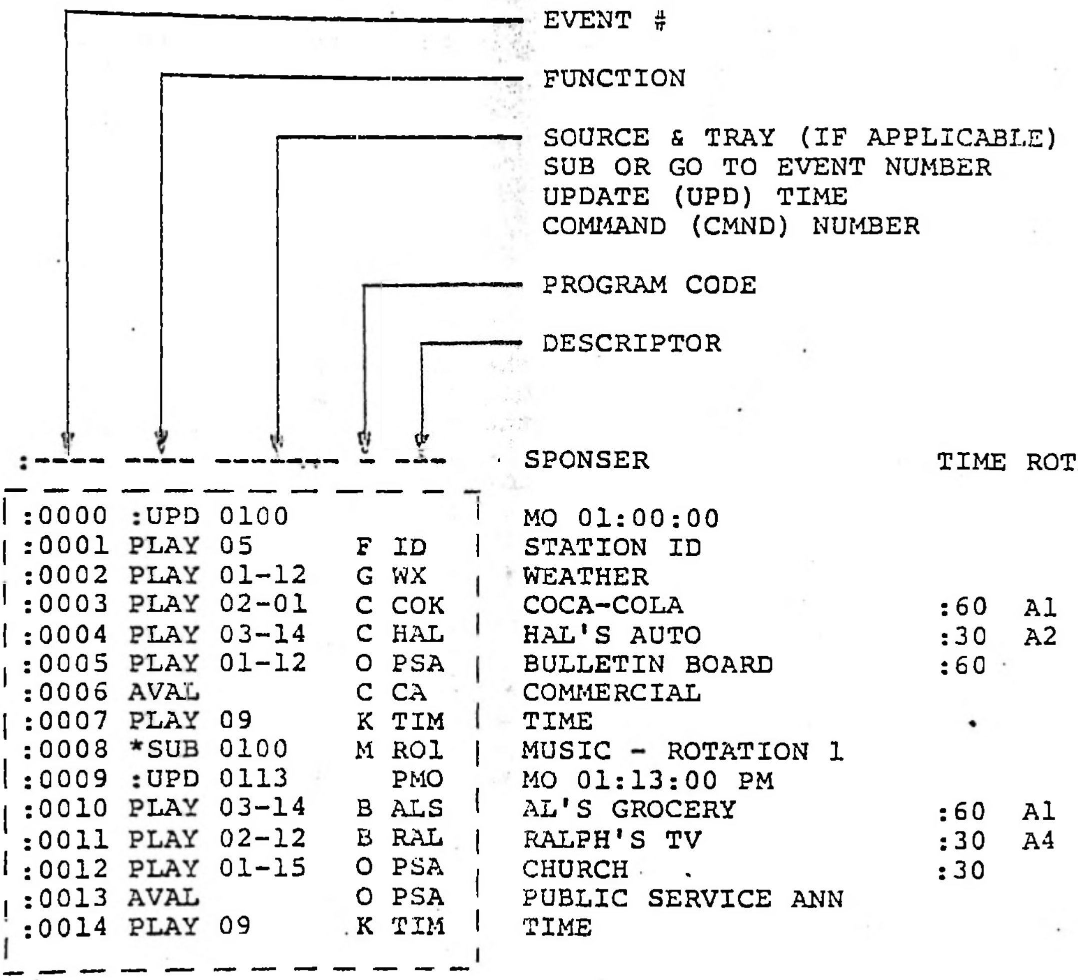
3. Press the LOAD/FF switch.

4. Set the RECORD CONTROL "TAPE FORMAT" switch to LINE. This will make editing easier as each segment of the tape will contain one line of data.

5. Set the RECORD CONTROL "ON/OFF" switch to ON.

6. Set the bottom row KEYBOARD, PLAYBACK, RECORD, and PRINTER switches to LOCAL.

7. Type in the pre-log with the heading desired. Note that the spacing of the characters to be loaded into memory (surrounded by dotted lines in Figure 10) must be positioned exactly as shown in figure 10. It is



```
                    KXYZ PRE-LOG

               MONDAY    MAY 7, 1979

                    EVENT #

                    FUNCTION

                    SOURCE & TRAY (IF APPLICABLE)
                    SUB OR GO TO EVENT NUMBER
                    UPDATE (UPD) TIME
                    COMMAND (CMND) NUMBER

                    PROGRAM CODE

                    DESCRIPTOR

:---- ---- -------- - ---  SPONSER                   TIME ROTATION BILLING

:0000 :UPD 0100            MO 01:00:00
:0001 PLAY 05      F ID    STATION ID
:0002 PLAY 01-12   G WX    WEATHER
:0003 PLAY 02-01   C COK   COCA-COLA                 :60  A1       1144555
:0004 PLAY 03-14   C HAL   HAL'S AUTO                :30  A2       1232311
:0005 PLAY 01-12   O PSA   BULLETIN BOARD            :60
:0006 AVAL         C CA    COMMERCIAL
:0007 PLAY 09      K TIM   TIME
:0008 *SUB 0100    M RO1   MUSIC - ROTATION 1
:0009 :UPD 0113      PMO   MO 01:13:00 PM
:0010 PLAY 03-14   B ALS   AL'S GROCERY              :60  A1       1233444
:0011 PLAY 02-12   B RAL   RALPH'S TV                :30  A4       1234677
:0012 PLAY 01-15   O PSA   CHURCH                    :30
:0013 AVAL         O PSA   PUBLIC SERVICE ANN
:0014 PLAY 09      K TIM   TIME
```

FIGURE 10   PRE-LOG EXAMPLE

recommended that the line prior to the first line of data to be loaded start with a ":" (to allow for the ":" ahead of the Event number) followed by dashes as shown in Figure 10 to allow for proper alignment of characters

8. After the last line of the pre-log is typed, press CTRL and S (X-off) keys simultaniously followed by the RETURN key.

9. Set RECORD CONTROL switch to "OFF".

10. The tape is now ready to load into memory.

2.4.5.3.2 LOADING THE MEMORY

1. Load the tape into the desired cassette holder 1 or 2.

2. Press REWIND switch for the appropriate cassette.

3. Press the LOAD/FF switch.

4. Set the KEYBOARD, PLAYBACK & PRINTER switches to LINE.

5. Press the CTRL & "L" keys simultaniously. The printer should respond by printing "&".

6. Type L (or LOAD if desired).

7. Press RETURN. The printer should respond by printing

```
:---- ---- ------- - ---
```

8. Press PLAYBACK CONTROL "CONT START" switch.

9. The memory should now begin loading. Verification of proper loading may be made by going to EDIT mode with a CRT & checking Events for proper data or by leaving the printer ON in LINE mode.

10. At the end of the load cycle the printer will print the number of line errors detected. These w be flagged on the print ou by ? following the error as shown in the example below. These events may then be hand corrected or a new tape may be made to correct those specific events.

ERROR EXAMPLE: Note lack of function and misplacement of Source and Tray data at Event 0003

```
:0000 :UPD 0100             MO 01:00:00
:0001 PLAY 05       F ID    STATION ID
:0002 PLAY 01-12    G WX    WEATHER
:000302-01          C COK   COCA COLA                 :60  A1     1144555
:0004 PLAY 03-14    C HAL   HAL'S AUTO                :30  A2     1232311
```

Note "?" on line for Event 0003

```
:0000 :UPD 0100             MO 01:00:00
:0001 PLAY 05       F ID    STATION ID
:0002 PLAY 01-12    G WX    WEATHER
:00030????????????????????  COCA COLA                 :60  A1     1144555
:0004 PLAY 03-14    C HAL   HAL'S AUTO                :30  A2     1232311
:0005 PLAY 01-12    O PSA   BULLETIN BOARD            :60
:0006 AVAL          C CA    COMMERCIAL
:0007 PLAY 09       K TIM   TIME
:0008 *SUB 0100     M R01   MUSIC - ROTATION 1
:0009 :UPD 0113       PMO   MO 01:13:00 PM
:0010 PLAY 03-14    B ALS   AL'S GROCERY              :60  A1     1233444
:0011 PLAY 02-12    B RAL   RALPH'S TV                :30  A4     1234677
:0012 PLAY 01-15    O PSA   CHURCH                    :30
:0013 AVAL          O PSA   PUBLIC SERVICE ANN
:0014 PLAY 09       K TIM   TIME
01 LINE ERRORS DETECTED
%
```

2.4.5.4 LISTING OR LOADING THE ENTIRE MEMORY USING A TI SILENT 700--It is possible to list the entire memory (including Time Events) to cassette and conversly load the entire memory from cassette using the TI Silent 700. It is necessary first to convert the Printer to a LOAD/DUMP terminal as follows:

1. Press LOCAL

2. Key in DUMP (or simply D if desired)

3. Press ENTER. The CRT will display "ASSIGNED TO LIST AND LOAD"

Now go to OPERATE mode by pressing OPER and proceed to paragraph 3.8 in the main manual for DUMP or LOAD procedure (note that general requirements or paragraph 3.8.1 do not apply in this case).

To return the TI Silent 700 to normal Printer status:

1. Press LOCAL

2. Press CTRL and D simultaniously

2.5 LOCAL MODE PRINT COMMANDS--There are four (4) printer commands available in LOCAL mode. They are:

1. PRINTER STATUS--Causes a check of the printer status, and one of the following messages to print.

PRINTER READY - PRINTER READY FOR LISTING

PRINTER BUSY - PRINTER LISTING NOT READY FOR NEW PRINTOUT

PRINTER NOT AVAILABLE - PRINTER NOT OPERATIONAL PRINTER MAY BE OUT OF PAPER OR TURNED OFF, OR DISCONNECTED

2. EVENT--Requests a listing of a block of events in numerical order.

3. TEST--Requests a listing of a block of events in the order in which they will "air". Will print "<ER" next to an event containing a subroutine stack error.

```
            TEST FROM-0100 TO-0105
EXAMPLE:   0100 PLAY 11     M MUS
           0101 PLAY 08     K TIM
           0102 *RTN              <ER<--RTN SCHEDULED BEFORE A SUB
           0103 AVAL                    COMMAND.  FLAGGED AS AN ERROR
           0104 AVAL
           0105 AVAL
```

4. SEARCH--Requests a search of a block of memory for desired parameters and prints all events with those parameters.

NOTE: 1. Pressing the CTRL and D keys simultaneously will cause the printer to stop. A slight delay may be experienced with some printers while their storage buffers empty.
2. "ESC" key may be pressed during Command Entry to cancel that command and allow a new Entry.

The following illustrates each of these modes.

2.5.1 DETERMINING PRINTER STATUS.

1. Press LOCAL. CRT will print LOCAL MODE.
2. Key in P (or the word PRINTER if desired).
3. Press ENTER. The CRT will print one of the following messages:

PRINTER READY
PRINTER BUSY
PRINTER NOT AVAILABLE

Refer to paragraph 2.5 for description of each message.

2.5.2 LISTING A BLOCK OF EVENTS IN NUMERICAL ORDER.

1. Press LOCAL.
2. Key in E (or the word EVENT if desired).
3. Press SPACE BAR. CRT will print "FROM-".
4. Key in first Event desired (e.g. 0000).
5. Press SPACE BAR. CRT will print "TO".
6. Key in last Event desired (e.g. 0005).
7. Press ENTER. The printer will now begin listing the desired Events.

EXAMPLE:

```
%E FROM-0000 TO-0005
0000 PLAY 01-02    C DYM
0001 PLAY 02-19    C CHV
0002 PLAY 01-35    C DEL
0003 SUB  0100     O JGL
0004 PLAY 02-03    C DTA
0005 PLAY 01-21    C CAR
```

2.5.3 LISTING A BLOCK OF EVENTS AS THEY WOULD "AIR".

1. Press LOCAL.
2. Key in T (or TEST if desired).
3. Press SPACE BAR. CRT will print "FROM-".
4. Key in first Event desired (e.g. 0000).
5. Press SPACE BAR. CRT will print "TO-".
6. Key in last Event desired (e.g. 0005).
7. Press ENTER. The printer will now begin listing the desired events in the order they will "AIR".

EXAMPLE:

```
%T FROM-0000 TO-0005
0000 PLAY 01-02    C DYM
0001 PLAY 01-19    C CHV
0002 PLAY 01-35    C DEL
0003 *SUB 0100     O JGL
0100 LINK 05       O JGL
0101 PLAY 06       O JGL
0102 PLAY 08       K TIM
0103 *RTN
0004 PLAY 02-03    C DTA
0005 PLAY 01-21    C CAR
```

NOTE: If the program does not allow the "TO-" Event to be reached, the printer will continue to print indefinately. If this condition occurs, press "CTRL" and "D" simultaniously to stop printer.

2.5.4 SEARCHING FOR AND PRINTING EVENTS WITH DESIRED PARAMETERS.

1. Press LOCAL.
2. Key in S (or SEARCH if desired).
3. Press ENTER. CRT will print "DESIRED CODES".
4. At this time, you may key in the desired Program Codes followed by the ENTER key; or press the SPACE BARif no specific Program Codes are desired. The CRT will print "SEARCH FOR-".

5. Key in the desired parameters for which the search is to be made. Use the ADV key for any parameters which do not matter. For example, assume it is desired to search for Events containing Source 01 and Descriptor MCD. Key in:

   a. ADV (indicates you don't care which FUNCTION is in Event)
   b. 0 1 (Source 01)
   c. ADV (Don't care which Tray)
   d. ADV (Program Codes were input at Step 4)
   e. M C D (Descriptor MCD)

   The CRT will show:

```
SEARCH  DESIRED CODES -*
SEARCH FOR **** 01-**** *MCD
```

6. Press ENTER. The CRT will print "FROM-".
7. Key in the first Event number to start searching.
8. Press SPACE BAR. The CRT will print "TO-".
9. Key in the Event number where search is to end.
10. Press ENTER. Printer will print any Events containing all the desired parameters. If none are found the printer will just print a line of das

2.6 <u>CREATING YOUR OWN PROGRAM</u>--Most broadcast stations have two basic elements that make up 90% of their programming. Those elements are MUSIC and COMMERCIALS. In most cases, the music follows some defined source rotation pattern which is repeated several times before switching to a new rotation pattern. Commercials, on the other hand, are typically random and usually are reprogrammed (changed) on a daily or periodic basis depending on total system memory capacity. With this in mind, the following steps are recommended in laying out a program for entry into the system memory:

1. Lay out the format as it is to play.

2. Separate the elements which repeat from the elements which remain random.

3. Assign event numbers to each format event.

Figure 11 illustrates the process of separating the repeated from the random events. Note that the events could be programmed sequentially as they are to play but considerably more memory addresses are required for pure sequential than for split memory programming.

Referring to Figure 11, it can be seen that the music (repeated) format runs for 1/2 hour and then repeats itself. Thus it is necessary only to set aside a block of memory and by use of the SUB (subroutine) command in the main (random or commercial) format, the music format can be selected as required.

Now that the program has been divided into its two principle parts (repeated music and random commercial), event numbers can be assigned to give the written program meaning. In order to determine the event numbers to be used, consider the following:

1. Each music cluster should be considered a subroutine, callable from the main random format at any time. Thus all one has to do to determine the total number of events is to ascertain the total number of "different" small music formats (subroutines) to be used at any time, and add the total number of elements in all the subroutines. Adding the number of subroutines allows for event locations for the RETN instructions to return to the main program at the end of each subroutine cluster.

    Example: Total Subroutines = 15
    Total Events = 60
    Total Addresses Required = 75

    For the example above, it would be logical to allocate the first 100 events (0000 through 0099) for subroutines. The rest of the memory (0100 through 0950 on standard systems) is then available for random events. Figure 12 illustrates how event numbers might be assigned and how those events might be programmed for the program in Figure 11. Figure 13 illustrates how the program would weave from the Main routine to the Subroutines. The following points should be considered in breaking down the format and assigning event numbers.

1. It is typically easiest to start the program from the Main format using the SUB function to go to the first music cluster.

2. Although random access sources can be scheduled in a subroutine, it is definitely not advised to schedule a random access source as the first event. This is due to the fact that subroutines are accessed is a somewhat random fashion, the one scheduling the commercials would have to be very familiar with the entire program to avoid scheduling two trays in the same machine back to back. Thus, if a Jingle, for example, is always scheduled at the beginning of a music subroutine but comes from a random access source, it is best to schedule that Jingle at the end of the commercial cluster.

3. Assign subroutine event numbers first so that it can be determined where SUB instructions should "go to".

4. In assigning event numbers for commercial clusters, ascertain the maximum number of events each specific cluster could contain, including SUB instruction, and assign that number of event locations to the specific day and time to be able to keep track of when a particular cluster will air (e.g. Tuesday 3:10 PM 0532 PLAY 01 27). Thus, event 0532 is the first event location for the cluster to air on Tuesday at 3:10 PM. Figure 14 is a sample worksheet which can be used to organize the program. This same sheet can be used to organize the Subroutines by simply ignoring the Day and Time columns. Figure 15 is a blank form which may be reproduced.

This concludes the basic formating discussion. A review of paragraphs 2.3.1 and 2.3.2 is recommended to determine which functions and commands may be of use in your specific format. If the system contains the Real Time option, proceed to paragraph 3.4 in the Main manual for instruction on programming Network Join, Sign On, etc. If the system has an external Time Clock rather than the Real Time option, proceed to paragraph 3.5. Note that paragraph 3.6 shows in detail the information found on the Video Monitor.

TIME (Approx.)	PROGRAM	SUBROUTINES (Repeated Format)	MAIN FORMAT (Random)
0700 AM			UPD 0700
	Legal ID		Legal ID
	Music (Source 11)	Music (11)	
	Music (Source 12)	Music (12)	
	Music (Source 13)	Music (13)	
0710 AM			UPD 0710
	Spot		Spot
	Spot		Spot
	Spot (Avail)		Spot (Avail)
	Jingle	Jingle	
	Music (Source 11)	Music (11)	
	Music (Source 13)	Music (13)	
	Time	Time	
0720 AM			UPD 0720
	Spot		Spot
	Spot		Spot
	Spot		Spot
	Music (Source 14)	Music (14)	
	Music (Source 12)	Music (12)	
	Music (Source 13)	Music (13)	
0730 AM			UPD 0730
	Station ID		Station ID
	Spot		Spot
	Spot		Spot
	Music (Source 11)	Music (11)	
	Music (Source 12)	Music (12)	
	Music (Source 13)	Music (13)	
0740 AM			UPD 0740
	Time		Time
	Spot	Repeat	Spot
	Spot	Of	Spot
	Spot (Avail)	Above	Spot (Avail)
	Jingle	Jingle	
	Music (Source 11)	Music (11)	
	Music (Source 13)	Music (13)	
	Time	Time	
	Etc.		

FIGURE 11 BREAKING DOWN PROGRAM

SUBROUTINES

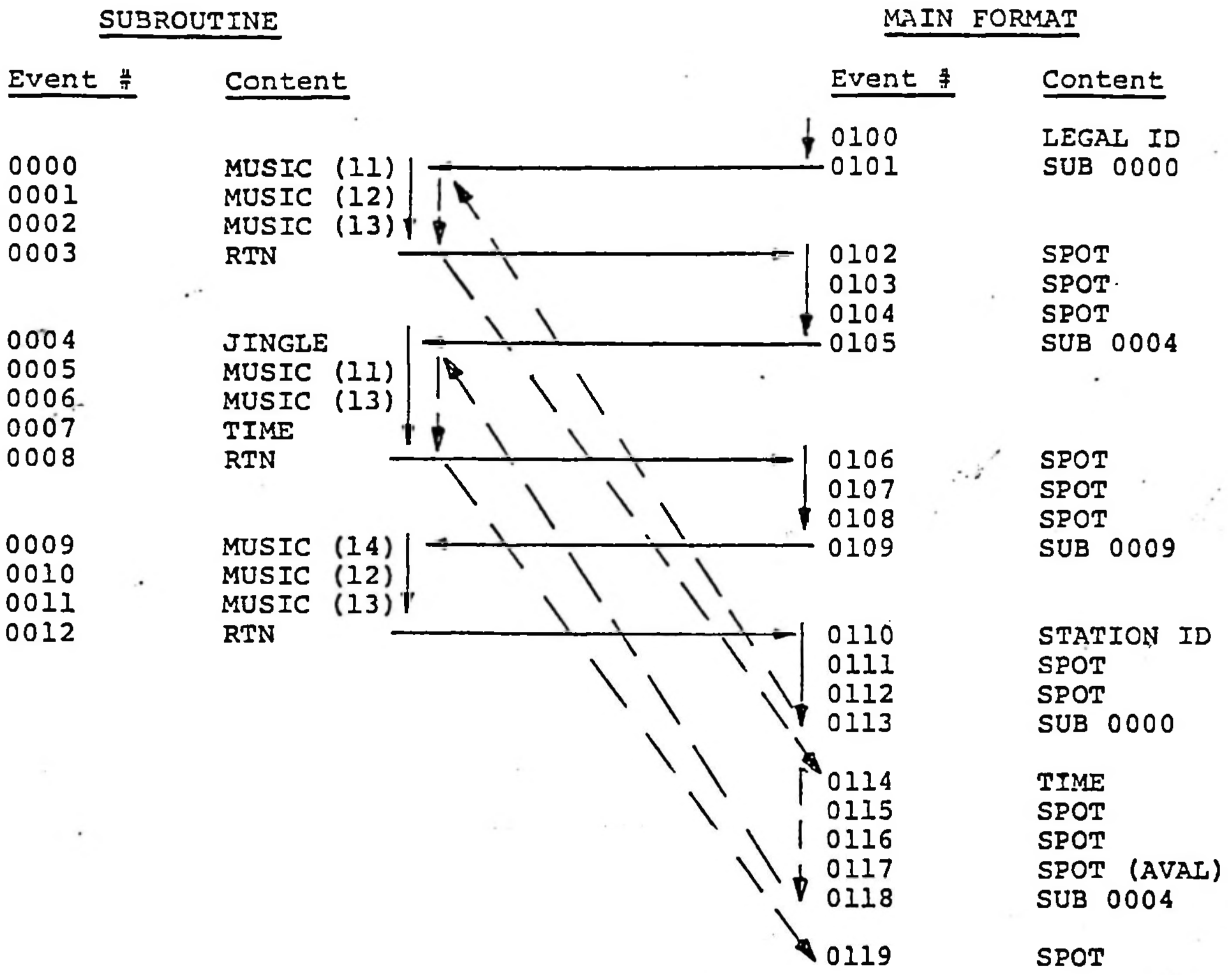
Content	Event	Function	Source	Tray
Music (11)	0000	PLAY	11	
Music (12)	0001	PLAY	12	
Music (13)	0002	PLAY	13	
	0003	RETN		
Jingle	0004	PLAY	05	
Music (11)	0005	PLAY	11	
Music (13)	0006	PLAY	13	
Time	0007	PLAY	06	
	0008	RETN		
Music (14)	0009	PLAY	14	
Music (12)	0010	PLAY	12	
Music (13)	0011	PLAY	13	
	0012	RETN		

MAIN (RANDOM) FORMAT

Content	Event	Function	Source*	Tray*
Legal ID	0100	PLAY	01	01
	0101	SUB	00	00
Spot	0102	PLAY	XX	XX
Spot	0103	PLAY	XX	XX
Spot (Aval)	0104	AVAL	–	–
	0105	SUB	00	04
Spot	0106	PLAY	XX	XX
Spot	0107	PLAY	XX	XX
Spot	0108	PLAY	XX	XX
	0109	SUB	00	09
Station ID	0110	PLAY	01	02
Spot	0111	PLAY	XX	XX
Spot	0112	PLAY	XX	XX
	0113	SUB	00	00
Time	0114	PLAY	06	–
Spot	0115	PLAY	XX	XX
Spot	0116	PLAY	XX	XX
Spot (Aval)	0117	AVAL	–	–
	0118	SUB	00	04
	•			
	•			
	•			
	Etc.			

* XX = Typically changes from day to day

FIGURE 12 ASSIGNING EVENT NUMBERS, FUNCTIONS, SOURCE, AND TRAY



SUBROUTINE

Event #	Content
0000	MUSIC (11)
0001	MUSIC (12)
0002	MUSIC (13)
0003	RTN
0004	JINGLE
0005	MUSIC (11)
0006	MUSIC (13)
0007	TIME
0008	RTN
0009	MUSIC (14)
0010	MUSIC (12)
0011	MUSIC (13)
0012	RTN

MAIN FORMAT

Event #	Content
0100	LEGAL ID
0101	SUB 0000
0102	SPOT
0103	SPOT
0104	SPOT
0105	SUB 0004
0106	SPOT
0107	SPOT
0108	SPOT
0109	SUB 0009
0110	STATION ID
0111	SPOT
0112	SPOT
0113	SUB 0000
0114	TIME
0115	SPOT
0116	SPOT
0117	SPOT (AVAL)
0118	SUB 0004
0119	SPOT

FIGURE 13 ORDER OF PLAY

Day	Time	Content	Event #	Function	Source	Tray	Pgm Code	Descriptor
Tuesday	3:10PM	Spot/Sears	0532	PLAY	01	27	C	SRS
		Spot/McD	0533	PLAY	02	15	C	MCD
		Spot/Z's	0534	PLAY	01	03	C	Z
			0535	*SUB	00	04		
	3:20PM	Spot/Twin S.	0536	PLAY	01	46	C	TWS
		Spot/Penny's	0537	PLAY	01	04	C	PEN
			0538	AVAL			C	
		Jingle	0539	PLAY	02	02	J	02
			0540	*SUB	00	09		
		Etc.	Etc.	Etc.	Etc.	Etc.	Etc.	Etc.

FIGURE 14 SA[illegible] FORMAT WORK SHEET

Day	Time	Content	Event#	Function	Source	Tray	Program Code	Descriptor

FIGURE 15 FORMAT WORK SHEET

LEVEL II SWITCH SETTINGS

2.7 GENERAL

Several new switch and jumper options have been added to the SERIES 7000, LEVEL 1A & II FIRMWARE. These options will be outlined in this section.

2.71 UNIVERSAL SOURCE BOARD

The ID switch (U27) located on each universal source card will have the following modifications (SEE page 6-22 of manual).

2.711 The CLOSE LOOP function which was automatically determined by the description chosen in LEVEL I has now been made switch selectable. SWITCH 4 of the ID switch will now control the operation of the CLOSE LOOP monitoring as follows

CONDITION	FUNCTION
S4 ON	CLOSE LOOP ACTIVATE
S4 OFF	CLOSE LOOP DEACTIVATE

2.72 MAIN CRT PORT (SIO)

The PERIPHERAL ID (U2) switch located on the SIO card used for the SYSTEM CONTROL CONSOLE (MAIN PORT) only will have the following modifications (SEE pages 6-8 to 6-10).

2.721 SWITCH 1 ON U2 controls the CRT SAVE feature in LEVEL 1A.

SWITCH 1 - ON <-- CRT will remain in upper intensity

SWITCH 1 - OFF<-- CRT will go into operate mode and switch to lower intensity 5 minutes after the last time a key on any terminal was pressed. Pressing any key of any terminal will place all CRTs back in upper intensity.

LEVEL II SWITCH SETTINGS

2.722 SWITCH 3 controls whether the FIX DESCRIPTORS in LEVEL II are used. If the DESCRIPTORS are not activated, the USER MEMORY is increased by 40% which represents the memory allotted to the DESCRIPTORS.
NOTE this selection should be made at installation and not changed. THIS IS A LEVEL II OPTION ONLY.

SWITCH 3 - ON <-- FIX DESCRIPTORS off
SWITCH 3 - OFF<-- FIX DESCRIPTORS on

2.723 SWITCHES 7 & 8 control the use of the station ID which appears in the title of each of the different modes to allow stations with multiple systems to know which system is being monitored.

SWITCH 7	SWITCH 8	
ON	ON	<-- No ID
OFF	ON	<-- "FM" ID
ON	OFF	<-- "AM" ID
OFF	OFF	<-- No ID

2.73 LOAD/DUMP & HIGH SPEED PRINTER BOARD (SIO)

The PERIPHERAL ID (U2) switch located on the SIO card used for the LOAD/DUMP or HIGH SPEED PRINTER (LEVEL II ONLY) port will have the following modifications:

2.731 SWITCH 8 controls the use of the port as either a controller or communications port. As a controller, the port will activate and de-activate the motor control on the peripheral device.

LEVEL II SWITCH SETTINGS

EX: The cassette machine tape motion will be controlled from the CONSOLE terminal. As a communication device, the port will be open to FULL DUPLEX communication with an external device such as BUSINESS SYSTEM. NOTE that there is not incoming data reception from any external device while the port is a controller except when activated by the CONSOLE. Also note if a cassette is connected to a port designated as a communications port, the motors will run all the time.

SWITCH 8 - ON <-- CONTROLLER PORT (FOR CASSETTE)
SWITCH 8 - OFF<-- COMMUNICATION PORT (FOR BUSINESS)

2.732 If SWITCH 8 is set OFF making it a COMMUNICATIONS PORT, the SWITCHES 1-7 are designated as follows:

SWITCHES 1-7 <-- These switches may now be set to represent an ASCII character which when received by the port will be interpreted to be a command to begin LOADING memory info from the external computer to the 7000. NOTE the port will echo the character designated to indicate to the external device that the command was received.

Transmission of the NEXT HIGHER CHARACTER in the ASCII code table will cause the 7000 to start LISTING the memory from the 7000 to the external device.

EX: A=LOAD, B<--next higher character

EX:

7000	EXTERNAL DEVICE	
<--	SEND "A"	<-- External device sends the character "A" as per SWITCHES 1-7 to indicate desire to LOAD.
"A"-->	RECEIVE "A"	<-- 7000 echos character back indicating LOAD READY.
<--	SEND DATA	<-- External device sends data to 7000

LEVEL II SWITCH SETTINGS

EX:	7000	EXTERNAL DEVICE		
	<--	SEND "B"	<--	Request from external device for 7000 to LIST memory.
	DATA-->	RECEIVE DATA	<--	7000 sends complete memory data to external device.

NEXT ASSY	USED ON	REV.	DESCRIPTION	DATE	APPR.

1.0 GENERAL DESCRIPTION

131-700-003

DWN. Ralph Smith	DATE 10/22/77
CHECK	
PROJ. ENG.	
APPR.	

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Cetec Broadcast Group

Cetec Corporation
1110 Mark Avenue, Carpinteria, California 93013

SERIES 7000 AUTOMATION TECHNICAL MANUAL

SECTION 1.0 GENERAL DESCRIPTION

SIZE	SHEET	DRAWING NUMBER	REV
A	1-1 OF	049-7003	

GEN. DESCRIPTION

1.0 GENERAL DESCRIPTION

1.1 SCOPE OF MANUAL

1.1.1 PURPOSE - The purpose of this manual is to provide the user with complete operating instructions (Section 3.0) as well as a comprehensive explanation of the operation of the system on both a block diagram and individual board basis (Section 5.0). Additionally, complete installation instructions (Section 2.0) are included which aid in the initial installation as well as during maintenance should boards or cables require removal.

Additionally, since the system is designed to be "individualized" to meet each owner's particular needs, selection switches and slip on jumpers are provided on several boards. Their functions and settings are discussed in Section 6.0.

Further, for those who are not familiar with "Binary" and "Hexadecimal", and explanation is provided in the Appendix.

1.1.2 MANUAL BREAKDOWN - The manual is divided into ten (10) major sections as described below:

SECTION 1.0 -	GENERAL DESCRIPTION - This section discusses the scope and format of the manual, gives a general description of the operation, illustrates the general physical layout, and contains the system warranty.
SECTION 2.0 -	INSTALLATION - Gives installation requirements including cable connections, auxiliary equipment cable connections, and general instructions for normal switch and jumper settings on P.C. boards.
SECTION 3.0 -	OPERATION - Includes complete operating instructions starting with Manual controls and then instructions for programming including sample programs for typical formats. Additionally, instructions for Encoding cartridges and listing and loading memory are included in this section.

NOTE: The Manual contains two (2) Section 3.0's; one for Level I Systems and one for Level II Systems. Be sure to consult the correct section for the type system you have. It is recommended that you remove the Section 3.0 that does not apply to your system.

SECTION 4.0 - PROGRAMMING AIDS - Special forms which aid in understanding and organizing programs are found in this section.

SECTION 5.0 - THEORY OF OPERATION - Contains complete and detailed information on the electrical operation of the system both on a block diagram and individual board level. The CONTROL chassis and AUDIO chassis are discussed separately with individual board responsibilities presented in the Block diagram discussion for each chassis.

SECTION 6.0 - BOARD SWITCH AND JUMPER TABLES - Gives detailed purpose and settings for all board switches and jumpers.

SECTION 7.0 - TROUBLESHOOTING - Outlines recommended troubleshooting approaches for both Audio and Digital problems as well as use of the optional DEBUG board in solving system problems.

SECTION 8.0 - GENERAL MAINTENANCE - Outlines general recommended maintenance as well as purpose and adjustment procedure for system potentiometers.

SECTION 9.0 - DRAWINGS

SECTION 10.0 - APPENDIX - Provides Integrated Circuit (IC) cross reference and IC pin designations and applicable truth tables as well as a recommended spare parts list. Additionally, an explanation of Binary and Hexadecimal is provided for those unfamiliar with those concepts.

1.2 OPERATION (GENERAL)

1.2.1 CONTROL and PROGRAMMING - All control (System START, STOP, etc.) and programming is accomplished from the Video terminal which is interfaced to the system by a Serial I/O board. A system may have more than one Video terminal, however Firmware interlocks prevent more than one terminal from editing the program memory at any one time. Detailed operating and programming instructions are found in Section 3.0 (OPERATION) of this manual.

Audio monitoring controls are found on the Local Status Panel normally located at the top of the System control rack. Included are two (2) VU Meters for monitoring the Left and Right channels simultaneously; selection of L-R, L+R, or NORMAL audio monitoring; selection of PROGRAM or any of five (5) types of off-air (Cue) sources, and a VOLUME control for the customer supplied monitor speakers.

Status indicators (LED's) are also found showing through the Local Status Panel. They include Alarm indicators to tell the operator not only that an alarm has occurred, but also whether it was caused by Silence Sense or by a Close Loop (failure of a source to start). Additionally, LED's indicate if Silence Sense has been disabled or audio is being faded by a FADE command. Finally indicators show which source is ON AIR, NEXT, and which source, if any, is in a PRE-ROLL condition.

1.2.2 BASIC ELECTRONICS OPERATION (Reference Block Diagram 114-700-001) - The series 7000 is a microprocessor controlled system with all basic programming stored in ROM (Read Only Memory) and all user source and function data stored in RAM (Random Access Memory). The basic system contains sufficient RAM on the CPU board to perform its tasks while more advanced systems require the addition of one or more ROM and RAM boards. If the optional Real Time Clock board is added, the system becomes a "Multi-Processor" system with the microprocessor on the CPU board acting as the main processor and the microprocessor on the Real Time Clock board functioning as a slave. This allows real time updating to occur simultaneously with normal processing.

The system is divided into two (2) main chassis; the Control chassis and the Audio chassis (the optional Expansion Audio chassis is essentially the same as the main Audio chassis). Communication between the various Control chassis elements is under the control of the CPU board which address the -

appropriate board via the Address Bus and instructs the board whether it wishes to "read" or "write" data via the Control Bus. The Data Bus is used to transfer data to and from the CPU board and the other Control chassis boards. The CPU board also communicates with the Audio chassis by way of the Audio Control and Buffer board. Thus it can be said that the CPU board is the heart (or more appropriately, brain) of the system, constantly updating the Video display, checking the ready status of audio sources, updating random access sources, and taking appropriate action when an interrupt occurs, such as starting the correct new source when an EOM (End of Message) tone occurs.

The Audio chassis controls audio source selection under CPU control and controls Audio selection for both PROGRAM output and CUE monitoring. PROGRAM audio is a function of which Audio Source is "on the air" while a selector switch on the Local Status Panel determines whether PROGRAM, CUE, TIME, NETWORK, AUX1, or AUX2 is presented to the VU Meters and monitor speakers. A jumper on the Universal Source board determines the source type (normal source "CUE", TIME, etc.) and thus which sources can present audio when a source type is selected.

The Audio Signal Block Diagram (114-700-004) details audio routing however, basically Program audio is routed from the Universal Source board to the Audio Distribution board and from there to the Audio Interface TB1. Cue audio comes from either the Universal Source board or the Monitor Amplifier board (AUX1 and AUX2) to the Audio Distribution board where it is then routed to the Local Status Panel for VU monitoring and level control and then routed back through the Audio Distribution board for transfer to the Monitor Amp board for final amplification prior to going to the speakers.

1.2.3 SPECIAL SYSTEM FEATURES - In addition to the normal functions of scheduling audio sources, updating the Video Terminal, sending data to the VEL (Verified Encoded Loggingboard, etc.; there are several special features which bear mentioning.

a. There are three (3) methods of fading PROGRAM audio:

   1. Each source can individually be set to fade ON, fade OFF, or both at all times (controlled by FADE EN jumper and diode installed on Universal Source board).
   2. Systems with Level II options allow each source to be individually set to fade ON, fade OFF, or both under CPU program control (Universal Source board FADE EN jumper removed).

   3. Audio on air can be faded OFF and EOM pulse produced to start the "NEXT" source or, if in "STOP REQ" mode, to step to a full STOP condition under Manual or CPU control.

b. By jumper selection on the Universal Source board(s), audio from each source can be routed to either non-compressed or compressed audio amplifiers. Thus at the customers discretion, some sources can be compressed while others are not; or, for formats using talk over intros, music sources can automatically be compressed during the voice introduction.

c. Under CPU program control, two (2) sources may be started at once. An EOM inhibit latch is set on the Universal Source board for the source programmed first to block its EOM tone from driving the 1EOMB bus and thus prevent it from starting another source. The EOM tone from the first source does, however, switch audio for that source from PROGRAM to CUE. The EOM tone from the second scheduled source causes the program to advance to the next source.

d. Under CPU program control, a Universal Source board for a reel to reel source can be set to respond to either a right or left channel 25Hz tone. If set to respond to a right channel tone, the source STOP pulse automatically resets the board to monitor left channel tones.

e. Two auxiliary audio inputs can be brought to the system for monitoring purposes. One input (AUX 2) feeds an audio level sensor which, if used, will give an indication on the log that a "transmitter off" condition has occurred should audio to this input drop below a set level for more than a preset time (typically 3 seconds). The time is adjustable from 0 to 8 seconds.

f. The Serial I/O board baud rate can either be set automatically under CPU program control or manually by means of DIP switches on the Serial I/O Board.

g. A manual OVERRIDE switch on the Audio Control and Buffer board which, if placed in the MAN position, allows manual starting of sources in the event of a serious system programming malfunction. Normal Cue audio is fed to the PROGRAM output and thus what ever source is rolling is "on the air". It is necessary to have the SOURCE switch on the Local Status Panel set to the proper type of Cue source in this emergency condition as the SOURCE switch controls which Cue outputs are enabled. For example, if the station is both AM and FM and the automation fails on FM, AM audio can be brought in on the AUX1 input and by placing the SOURCE switch on AUX1 and placing the OVERRIDE switch in MAN, AM will be simulcast. Likewise placing the SOURCE switch in CUE allows system audio sources to be used under manual control. For Network place SOURCE switch in NETWORK, etc. Thus maintenance can be performed on the Control Chassis while a manual operator maintains the format on the air having the full compliment of sources with which to work.

1.3 PHYSICAL LAYOUT - Though the placement of the Audio sources is specified by the individual customer, the Control rack is generally arranged as shown in Figure 1-1 (Standard) and Figure 1-2 (with Expansion Audio Chassis). Figure 1-3 shows the placement of the boards in the Audio Chassis. Note that due to the parallel bus structure there is no specific assignment for boards in the Control chassis with the exception that the CPU board is generally placed in slot XA1 due to the short interconnect cable to the Audio Control and Buffer board. All other boards can be placed in any available slot.

CAUTION: Though PC boards have off-center connectors preventing them from being installed in their respective chassis upside down, should the keys be removed in the Extender board, it would be possible to place a board in the Extender board upside down which would result in probable damage to the PC board.

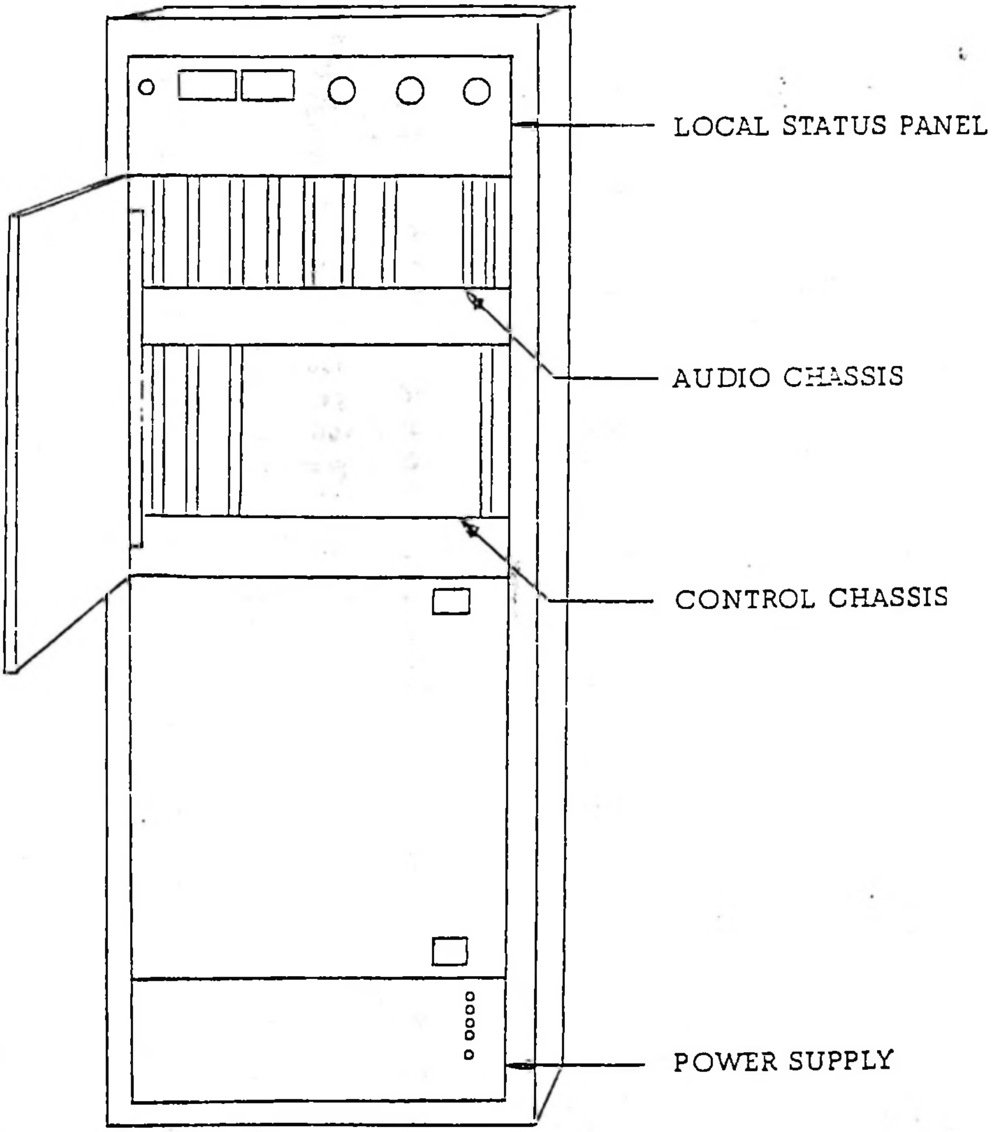

Fig. 1-1 Control Rack Layout (Standard)

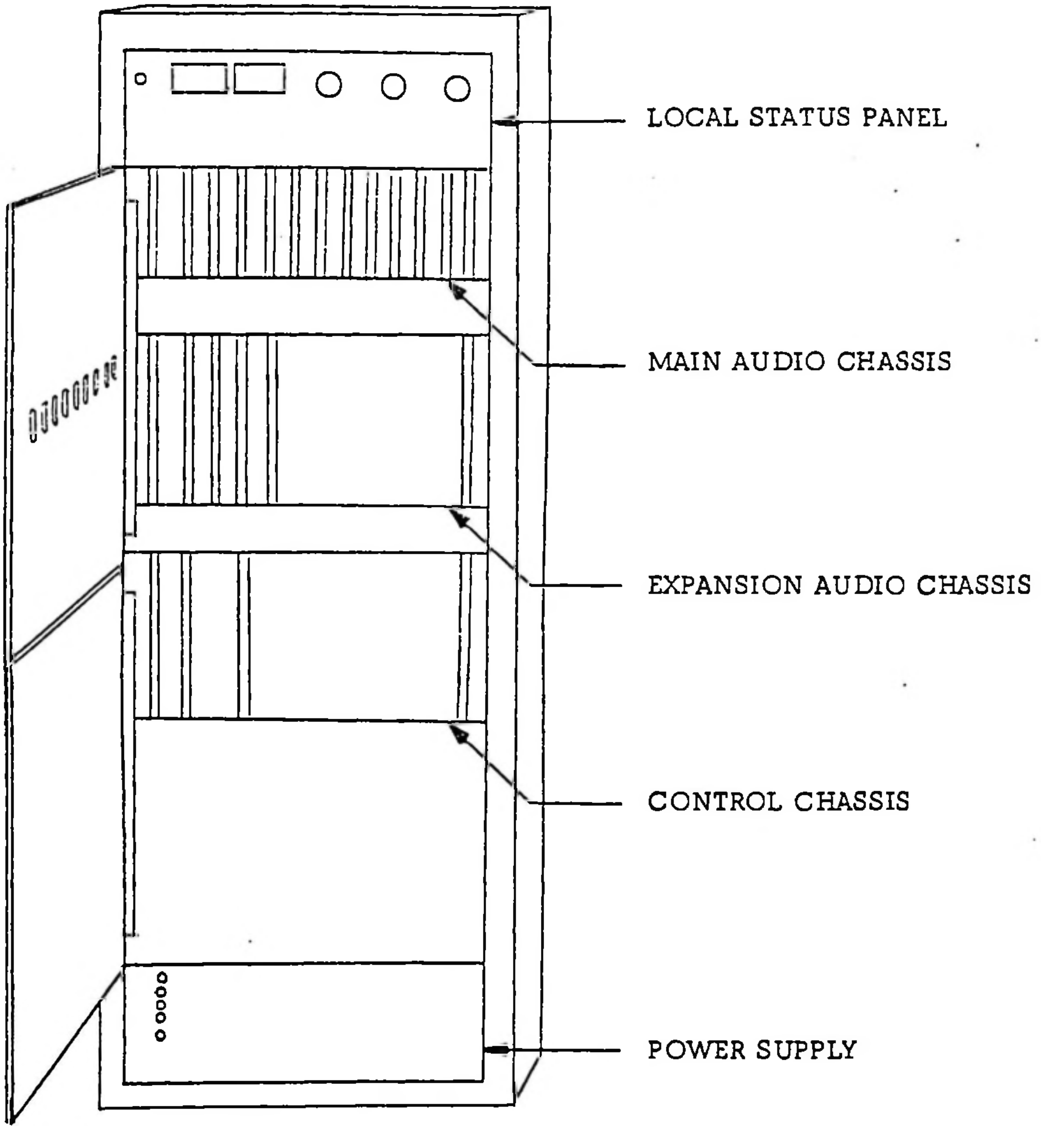

Fig. 1-2 Control Rack Layout (with Expansion Audio Chassis)

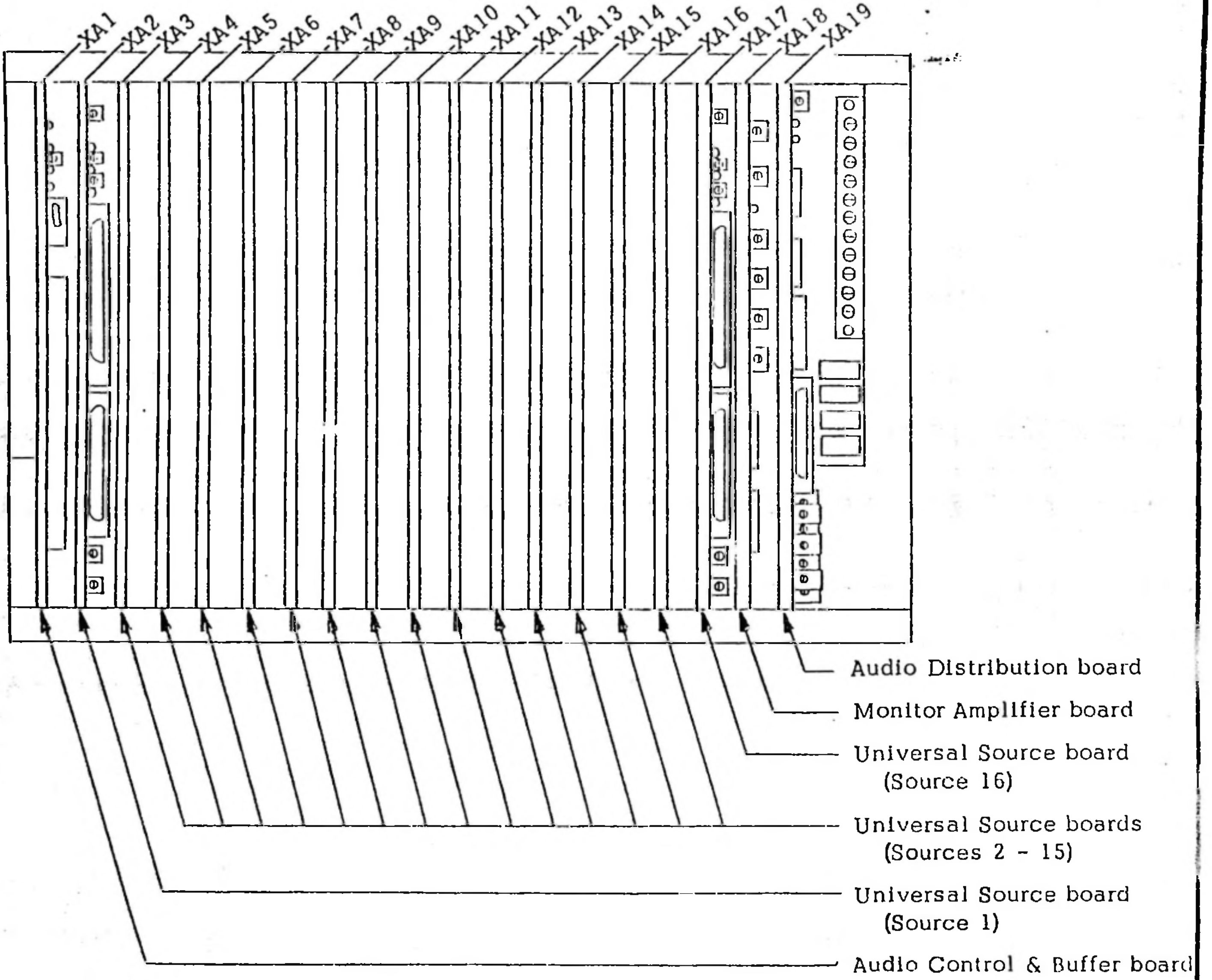

Fig. 1-3 Audio Chassis Layout

ADDENDUM - INSTALLATION - SECTION 2.0

INSTALLATION CHECK LIST

Section 2.0 contains detailed INSTALLATION instructions, however the following list may be used as a check list. It is recommended that SECTION 2.0 be reviewed prior to installation to familiarize yourself with information and illustrations contained therein.

1. Unpack or uncrate racks.
2. Assemble racks with 7000 Control Rack on left with all other racks per racking chart.
3. Bolt racks together with 1/4" bolts provided. Be sure to scrape paint away from mounting hole area and then place star washers against racks on each side.
4. Connect the ground strap in each rack to the bottom rear bolt and to the same bolt for two racks where possible.
5. Remove all packing and protecting tape.
6. Locate power cable from Waber Box in main rack. Position this cable to be used for power to automation system. Do not apply power at this time.
7. Observe that the power supply is plugged into this Waber Box. The power supply does not have a power switch. To remove power, remove this cable from the power supply.
8. Connect Waber Box power cables from other racks into this Waber Box.
9. Connect all power cables to the closest Waber Box.
10. Pull cables from each rack that correspond to a tape deck and route to the Source cards in the top chassis. Run the cables between the two chassis. Note each cable has a source number on its hood.
11. Unpack the CRT Terminal and set at desirable location. For testing purposes, this should be near the automation system. After checkout, it can be placed anywhere within the range of the interconnect cable.

INSTALLATION

12. Connect CRT Cable to MODEM on CRT and to bottom connector on SIO card located in bottom chassis (see Figure 2-2 or 2-3). Set BAUD RATE to 14.

13. Remove Fuse from taped bag located on rear of Power Supply and place in Fuse Holder. Battery switch should be in "OFF" position.

14. Check all cards for complete insertion.

15. Turn battery switch to Local Battery when it is desired to hold memory during power interruptions. If AC power is removed for any long period of time, this switch should be placed to "OFF" so that the battery will not be completely discharged.

16. Apply power to the Video Terminal (CRT) then plug in the 7000 power cord to suitable source and observe that all lamps light on Power Supply.

17. Press OPER key on Video Monitor to obtain Operate mode display on Video Monitor screen.

18. Press EDIT key. CRT should display EDIT mode similar to Figure 3-6 in OPERATION section.

NOTE: Should a problem be encountered getting the CRT to display properly, contact Cetec Broadcast Group Customer Service.

19. Proceed to the OPERATION section. Paragraph 3.3 begins the discussion on programming the system. Be sure to review all of the OPERATION section prior to operating the system.

NEXT ASSY	USED ON	REVISIONS			
		REV.	DESCRIPTION	DATE	APPR.

2.0 INSTALLATION

DWN. Ralph Smith	DATE 10/31/77
CHECK	
PROJ. ENG.	
APPR.	

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SERIES 7000 AUTOMATION TECHNICAL MANUAL

SECTION 2.0 INSTALLATION

SIZE		DRAWING NUMBER	REV
A	SHEET 2-1 OF	049-7004	

2.0 INSTALLATION

2.1 GENERAL INSTRUCTIONS

2.1.1 INITIAL INSPECTION - Equipment racks may or may not be shipped in shipping crates depending on the method of shipment. In either case, immediately inspect equipment for shipping damage.

Carefully open accessory shipping container(s) and inspect for shipping damage and/or shortages using the packing list as a guide.

NOTE: List any shipping damage and/or shortages and notify both the carrier and Cetec Schafer immediately.

2.1.2 POSITIONING EQUIPMENT - Normally positioning of racked equipment and accessories has been discussed and approved by the customer. Thus cable lengths have been determined based on customer desires. Therefore the quickest, neatest installation is obtained if the original racking orientation is maintained.

The following are recommendations as to the actual location of the equipment:

1. Location should be free from excessive foot traffic.
2. Must be near enough to a standard 110VAC, 60Hz, 20 amp grounded outlet for the system power cord (6 ft) to reach. It is recommended that the AC line be dedicated solely to the Automation.
3. Location should be as free as possible from RF and static.
4. Location should be free from excessive dust and extreme temperature variations.

5. Some customers have found that placing the equipment racks on a platform of 2x4's helps keep equipment from being damaged during floor cleaning and also places the equipment at a more desirable height.

Once the location for the equipment racks is determined, position the racks in the assigned order and bolt the racks together with hardware supplied insuring that lock washers are used on both racks as shown in Figure 2-1.

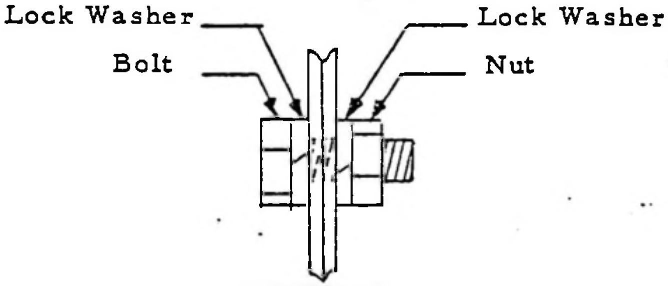


FIGURE 2-1

Locate the Video Terminal on any convenient table surface near enough to the System Control Rack for its interconnect cable to reach. Any additional accessory equipment should be placed at the most convenient location within the limits of their interconnect cable length.

Encode Center equipment (Teletype or CRT and cartridge recorder) is generally located in the recording studio.

2.2 CONTROL RACK INTERCONNECT CABLES - Figure 2-2 illustrates the Control Rack interconnect connections for a standard system. Figure 2-3 illustrates a system Control Rack with an expansion audio chassis. The interconnect connect cables are listed in Figure 2-4. Figure 2-5 lists the connections from the Power Distribution board to the chassis backplanes. Since all three terminal blocks on the Power Distribution board are in parallel, it makes no difference which chassis is tied to any specific terminal block. All these cables are normally installed at the factory, thus only verification of solid and proper connection should be required.

2.3 PERIPHERAL EQUIPMENT INTERCONNECT CABLES

2.3.1 GENERAL - Cables for equipment mounted in racks are generally coiled up in the rack with the equipment. Cables for non rack mounted equipment such as Video Monitors, Teletypes, Printers, etc., are generally found in the Box(es of accessory equipment. Route rack cables to the Control rack passing cables through holes provided in racks. Brin external cables in through an end rack and route to the Control Rack. Figure 2-6 illustrates cable routing for a typical system.

2.3.2 AUDIO SOURCES - Cables for Reel to Reel, Cartridge, and Random Access audio sources are normally supplied with the system pre-made ready to connect to the appropriate Universal Source board located in the Audio chassis. Cables for Studio or Network sources are generally made up by the customer to the mating connector supplied for that source. Figure 2-7 illustrates the typical wiring configuration for Studio or Network sources.

Reel to Reel and single play cartridge sources have a single connector which connects to J2 on the Universal Source board (see Figure 2-8). Locate the appropriate Universal Source board by determining the source number for the Audio source and then locating the Universal Source board for that source as specified by the board location identification above the boards in the Audio Chassis.

All Random Access Sources (RAS) have at least two (2) connections to connect to the Universal Source board. Some sources connect directly to J1 and J2 on the Universal Source board while others require routing through an Interface board (generally located in the Control Chassis directly below the Universal Source board assigned to the RAS source or immediately next to the Universal Source board) and from there to J1 and J2 of the Universal Source board. Note that the cables from the RAS Interface board to the Universal Source board are generally installed at the factory. Figures 2-9a through 2-9c illustrate cable connections for various sources requiring a RAS Interface board.

Figure 2-10 shows pin assignments for J1 and J2 of the Universal Source board.

2.3.3 CONTROL AND/OR MONITOR DEVICES - Video Terminals, Teletypes, etc., interface to the system by way of a Serial I/O board. There is one (1) Serial I/O board for each such device to be connected to the system. Each Serial I/O board is coded by a DIP switch (U12) for the device to be interfaced. Refer to Figure 2-11 to identify the code for the device to be interfaced. Unless shipping has altered their position, the switches should be in the correct position for system peripherals as set at the factory.

Most RS232 devices and 20ma loop devices connect to J2 (see Figure 2-11). Figure 2-12 gives the pin lists for connectors J1 and J2, and notes which devices should be connected to J1, instead of J2.

2.3.4 LOGGING DEVICES - Logging devices connect to the VEL board. Most RS232 devices and 20ma loop devices connect to J2. Figure 2-13 lists pin assignments for connectors J1 and J2.

2.3.5 EXTERNAL CLOCK MONITORS - Up to 15 external clock monitors can be driven by the Real Time Clock board from J1. Figure 2-14 lists pin assignments for J1.

2.3.6 REMOTE CONTROL - Provision has been made to allow interfacing a Remote Control Box to the system through a Parallel I/O board. Either the Cetec manufactured Remote Box or a customer designed remote box may be used. The functions which can be remoted are:

START - Starts system.

STOP - Places system in a Stop request condition. Goes to full Stop condition at the end of the current "on air" selection.

STEP - Causes system to step immediately to the next scheduled source or, if in a STOP REQ mode, into a full STOP condition.

FADE - Fades the current "on air" source and starts the next scheduled source at the end of the fade delay.

Figure 2-15 illustrates a typical Remote Control.

2.3.7 REMOTE TIME INPUT FUNCTIONS - Provision has been made to allow a remote time clock to activate four (4) real time functions through the Parallel I/O board. The functions which can be remoted are:

UPDATE - Causes program to advance to the source immediately following the next UPD flag.

JOIN - Starts a dedicated pre-roll source (see Section 6.0 Universal Source ID switches), and advances program to the source immediately following the next UPD flag.

LEAVE - Checks whether Network source is "on air". It it is, system steps immediately to next event. If not, no action occurs.

INSERT - Causes source scheduled in last memory address to schedule next.

Figure 2-16 illustrates a typical remote clock wiring diagram. Figure 2-16a illustrates wiring if only Join and Update functions are desired.

NOTE: Both a Remote Time Clock and a Remote Control Box may b tied to a Parallel I/O board simultaneously even though several input connections are shared. Remote Time Clock inputs toggle the CA2 input to U11 (Parallel I/O board) while Remote Control Box inputs toggle CA1.

2.3.8 ENCODE CENTER - The Encode Center is totally independent of the Automation system. It is usually installed in a production studio. Figure 2-17 illustrates the cabling hook-up for a typical Encode Center.

2.4 AUDIO, MONITOR, AND PARALLEL I/O INTERFACE TERMINAL CONNECTIONS.

2.4.1 GENERAL - Figure 2-18 shows the location of the three (3) Interface Terminal boards. These boards are used to tie the system to monitor speakers, the transmitter, auxiliary inputs, remote output functions, etc., as outlined in the following paragraphs.

2.4.2 AUDIO INTERFACE TERMINAL BOARD - The Audio Interface Terminal board contains the final PROGRAM audio (TB1) and tie points for connecting audio processing equipment (TB3 and TB4) as shown on Figure 2-19. Note that when shipped, jumpers are installed as shown in Figure 2-19. These jumpers may be removed and customer audio processing equipment installed as illustrated in Figure 2-19.

2.4.3 MONITOR INTERFACE TERMINAL BOARD - Figure 2-20 illustrates the inputs to the Monitor Interface Terminal board which provides terminals for the Aux 1 and Aux 2 audio inputs, audio outputs for the monitor speakers, and an input for an "off air" monitor switch closure.

2.4.4 PARALLEL I/O INTERFACE TERMINAL BOARD - The Parallel I/O board provides eight remote function relay outputs which provide a 1 second relay closure when activated by Remote Function 1 through 8. Function 8 has been assigned the task of starting a remote memory load device while functions 1 through 7 are available for user assignments. Further information in Section 3.0 of this manual illustrates how to program these remote functions. These relay outputs as well as several photo isolated inputs are brought to the Parallel I/O Interface Terminal board as shown in Figure 2-21. Figure 2-22 illustrates some ways of connecting and using the remote functions.

2.5 PC BOARD SWITCH AND JUMPER SETTINGS (GENERAL) - Many of PC boards in the system contain switches and/or push on jumpers which allow for ease in changing the board configuration to accomodate varying customer requirements. Section 6.0 of this manual details the function of and conditions for setting the various switches and jumpers.

Though most of the switches and jumpers are set by the factory prior to shipment, it is recommended that verification of the switch and jumper settings be made during installation in the event that shipping vibration may have caused switches to change from their original setting. Additionally, reviewing Section 6.0 will familiarize the user with the optional configurations available.

2.6 INITIAL POWER UP

2.6.1 Verify all cables are properly connected, and all P.C. Boards are fully seated.

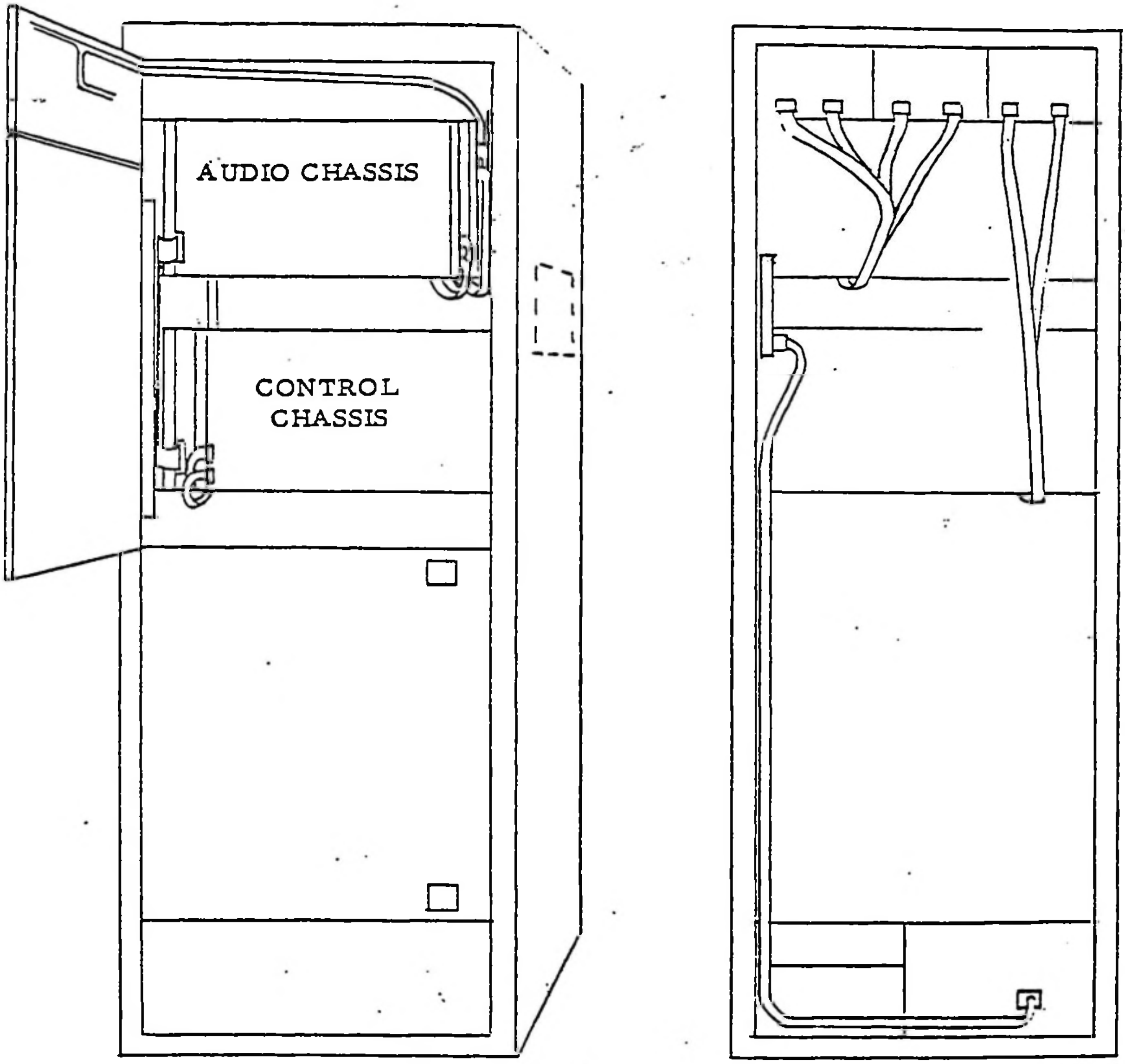
2.6.2 Remove fuse from taped bag located at rear of Power Supply, and install in fuse holder. Battery switch should be in OFF position.

2.6.3 Set battery switch on back of Power Supply to "LOCAL BATTERY", unless external battery is connected, in which case set the switch to "EXTERNAL". NOTE: If a prolonged power outage is experienced, the battery switch should be set to "OFF" to avoid fully discharging the battery.

2.6.4 Apply power to the Video Terminal (CRT). The "CAP LOCK" lamp on the left side of the Keyboard should be lit. Verify BAUD RATE is set to 14.

2.6.5 Plug in Power Supply power cord to 115VAC power source and verify all power supply lamps are ON.

2.6.6 Press OPER key on Video Terminal to obtain Operate mode display. Press the EDIT key. The CRT should display EDIT mode similar to Figure 3-6 in OPERATIOI SECTION. NOTE: Should a problem be encountered getting the CRT to display EDIT mode, recheck cable connections. If all cables are properly installed, contact Cetec Broadcast Group Customer Service.



FRONT VIEW

REAR VIEW

FIGURE 2-2

STANDARD CONTROL RACK INTERCONNECT CABLES

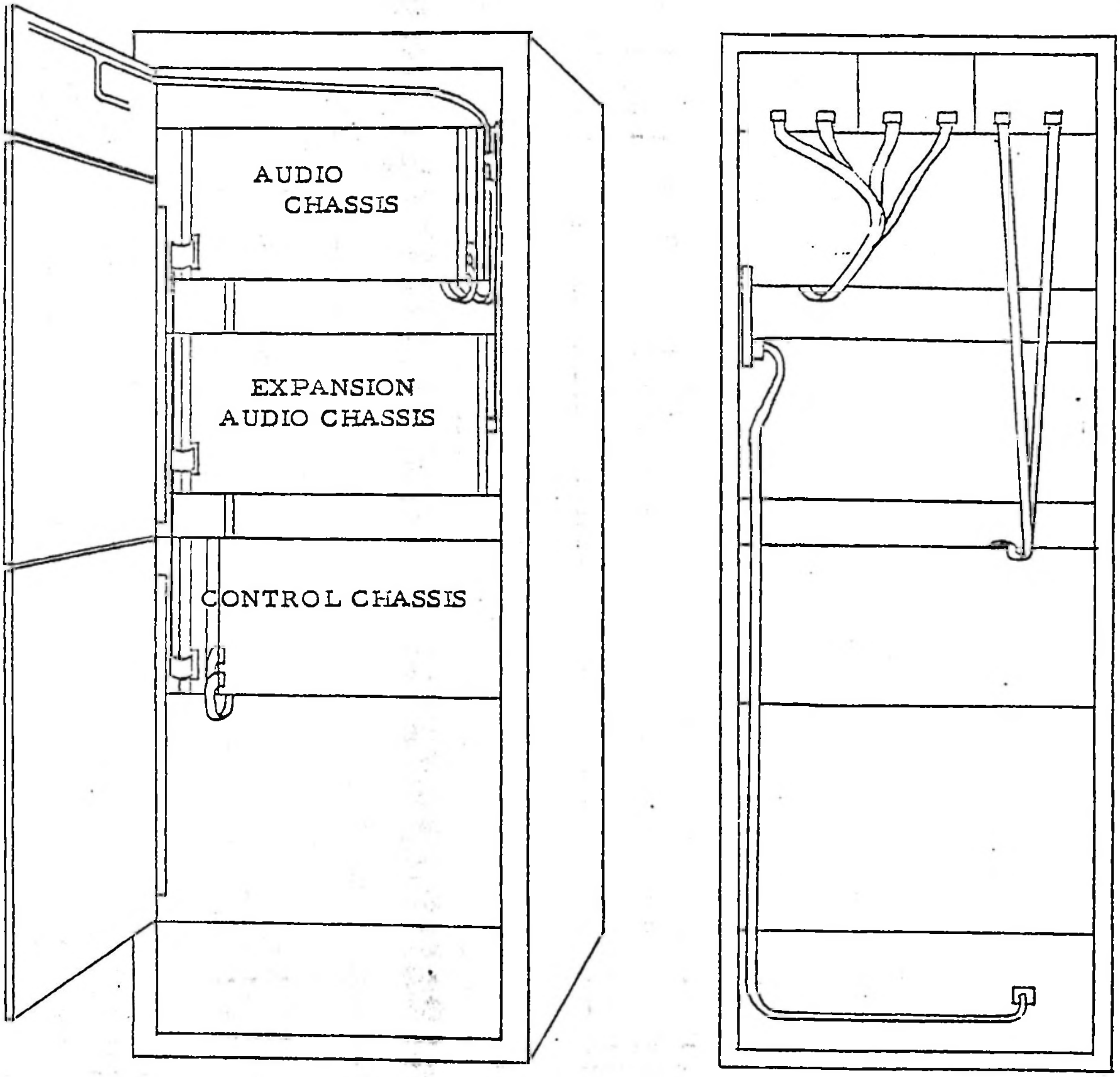


FIGURE 2-3

INTERCONNECT CABLES FOR SYSTEM WITH EXPANSION AUDIO CHASSIS

CONTROL CHASSIS		EXPANSION AUDIO CHASSIS(Optional)		MAIN AUDIO CHASSIS		INTERFACE TERMINAL BOARDS	
BOARD	CONN.	BOARD	CONN	BOARD	CONN	BOARD	CONN
CPU*	J1	Audio Control & Buffer	J1	Audio Control & Buffer	J1		
		Audio Distribution	J3	Audio Distribution	J3		
				Audio Distribution	J1	Audio	J1
				Audio Distribution	J2	Audio	J2
				Audio Distribution	J4	Local Status Pnl.	
				Monitor Amplifier	J1	Monitor	J1
				Monitor Amplifier	J2	Monitor	J2
P10 (Optional)	J1					P10	J1
P10 (Optional)	J2					P10	J2

POWER SUPPLY J1 TO POWER DISTRIBUTION BOARD J1

*If system does not contain Expansion Audio Chassis, CPU board (J1) connects to Audio Control & Buffer board (J1) in Main Audio Chassis.

FIGURE 2-4 CONTROL RACK INTERFACE CABLE LIST

POWER DISTRIBUTION BOARD	TO CONTROL OR AUDIO CHASSIS	MNEUMONIC
TB1, TB2, or TB3	TB1	
1	1	+5V
2	2	D COM
3		Not Used
4	4	+5V HELD
5		Not Used
6	6	+24V
7	7	S COM
8	8	+15V
9	9	A COM
10	10	-15V

FIGURE 2-5 POWER DISTRIBUTION BOARD CABLE CONNECTIONS

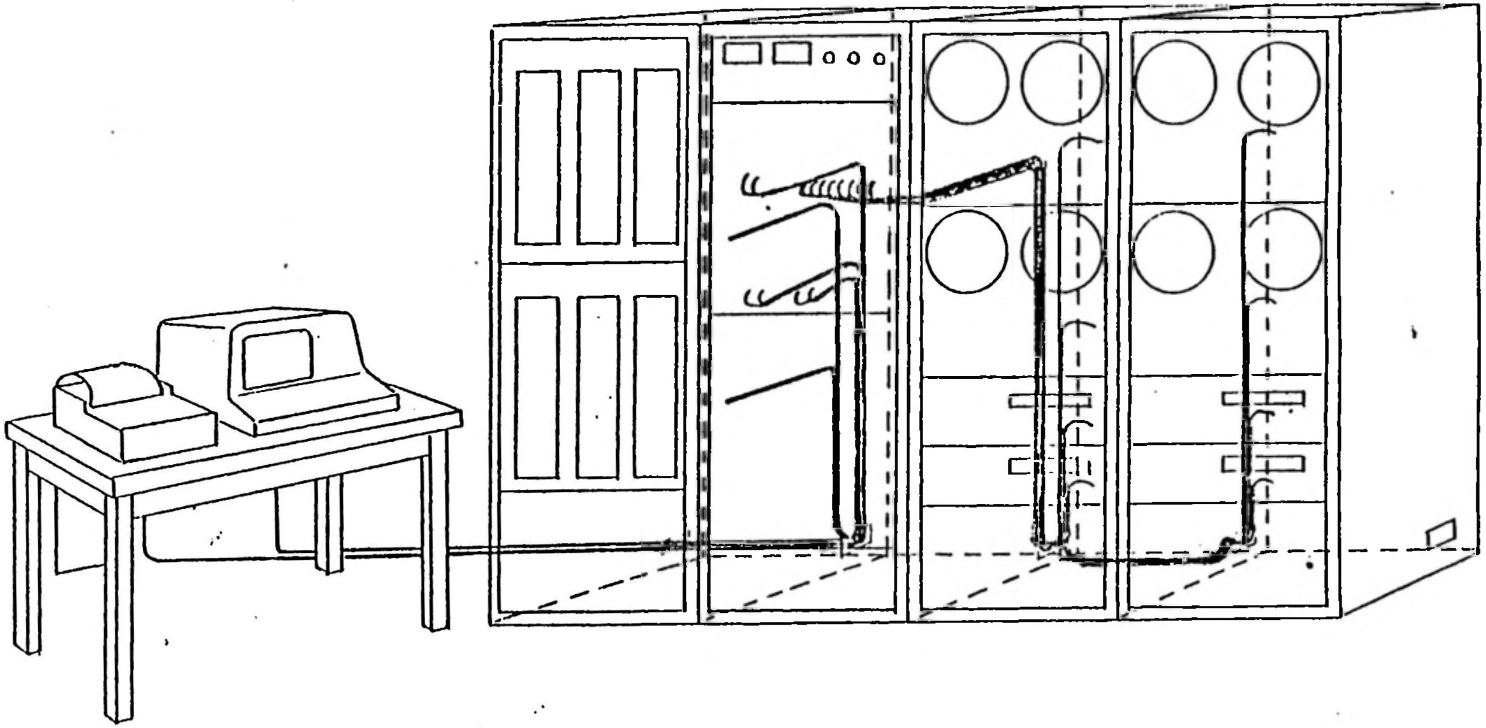


FIGURE 2-6 TYPICAL CABLE ROUTING

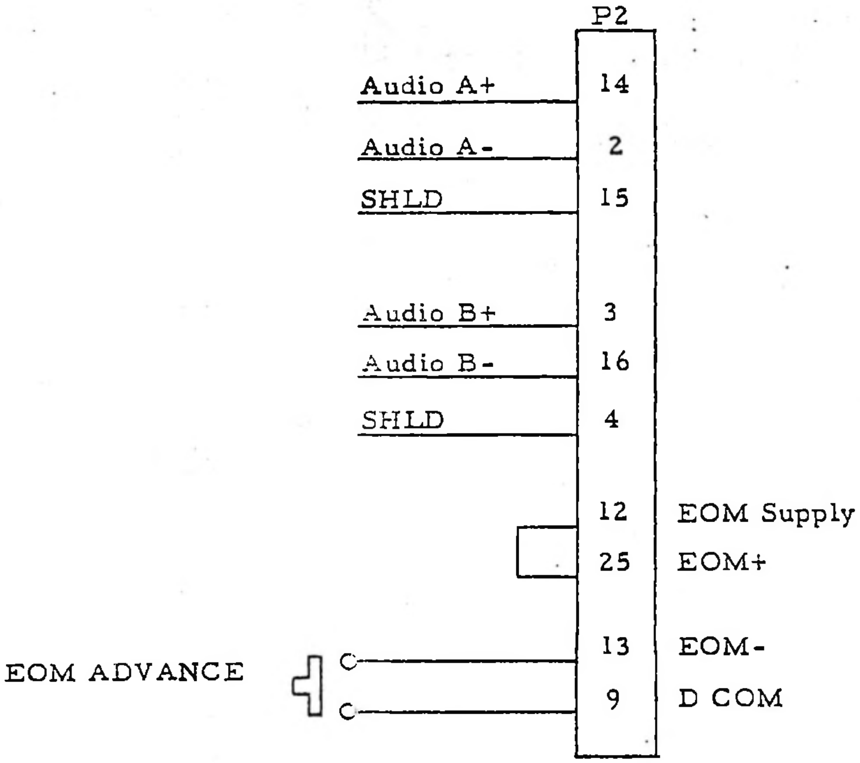


FIGURE 2-7

UNIVERSAL SOURCE BOARD CONNECTIONS FOR STUDIO, NEWS OR NETWORK SOURCE

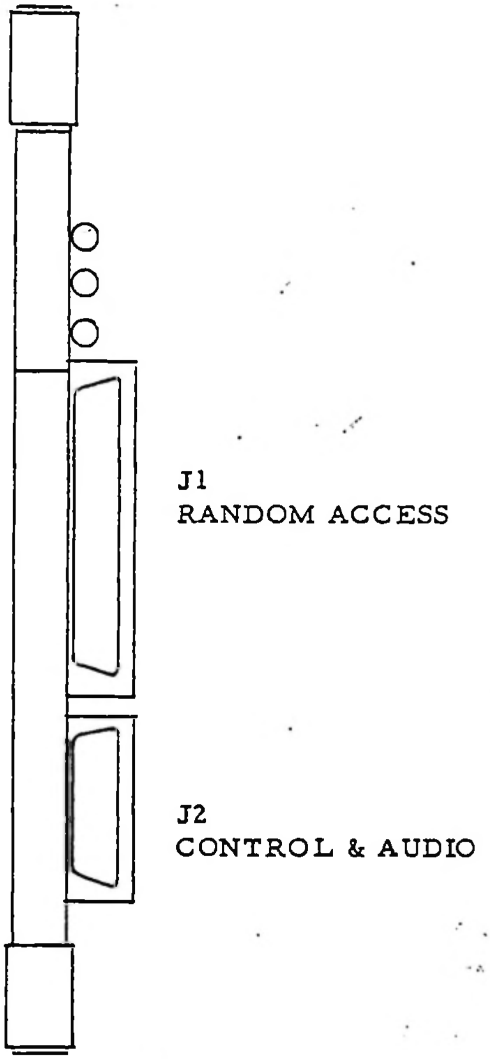


FIGURE 2-8

UNIVERSAL SOURCE BOARD INTERFACE CONNECTIONS

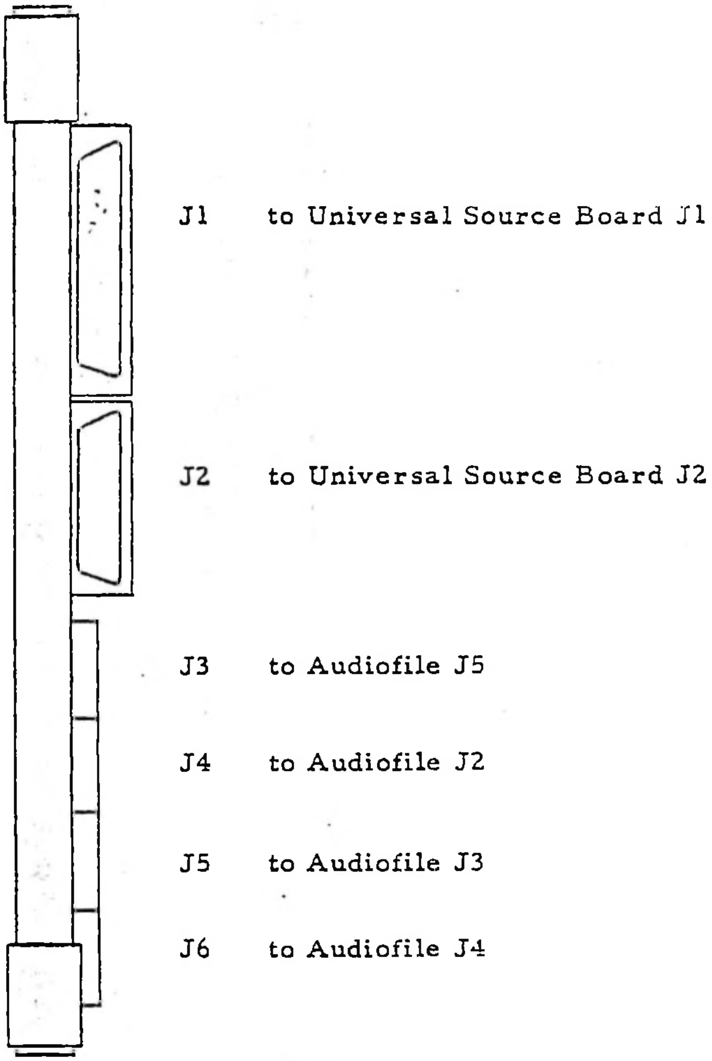


FIGURE 2-9A

AUDIOFILE INTERFACE BOARD

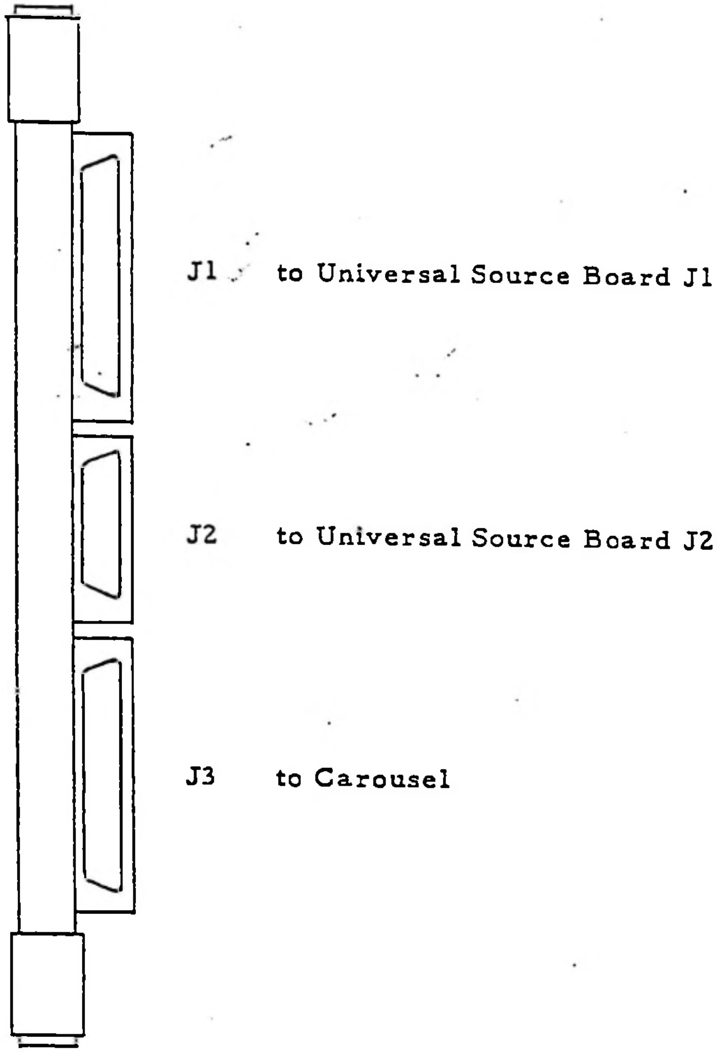


FIGURE 2-9B

CAROUSEL RAS INTERFACE BOARD

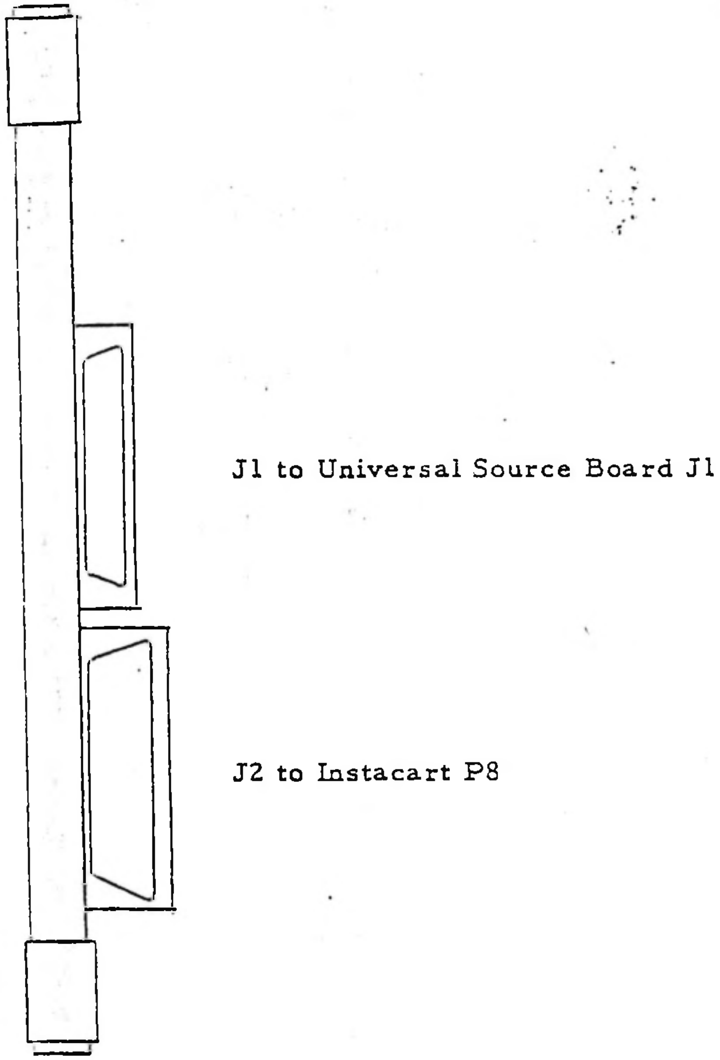


FIGURE 2-9C

INSTACART RAS INTERFACE BOARD

J1 (Random Access Data & Cue Audio)

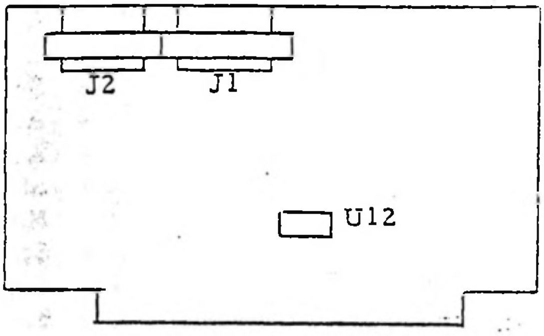
1 - Tray Data 0 (Return)
2 - Tray Data 1 (Return)
3 - Tray Data 2 (Return)
4 - Tray Data 3 (Return)
5 - Tray Data 4 (Return)
6 - Tray Data 5 (Return)
7 - Tray Data 6 (Return)
8 - Tray Data 7 (Return)
9 - Tray Data Write (Return)
10 - Hand Shake Out 2 (Return)
11 - Hand Shake Out 1 (Return)
12 - Hand Shake Out 0 (Return)
13 - Hand Shake In 3+
14 - Hand Shake In 2+
15 - Hand Shake In 1+
16 - SHLD
17 - Cue Audio B+
18 - Cue Audio A-
19 - SHLD
20 - Tray Data 0
21 - Tray Data 1
22 - Tray Data 2
23 - Tray Data 3
24 - Tray Data 4
25 - Tray Data 5
26 - Tray Data 6
27 - Tray Data 7
28 - Tray Data Write
29 - Hand Shake Out 2
30 - Hand Shake Out 1
31 - Hand Shake Out 0
32 - Hand Shake In 3-
33 - Hand Shake In 2-
34 - Hand Shake In 1-
35 - Cue Audio B-
36 - SHLD
37 - Cue Audio A+

J2 (Control & Audio)

1 - SHLD (A COM)
2 - Audio A-
3 - Audio B+
4 - SHLD (A COM)
5 - Hand Shake In 0 - (Playing)
6 - Stop Relay (COM)
7 - Spare
8 - 3.5KHz Encode In +
9 - SHLD (D COM)
10 - 1START (Open Col. Driver)
11 - START Relay (COM)
12 - EOMS (+5V Pull Up)
13 - EOM -
14 - Audio A+
15 - SHLD (A COM)
16 - Audio B-
17 - Hand Shake In 0 + (Playing)
18 - Stop Relay (NC)
19 - Stop Relay (NO)
20 - SHLD (D COM)
21 - 3.5KH Encode In -
22 - START Return
23 - START Relay (NC)
24 - START Relay (NO)
25 - EOM +

FIGURE 2-10

UNIVERSAL SOURCE BOARD CONNECTOR PIN ASSIGNMENTS



DEVICE	U12							
	1	2	3	4	5	6	7	8
1. System Control Console								
2. Secondary Program Console		X			Used For Baud Rate Selection			
3. Modem				X				
4. Computer Link		X		X				
5. VEL Printer	X							
6. General Printer	X	X						
7. Load/Dump Terminal	X			X				

X = ON
BLANK = OFF

FIGURE 2-11

SERIAL I/O PERIPHERAL ID SWITCH SETTINGS

J1 (RS232 Data Sets only)*		J2 (20 ma or RS232 Data Terminals)**	
1	D COM	1	D COM
2	TxD	2	RxD
3	RxD	3	TxD
4	RTS	4	
5	CTS	5	RTS
6	DSR	6	DTR
7	Signal GND	7	Signal GND
8		8	
9		9	XPLUP+
10		10	
11		11	RCVR-
12		12	XMTR-
13		13	
14		14	
15		15	Ext Clock In
16		16	
17		17	
18		18	
19		19	
20	DTR	20	DSR
21		21	PREN (Print Enable)
22		22	
23		23	RCVR+
24		24	XMTR+
25		25	

Reference: 100-700-009 Schematic

* Use J1 for cassette dump & load, Modem, etc.

** Use J2 for all other peripheral devices (Video Monitors, Teletypes, Printers, etc.)

FIGURE 2-12

SERIAL I/O PIN LIST

J1 (RS232 Data Sets only)

1	D COM
2	TxD
3	RxD
4	RTS
5	CTS
6	DSR
7	Signal GND
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	DTR
21	
22	
23	
24	
25	

J2 (20ma or RS232 Data Terminals)

1	D COM
2	RxD
3	TxD
4	
5	RTS
6	DTR
7	Signal GND
8	
9	XPLUP+
10	
11	RCVR-
12	XMTR-
13	
14	
15	Ext Clock In
16	
17	
18	
19	
20	DSR
21	PREN (Print Enable)
22	
23	RCVR+
24	XMTR+
25	

Reference: 100-700-118 Schematic

FIGURE 2-13

VEL PIN LIST

J1

1 - Output 1 (Inverted)

2 - Output 1

3 - GND

4 - Output 2 (Inverted)

5 - Output 2

6 - GND

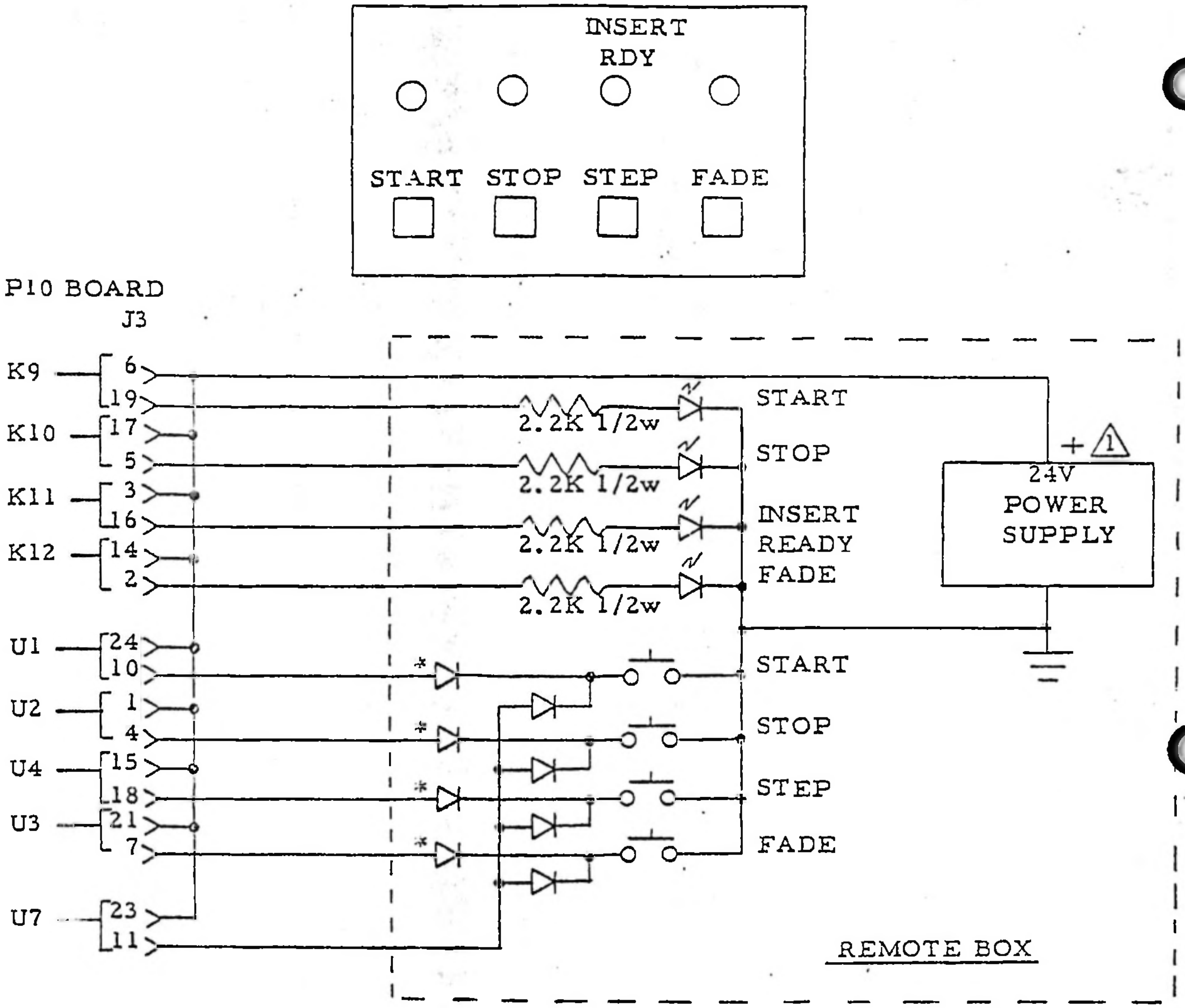
7 - GND

8 - GND

9 - GND

FIGURE 2-14

REAL TIME CLOCK EXTERNAL CLOCK PIN LIST

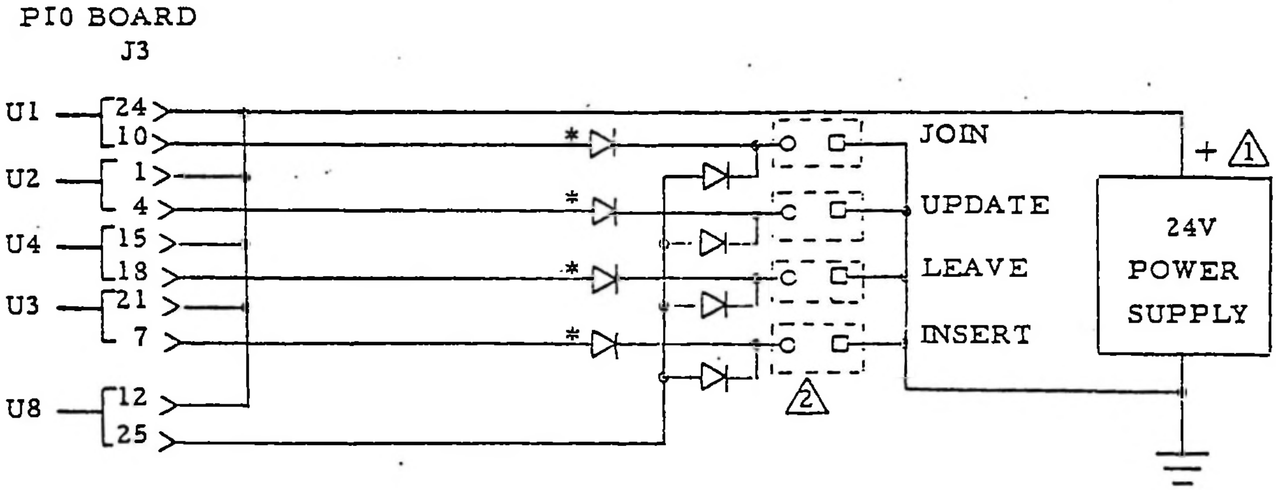


* These diodes required only if both Remote Control Box and Remote Time Clock are used.

⚠1 Should supply voltage other than 24V be used, change resistors in Remote Control Box and R5 through R9 on P10 board as follows:

5V - 470 ohm, 1/4 watt
12V - 1.2K ohm, 1/4 watt
48V - 4.8K ohm, 1 watt

FIGURE 2-15
TYPICAL REMOTE CONTROL

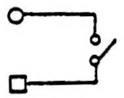


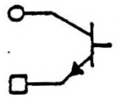
* These diodes required only if both Remote Control Box and Remote Time Clock are used.

△1 Should supply voltage other than 24V be used, change resistors in Remote Time Circuit and R5 through R8 and R10 on P10 board as follows:

5V - 470 ohm, 1/4 watt
12V - 1.2K ohm, 1/4 watt
48V - 4.8K ohm, 1 watt

△2 Remote Time Clock terminals. Wire as shown below depending on whether switch (or relay) or transistor output is provided.


Switch or Relay


NPN

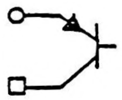
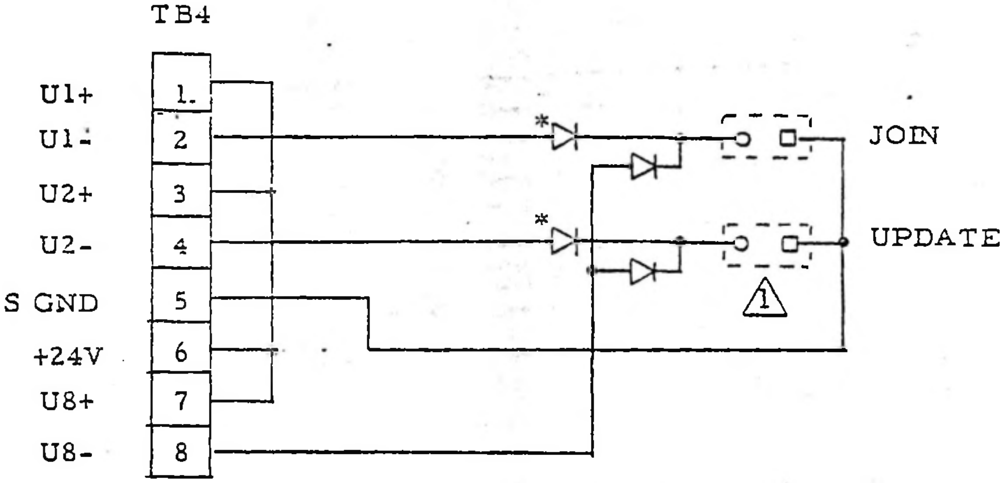

PNP

FIGURE 2-16

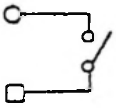
TYPICAL REMOTE TIME CLOCK WIRING DIAGRAM

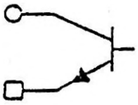
P10 INTERFACE TERMINAL (A3)



* These diodes required only if Remote Control Box is also used.

⚠1 Remote Time Clock terminals. Wire as shown below depending on whether switch (or relay) or transistor output is provided.


Switch or Relay


NPN

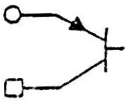
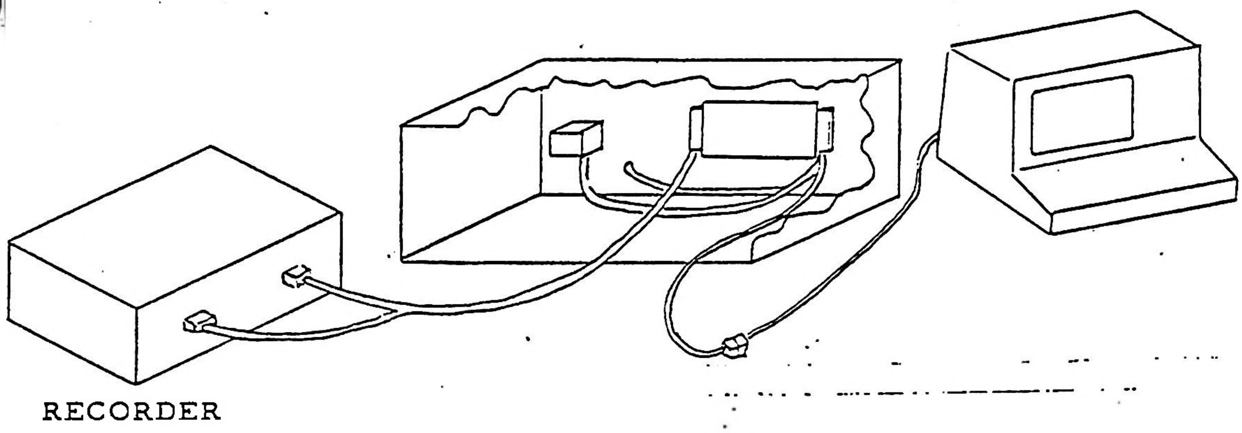

PNP

FIGURE 2-16a
REMOTE TIME CLOCK (JOIN and UPDATE FUNCTIONS ONLY)

CRT



TTY

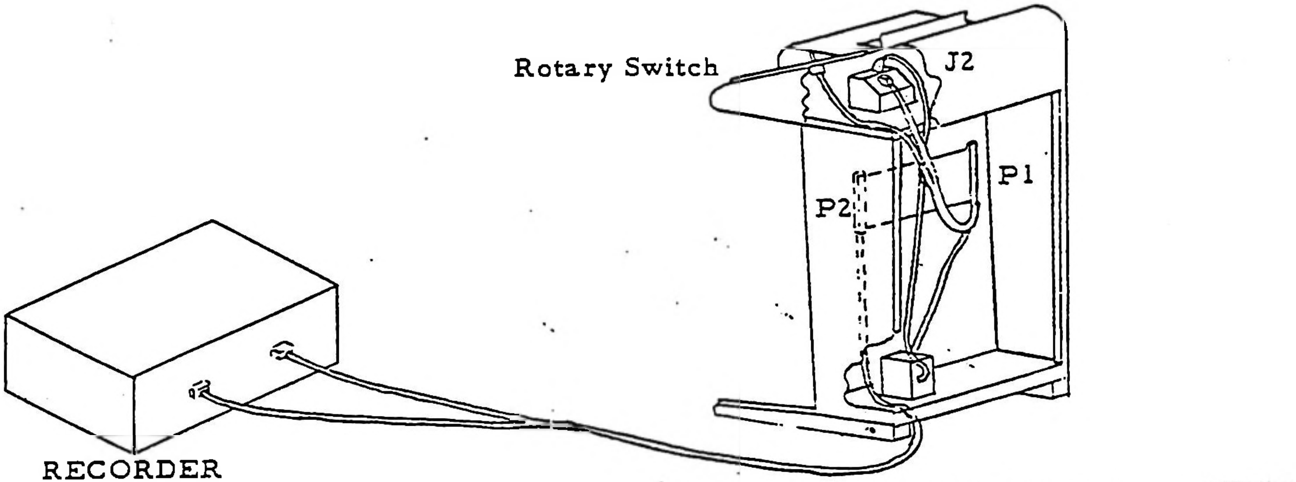
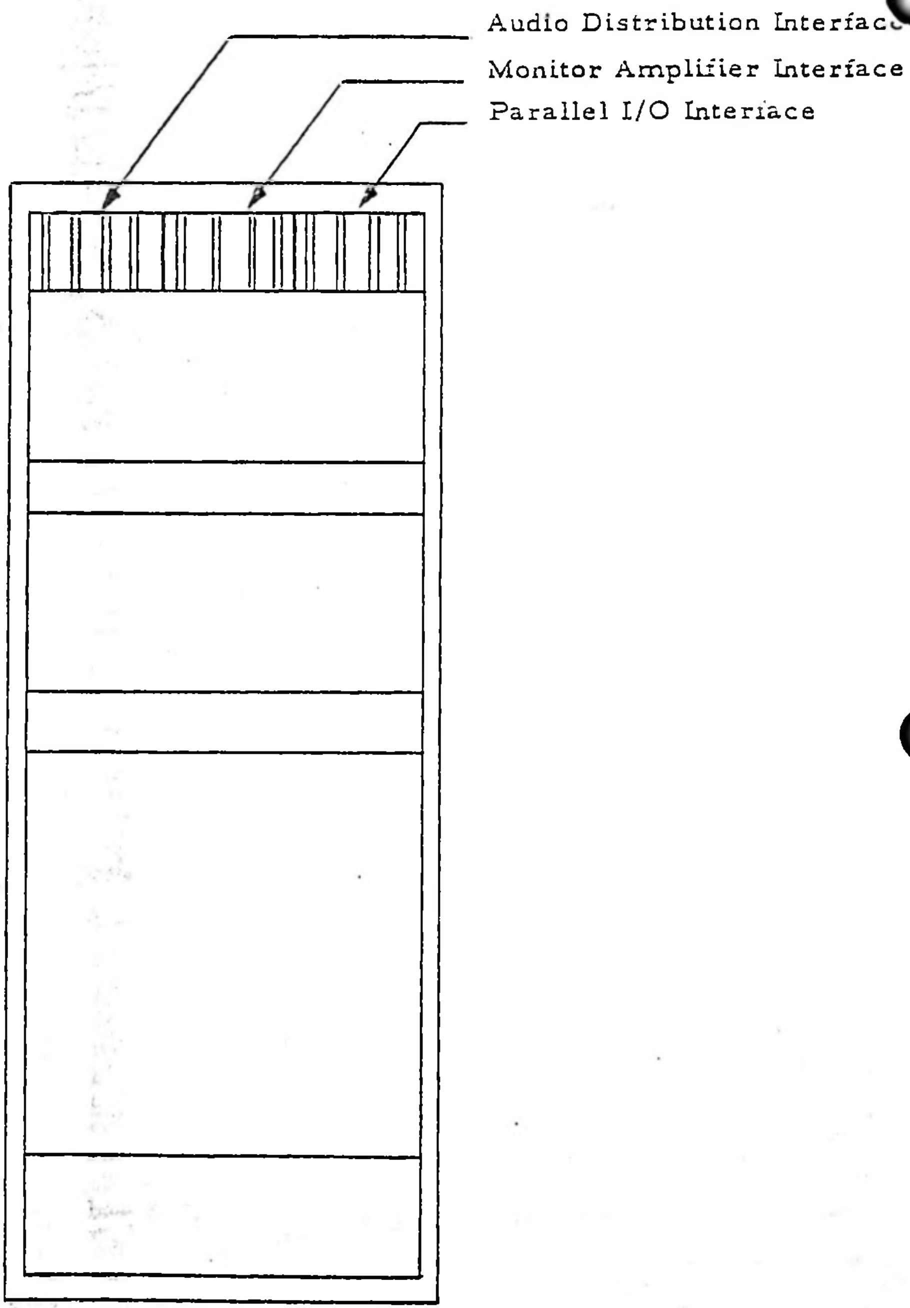


FIGURE 2-17

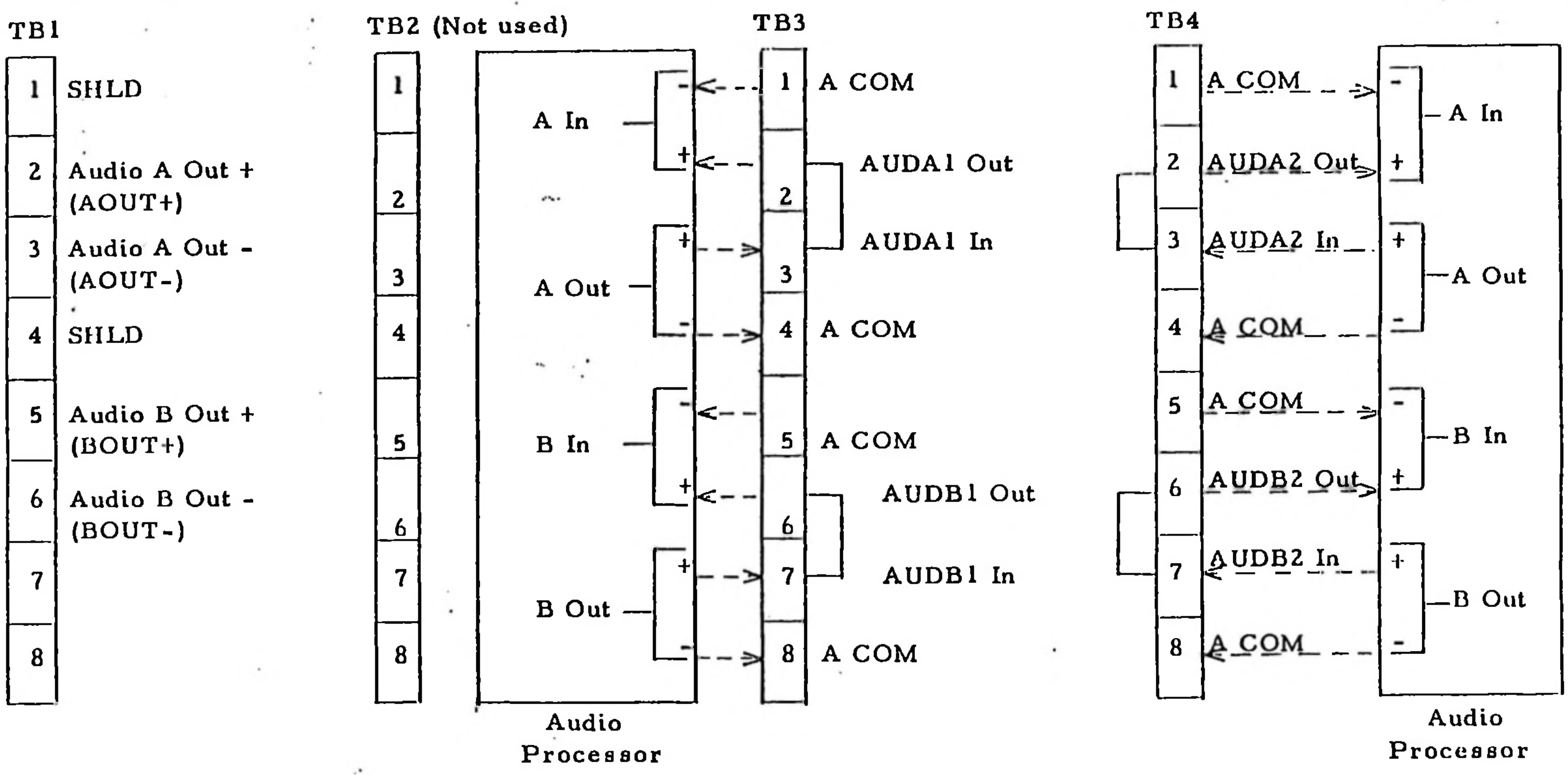
ENCODE CENTER CABLING



REAR VIEW

FIGURE 2-18

INTERFACE TERMINAL LOCATIONS



NOTES:

1. AUDA1 and AUDB1 are not compressed by system.
2. AUDA2 and AUDB2 are compressed by system.
3. If external Audio Processor(s) is used, remove applicable jumpers (TB3 and TB4).

FIGURE 2-19

AUDIO INTERFACE TERMINAL BOARD (A1)

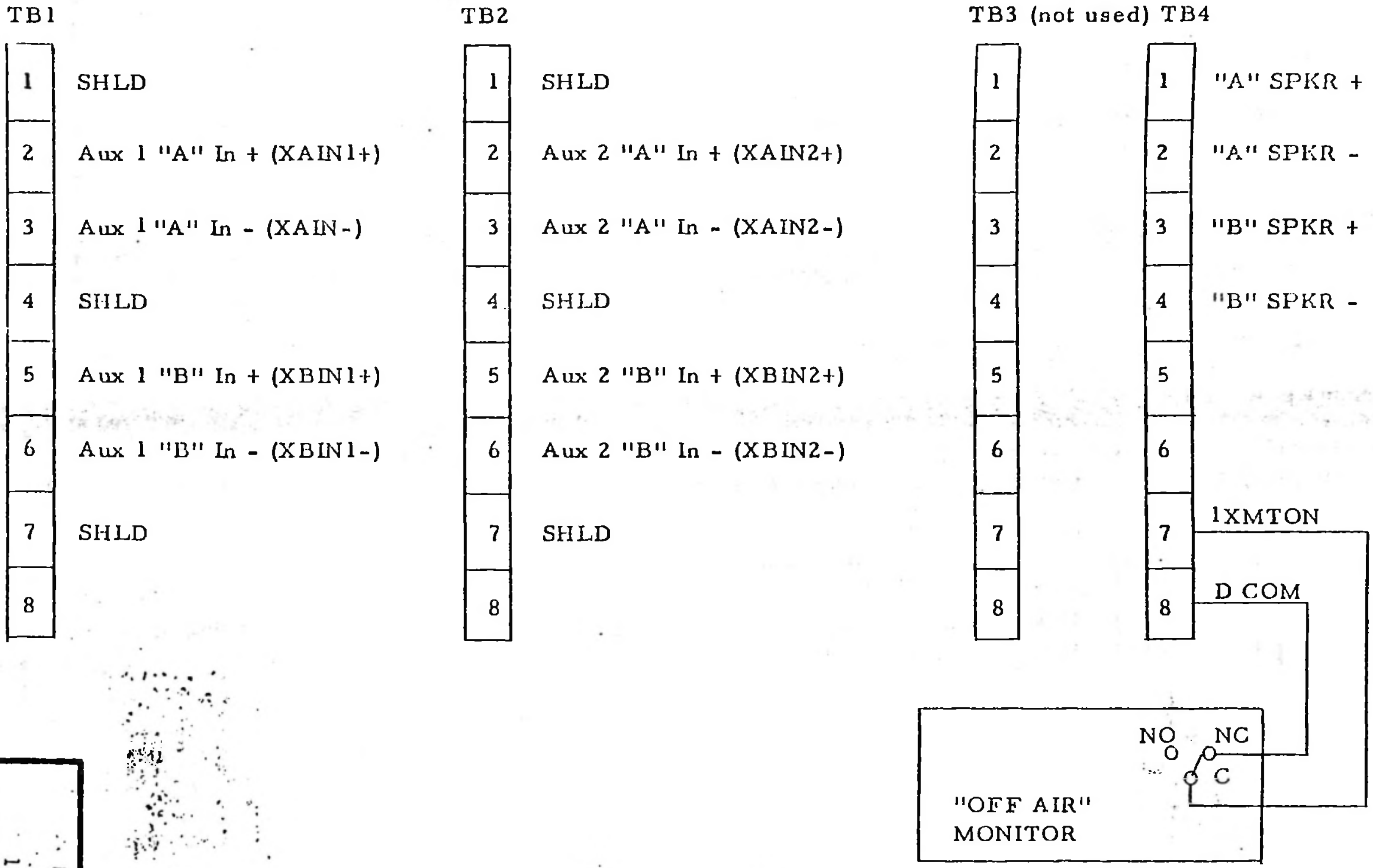
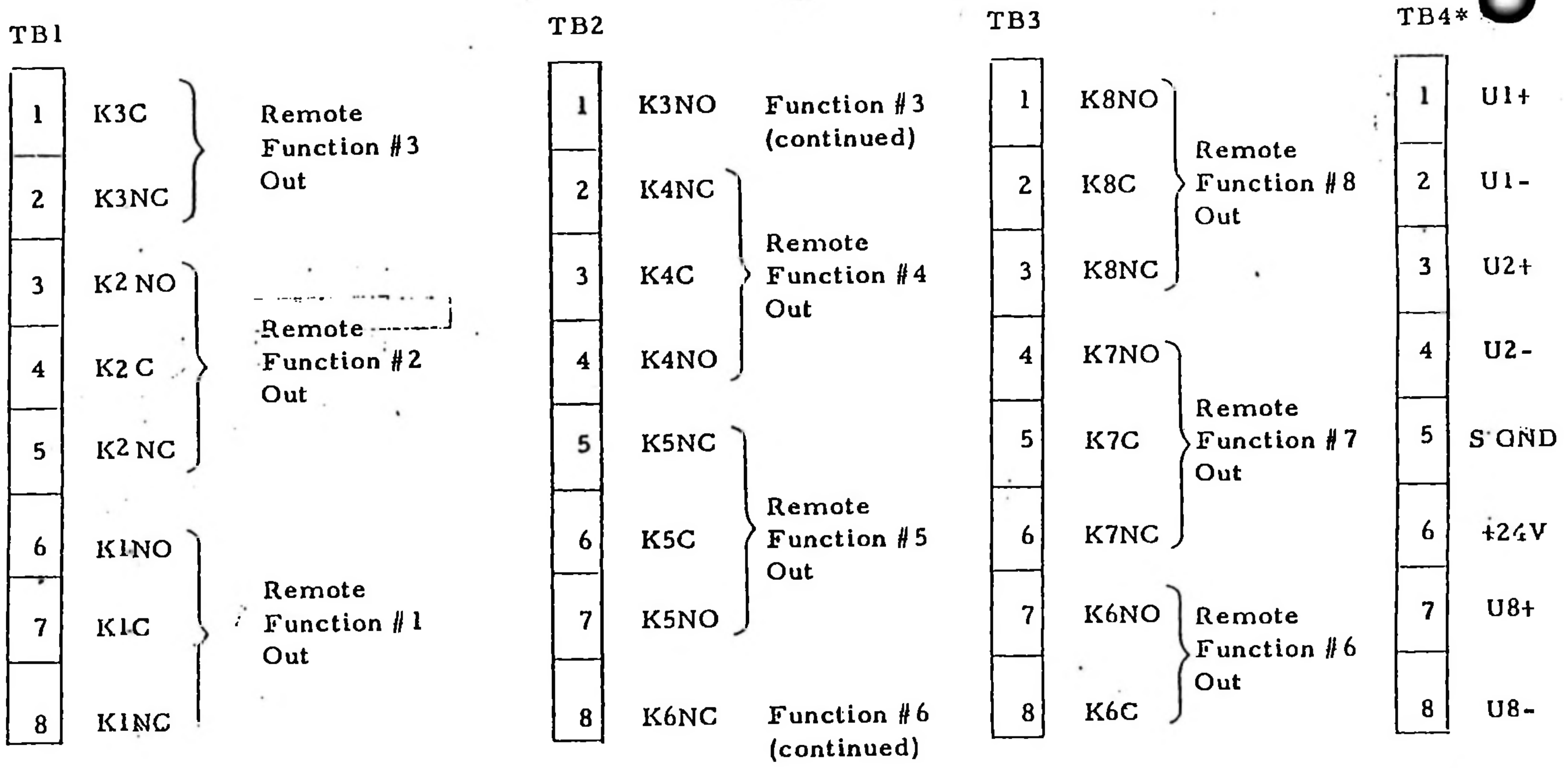


FIGURE 2-20

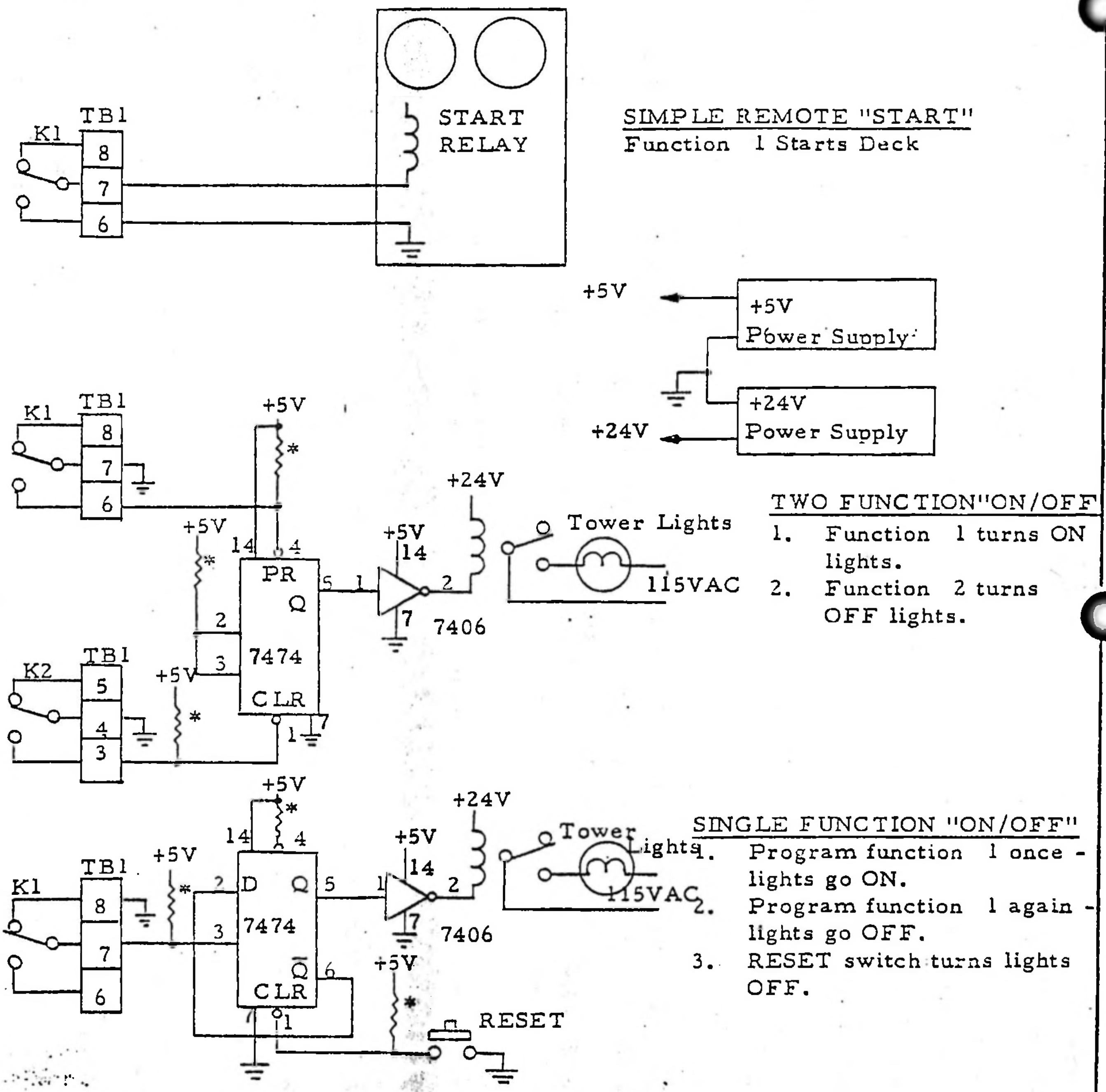
MONITOR INTERFACE TERMINAL BOARD (A2)



TB4*	REMOTE INPUTS	U1	U2
	REMOTE TIME CLOCK	Join	Update

FIGURE 2-21

PARALLEL I/O INTERFACE TERMINAL BOARD (A3)



SIMPLE REMOTE "START"

Function 1 Starts Deck

TWO FUNCTION "ON/OFF"

1. Function 1 turns ON lights.
2. Function 2 turns OFF lights.

SINGLE FUNCTION "ON/OFF"

1. Program function 1 once - lights go ON.
2. Program function 1 again - lights go OFF.
3. RESET switch turns lights OFF.

NOTE: All Resistors 1K

FIGURE 2-22

REMOTE FUNCTION EXAMPLES

NEXT ASSY	USED ON	REVISIONS			
		REV.	DESCRIPTION	DATE	APPR.

3.0 OPERATION

DWN. R. Smith	DATE 8/31/81
CHECK	
PROJ. ENG.	
APPR.	

Cetec Broadcast Group

Cetec Corporation
1110 Mark Avenue, Carpinteria, California 93013

SERIES 7000 AUTOMATION TECHNICAL MANUAL

SECTION 3.0 OPERATION (LEVEL II SYSTEMS)

SIZE		DRAWING NUMBER	REV
A	SHEET 3-1 OF	049-7005-10	

3.0 OPERATION

3.1 GENERAL - Operating controls for the system center in two locations; the Local Status Panel and the Video Terminal. The Local Status Panel is used solely for monitoring audio and system status as discussed in paragraph 3.2.1 while the Video Terminal is used to input the station program, monitor current and future program events, and manually control the Automation system (START, STOP, FADE, etc.).

3.2 MANUAL CONTROLS -

3.2.1 LOCAL STATUS PANEL - Figure 3-1 illustrates the Local Status Panel control switches and indicator meters, lamps, and LED's (light emitting diodes). The following discusses the function of the switches and indicators:

3.2.1.1. AUDIO MONITOR SWITCHES AND METERS

VU METERS - There are two VU Meters. The one on the left monitors A Channel audio level, while the one on the right measures B Channel audio level (assuming the MODE switch is in NORMAL).

MODE SWITCH - Used to select one of three (3) audio display modes.

1. L + R - Combines A and B Channel audio in phase and displays results on VU Meters and monitor speakers.
2. L - R - Combines A and B Channel audio 180 out of phase and displays results on A Channel (left) VU Meter and speaker. Note that the right VU Meter will deflect, but it does not indicate true L-R condition.
3. NORMAL - Displays A Channel audio on left VU Meter and B Channel audio on right VU Meter.

SOURCE SWITCH - Used to select one of six (6) source types for monitoring.

1. PROGRAM - Audio source which is "ON AIR". Monitored prior to 25Hz reject filter in final output stage to allow 25Hz switching tones to be monitored.

NOTE: The following switch positions are used to monitor audio sources which are not "ON AIR".

2. CUE - Selected to monitor any source which does not fit into the following categories (3 through 6). If selected, any source which is started (manually or by preroll command) will be displayed on VU Meters and heard on the monitor speakers.

3. TIME - Selects Audio Clock for monitoring.

4. NETWORK - Selects Network and/or Studio audio sources for monitoring.

5. AUX 1 - Selects audio source connected to Aux 1 inputs or Monitor Interface Terminal Board (TB1) for monitoring.

6. AUX 2 - Selects audio source connected to Aux 2 inputs of Monitor Interface Terminal Board (TB2) for monitoring. Normally used to monitor the Transmitter "AIR" signal.

VOLUME SWITCH - Adjusts volume level to monitor speakers.

3.2.1.2 INDICATOR LAMPS AND LED's

ALARM Switch and Lamp - Lamp comes ON in the event of a Silence Sense or Close Loop malfunction. Press to reset lamp.

LOOP - Lights in event of Closed Loop malfunction (source does not start and go "ON AIR"). Reset by resetting ALARM indicator.

SILENCE - Lights in event of Silence Sense malfunction (Loss of audio for typically more than 3 seconds). Reset by resetting ALARM indicator.

DISABLE - Lights whenever:

1. Audio is present.
2. ALARM switch is pressed.
3. Silence Sense is disabled by program.

FADE - Lights whenever audio is being faded by FADE command.

NOTE: The following LED's are on each Universal Source Board and light only for the appropriate source board for which the indicator applies as determined by the source numbers above the LED's.

ON AIR - Lights to indicate which audio source is "ON the AIR".

NEXT - Lights to indicate which audio source is NEXT to play.

PRE-ROLL - Lights to indicate audio source is in a PRE-ROLL (or dead roll) condition.

3.2.2 VIDEO TERMINAL - Keys used in programming the system as well as manual operating controls are located in the Video Terminal keyboard. There are four (4) major groups of keys which are color-coded as follows:

RED -	SYSTEM CONTROL KEYS
BLUE -	PROGRAM EDIT AND FUNCTION KEYS
GREY -	TIME EDIT KEYS
BLACK -	LOCAL MODE

The System Control Keys will be discussed in this paragraph, while the Program Edit and Function, and the Time Function Keys are discussed in paragraphs 3.3 and 3.7 respectively.

Figure 3-2 outlines the System Control Keys. Their function is as follows:

OPER -	(Operate) when pressed, all other Control keys are enabled. Additionally, the Video Monitor displays the current system status as illustrated in Figure 3-3. Edit functions are also disabled.
START -	When pressed, system is placed in a START (running) condition.
STOP -	NOTE: To activate the STOP key it is necessary to simultaneously press the CTRL Key. When pressed, system is placed in a STOP REQUEST condition. Video Monitor displays "STOP REQ" in upper right corner. When the current source is completed, the system goes to a full STOP condition, removing "ON AIR" and "STOP REQ" from upper right corner of Video Monitor. Pressing STEP or FADE prior to the end of the "ON AIR" source will cause the system to go to a full STOP condition, if STOP has been pressed first. Pressing START will cancel STOP request.
STEP -	When pressed, causes system to immediately step to the next scheduled source and immediately remove the audio from the current source from the PROGRAM bus.
FADE -	When pressed, causes audio from the current "ON AIR" source to fade. At end of fade time out (typically 2-4 seconds), system steps to next scheduled source. Note that fade cannot be monitored by selecting program, but must be heard on final audio output. Tying final output to Aux 1 or Aux 2 input allows monitoring final output in these positions (see paragraph 2.4 in INSTALLATION Section for connection information).

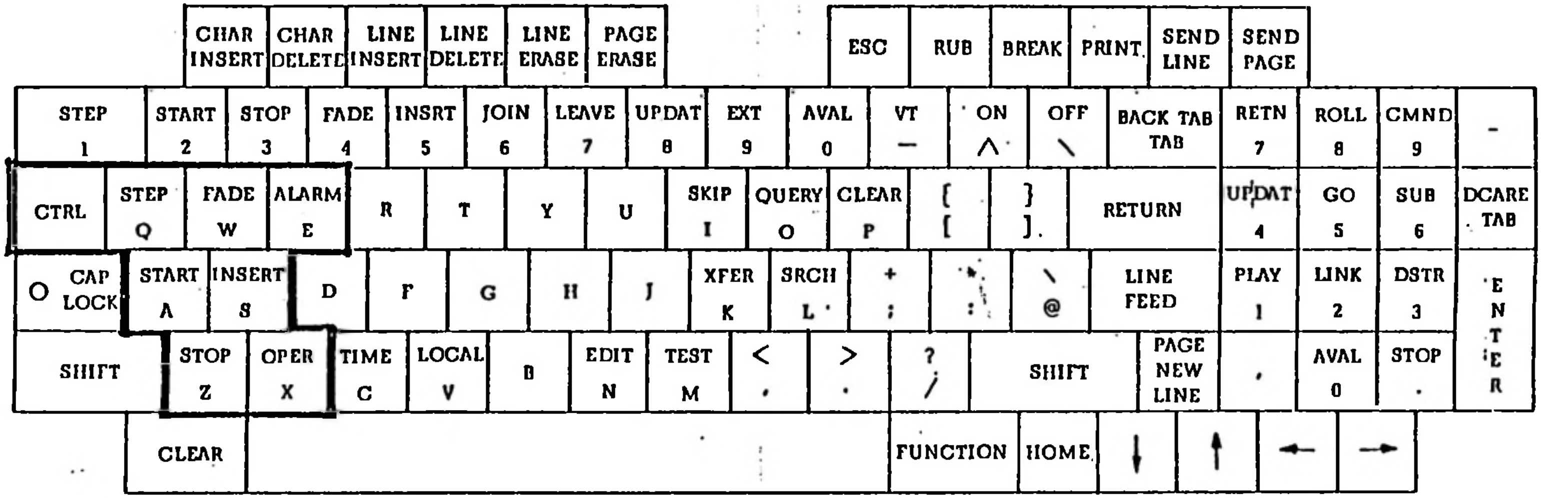
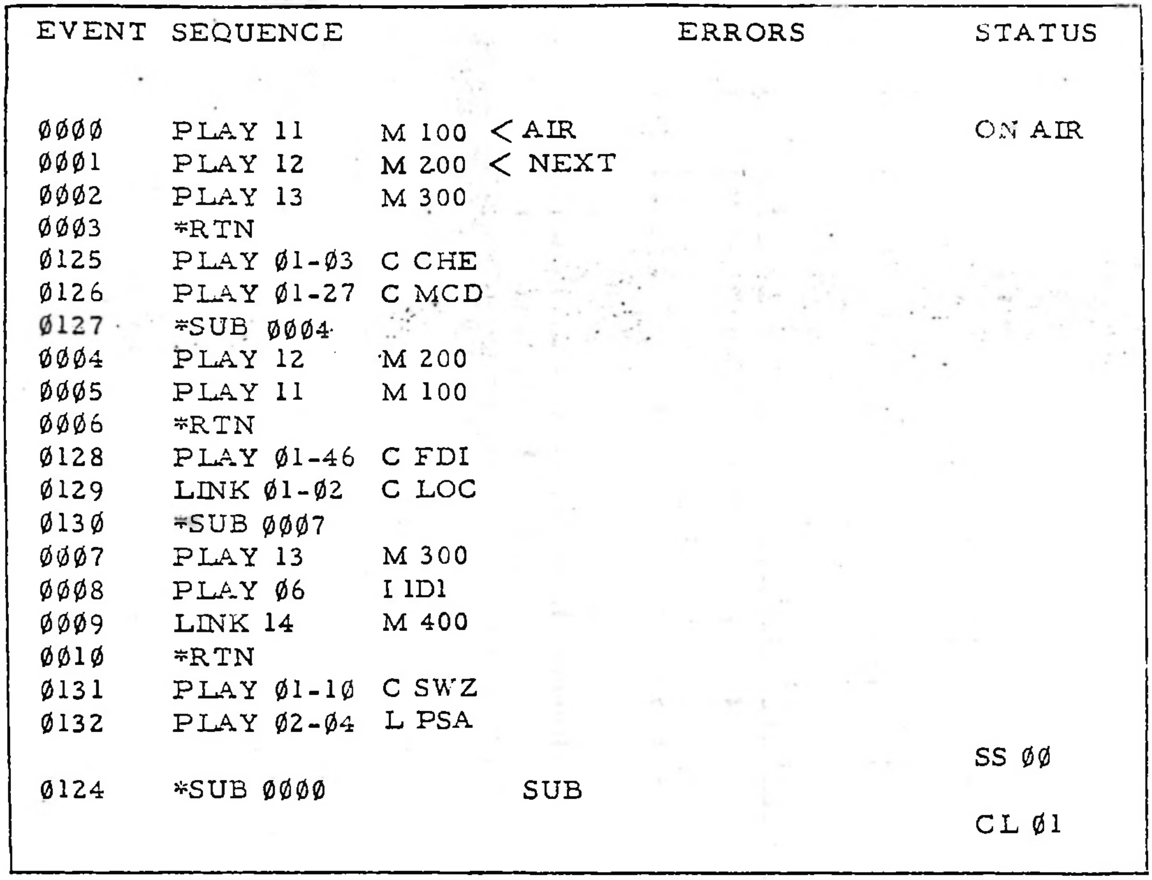


FIGURE 3-2 SYSTEM CONTROL KEYS



```
EVENT  SEQUENCE                              ERRORS          STATUS


0000   PLAY 11      M 100  < AIR                             ON AIR
0001   PLAY 12      M 200  < NEXT
0002   PLAY 13      M 300
0003   *RTN
0125   PLAY 01-03   C CHE
0126   PLAY 01-27   C MCD
0127   *SUB 0004
0004   PLAY 12      M 200
0005   PLAY 11      M 100
0006   *RTN
0128   PLAY 01-46   C FDI
0129   LINK 01-02   C LOC
0130   *SUB 0007
0007   PLAY 13      M 300
0008   PLAY 06      I 1D1
0009   LINK 14      M 400
0010   *RTN
0131   PLAY 01-10   C SWZ
0132   PLAY 02-04   L PSA
                                                             SS 00
0124   *SUB 0000            SUB
                                                             CL 01
```

FIGURE 3-3 TYPICAL OPERATE MODE DISPLAY
(Without Time Functions)

INSRT -	(Insert) When pressed, causes system to schedule audio source programmed in the last event location (shown just ahead of Event 0000 in EDIT mode) NEXT. Additionally, "INSERT NEXT" plus the audio source number to be inserted, will display on the right side of the Video Monitor. When the Insert source is complete, the program continues from where it left off. If the program is in a LINK condition, the insert must wait until all linked events in the cluster are played. If in INSERT mode, pressing INSRT will cancel Insert.
ALARM -	Used to turn off audio beeper in Video Terminal and reset ALARM, LOOP, and SILENCE indicators on Local Status Panel in the event of a Close Loop or Silence Sense malfunction. Pressing once turns OFF the Audio Beeper. Pressing a second time clears the alarm message on the right side of the screen and re-enables the Voice Track Source (if used).

3.2.3 MANUALLY MOVING TO NEW FORMAT LOCATION - When a system is initially powered, or following a power outage, or, in some cases, at the beginning of each program day, it may be necessary to transfer the system NEXT pointer to a specific event number. The procedure involves the use of some of the Program Edit and Function keys whose functions are detailed in paragraph 3.3. The following is the procedure for transferring the system NEXT pointer to a specific event number (reference Figure 3-4).

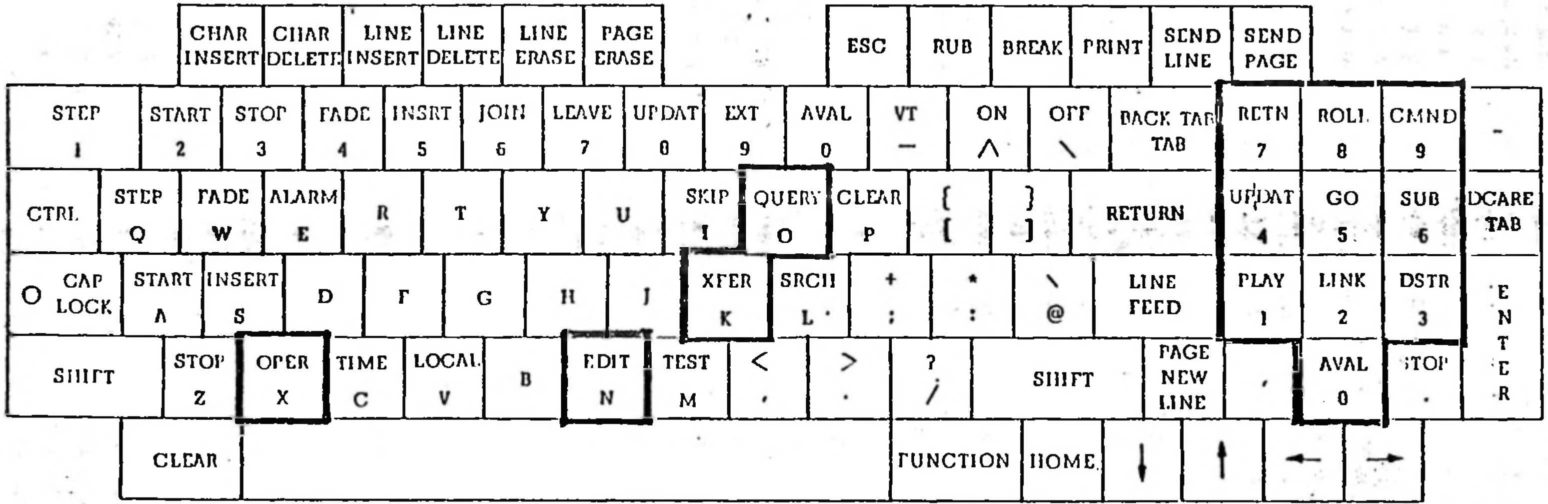
1. Press EDIT. Display will switch from "operate" to "edit" display.

2. The CRT will request "PROGRAM CODES DESIRED".

3. Press the Space Bar.

4. Press QUERY. Display curser will move to far left of event section allowing a new event number to be keyed in.

5. Using number keys at right side of terminal, key in desired event. Upon pressing the fourth key, the display will shift, showing the keyed-in event number at the center of the CRT with adjacent events above and below it.



Case

Robin

684 –

7687

Call

by [illegible]

am [illegible]

7:30

Ewing Coor

Boards

FIGURE 3-4 KEYS USED IN "MANUAL" TRANSFER

4. Press XFER. Video Monitor will display "XFER TO NEXT?" near the center of the CRT. Press XFER again, and the Video Monitor switches to OPERATE mode, displaying the keyed-in event number as the "next" event.

3.3 PROGRAMMING THE BASIC FORMAT

- The following paragraphs outline the steps to entering and changing the program in memory as well as examples of actual programs to aid in understanding how to take your program and convert it to a form that can be programmed into the memory.

3.3.1 FORMAT EDIT AND FUNCTION KEYS

- The keys shown in Figure 3-5 are used in editing the system program. Note that the group of thirteen (13) keys to the right of the main terminal group serves as FUNCTION entry keys and NUMBER entry keys. Based on where in the entry procedure the switch is pressed, a determination is made by the system as to whether a "function" or "number" is intended. The numbers are self-explanatory, so only the functions are defined.

The two groups of EDIT keys in the main keyboard section are used in controlling the Video Monitor for editing purposes. Their functions are as follows:

EDIT - When pressed, enables all other EDIT keys and causes display to switch to "edit" display (see Figure 3-6). Note that the event number to be edited is always the center event on the display (the EDIT arrow remains fixed while the events shift). Additionally, when EDIT is pressed, the area of memory displayed is always the area last edited. In other words, the system remembers where it left off from the previous editing session. EDIT may be pressed any time new Program Codes are desired.

TEST - Allows the CRT to display 66 events at a time (starting at any desired event number) in exactly the order they will occur. This allows the program to be previewed prior to going "on the air".

XFER - (Transfer) Used to transfer NEXT pointer to a new EVENT number. See paragraph 3.2.3 for operating procedure.

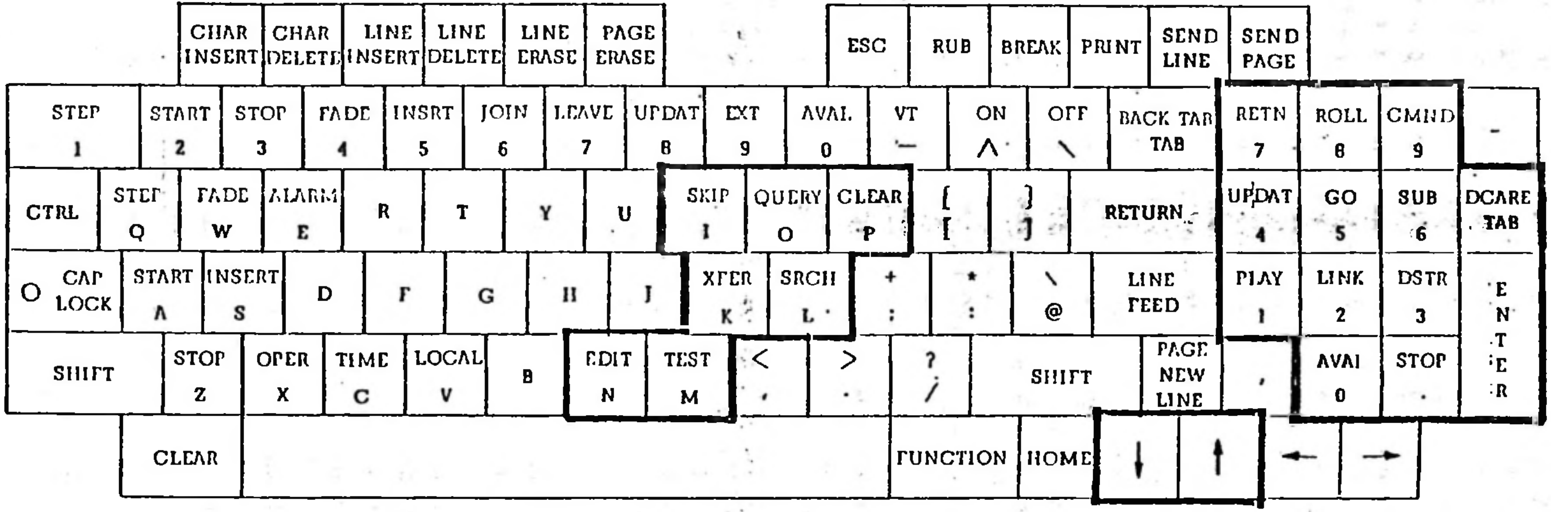


FIGURE 3-5 PROGRAM EDIT AND FUNCTION KEYS

```
SERIES 7000/2        EDIT

PROGRAM CODES DESIRED>    *


0047          PLAY 02-05       C 050
0048          PLAY 11          M
0049          *RTN
0050          PLAY 12          M
0051          LINK 16          L VT1      <EDIT FUNCTION?
0052          *SUB 0020
0053          PLAY 13          M
0054          PLAY 11          M
0055          PLAY 14          M
0056          LINK 09          L JIN
```

FIGURE 3-6   TYPICAL EDIT DISPLAY

SRCH (Search) Used to locate events containing specific desired parameters (e.g. all events containing Source 01 or all events with a Program Code of "C", etc). Refer to paragraph 3.4.3 for actual operating procedures.

SKIP - Used when advancing edit display. Will cause displ to slip over any AVAIL events and stop only at events containing data.

QUERY - Shifts display curser to extreme left of event number allowing new address to be keyed in.

CLEAR - Shifts display curser to FUNCTION section of display. Used primarily when an error is made in changing data to memory. Does not clear memory, only allows new data to be keyed in.

NOTE: The following keys are located on the right side of the keyboard.

ENTER - When pressed, enters data in event number to left of EDIT arrow. Note that this key has no effect unless "PGM CODE?", "DESCRIPTOR", or "ENTER?" is displayed to right of EDIT arrow (reference Figure 3-6

DCARE - (Don't Care) Used in conjunction with SRCH (Search) key and in Local mode with the Change and Search features to indicate that a requested parameter is insignificant (you don't care about that particular parameter).

↑ - Advances edit display by one event each time is pressed.

↓ - Backs up edit display by one event each time is pressed.

NOTE: If ↓ or ↑ are held from more 1 second, the Repeat mode is activated allowing rapid advancement or backing through several event numbers.

The following keys serve as both FUNCTION and NUMBER keys. If the display is requesting a "function" ("FUNCTION?" displayed to the right of the EDIT arrow), the keys are defined as "function" keys. If "SOURCE", "TRAY?", "EVENT?", "GO TO?", "COMMAND?", "WHEN?", or "DESCRIPTOR" is displayed, the keys are defined as "number" keys.

AVAL - (Available) Used to clear data from specific event number. If ENTER is pressed following AVAL; FUNCTION, SOURCE, and TRAY are cleared and display will show "AVAL" for that Event. If Program Code and/or Descriptor are to be cleared, use Space Bar as required prior to pressing ENTER.

STOP - Used to load Format STOP command allowing system to automatically go to STOP REQUEST mode when event number with STOP function is selected.

PLAY - Indicates normal audio source. This function is used when none of the other functions apply.

LINK - Used to insure that the audio source with a LINK function plays immediately after the previously scheduled audio source. Any "inserts" or "time updates" must wait until "linked" source plays.

DSTR - (Double Start) Advises system that source with DSTR function and the following scheduled audio source are to start simultaneously. The system advance tone on the audio source scheduled first will be ignored.

UPDAT - (Update) Used as a flag to define the start of a new block to play after a "time update" command. Refer to program examples for Real Time Events (paragraph 3.7) or External Clock Functions (paragraph 3.8) for examples of use.

GO - (Go To) Instructs system to go to specific event number shown to right of GO instruction (e.g. "0020 GO 0205" would cause system to go to event 0205 to schedule the next source when event 0020 is scheduled).

SUB - (Go To Subroutine) Similar to GO except that with SUB instruction, system remembers the event number it left so that it can return to that location and schedule the next event when a RETN instruction is given. The system allows two (2) levels of subroutine. That is, it can go to a subroutine from a subroutine. It cannot, however, go to a third subroutine from the second subroutine.

RETN - (Return) Instructs system to return to event following the event number it left in main program due to SUB instruction. It is always scheduled as the last function in a subroutine.

ROLL - (Pre-Roll) Identifies source as a dead roll source. When activated, source will start "off air" and roll to next stop tone. Does not schedule NEXT. Can be used randomly in format to create more varied music mix.

CMND - (Command) Identifies the data as a "format command" rather than a "Source" and "Tray" (see paragraph 3.3.2).

3.3.2 FORMAT COMMANDS - The following lists the Format Commands available in a basic system. Note that the CMND function must accompany the command code to distinguish it from a source and tray (e.g. "0010 CMND 0001" = disable Silence Sense when event 0010 is scheduled).

COMMAND CODE	FUNCTION
0000	Silence Sense Enable
0001	Silence Sense Disable
0010	Real Time Clock Enable
0011	Real Time Clock Disable (System to ignore Real Time functions)
0020	Program Audio Fade
01XX	External Function XX

(XX = External Function 01 through 10).

3.3.3 PROGRAM ENTRY PROCEDURE - The following examples illustrate how to gain access to the memory for interrogation and/or editing purposes. Prior to discussing program entry, it is necessary to point out a few features relative to entering data.

1. In the "edit" mode, the display will ask for the data it needs by printing its request just to the right of the word "EDIT" in the center of the display. The request words used are:

FUNCTION? - Which Function?
SOURCE? - Which Source?
TRAY? - Which Tray?
PGM CODE? - Which Program Code? (Any letter "A" through "0" -- see note below)
DESCRIPTOR? - What 3 digit special user designation is desired? (See note below)
ENTER? - OK to Enter
EVENT? - Which Event (Number)
COMMAND? - Which Command?
GO TO? - Go to which Event (Number)
WHEN? - Update When?

NOTE: The PGM CODE and DESCRIPTOR are optional data not required in order to ENTER data into an Event number.

2. ID switches on Universal Source board indicate if source is Random Access device. If the source is not Random Access, the display does not ask for "TRAY?" but goes immediately to "PGM CODE?".

3. If RTN, AVAL, or STOP are keyed in, the display skips request for Source and Tray and goes immediately to "PGM CODE?".

4. If a non-existent source or tray is keyed in, the display bell will sound, the display will show "OUT OF RANGE", and the curser will move back to allow a legitimate source or tray to be keyed in.

5. If an operator attempts to program two Random Access carts back to back which cannot play back to back because they both reside in the same machine (such as two carts in the same Audiofile module [or row] or two carts in the same SMC Carousel), the display bell will sound, the display will show "ADJACENT TRAYS", and the curser will move back to allow a legitimate tray to be programmed.

6. If a GO or SUB command is programmed to go to its own address (e.g. 0550 GO 0550), the display will show "ILLEGAL ENTRY" and the curser will move back to allow a legal address to be keyed in.

Example 1: Initial power up, memory empty, key in first 4 events.

STEP	KEY IN	DISPLAY
1.	EDIT N	Series 7000/2 EDIT PROGRAM CODES DESIRED > ▯ <EDIT
2.	SPACE BAR*	0946 AVAL . . . 0950 AVAL 0000 AVAL <EDIT FUNCTION? 0001 AVAL . . . 0005 AVAL
3.	PLAY 1	0000 PLAY ▯ <EDIT SOURCE?
4.	PLAY 1 PLAY 1	0000 PLAY 11▯ <EDIT PGM CODE?
5.	ENTER NOTE: Keying ENTER at this point indicates that no Program Code or Descriptor is desired. They will be illustrated in later program examples.	0947 AVAL . . . 0000 PLAY 11 0001 AVAL <EDIT FUNCTION? 0002 AVAL

* Pressing SPACE BAR (Step 2) indicates that no specific Program Codes are desired and thus all Events will be displayed and may be edited.

Example 1 -- Continued

STEP	KEY IN	DISPLAY
6.	PLAY 1	0001 PLAY ▯ <EDIT SOURCE?
7.	PLAY 1 LINK 2	0001 PLAY 12▯ <EDIT PGM CODE?
8.	ENTER	0948 AVAL . . . 0000 PLAY 11 0001 PLAY 12 0002 AVAL <EDIT FUNCTION? 0003 AVAL . . . 0007 AVAL
9.	PLAY 1	0002 PLAY ▯ <EDIT SOURCE?
10.	PLAY 1 DSTR 3	0002 PLAY 13▯ <EDIT PGM CODE?
11.	ENTER	0949 AVAL . . . 0000 PLAY 11 0001 PLAY 12 0002 PLAY 13 0003 AVAL <EDIT FUNCTION? . . . 0008 AVAL

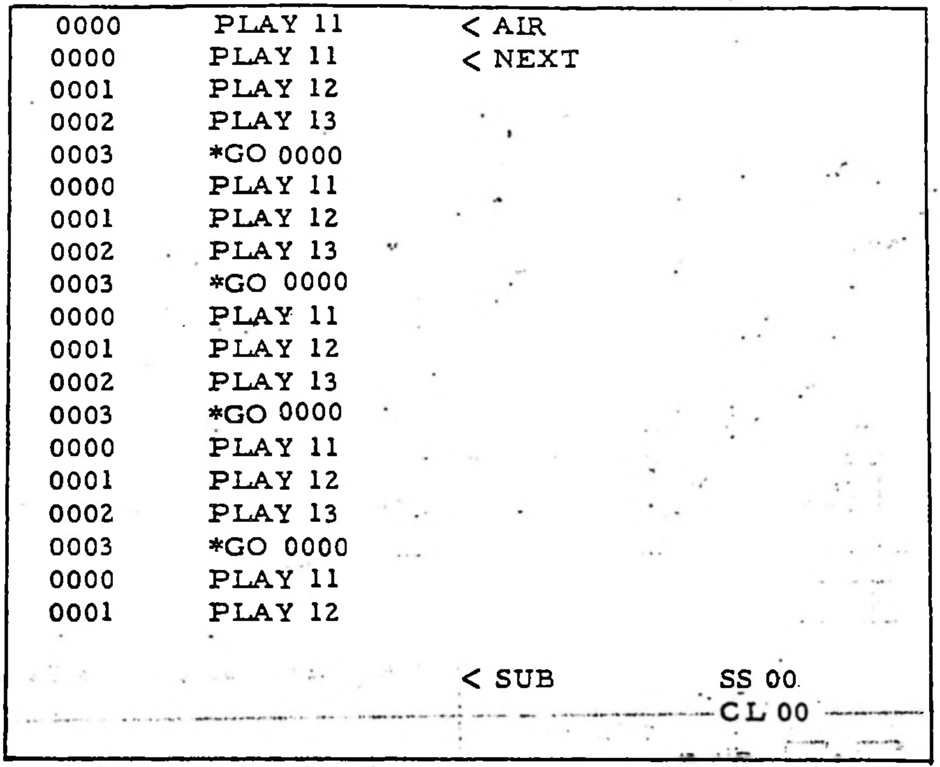
Example 1 - continued

STEP	KEY IN	DISPLAY
12.	GO 5	0003 *GO ▯ < EDIT GO TO?
13.	AVAL 0 AVAL 0 AVAL 0 AVAL 0	0003 *GO 0000▯ <EDIT PGM CODE?
14.	ENTER	0950 AVAL • • • 0000 PLAY 11 0001 PLAY 12 0002 PLAY 13 0003 *GO 0000 0004 AVAL < EDIT FUNCTION? • • • 0009 AVAL

What has been created is a very simple program that will play source 11, followed by source 12, followed by source 13; and then repeat that same sequence indefinitely or until the system is stopped.

```
0000        PLAY 11
0001        PLAY 12
0002        PLAY 13
0003        *GO 0000
```

By pressing OPER X it can be shown how this simple format would appear in the operate mode display (see Figure 3-7):



```
0000      PLAY 11         < AIR
0000      PLAY 11         < NEXT
0001      PLAY 12
0002      PLAY 13
0003      *GO 0000
0000      PLAY 11
0001      PLAY 12
0002      PLAY 13
0003      *GO 0000
0000      PLAY 11
0001      PLAY 12
0002      PLAY 13
0003      *GO 0000
0000      PLAY 11
0001      PLAY 12
0002      PLAY 13
0003      *GO 0000
0000      PLAY 11
0001      PLAY 12

                          < SUB          SS 00
                                         CL 00
```

FIGURE 3-7 OPERATE DISPLAY FOR EXAMPLE 1

Example 2: Go to new area of memory to program 5 events.		
STEP	KEY IN	DISPLAY
1.	EDIT N	Series 7000/2 EDIT PROGRAM CODES DESIRED> ▯ <EDIT

Examp. . Continued

STEP	KEY IN	DISPLAY
2.	SPACE BAR	0950 AVAL . . . 0004 AVAL <EDIT FUNCTION? . . . 0009 AVAL
3.	QUERY	0004 AVAL <EDIT EVENT?
4.	0 0 5 0	0050 AVAL <EDIT FUNCTION?
5.	PLAY	0050 PLAY ▯ <EDIT SOURCE?
6.	0 1	0050 PLAY 01▯ <EDIT TRAY? * Assumes Source 01 is Random Access
7.	0 1	0050 PLAY 01-01▯ <EDIT PGM CODE

Lets continue to ignore Program Codes for now.

8.	ENTER	0050 PLAY 01-01 0051 AVAL <EDIT FUNCTION?
9.	PLAY	0051 PLAY ▯ <EDIT SOURCE?
10.	0 1	0051 PLAY 01▯ <EDIT TRAY?
11.	3 2	0051 PLAY 01-32▯ <EDIT PGM CODE?

Example 2: Continued

STEP	KEY IN	DISPLAY
12.	ENTER	0051 PLAY 01-32 0052 $\boxed{A}$VAL <EDIT FUNCTION?
13.	PLAY	0052 PLAY▯ <EDIT SOURCE?
14.	0 1	0052 PLAY 01▯ <EDIT TRAY?
15.	1 3	0052 PLAY 01-13▯ <EDIT PGM CODE?
16.	ENTER	0052 PLAY 01-13 0053 $\boxed{A}$VAL <EDIT FUNCTION?
17.	SUB	0053 *SUB▯ <EDIT GO TO?
18.	0 0 0 0	0053 *SUB 0000▯ <EDIT PGM CODE?
19.	ENTER	0053 *SUB 0000 0054 AVAL▯ <EDIT FUNCTION?
20.	PLAY	0054 PLAY▯ <EDIT SOURCE?
21.	0 1	0054 PLAY 01▯ <EDIT TRAY?
22.	1 7	0054 PLAY 01-17▯<EDIT PGM CODE?

Example 2: Continued

STEP	KEY IN	DISPLAY
23.	ENTER	0054 PLAY 01-17 0055 AVAL <EDIT FUNCTION?
24.	PLAY	0055 PLAY▯ <EDIT SOURCE?
25.	0 1	0055 PLAY 01 ▯ <EDIT TRAY?
26.	4 6	0055 PLAY 01-46▯ <EDIT PGM CODE?
27.	ENTER	0055 PLAY 01-46 0056 AVAL <EDIT FUNCTION?
28.	SUB	0056 *SUB▯ <EDIT GO TO?
29.	0 0 0 4	0056 *SUB 0004▯ <EDIT PGM CODE?
30.	ENTER	0056 *SUB 0004 0057 AVAL <EDIT FUNCTION?

Example 2 should have added the following to the program:

```
0050      PLAY 01-01
0051.     PLAY 01-32
0052      PLAY 01-13
0053      *SUB 0000
0054      PLAY 01-17
0055      PLAY 01-46
0056      *SUB 0000
```

To verify the seven events, key in QUERY 0 and 0 0 5 3 to display all the events.

The following example shows how to edit an event which was previously programmed.

Example 3: Editing a previously programmed event.

STEP	KEY IN	DISPLAY
1	QUERY	0053 *SUB 0000 < EDIT EVENT?
2	0 0 0 3	0003 *GO 0000 < EDIT FUNCTION?
3	RETN	0003 *RTN ▯ < EDIT PGM CODE?
4	ENTER	0003 *RTN 0004 AVAL < EDIT FUNCTION?

Continue to add to the program as shown in the following exercise:

STEP	KEY IN	DISPLAY
1	PLAY	0004 PLAY ▯ < EDIT SOURCE?
2	0 1	0004 PLAY 01-▯ < EDIT TRAY?
3	2 2	0004 PLAY 01-22▯< EDIT PGM CODE?

Now let's talk about Program Codes.

WHAT IS A PROGRAM CODE? It is any of 15 letters from A to O that you the user wish to assign to a particular Event. Typically it would relate to the Audio Source type or Function (i.e. "C" for Commercial Audio Sources, "M" for Music, etc).

WHY USE PROGRAM CODES? By assigning a unique Program Code to each Event, you may later request a listing on the CRT of only Events with desired codes. Thus if Commercial Sources are being edited, all Music, PSA, Time, etc., will not display. Only Events with the selected Program Codes and Events with no Program Code will be displayed. And thus Events with other Program Codes cannot be accidentally changed.

HOW DO YOU DECIDE WHAT PROGRAM CODE TO USE? You are totally free to develop a system of Program Codes that is meaningful to your unique programming needs. For example you may choose to use an "A" for commercials which run 7 days a week and a "B" for ones which only run on weekends. Or you may wish to use different codes to denote different billing rates. You need only know what each Program Code letter relates to.

Now let's continue with our example by programming in a Program Code. For our example, we'll use a Program Code of "C".

STEP	KEY IN	DISPLAY
4.	C	0004 PLAY 01-22 C▯<EDIT DESCRIPTOR

WHAT IS A DESCRIPTOR? It is any abbreviation up to three (3) digits consisting of letters and/or number and some punctuation (e.g. ".", "/", ":", and "SPACE") which helps you to identify the source. For example, let's assume that Source 01 Tray 22 contains a spot for McDonald's. You could use a Descriptor of "MCD". Or perhaps McDonald's has a billing or client number "023" and thus a Descriptor of "023" might be used. Thus step 5 would be:

Note: If a DESCRIPTOR is desired but no PROGRAM CODE is desired, press SPACE BAR when CRT requests "PGM CODE?".

5.	0 2 3	0004 PLAY 01-22 C 023 <EDIT ENTER?▯
6.	ENTER	0004 PLAY 01-22 C 023 0005 AVAL <EDIT FUNCTION?
7.	PLAY	0005 PLAY▯ <EDIT SOURCE?

STEP	KEY IN	DISPLAY
8.	1 2	0005 PLAY 12▯ <EDIT PGM CODE?
9.	M	0005 PLAY 12 M▯ <EDIT DESCRIPTOR

This time we will not put in a Descriptor and instead just press ENTER.

STEP	KEY IN	DISPLAY
10.	ENTER	0005 PLAY 12 M 0006 AVAL <EDIT FUNCTION?
11.	PLAY	0006 PLAY▯ <EDIT SOURCE?
12.	1 3	0006 PLAY 13▯ <EDIT PGM CODE?
13.	M	0006 PLAY 13 M▯ <EDIT DESCRIPTOR
14.	ENTER	0006 PLAY 13 M 0007 AVAL <EDIT FUNCTION?
15.	STOP	0007 STOP ▯ <EDIT PGM CODE?
16.	ENTER	0007 STOP 0008 AVAL <EDIT FUNCTION?
17.	GO	0008 *GO ▯ <EDIT GO TO?

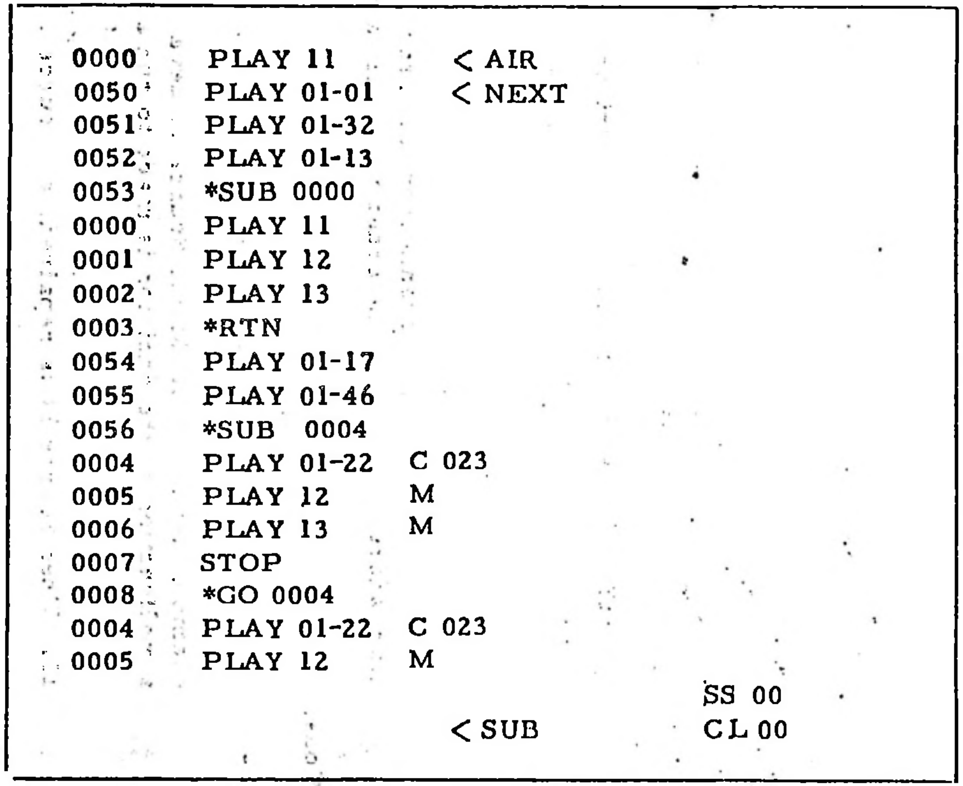
STEP	KEY IN	DISPLAY
18.	0 0 0 4	0008 *GO 0004 ▯ <EDIT PGM COD
19.	ENTER	0008 *GO 0004 0009 AVAL <EDIT FUNCTION?

Now move the program NEXT pointer to event number 0050 as shown in example 4:

Example 4: Moving program NEXT pointer (assumes display is in EDIT Mode).

STEP	KEY IN	DISPLAY
1.	QUERY	0009 AVAL <EDIT EVENT?
2.	0 0 5 0	0050 PLAY 01-01 <EDIT FUNCTION?
3.	XFER	XFER TO NEXT? 0050 PLAY 01-01 <EDIT FUNCTION?
4.	XFER	See Figure 3-8

Thus a short program has been created which would play exactly as shown in Figure 3.8



```
0000    PLAY 11          < AIR
0050    PLAY 01-01       < NEXT
0051    PLAY 01-32
0052    PLAY 01-13
0053    *SUB 0000
0000    PLAY 11
0001    PLAY 12
0002    PLAY 13
0003    *RTN
0054    PLAY 01-17
0055    PLAY 01-46
0056    *SUB  0004
0004    PLAY 01-22  C 023
0005    PLAY 12     M
0006    PLAY 13     M
0007    STOP
0008    *GO 0004
0004    PLAY 01-22  C 023
0005    PLAY 12     M
                                    SS 00
                 < SUB              CL 00
```

FIGURE 3-8   OPERATE DISPLAY FOR EXAMPLE 4

3.4 MAKING CHANGES TO AN EXISTING PROGRAM. Once the memory has been programmed, it may be necessary to make changes other than the normal changes required to update the Commercial Load. There are four (4) basic EDIT functions and three (3) LOCAL mode functions to aid in this task.

EDIT Functions:

INSERT - Allows inserting an event between existing events. Pushes all other events down in memory and corrects all SUB (Subroutine) and GO (Go To) instructions. This should not be confused with the Operate mode INSERT function which causes the Source in the last Event location to be scheduled next.

DELETE - Allows removing an event. Pushes all other events up in memory to fill the void and corrects all SUB and GO instructions.

SRCH - (Search) Allows for a Search of memory and display of only events containing the desired parameters. For example, you may wish to display only events containing Source "01" Tray "22" with Program Code "C".

TEST - Allows the display of 66 events from the requested start address in exactly the order they will "air".

LOCAL MODE Functions:

CHANGE - Allows any particular parameter or parameters in a desired block of memory to be changed. For example, let's assume Music Source 11 develops a malfunction so the decision is made to run all Source 11 tapes on Source 15. The system could be requested to change all Source 11's to backup Source 15. When Source 11 is repaired, all source 15's could be changed back to Source 11.

MOVE - This allows a block of events to be copied in another area of memory. It does not destroy the area being copied.

LOAD - Allows the memory to be loaded from TI SILENT 700. The data to be loaded is typed in English in the normal EDIT format.

Note that with the addition of an optional printer, it is possible to list a block of memory, list the events in the order of play, and search for and print all events in a block of memory which contain the desired parameters. These functions are discussed in Paragraph 3.5.

3.4.1 INSERTING AN EVENT -- Let's assume it is desired to insert an additional event between Event 0051 and 0052. Procede as follows:

1. Press EDIT.
2. Press SPACE BAR.
3. Press QUERY.
4. Key in 0052 (Note: The new event will be stored at Event 0052 while the data previously at 0052 will move to Event 0053).
5. Press CLEAR followed by ENTER to get into INSERT mode. The display will show:

```
0052▯                                   <INSERT FUNCTION?
```

6. Let's assume it is desired to insert:

```
PLAY 01-20  C  024
```

7. Press PLAY.
8. Key in 01, 20, C, 024 as the CRT requests SOURCE?, TRAY?, PGM CODE?, and DESCRIPTOR respectively.

CAUTION: When inserting a Random Access source, be sure to check Tray numbers to verify no conflicts with two trays which cannot play back to back.

9. Press ENTER.

The CRT will now display:

```
                 0048  AVAL
                 0049  AVAL
                 0050  PLAY 01-01
                 0051  PLAY 01-32
Inserted Event-->0052  PLAY 01-20   C 024
                 0053  ▯LAY 01-13              <EDIT FUNCTION?
                 0054  *SUB 0000
                 0055  PLAY 01-17
                 0056  PLAY 01-46
                 0057  *SUB 0004
                 0058  AVAL
```

Figure 3-9

NOTE: To cancel the INSERT function, press any "Command" key, (SKIP, QUERY, etc.).

DELETING AN EVENT -- Assume [illegible] sired to delete Event 0052.

1. Press EDIT.
2. Press SPACE BAR.
3. Press QUERY.
4. Key in 0052.
5. Press QUERY followed by ENTER to delete the Event.

The "PLAY 01-20 C 024" at Event 0052 will be eliminated and replaced with the "PLAY 01-13" that was in Event 0053, see Figure 3.9. Additionally all other Events will be pushed up one Event as shown below:

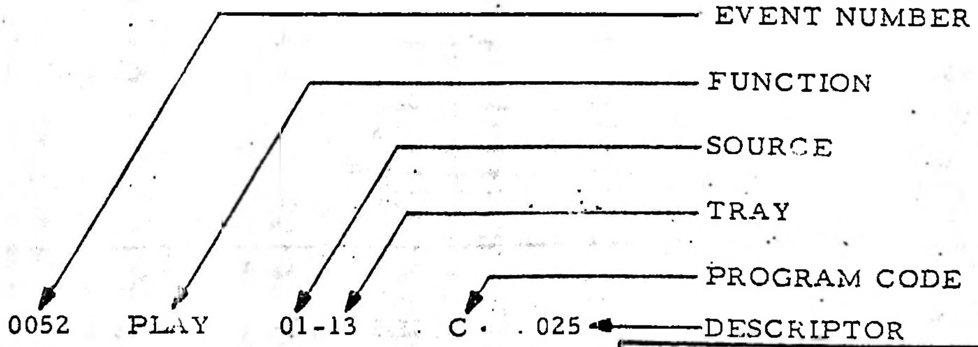
```
0047   AVAL
0048   AVAL
0049   AVAL
0050   PLAY 01-01
0051   PLAY 01-32
0052   PLAY 01-13
0053   *SUB 0000
0054   PLAY 01-17
0055   PLAY 01-46
0056   *SUB 0004
0057   AVAL
```

3.4.3 SEARCHING FOR SPECIFIC PARAMETERS -- The Search mode allows the programmer to seek out and display events which contain specific parameters desired. For example, assume only events containing Source 01 are desired.

1. Press EDIT.
2. Press SPACE BAR.
3. Press SRCH to access Search mode. The display will show:

```
0052▯              <SEARCH
```

4. At this point the desired parameters should be keyed in. The following chart will aid in locating these parameters.



NOTE: 1. Any desired event number may be used as a starting by pressing QUERY followed by the desired event nu

2. If a parameter is unimportant, the DCARE key may pressed to advise that you "don't care" what that par is.

EXAMPLE 1: DCARE press

0052 **** 01- **** * *** (Search for all containing Sou

EXAMPLE 2: 0052 **** 01- **** C 025 (Search for all containing Sou Program Code and Descriptor

3. Press ENTER. The CRT should display up to 5 even before and after the starting event number which cont desired parameters, in the case of Example 2, to thi we have not programmed any event with all those spe parameters so the CRT will print "NO MATCH FOUN

Note that the following keys are active and function as noted in the SE mode:

CLEAR -	RE-ENTER FROM FUNCTION POSITION
ENTER -	ENTER SEARCH PARAMETERS
↑ ↓ -	MOVE TO NEXT MATCHING EVENT
SKIP -	SKIP FORWARD TO NEXT MATCHING EVE
QUERY -	DISPLAY EVENT QUERIED IF MATCHING. NOT, SKIP FORWARD TO FIRST MATCHIN EVENT FROM EVENT QUERIED
XFER -	TRANSFER EVENT IN EDIT POINTER TO "
EDIT -	ENTER NEW PROGRAMMING CODES
SRCH -	TO DEACTIVATE SEARCH MODE OR TO CH THE SEARCH PARAMETERS
DCARE -	PARAMETER UNIMPORTANT

NOTE: SEARCH mode will remain active and displayed on upper section of the CRT even if the operator chang modes until deactivated by pressing SRCH.

3.4.4 [illegible]DE -- The T[illegible] mode allo[illegible] listing of 66 e[illegible] exactly as they will "air". T[illegible]ss TEST mode:

1. Press EDIT..
2. Press SPACE BAR.
3. Press TEST. The display will show:

```
 □                              TEST FROM EVENT?
```

4. Key in the starting event number (e.g. 0050). The CRT will now display 66 events.

NOTE:
1. Pressing ↑ will cause the next 66 events to display.

2. Pressing QUERY allows a new starting event number to be keyed in.

3. Press TEST to go back to normal EDIT mode.

3.4.5 <u>LOCAL MODE</u> -- Local mode command allows for changing specific parameters in a block of memory, copying data from one block of data to another, and loading the memory from a TI SILENT 700 teleprinter. The addition of an optional printer allows for listing a block of events, listing events as they would air, and searching for and listing events containing specific desired parameters. Also the printer status can be determined in LOCAL mode.

3.4.5.1 <u>CHANGING A PARAMETER OR PARAMETERS IN A BLOCK OF EVENTS</u> -- Any Function, Source, Tray, Program Code, or Descriptor within a desired block of events may be changed in LOCAL mode. For example, assume it is desired to change all Source 11's from event 0000 through 0005 to Source 15. This would be accomplished as follows:

1. Press the black LOCAL key. (Note that the system must be in OPERATE display mode to go to LOCAL mode). The display will show:

```
  LOCAL MODE
   % □
```

2. Key in CHANGE. Note that only the "C" key is required; the rest of the letters are optional

3. Press SPACE BAR. The CRT will print "FROM-".

4. Key in the starting EVENT (e.g. 0000).

5. Press SPACE BAR. The CRT will print "TO-".

6. Key in the ending EVENT (e.g. 0005).

7. Press ENTER. The CRT will print "NOW".

8. Key in the current parameters using the DCARE key for parameters which will not change (i.e. have no bearing on the change).

EXAMPLE:
a. NOW PLAY 11
b. KEY IN DCARE, 11, DCARE, DCARE, DCARE
c. DISPLAY **** 11- **** * ***

9. Press ENTER. The CRT will print "BECOMES".

10. Key in the changes.

EXAMPLE:
a. KEY IN DCARE, 15, DCARE, DCARE, DCARE
b. DISPLAY **** 15- **** * ***

11. Press ENTER. The CRT will print "%" indicating the changes are made.

To verify changes, go to OPERATE mode (press OPER) and then to EDIT mode (press EDIT) or go to LOCAL mode (press LOCAL) and use SEARCH mode (reference paragraph 3.5.4).

3.4.5.2 MOVING A BLOCK OF EVENTS FROM ONE LOCATION TO ANOTHER -- It may be desired when making changes to the program to move a block of memory to a new location. Note that the block of memory is only copied and thus the original data remains intact. The following illustrates the steps in moving a block of data.

1. Press LOCAL (remember, you must be in OPERATE display mode).

2. Key in MOVE (or simply M if desired).

3. Press SPACE BAR. The CRT will print "FROM-".

4. Key in first Event number of the block to be moved (e.g. 0000).

5. Press SPACE BAR. CRT will print "TO-".

6. Key in the last Event number in the block to be moved (e.g. 0050).

7. Press SPACE BAR. The CRT will print "DEST-".

8. Key in the first Event number in the location the data is to be moved to (e.g. 0100).

9. Press ENTER. The CRT will print "%" indicating the move has been made. To verify:

   a. Press OPER
   b. Press EDIT
   c. Press SPACE BAR
   d. Press QUERY
   e. Key in first Event number in new block (e.g. 0100)

   Or refer to paragraph 3.5.2 showing how to list a block of Events in LOCAL mode.

3.4.5.3 LOADING MEMORY FROM A TI SILENT 700

3.4.5.3.1 PREPARATION OF THE PRE-log and TA

Prior to loading the memory it is necessary to prepare a tape. While making the tape, the pre-log is also made.

Prior to actually making a tape, the following should be noted:

1. Do not use colons (:) in the log heading as a colon following a RETURN is a flag to tell the system that the Event number should follow. Once the Event number is keyed in, colons may be usec prior to activating the ENTER key (see Figure 3-10).

2. Any desired information may be typed in following DESCRIPTOR (see Figure 3-10). The system will ignore this during the load cycle.

3. Some functions have a character (i.e. :, *, +) as their first digit. It is imperative that the correct character be keyed in for these functions as shown below:

    :UPD
    * GO (note space between
    * and G)
    *SUB
    *RTN
    +CMD

The following procedure may be used as a guide to preparing the pre-log and tape. Refer to the TI 700 Operator's Manual for detailed operation information.

1. Load the tape into the desired cassette holder 1 or 2.

2. Press the REWIND switch for the appropriate cassette.

3. Press the LOAD/FF switch.

4. Set the RECORD CONTROL "TAPE FORMAT" switch to LINE. This will make editing easier as each segment of the tape will contain one line of data.

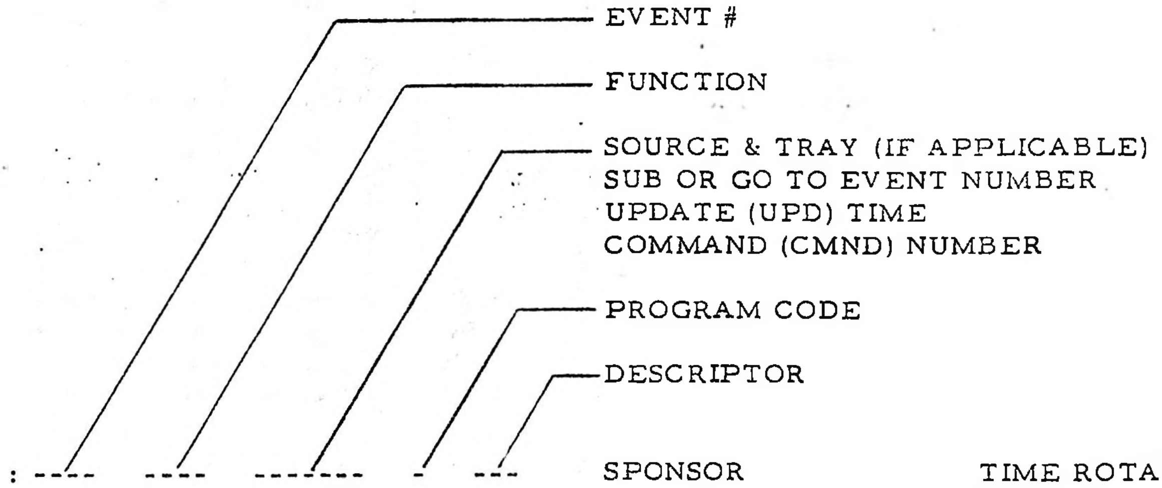
5. Set the RECORD CONTROL "ON/OFF" switch to ON.

6. Set the bottom row KEYBOARD, PLAYBACK, RECORD, and PRINTER switches to LOCAL.

7. Type in the pre-log with the heading desired. Note that the spacing of the characters to be loaded into memory (surrounded by dotted lines in Figure 3-10) <u>must be</u> positioned exactly as shown in Figure 3-10. It is recommended that the line prior to the first line of data to be loaded start with a ":" (to allow for the ":" ahead of the Event number) followed by dashes as shown in Figure 3-10 to allow for proper alignment of characters.

KXYZ -LOG

MONDAY MAY 7, 1979



```
: ----   ----   -------   -   ---   SPONSOR                  TIME ROTATION BILLING

:0000  :UPD  0100                   MO 01:00:00
:0001  PLAY  05          F  ID      STATION ID
:0002  PLAY  01-12       G  WX      WEATHER
:0003  PLAY  02-01       C  COK     COCA-COLA               :60    A1       1144555
:0004  PLAY  03-14       C  HAL     HAL'S AUTO              :30    A2       1232311
:0005  PLAY  01-12       O  PSA     BULLETIN BOARD          :60
:0006  AVAL              C  CA      COMMERCIAL
:0007  PLAY  09          K  TIM     TIME
:0008  *SUB  0100        M  R01     MUSIC - ROTATION 1
:0009  :UPD  0113           PMO     MO 01:13:00  PM
:0010  PLAY  03-14       B  ALS     AL'S GROCERY            :60    A1       1233444
:0011  PLAY  02-12       B  RAL     RALPH'S TV              :30    A4       1234677
:0012  PLAY  01-15       O  PSA     CHURCH                  :30
:0013  AVAL              O  PSA     PUBLIC SERVICE ANN
:0014  PLAY 09           K  TIM     TIME
```

FIGURE 3-10 PRE-LOG EXAMPLE

8. After the last line of the pre-log is typed, press CTRL and S (X-off) keys simultaneously followed by the RETURN key.

9. Set RECORD CONTROL switch to "OFF".

10. The tape is now ready to load into memory.

3.4.5.3.2 LOADING THE MEMORY

1. Load the tape into the desired cassette holder 1 or 2.

2. Press REWIND switch for the appropriate cassette.

3. Press the LOAD/FF switch.

4. Set the KEYBOARD, PLAYBACK, and PRINTER switches to LINE.

5. Press the CTRL and "L" keys simultaneously. The printer should respond by printing "%".

6. Type L (or LOAD if desired).

7. Press RETURN. The printer should respond by printing

```
:---- ---- ------- - ---
```

8. Press PLAYBACK CONTROL "CONT START" switch.

9. The memory should now begin loading. Verification of proper loading may be made by going to EDIT mode with a CRT and checking Events for proper data or by leaving the printer ON in LINE mode.

10. At the end of the load cycle the printer will print the number of line errors detected. These will be flagged on the print out by ? following the error as shown in the example below. These events may then be hand corrected or a new tape may be made to correct those specific events.

ERROR EXAMPLE: Note lack of function and misplacement of Source and Tray data at Event 0003.

```
:0000  :UPD   0100           MO 01:00:00
:0001  PLAY   05       F  ID     STATION ID
:0002  PLAY   01-12    G  WX     WEATHER
:000302-01             C  COK    COCA COLA          :60     A1       1144555
:0004  PLAY   03-14    C  HAL    HAL'S AUTO         :30     A2       1232311
```

Note "?" on line for Event 0003

```
:0000  :UPD   0100           MO 01:00:00
:0001  PLAY   05       F  ID     STATION ID
:0002  PLAY   01-12    G  WX     WEATHER
:00030???????????????            COCA COLA          :60     A1       1144555
:0004  PLAY   03-14    C  HAL    HAL'S AUTO         :30     A2       1232311
:0005  PLAY   01-12    O  PSA    BULLETIN BOARD     :60
:0006  AVAL            C  CA     COMMERCIAL
:0007  PLAY   09       K  TIM    TIME
:0008  *SUB   0100     M  RO1    MUSIC - ROTATION 1
:0009  :UPD   0113        PMO    MO 01:13:00 PM
:0010  PLAY   03-14    B  ALS    AL'S GROCERY       :60     A1       1233444
:0011  PLAY   02-12    B  RAL    RALPH'S TV         :30     A4       1234677
:0012  PLAY   01-15    O  PSA    CHURCH             :30
:0013  AVAL            O  PSA    PUBLIC SERVICE ANN
:0014  PLAY   09       K  TIM    TIME
01 LINE ERRORS DETECTED
%
```

3.4.5.4 **LISTING OR LOADING THE ENTIRE MEMORY USING A TI SILENT 700** -- It is possible to list the entire memory (including Time Events) to cassette and conversly load the entire memory from cassette using the TI Silent 700. It is necessary first to convert the Printer to a LOAD/DUMP terminal as follows:

1. Press LOCAL.
2. Key in DUMP (or simple D if desired)
3. Press ENTER. The CRT will display "ASSIGNED TO LIST AND LOAD".

Now go to OPERATE mode by pressing OPER and proceed to paragraph 3.11 for DUMP or LOAD procedure (note that general requirements or paragraph 3.11.1 do not apply in this case).

To return the TI Silent 700 to normal Printer status:

1. Press LOCAL.
2. Press CTRL and D simultaneously.

3.5 **LOCAL MODE PRINT COMMANDS** -- There are four (4) printer commands available in LOCAL mode. They are:

1. **PRINTER STATUS** -- Causes a check of the printer status, and one of the following messages to print.

PRINTER READY - PRINTER READY FOR LISTING

PRINTER BUSY - PRINTER LISTING
NOT READY FOR NEW PRINTOUT

PRINTER NOT AVAILABLE - PRINTER NOT OPERATIONAL
PRINTER MAY BE OUT OF
PAPER OR TURNED OFF, OR
DISCONNECTED

2. **EVENT** -- Requests a listing of a block of events in numerical order.

3. <u>TEST</u> Requests a listing of a block of events in the order in which they will "air". Will print " <ER" next to an event containing a subroutine stack error.

```
TEST FROM-0100 TO-0105

EXAMPLE:  0100  PLAY 11   M MUS
          0101  PLAY 08   K TIM
          0102  *RTN                <ER←RTN SCHEDULED BEFORE A SUB
          0103  AVAL                   COMMAND.  FLAGGED AS AN ERROR
          0104  AVAL
          0105  AVAL
```

4. <u>SEARCH</u> -- Requests a search of a block of memory for desired parameters and prints all events with those parameters.

NOTE:
1. Pressing the CTRL and D keys simultaneously will cause the printer to stop. A slight delay may be experienced with some printers while their storage buffers empty.
2. "ESC" key may be pressed during Command Entry to cancel that command and allow a new Entry.

3.5.1 <u>DETERMINING PRINTER STATUS</u>

1. Press LOCAL. CRT will print LOCAL MODE.
2. Key in P (or the word PRINTER if desired).
3. Press ENTER. The CRT will print one of the follow messages:

PRINTER READY
PRINTER BUSY
PRINTER NOT AVAILABLE

Refer to paragraph 3.5 for description of each message.

3.5.2 <u>LISTING A BLOCK OF EVENTS IN NUMERICAL ORDER</u>

1. Press LOCAL.
2. Key in E (or the word EVENT if desired).
3. Press SPACE BAR. CRT will print "FROM-".
4. Key in first Event desired (e.g. 0000).
5. Press SPACE BAR. CRT will print "TO".
6. Key in last Event desired (e.g. 0005).
7. Press ENTER. The printer will now begin listing the desired Events.

EXAMPLE:

```
%E FROM-0000 TO-0005
0000  PLAY  01-02   C  DYM
0001  PLAY  02-19   C  CHV
0002  PLAY  01-35   C  DEL
0003  SUB   0100    O  JGL
0004  PLAY  02-03   C  DTA
0005  PLAY  01-21   C  CAR
```

3.5.3 LISTING A BLOCK OF EVENTS AS THEY WOULD "AIR".

1. Press LOCAL.
2. Key in T (or TEST if desired).
3. Press SPACE BAR. CRT will print "FROM-".
4. Key in first Event desired (e.g. 0000).
5. Press SPACE BAR. CRT will print "TO-".
6. Key in last Event desired (e.g. 0005).
7. Press ENTER. The printer will now begin listing the desired events in the order they will "AIR".

EXAMPLE:

```
%T FROM-0000 TO-0005
0000  PLAY  01-02   C  DYM
0001  PLAY  01-19   C  CHV
0002  PLAY  01-35   C  DEL
0003  *SUB  0100    O  JGL
0100  LINK  05      O  JGL
0101  PLAY  06      O  JGL
0102  PLAY  08      K  TIM
0103  *RTN
0004  PLAY  02-03   C  DTA
0005  PLAY  01-21   C  CAR
```

NOTE: If the program does not allow the "TO-" Event to be reached, the printer will continue to print indefinitely. If this condition occurs, press "CTRL" and "D" simultaneousl to stop printer.

3.5.4 SEARCHING FOR AND PRINTING EVENTS WITH DESIRED PARAMETERS.

1. Press LOCAL.
2. Key in S (or SEARCH if desired).
3. Press ENTER. CRT will print "DESIRED CODES".
4. At this time, you may key in the desired Program Codes followed by the ENTER key; or press the SPACE BAR if no specific Program Codes are desired. The CRT will print "SEARCH FOR-".

5. Key in the desired parameters for which the search is to be made. Use the DCARE key for any parameters which do not matter. For example, assume it is desired to search for Events containing Source 01 and Descriptor MCD. Key in:

   a. DCARE (indicates you don't care which FUNCT is in Event).
   b. 01 (Source 01).
   c. DCARE (Don't care which Tray).
   d. DCARE (Program Codes were input at Step 4).
   e. MCD (Descriptor MCD).

   The CRT will show:

   ```
   SEARCH DESIRED CODES -*
   SEARCH FOR **** 01-**** *MCD
   ```

6. Press ENTER. The CRT will print "FROM-".

7. Key in the first Event number to start searching.

8. Press SPACE BAR. The CRT will print "TO-".

9. Key in the Event number where search is to end.

10. Press ENTER. Printer will print any Events containing all the desired parameters. If none are found the printer will just print a line of dashes.

3.6 CREATING YOUR OWN PROGRAM - Most broadcast stations have two basic elements that make up 90% of their programming. Those elements are MUSIC and COMMERCIALS. In most cases, the music follows some defined source rotation pattern which is repeated several times before switching to a new rotation pattern. Commercials, on the other hand, are typically random and usually are reprogrammed (changed) on a daily or periodic basis depending on total system memory capacity. With this in mind, the following steps are recommended in laying out a program for entry into the system memory:

1. Lay out the format as it is to play.

2. Separate the elements which repeat from the elements which remain random.

3. Assign event numbers to each format event.

Figure 3-11 illustrates the process of separating the repeated from the random events. Note that the events could be programmed sequentially as they are to play but considerably more memory addresses are required for pure sequential than for split memory programming.

Referring to Figure 3-11, it can be seen that the music (repeated) format runs for 1/2 hour and then repeats itself. Thus it is necessary only to set aside a block of memory and by use of the SUB (subroutine) command in the Main (random or commercial) format, the music format can be selected as required.

Now that the program has been divided into its two principle parts (repeated music and random commercial), event numbers can be assigned to give the written program meaning. In order to determine the event numbers to be used, consider the following:

1. Each music cluster should be considered a subroutine, callable from the main random format at any time. Thus all one has to do to determine the total number of events is to ascertain the total number of "different" small music formats (subroutines) to be used at any time, and add the total number of elements in all the subroutines. Adding the number of subroutines allows for event locations for the RETN instructions to return to the main program at the end of each subroutine cluster.

   Example: Total Subroutines = 15
   Total Events = 60
   Total Addresses Required = 75

   For the example above, it would be logical to allocate the first 100 events (0000 through 0099) for subroutines. The rest of the memory is then available for random events. Figure 3-12 illustrates how event numbers might be assigned and how those events might be programmed for the program in Figure 3-11. Figure 3-13 illustrates how the program would weave from the Main routine to the Subroutines. The following points should be considered in breaking down the format and assigning event numbers.

   1. It is typically easiest to start the program from the Main format using the SUB function to go to the first music cluster.

   2. Although random access sources can be scheduled in a subroutine, it is definitely not advised to schedule a

random access source as the first event. This is due to the fact since subroutines are accessed in a somewhat random fashion, the one scheduling the commercials would have to be very familiar with the entire program to avoid scheduling two trays in the same machine back to back. Thus, if a Jingle, for example, is always scheduled at the beginning of a music subroutine but comes from a random access source, it is best to schedule that Jingle at the end of the commercial cluster.

3. Assign subroutine event numbers first so that it can be determined where SUB instructions should "go to".

4. In assigning event numbers for commercial clusters, ascertain the maximum number of events each specific cluster could contain, including SUB instruction, and assign that number of event locations to the specific clusters. It is necessary to assign clusters to a specific day and time to be able to keep track of when a particular cluster will air (e.g. Tuesday 3:10PM 0532 Play 01 27). Thus, event 0532 is the first event location for the cluster to air on Tuesday at 3:10PM. Figure 3-14 is a sample worksheet which can be used to organize the program. This same sheet can be used to organize the Subroutines by simply ignoring the Day and Time columns. Section 4.0 (Programming Aids) contains a blank form which may be reproduced.

This concludes the basic formating discussion. A review of paragraphs 3.3.1 and 3.3.2 is recommended to determine which functions and commands may be of use in your specific format. If the system contains the Real Time option, proceed to paragraph 3.7 for instruction on programming Network Join, Sign On, etc. If the system has an external Time Clock rather than the Real Time option, proceed to paragraph 3.8 . Note that paragraph 3.9 shows in detail the information found on the Video Monitor.

TIME (Approx.)	PROGRAM	SUBROUTINES (Repeated Format)		MAIN FORMAT (Random)
0700 AM				UPD 0700
	Legal ID			Legal ID
	Music (Source 11)	Music (11)		
	Music (Source 12	Music (12)		
	Music (Source 13)	Music (13)		
0710 AM				UPD 0710
	Spot			Spot
	Spot			Spot
	Spot (Avail)			Spot (Avail)
	Jingle	Jingle		
	Music (Source 11)	Music (11)		
	Music (Source 13)	Music (13)		
	Time	Time		
0720 AM				UPD 0720
	Spot			Spot
	Spot			Spot
	Spot			Spot
	Music (Source 14)	Music (14)		
	Music (Source 12)	Music (12)		
	Music (Source 13)	Music (13)		
0730 AM				UPD 0730
	Station ID			Station ID
	Spot			Spot
	Spot			Spot
	Music (Source 11)	Music (11)		
	Music (Source 12)	Music (12)		
	Music (Source 13)	Music (13)		
0740 AM				UPD 0740
	Time			Time
	Spot		Repeat	Spot
	Spot		Of	Spot
	Spot (Avail)		Above	Spot (Avail)
	Jingle	Jingle		
	Music (Source 11)	Music (11)		
	Music (Source 13)	Music (13)		
	Time	Time		
	.Etc.			

FIGURE 3-11 BREAKING DOWN PROGRAM

SUBROUTINES

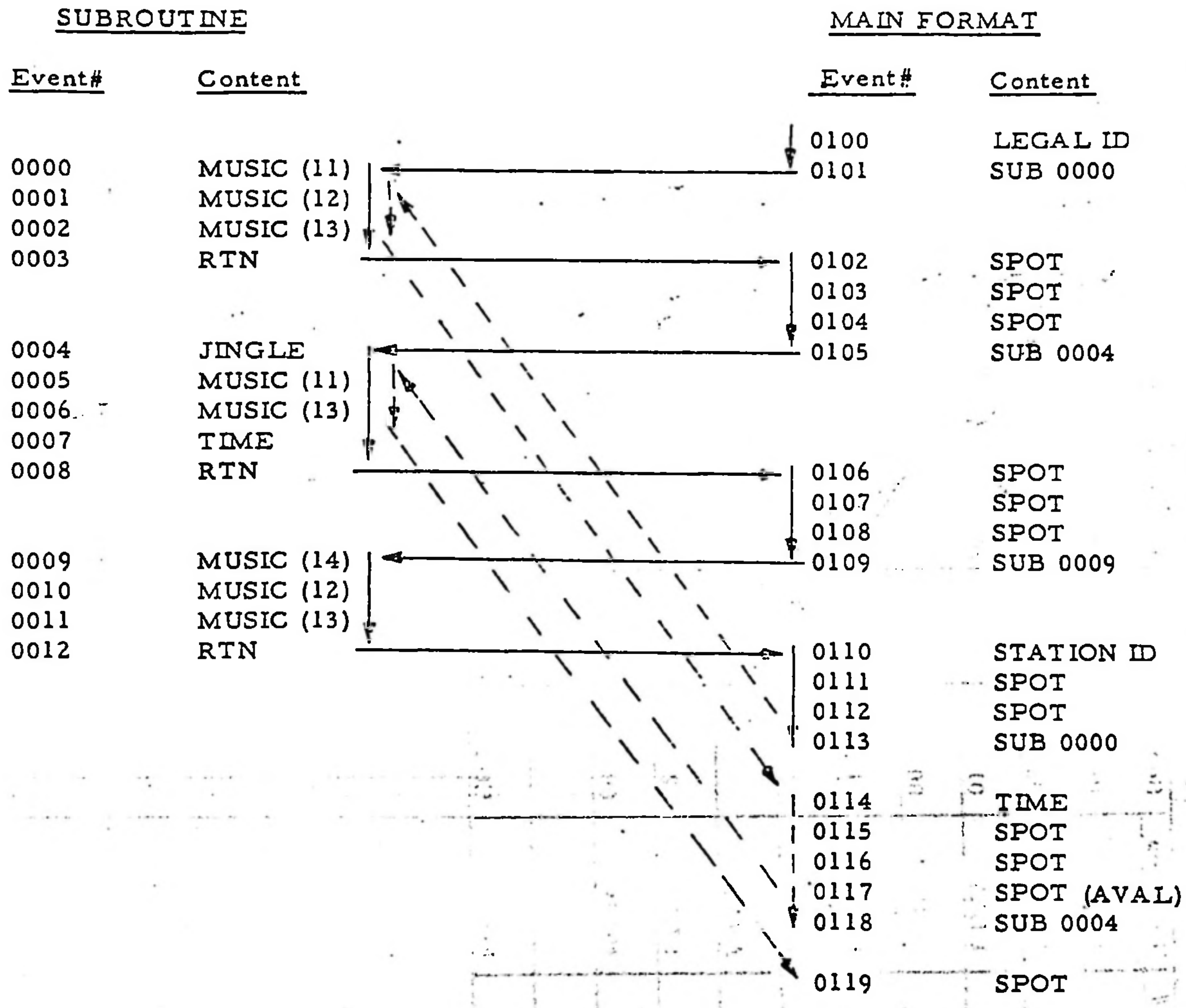
Content	Event	Function	Source	Tray
Music (11)	0000	PLAY	11	
Music (12)	0001	PLAY	12	
Music (13)	0002	PLAY	13	
	0003	RETN		
Jingle	0004	PLAY	05	
Music (11)	0005	PLAY	11	
Music (13)	0006	PLAY	13	
Time	0007	PLAY	06	
	0008	RETN		
Music (14)	0009	PLAY	14	
Music (12)	0010	PLAY	12	
Music (13)	0011	PLAY	13	
	0012	RETN		

MAIN (RANDOM) FORMAT

Content	Event	Function	Source*	Tray*
Legal ID	0100	PLAY	01	01
	0101	SUB	00	00
Spot	0102	PLAY	XX	XX
Spot	0103	PLAY	XX	XX
Spot (Aval)	0104	AVAL	-	-
	0105	SUB	00	04
Spot	0106	PLAY	XX	XX
Spot	0107	PLAY	XX	XX
Spot	0108	PLAY	XX	XX
	0109	SUB	00	09
Station ID	0110	PLAY	01	02
Spot	0111	PLAY	XX	XX
Spot	0112	PLAY	XX	XX
	0113	SUB	00	00
Time	0114	PLAY	06	-
Spot	0115	PLAY	XX	XX
Spot	0116	PLAY	XX	XX
Spot (Aval)	0117	AVAL	-	-
	0118	SUB	00	04
	.			
	.			
	.			
	Etc.			

* XX = Typically changes from day to day.

FIGURE 3-12 ASSIGNING ADDRESSES, FUNCTIONS, SOURCE, AND TRAY



SUBROUTINE

Event#	Content
0000	MUSIC (11)
0001	MUSIC (12)
0002	MUSIC (13)
0003	RTN
0004	JINGLE
0005	MUSIC (11)
0006	MUSIC (13)
0007	TIME
0008	RTN
0009	MUSIC (14)
0010	MUSIC (12)
0011	MUSIC (13)
0012	RTN

MAIN FORMAT

Event#	Content
0100	LEGAL ID
0101	SUB 0000
0102	SPOT
0103	SPOT
0104	SPOT
0105	SUB 0004
0106	SPOT
0107	SPOT
0108	SPOT
0109	SUB 0009
0110	STATION ID
0111	SPOT
0112	SPOT
0113	SUB 0000
0114	TIME
0115	SPOT
0116	SPOT
0117	SPOT (AVAL)
0118	SUB 0004
0119	SPOT

FIGURE 3-13 ORDER OF PLAY

Day	Time	Content	Event #	Function	Source	Tray	Pgm. Code	Descriptor
Tuesday	3:10PM	Spot/Sears	0532	PLAY	01	27	C	SRS
		Spot/McD	0533	PLAY	02	15	C	MCD
		Spot/Z's	0534	PLAY	01	03	C	Z
			0535	*SUB	00	04		
	3:20PM	Spot/Twin S.	0536	PLAY	01	46	C	TWS
		Spot/Penny's	0537	PLAY	01	04	C	PEN
			0538	AVAL			C	
		Jingle	0539	PLAY	02	02	J	02
			0540	*SUB	00	09		
		Etc.	Etc.	Etc.	Etc.	Etc.	Etc.	Etc.

FIGURE 3-14 SA LE FORMAT WORK SHEET

3.7 PROGRAMMING REAL TIME EVENTS

3.7.1 GENERAL - If the system is equipped with the Real Time option, functions can be programmed in by Real Time to Update the format, Join and Leave a network, Sign On and Off, drive External Functions, and Insert a source into the program by use of the TIME keys function. Up to four (4) functions can be programmed to occur at one time. Note that the functions should be programmed from left to right in the order they are to occur. Additionally, the Time Edit format allows for rapid selection of specific days, hours, minute and second a specific function (or set of functions) is to occur.

Note that the Time Edit Display is divided into two sections as shown in Figure 3-16. The top section (called the "Programming Matrix") is used to allocate which days and hours as well as AM and/or PM that functions are to occur for a specific minute and second. Additionally the specific Function(s) are entered into this section of the display at the far right.

The center left of the display is used for keying in a starting day and time as well as for viewing time events in their order of occurrence.

3.7.2 SETTING THE CLOCK TO REAL TIME - When the power is first applied the clock will read MO 12:00:00A and the Video Monitor will display that until the clock is set as follows:

1. Press TIME C . Note, system must be in Operate mode prior to pressing the "TIME" key.

2. Key in the next upcoming real time (e.g. real time = Monday, 09:53:21 am; Key in:

TEST	QUERY	AVAL	CMND	GO	UPDAT	AVAL	AVAL	START
M	0	0	9	5	4	0	0	A

Note that the display will ask for "DAY?", "HOUR?", "MIN?", "SEC?", and "A/P?".

3. Then press XFER K. The display will indicate "SET TIME?".

4. Press XFER K again, at the exact second that real time equals the time keyed in in step 2. The clock will start counting from that point and the display will switch to the Operate mode.

The abbreviations for the days of the week and AM/PM are:

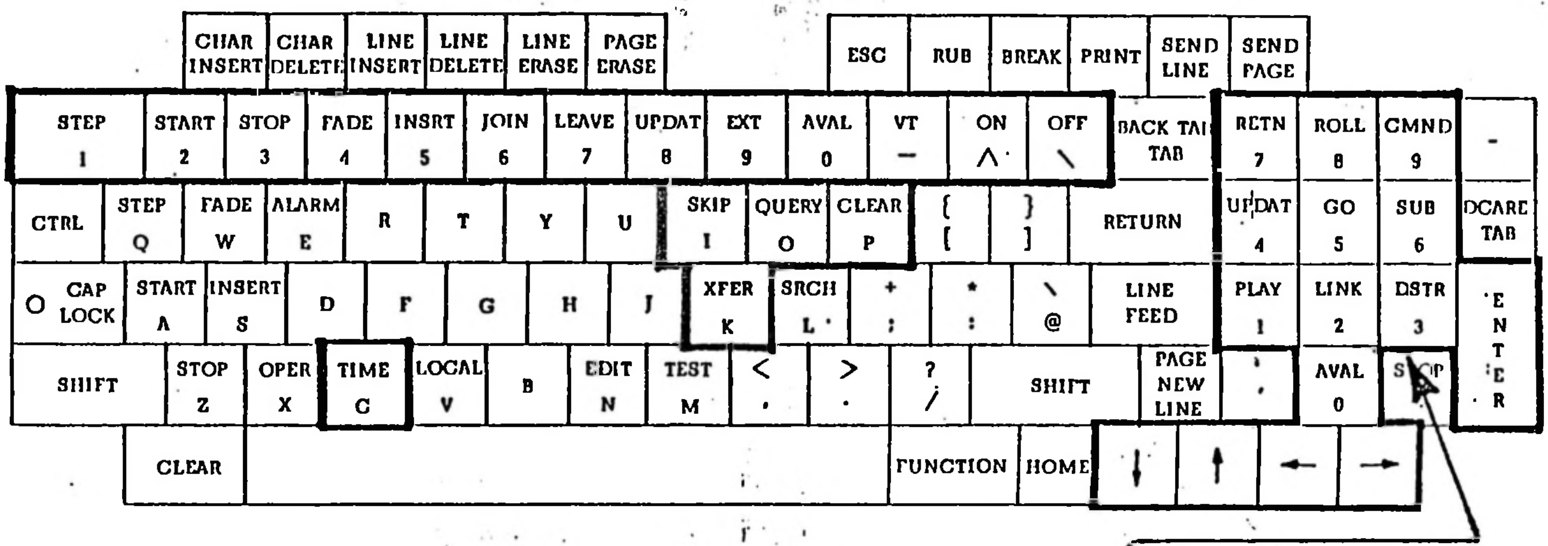
SUNDAY - SU
MONDAY - MO
TUESDAY - TU
WEDNESDAY - WE
THURSDAY - TH
FRIDAY - FR
SATURDAY - SA

AM - A
PM - P

3.7.3 TIME EDIT and FUNCTION KEYS - Some of the EDIT keys and all of the TIME EDIT keys are used in the Time Edit Mode. Their function is as follows:

3.7.3.1 EDIT keys:

XFER -	(Transfer) used to transfer new time into Real Time Clock (reference paragraph 3.7.2).
SKIP -	Used to clear Functions for all days and hours for minutes and seconds displayed in the "Programming Matrix". Curser must be in "Programming Matrix". Pressing once causes CRT to display "DELETE ENTRY?". Pressing again causes entry to be deleted. Press any key except "SKIP" to cancel Skip request.
QUERY -	When pressed, moves curser to "DAY" column to allow new day and time to be keyed in.
CLEAR -	When pressed, moves curser to "MO" (Monday) in the "Programming Matrix".
ENTER -	Pressing this key enters data into memory Note that Curser must be in "Programming Matrix" area of display.



NOTE: These keys used for numbers only. These functions do not apply in Time Edit mode. Time Function keys may also be used for number entries.

FIGURE 3-15   TIME EDIT & FUNCTION KEYS

Advances display by one time event. If curser is in Program Matrix section of display.

↑ - Backs up display by one time event if curser is in Program Matrix section of display.

3.7.3.2 TIME FUNCTION keys:

At Time Programmed:

STEP - Causes system to step to next event. If in STOP REQ mode, will step to full Stop condition.

START - Causes system to go to Start mode.

STOP - Places system in STOP REQ mode.

FADE - Fades audio on "AIR" source and steps to next event at end of fade. If in STOP REQ mode, will step to full Stop condition at end of fade.

INSRT - (Insert) Schedules source programmed in last memory location (shown just ahead of event 0000 in EDIT mode) as next event. Will not, however, usurp a LINK condition. Program resumes its normal order after inserted source airs.

JOIN - Starts dedicated pre-roll source off air and advances program to the next "UPD" (Update) source.

LEAVE - Checks to see if Network source is "on air". If so, steps to next event. If not, does nothing.

UPDAT - Causes program to advance to next source following next programmed "UPD" function.

EXT - Actuates External Function relay (1 of 8 as determined by number following EXT function) for 1 second. EXT 09 = Cassette Memory Load. EXT 10 = Cassette Memory List.

AVAL - Used to clear Function from "Programming Matrix".

VT - Starts the Voice Track deck "off air". The deck will roll until the right Channel 25Hz tone is sensed.

NOTE: The following keys are found at the lower right corner of the display.

OFF -	Deletes Day, Hour, AM or PM when programming in "Programming Matrix".
ON -	Schedules Day, Hour, AM or PM when programming in "Programming Matrix".
← -	Used to move Curser left one space each time pressed when Curser is in the "Programming Matrix" section of the display.
→ -	Used to move Curser right one space each time pressed when Curser is in the "Programming Matrix" section of the display.

3.7.4 ENTRY PROCEDURE - The following examples illustrate how to enter real time functions.

NOTE: Since some of the letters used in keying in the "day" share the same keys as some of the Functions, the "DAY?" request must not be on if it is desired to return to Operate mode. If it is "on," simply type in any day and then key in OPER.

EXAMPLE 1 - Time memory empty. First entry. Start function to occur Monday through Sunday at 06:00:00AM.

STEP	KEY IN	DISPLAY	
1	TIME C	□	<EDIT DAY?
2	TEST M QUERY O	MO □	<EDIT HOUR?
3	AVAL 0 SUB 6	MO 06: □	<EDIT MIN?
4	AVAL 0 AVAL 0	MO 06:00:□	<EDIT SEC?
5	AVAL 0 AVAL 0	MO 06:00:00 □	<EDIT A/P?

<table>
<tr><th>STEP</th><th>KEY IN</th><th>DISPLAY</th></tr>
<tr><td>6</td><td>START
A</td><td>MO 06:00:00A < EDIT</td></tr>
<tr><td colspan="3">At this time the Curser will move to the "Programming Matrix" at the top of the screen, positioning itself below the MO location in the day section.</td></tr>
<tr><td>7</td><td>ON
∧</td><td>MO TU WE TH FR SA SU
▯</td></tr>
<tr><td>8</td><td>ON
∧</td><td>MO TU WE TH FR SA SU
* * ▯</td></tr>
<tr><td colspan="3">Note: Continue keying in ON ∧ through Sunday (SU).</td></tr>
<tr><td>9</td><td colspan="2">Use → to move Curser below the "6"</td></tr>
<tr><td>10</td><td>ON
∧</td><td>1 2 3 4 5 6 7, etc.
* ▯</td></tr>
<tr><td>11</td><td colspan="2">Use → to move Curser below the "A"</td></tr>
<tr><td>12</td><td>ON
∧</td><td>11 A P
* ▯</td></tr>
</table>

NOTE: If a mistake is made (e.g. you moved the Curser past the "A" to "P"), use the "←" to move back one (1) space. Then press ON ∧ and continue programming.

EXAMPLE 2 - JOIN function to occur at XX:56:32 every hour every day.

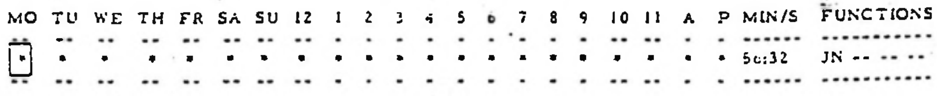
STEP	KEY IN	DISPLAY
1	Go to Time Edit Mode (Example 1, Step 1)	See Figure 3-16
2	QUERY O	☐ <EDIT DAY?
3	INSRT S U	SU ☐ <EDIT HOUR?
4	AVAL O PLAY 1	SU 01: ☐ <EDIT MINUTE?
5	GO 5 SUB 6	SU 01:56: ☐ <EDIT SECOND?
6	DSTR 3 LINK 2	SU 01:56:32 ☐ <EDIT A/P?
7	START A	SU 01:56:32 A <EDIT

NOTE: At this time the Curser will move to the "Programming Matrix" at the top of the screen.

STEP	KEY IN	DISPLAY
8	ON ^	MO TU WE TH FR SA SU *
9	Continue keying in ON ^ through the "P" so that display is as follows:	

```
MO  TU  WE  TH  FR  SA  SU  12  1  2  3  4  5  6  7  8  9  10  11  A  P  MIN/S  FUNCTIONS
--  --  --  --  --  --  --  --  -  -  -  -  -  -  -  -  -  --  --  -  -  -----  ----------
 •   •   •   •   •   •   •   •  •  •  •  •  •  •  •  •  •   •   •  •  •  56:32  ☐-- -- --
--  --  --  --  --  --  --  --  -  -  -  -  -  -  -  -  -  --  --  -  -  -----  ----------
```

STEP	KEY IN	DISPLAY
10	JOIN 6	FUNCTIONS JN -- -- --
11	ENTER	See Below



SA 11:56:32 PM
JN -- -- --
SU 12:56:32 AM
JN -- -- --
SU 01:56:32 AM
JN -- -- --
SU 02:56:32 AM EDIT
JN -- -- --
SU 03:56:32 AM
JN -- -- --
SU 04:56:32 AM
JN -- -- --
SU 05:56:32 AM
JN -- -- --

EVENTS AVAL - 0098

ADDITIONAL NOTES:

1. For external functions, it is necessary to key in which of ten functions is desired after keying in "EXT".

2. To delete all data in a time address, press QUERY O then key in desired address. Then press SKIP 1, followed by another SKIP 1. The display will show "DELETE ENTRY" when first "SKIP" is pressed.

3.7.5 PROGRAM EXAMPLES

3.7.5.1 UPDATING THE PROGRAM

UPDATING THE PROGRAM - Most formats are geared to 1/4 hour, 1/2 hour, or 1 hour resets to adjust the format to varying music lengths. The most basic approach to this type of programming is to over-program the music format and update to the next commercial cluster at fixed times (typically :13, :28, :43, and :58 minutes for 1/4 hour formats).

Figure 3-17 is an example of how a 1/4 hour format might be programmed. Note that UPD (UPDAT) flags are programmed as the first event in each 1/4 hour spot cluster (event 0100, 0107, etc., with the first source to play immediately following the UPD flags. Additionally observe that the schedule hour and minute can be programmed into the event containing the UPD instruction to identify the spot break when reviewing the program. Note also that the music subroutines which would be playing when the update instruction occur have a "pad" section created by the GO functions at events 0007 and 0017. The GO functions send the program to event 0050 which, in the example, will cause the system to alternate between Source 11 and 12 until the UPD function occurs sending the program to the main format. Note that if it were not desirable to just alternate between two sources, any number of sources could be programmed in the routine starting at event 0050. Note also

SUBROUTINE (MUSIC)

CONTENT	EVENT	FUNCTION	SOURCE	TRAY
MUSIC (11)	0000	PLAY	11	
MUSIC (12)	0001	PLAY	12	
	0002	*RTN		
MUSIC (13)	0003	PLAY	13	
V.T. (Outro)	0004	LINK	09	
MUSIC (Pad)	0005	PLAY	11	
MUSIC (Pad)	0006	PLAY	12	
	0007	*GO	00	50
V.T. (Intro)	0008	PLAY	08	
MUSIC (14)	0009	LINK	14	
MUSIC (11)	0010	PLAY	11	
	0011	*RTN		
MUSIC (12)	0012	PLAY	12	
MUSIC (13)	0013	PLAY	13	
V.T. (Outro)	0014	LINK	09	
MUSIC (Pad)	0015	PLAY	11	
MUSIC (Pad)	0016	PLAY	12	
	0017	*GO	00	50
MUSIC (Pad)	0050	PLAY	11	
MUSIC (Pad)	0051	PLAY	12	
"	0052	PLAY	11	
"	0053	PLAY	12	
"	0054	*RTN		

MAIN FORMAT (SPOTS)

TIME	CONTENT	EVENT	FUNCTION	SOURCE*	TRAY*
:58	UPDATE	0100	:UPD	XX	58
	LEGAL ID	0101	PLAY	01	01
		0102	*SUB	00	00
:08	SPOT	0103	PLAY	XX	XX
	SPOT	0104	PLAY	XX	XX
	SPOT (Aval)	0105	AVAL		
		0106	*SUB	00	03
:13	UPDATE	0107	:UPD	XX	13
	SPOT	0108	PLAY	XX	XX
	SPOT	0109	PLAY	XX	XX
		0110	*SUB	00	08
:21	SPOT	0111	PLAY	XX	XX
	SPOT	0112	PLAY	XX	XX
	JINGLE	0113	PLAY	02	01
		0114	*SUB	00	12
:28	UPDATE	0115	:UPD	XX	28
	STATION ID	0016	PLAY	01	02
	SPOT	0017	PLAY	XX	XX
		0018	*SUB	00	00

* XX = Typically changes from day to day

FIGURE 3-17 1/4 HOUR FORMAT EXAMPLE

that a RTN function must be scheduled at the end of the pad routine (event 0054).

The LINK functions at events 0004 , 0009, and 0014 insure that if they are scheduled NEXT, they will go "ON AIR" prior to the update. Additionally the Video Monitor would display "UPDATE HOLD". Thus the Voice Outros would not be USURPED, nor could the Voice Intro prior to source 14 air without source 14 following it. This is especially important if music in the "pad" routine is front or back announced.

If the updates are to occur each and every hour at the same time, program as in the following example:

```
MO  TU  WE  TH  FR  SA  SU  12  1  2  3  4  5  6  7  8  9  10  11  A  P  MIN/S   FUNCTIONS
--  --  --  --  --  --  --  --  -  -  -  -  -  -  -  -  -  --  --  -  -  ------  -----------
 .   .   .   .   .   .   .   .  .  .  .  .  .  .  .  .  .   .   .  .  .  13:00   UD -- -- --
--  --  --  --  --  --  --  --  -  -  -  -  -  -  -  -  -  --  --  -  -  ------  -----------
```

Note that any minute and second may be used. The above are simply examples.

3.7.5.2 JOINING AND LEAVING A NETWORK OR LIVE STUDIO (DEAD ROLL METHOD) -

The following is typical of a normal network format using a deal roll (pre-roll) source:

- Dead Roll source.
- Legal ID.
- Network.
- Jingle.
- Go to Subroutine.

The dead roll source would have music selections of a precise length (should be longer than any music normally found in the music format). The designated dead roll source (designated by switch U27 on the Universal Source board), starts at the precise time that the JOIN function occurs. Additionally the system updates to the next UPD source. Thus the network format would be programmed as shown in the following example:

CONTENT	EVENT	FUNCTION	SOURCE	TRAY
UPDATE	0553	:UPD	XX	58
DEAD ROLL (4:00)	0554	PLAY	16	
LEGAL ID (:05)	0555	PLAY	01	01
NET	0556	PLAY	10	
JINGLE	0557	PLAY	06	
	0558	*SUB	00	25

Thus if the dead roll music length is 4.0 minutes and the ID is :05 seconds, the JOIN function should occur at XX:55:55 to bring the network in at XX:00:00. This starts the dead roll source and schedules it next. At the end of the current "on air" source, the dead roll source fades "on". It is followed by the legal ID and then the Network. At the precise time the Network is to end (e.g. 5 minutes past the hour), a LEAVE function would be executed advancing the program to the Jingle and then on to the subroutine starting at event 0025. The Network can, of course, be followed by anything including a SUB (go to subroutine) function.

The Time memory would contain the following entries if the JOIN and LEAVE are to occur each hour:

```
MO TU WE TH FR SA SU 12 1 2 3 4 5 6 7 8 9 10 11 A P MIN/S  FUNCTIONS
-- -- -- -- -- -- -- -- - - - - - - - - - -- -- - - -----  ----------
 •  •  •  •  •  •  •  • • • • • • • • • •  •  • • • 55:55  JN -- -- --
-- -- -- -- -- -- -- -- - - - - - - - - - -- -- - - -----  ----------

MO TU WE TH FR SA SU 12 1 2 3 4 5 6 7 8 9 10 11 A P MIN/S  FUNCTIONS
-- -- -- -- -- -- -- -- - - - - - - - - - -- -- - - -----  ----------
 •  •  •  •  •  •  •  • • • • • • • • • •  •  • • • 05:00  LV -- -- --
-- -- -- -- -- -- -- -- - - - - - - - - - -- -- - - -----  ----------
```

If it is desired to block out certain hours from joining the network, the OFF and ON functions may be used. For example, assume no network join is to schedule between the hours of 12PM to 3PM. It would be necessary to schedule a JOIN for all AM hours, except 11AM and a JOIN for all PM hours except 12 through 2 (no Join for 11:55:55AM through 02:55:55 PM) as follows:

```
MO TU WE TH FR SA SU 12 1 2 3 4 5 6 7 8 9 10 11 A P MIN/S  FUNCTIONS
-- -- -- -- -- -- -- -- - - - - - - - - - -- -- - - ------ -----------
•  •  •  •  •  •  •  •  • • • • • • • • • •     •   55:55  JN -- -- --
-- -- -- -- -- -- -- -- - - - - - - - - - -- -- - - ------ -----------
```

```
MO TU WE TH FR SA SU 12 1 2 3 4 5 6 7 8 9 10 11 A P MIN/S  FUNCTIONS
-- -- -- -- -- -- -- -- - - - - - - - - - -- -- - - ------ -----------
•  •  •  •  •  •  •         • • • • • • • •  •    • 55:55  JN -- -- --
-- -- -- -- -- -- -- -- - - - - - - - - - -- -- - - ------ -----------
```

Note that the LEAVE (LV) function could be programmed for all hours since it only executes a STEP NOW function if the NETWORK SOURCE is on the air.

ADDING COMMERCIALS to the network format is simply a matter of adding them to the format and adding a STEP function to the Time memory at the appropriate time. For example the format might be changed as follows:

CONTENT	EVENT	FUNCTION	SOURCE	TRAY
UPDATE	0553	:UPD	XX	58
DEAD ROLL (4:00)	0554	PLAY	16	
LEGAL ID (:05)	0555	PLAY	01	01
NET	0556	PLAY	10	
SPOT (:30)	0557	PLAY	01	36
SPOT (:30)	0558	PLAY	02	05
NET	0559	PLAY	10	
JINGLE	0560	PLAY	06	
	0561	*SUB	00	25

If the first spot was to air at XX:02:00, the Time memory would contain the following (assumes spots are programmed all days and all hours):

MO	TU	WE	TH	FR	SA	SU	12	1	2	3	4	5	6	7	8	9	10	11	A	P	MIN/S	FUNCTIONS
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	02:00	SN -- -- --

3.7.5.3 JOINING AND LEAVING NETWORK OR LIVE STUDIO (FADE TO NET METHOD) - The format and Time entries for Fading to Network are the same as for joining by the pre-roll method (paragraph 3.7.5.2) except that instead of the JOIN instruction a FADE instruction would be used and the first format event would be an ID rather than a pre-roll source. Read paragraph 3.7.5.2 for further clarification. Thus the format would appear as follows for the example with spots:

CONTENT	EVENT	FUNCTION	SOURCE	TRAY
UPDATE	0553	:UPD	XX	58
LEGAL ID (:05)	0554	PLAY	01	01
NET	0555	PLAY	10	
SPOT (:30)	0556	PLAY	01	36
SPOT (:30)	0557	PLAY	02	05
NET	0558	PLAY	10	
JINGLE	0559	PLAY	06	
	0560	*SUB	00	25

Since the ID runs :05 seconds and since the FADE will be about :03 seconds, the FADE function should occur at - - :59:52 if the net is to air at the top of the hour. It is also necessary to schedule an UPDAT to get the program to schedule the ID next. Thus the time entries would appear as follows:

MO	TU	WE	TH	FR	SA	SU	12	1	2	3	4	5	6	7	8	9	10	11	A	P	MIN/S	FUNCTIONS
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	59:52	UD FD ----

If it is not desired to execute the functions every day and every hour, it is necessary to program the specific days and hours for AM and then after entering that data, query a PM time and enter the specific days and hours for the PM hours.

3.7.5.4 SIGN ON - The only things required to sign on properly are to insure that the "next" pointer is at the correct event and to schedule a START function at the correct time. The most logical way to schedule the "sign on" source is to schedule it following the sign off STOP function. For example:

CONTENT	EVENT	FUNCTION	SOURCE	TRAY
UPDATE	0501	:UPD	12	59
"SIGN OFF" CART	0502	PLAY	01	47
	0503	STOP		
"SIGN ON" CART	0504	PLAY	01	01
GO TO MUSIC	0505	*SUB	00	01

The Time memory would contain a START at, for example, 06:00:00 AM for each day of the week.

MO	TU	WE	TH	FR	SA	SU	12	1	2	3	4	5	6	7	8	9	10	11	A	P	MIN/S	FUNCTIONS
●	●	●	●	●	●	●							●						●		00:00	ST -- -- --

3.7.5.5 SIGN OFF - The simplest way to Sign Off is to update to the sign off source just prior to sign off time. It should be re-emphasized at this point that it is mandatory that memory event blocks be assigned to a specific "day" and "time" (or spot break, news cluster, etc.) in order to know where to schedule the sign off source. A format STOP function would be programmed just following the "sign off" source as follows:

CONTENT	EVENT	FUNCTION	SOURCE	TRAY
UPDATE	0501	:UPD	12	59
"SIGN OFF" CART	0502	PLAY	01	47
	0503	STOP		
"SIGN ON" CART	0504	PLAY	01	01

If sign off was to occur at about 01:00:00AM, the Time memory would contain an UPDAT function just before 1AM.

MO	TU	WE	TH	FR	SA	SU	12	1	2	3	4	5	6	7	8	9	10	11	A	P	MIN/S	FUNCTIONS
•	•	•	•	•	•	•	•												•		59:00	UD -- -- --

Thus the current "on air" source would finish, the "sign off" cart would air, and the system would go to a STOP condition with the "sign on" cart scheduled "next".

If "sign off" must occur no later than a specified time (such as a daytimer that must be off the air by 6:00:00 PM), the "sign off" cluster can be treated like a Network cluster to be joined using a dead-roll source or by fading out the "on air" source as the appropriate time. For example, assume the "sign off" cart runs :30 seconds and sign off must end at 06:00:00 PM. The dead-roll format and time might be scheduled as follows:

FORMAT

CONTENT	EVENT	FUNCTION	SOURCE	TRAY
UPDATE	0501	:UPD	55	30
DEAD-ROLL (4:00)	0502	PLAY	16	
SIGN OFF (:30)	0503	PLAY	01	47
	0504	STOP		
SIGN ON	0505	PLAY	01	01

TIME

MO	TU	WE	TH	FR	SA	SU	12	1	2	3	4	5	6	7	8	9	10	11	A	P	MIN/S	FUNCTIONS
•	•	•	•	•	•	•						•								•	55:30	JN -- -- --

Thus at 05:55:30 PM the dead-roll source would start and the program would update to event 0502. At the completion of the "on air" source, the dead-roll source would fade on, finish, and step to the "sign off" cart at exactly 05:59:30. The "sign off" cart would end at exactly 06:00:00 PM and the system would go to a full STOP condition.

To fade to the "sign off" source. the program would be changed as follows:

FORMAT

CONTENT	EVENT	FUNCTION	SOURCE	TRAY
UPDATE	0501	:UPD	59	27
SIGN OFF (:30)	0502	PLAY	01	47
	0503	STOP		
SIGN ON	0504	PLAY	01	01

TIME

```
MO  TU  WE  TH  FR  SA  SU  12  1  2  3  4  5  6  7  8  9  10  11  A  P  MIN/S   FUNCTIONS
--  --  --  --  --  --  --  --  -  -  -  -  -  -  -  -  -  --  --  -  -  ------  ----------
 *   *   *   *   *   *   *                  *                          *  59:27   UD FD -- --
--  --  --  --  --  --  --  --  -  -  -  -  -  -  -  -  -  --  --  -  -  ------  ----------
```

Thus at 05:59:27 the program would update to event 0502, and begin to FADE the "on air" source. Assuming the fade delay is set to 3 seconds, the system would step to the "sign off" cart at exactly 05:59:30 allowing it to end at exactly 06:00:00 PM.

3.7.5.6 EXTERNAL FUNCTIONS - There are eight (8) external functions available which, when activated by a time instruction, actuate a relay on the Parallel I/O board assigned to the function number for 1 second. Functions 1 through 8 are assigned by the user while functions 9 and 10 are dedicated to the memory load and dump feature. Thus to program function 1 on Monday through Friday at 06:15:30 PM, simply key in:

MO 06: 15: 30 P

and then set up the "Programming Matrix" as follows:

MO	TU	WE	TH	FR	SA	SU	12	1	2	3	4	5	6	7	8	9	10	11	A	P	MIN/S	FUNCTIONS
●	●	●	●	●									●							●	15:30	EX 01 -- --

Refer to paragraph 2.4.4 in the INSTALLATION section for details on connecting Remote functions.

3.7.5.7 REAL TIME INSERTS - An audio source scheduled at the last memory location can be injected into the normal program by scheduling an INSRT (IN) at desired times. This function may be used to randomly add a "variation factor" to the normal music format. If the system is in a LINK condition, the linked sources must air before the "insert" can occur.

3.8 EXTERNAL TIME CLOCK FUNCTIONS

3.8.1 GENERAL

3.8.1 GENERAL - A remote time clock can be tied to the system which allows the following functions to occur by Real Time:

UPDATE -	Allows program to update to a predetermined event number. Used to periodically reset the format to create quarter hour, half hour, etc., format blocks. See program examples which follow for further clarification.
JOIN -	Used to join a network by means of a DEAD ROLL source. When the JOIN command occurs, the dedicated DEAD ROLL source starts and the system updates to the event following the next UPDAT (UPD) flag which would contain the Dead-Roll source.
LEAVE -	May be used to leave the network. When activated, the system checks to see if the network source is still on the air. If it is, the system steps on to the next event. If it is not, nothing occurs.
INSERT -	Used to cause the "insert" source scheduled at the last event number (shown just ahead of event 0000 in EDIT mode) to schedule NEXT. If the program is in a LINK condition, the insert must wait until all linked events in the cluster are played.

Figure 2-9 in the INSTALLATION section of this manual illustrates how to connect the remote time functions to the system.

3.8.2 PROGRAM EXAMPLES

3.8.2.1 UPDATING THE FORMAT - Most formats are geared to 1/4Hr, 1/2Hr, or 1Hr resets to adjust the format to varying music lengths. The most basic approach to this type of programming is to over program the music format and update to the next commercial cluster at fixed times (typically :13, :28, :43, and :58 minutes for 1/4Hr. formats).

Figure 3-18 is an example of how a 1/4 hour format might be programmed. Note that UPD (UPDAT) flags are programmed at the first event in each 1/4 hour spot cluster (event 0100, 0107, etc.) with the first source to play immediately following the UPD flag. Additionally observe that the schedule hour and minute can be programmed into the event containing the UPD instruction to identify the spot break when reviewing the program. Note also that the music subroutines which would be playing when the update instructions occur have a "pad" section created by the GO functions at events 0007 and 0017. The GO functions send the program to event 0050 which, in the example, will cause the system to alternate between source 11 and 12 until the UPD function occurs sending the program to the main format. Note that if it were not desirable to just alternate between two sources, any number of sources could be programmed in the routine starting at event 0050. Note also that a RTN function must be scheduled at the end of pad routine (event 0054).

The LINK functions at events 0004, 0009, and 0014, insure that if they are scheduled NEXT, they will go "ON AIR" prior to the update. Additionally the Video Monitor would display "UPDATE HOLD". Thus the voice outros would not be usurped, nor could the voice intro prior to source 14 air without source 14 following it. This is especially important if music in the pad routine is front or back announced.

3.8.2.2 JOINING AND LEAVING A NETWORK OR LIVE STUDIO (DEAD ROLL METHOD) - The following is typical of a normal network FORMAT, using a dead roll (pre-roll) source.

- Dead Roll Source
- Legal ID
- Network
- Jingle
- Go To Subroutine

SUBROUTINE (MUSIC)

Content	Event #	Function	Source	Tray
MUSIC (11)	0000	PLAY	11	
MUSIC (12)	0001	PLAY	12	
	0002	*RTN		
MUSIC (13)	0003	PLAY	13	
V.T. (Outro)	0004	LINK	09	
MUSIC (Pad)	0005	PLAY	11	
MUSIC (Pad)	0006	PLAY	12	
	0007	*GO	00	50
V.T. (Intro)	0008	PLAY	08	
MUSIC (14)	0009	LINK	14	
MUSIC (11)	0010	PLAY	11	
	0011	*RTN		
MUSIC (12)	0012	PLAY	12	
MUSIC (13)	0013	PLAY	13	
V.T. (Outro)	0014	LINK	09	
MUSIC (Pad)	0015	PLAY	11	
MUSIC)Pad)	0016	PLAY	12	
	0017	*GO	00	50
MUSIC (Pad)	0050	PLAY	11	
"	0051	PLAY	12	
"	0052	PLAY	11	
"	0053	PLAY	12	
"	0054	*RTN		

MAIN FORMAT (SPOTS)

Time	Content	Event #	Function	Source	Tray
.58	UPDATE	0100	:UPD	08	58
	LEGAL ID	0101	PLAY	01	01
		0102	*SUB	00	00
:08	SPOT	0103	PLAY	XX	XX
	SPOT	0104	PLAY	XX	XX
	SPOT (Aval)	0105	AVAL		
		0106	*SUB	00	03
:13	UPDATE	0107	:UPD	09	13
	SPOT	0108	PLAY	XX	XX
	SPOT	0109	PLAY	XX	XX
		0110	*SUB	00	08
:21	SPOT	0111	PLAY	XX	XX
	SPOT	0112	PLAY	XX	XX
	JINGLE	0113	PLAY	02	01
		0114	*SUB	00	12
:28	UPDATE	0115	: UPD	09	28
	STATION ID	0016	PLAY	01	02
	SPOT	0017	PLAY	XX	XX
		0018	*SUB	00	00

NOTE: XX = Typically changes from day to day.

FIGURE 3-18 1/4 HOUR FORMAT EXAMPLE

The Dead-Roll source would have music selections of a precise length (should be longer than any music normally found in the music format). The designated Dead-Roll source (designated by switch U27 on the Universal Source board) starts at the precise time that the Join function occurs. Additionally the system updates to the next UPD source. Thus the network format would be programmed as shown in the following example:

Content	Event	Function	Source	Trav
Update	0553	:UPD	XX	58
Dead-Roll (4:00)	0554	PLAY	16	
Legal ID (:05)	0555	PLAY	01	01
Net	0556	PLAY	10	
Jingle	0557	PLAY	06	
	0558	*SUB	00	25

Thus if the Dead-Roll music length is 4.0 minutes and the ID is :05 seconds, the Join function should occur at XX:55:55 to bring the network in at XX:00:00. This starts the Dead-Roll source and schedules it next. At the end of the current "on air" source, the Dead-Roll source fades "on". It is followed by the legal ID and then the network. At the precise time the network is to end, a LEAVE function would be executed by the Remote Time Clock advancing the program to the Jingle and then on to the subroutine starting at event 0025. The network can, of course, be followed by anything including a SUB (go to subroutine) function.

3.8.2.3 JOINING AND LEAVING NETWORK OR LIVE STUDIO (FADE TO NET METHOD).

The format to fade to network would begin with a "fade" command (0020) followed by an UPD function and then the first event in the network sequence as shown in the following example:

Content	Event	Function	Source	Tray
"Fade" Command	0053	+CMD	00	20
Update	0554	:UPD	XX **	58
Legal ID (:05)	0555	PLAY	01	01
Net	0556	PLAY	10	
	0557	PLAY	06	
	0558	*SUB	00	25

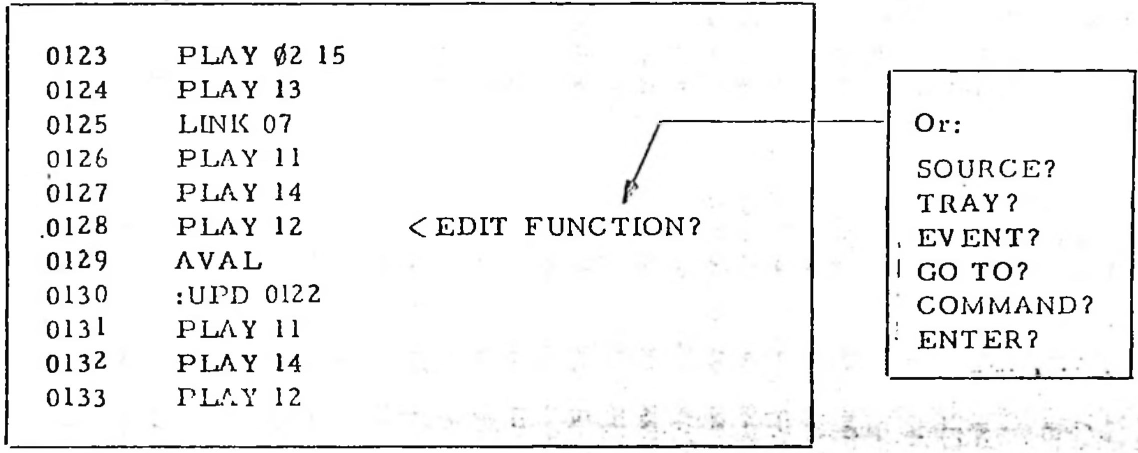
**XX = Correct Hour

To execute the fade to network, an Update from the Remote Time Clock function needs to occur approximately 8 seconds prior to the time the network starts (3 seconds for the fade and 5 seconds for the ID). As the system scans past event 0553 the "fade" command is executed. The system stops at event 0555 (since it follows the UPD function) and schedules the ID (01 01) next. At the end of the fade time out, the ID would air followed by the network. At the precise time the network is to end, a LEAVE function would be executed by the Remote Time Clock advancing the program to the Jingle and then to the subroutine starting at event 0025. The network can, of course, be followed by anything including a SUB (go to subroutine) function.

3.8.2.4 REAL TIME INSERT - If a Remote Time Clock INSERT instruction is executed, the system will insert the source programmed at the last event number (shown just ahead of event 0000 in EDIT mode) as the NEXT event. If the system is in a LINK condition, the linked sources must air before the "insert" can occur.

3.9 VIDEO MONITOR FORMAT - Figures 3-19 through 3-22 illustrate the format, range of information, and purpose of each section of the Video display for:

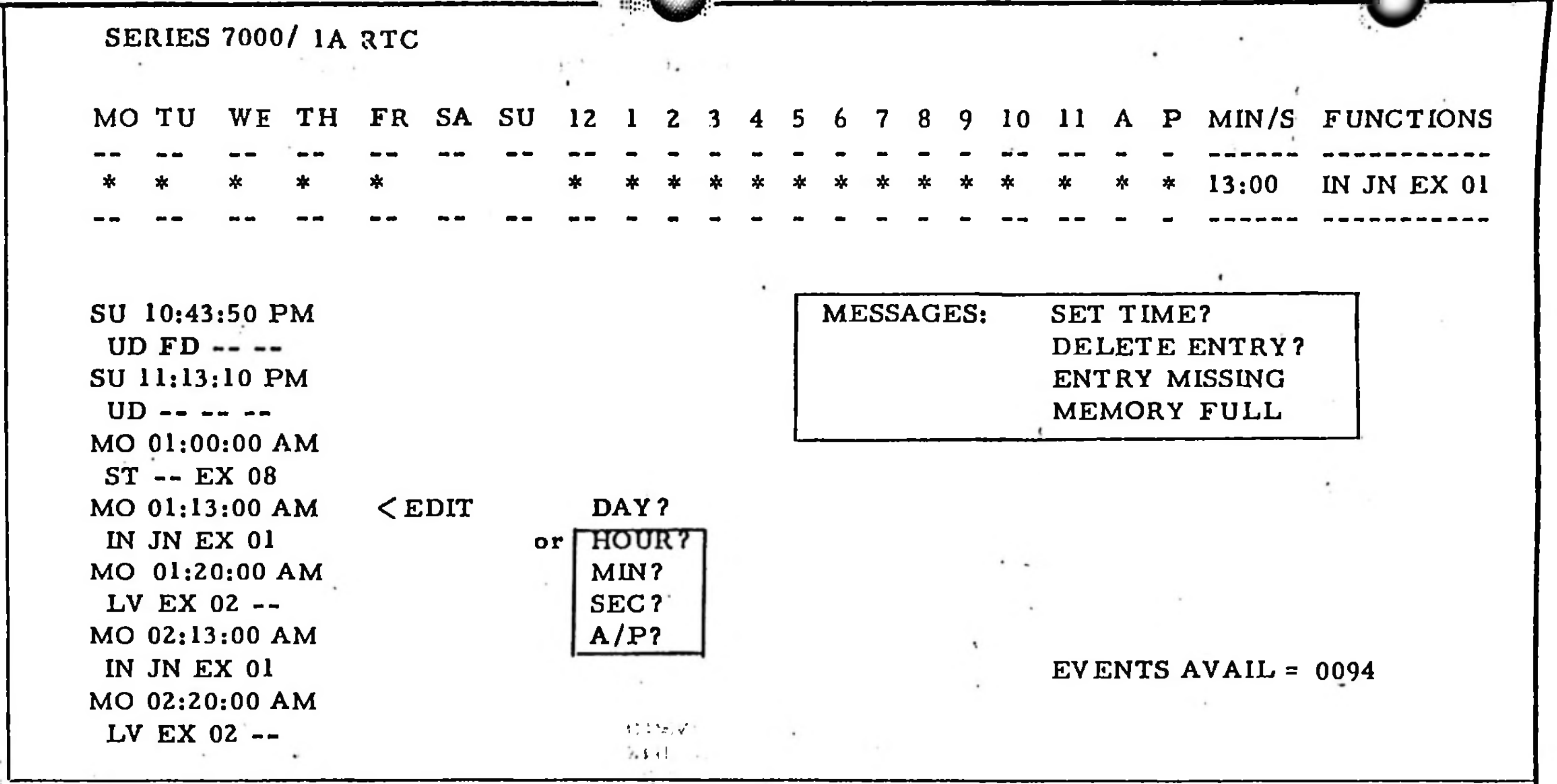
- Edit Mode
- Time Edit Mode
- Operate Mode (no Time Functions)
- Operate Mode (with Time Functions)



```
0123      PLAY 02 15
0124      PLAY 13
0125      LINK 07
0126      PLAY 11
0127      PLAY 14
0128      PLAY 12          <EDIT FUNCTION?
0129      AVAL
0130      :UPD 0122
0131      PLAY 11
0132      PLAY 14
0133      PLAY 12
```

```
Or:
SOURCE?
TRAY?
EVENT?
GO TO?
COMMAND?
ENTER?
```

FIGURE 3-19 EDIT DISPLAY

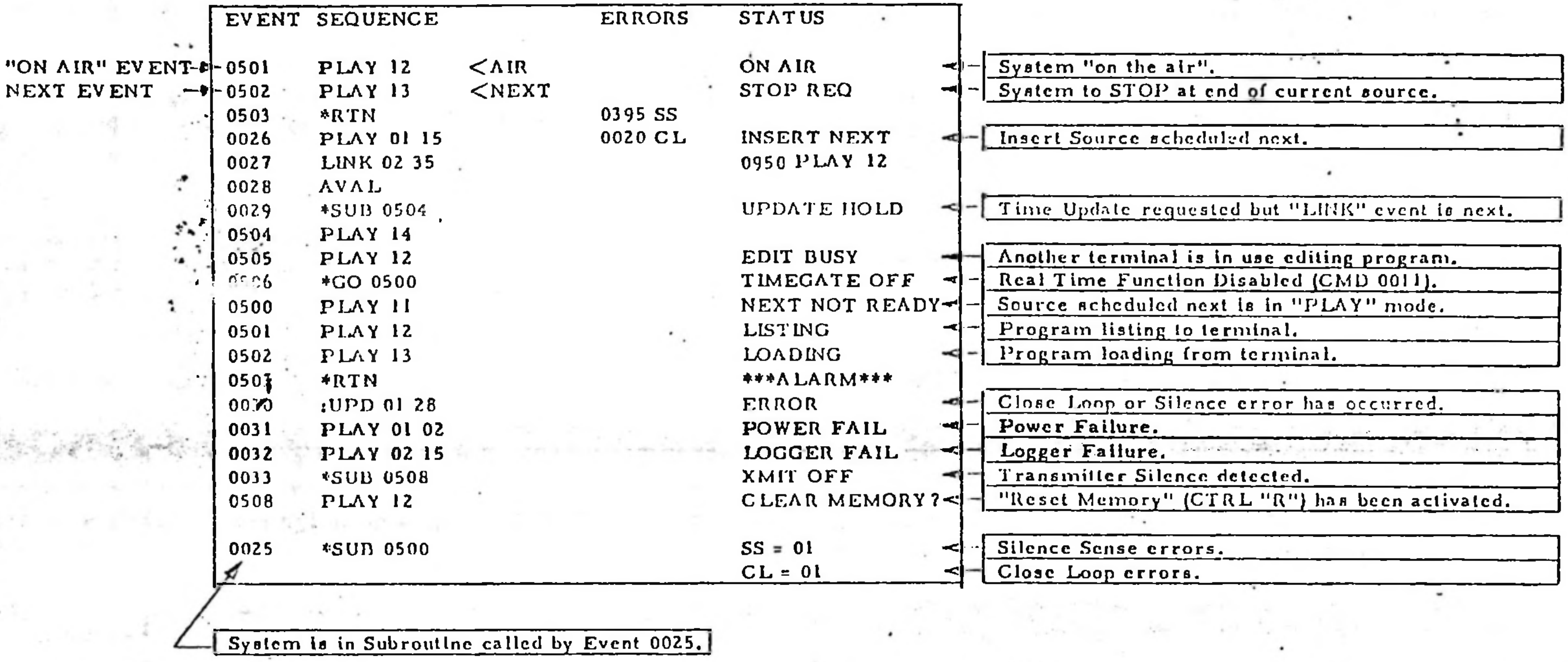


```
SERIES 7000/ 1A RTC

MO TU  WE  TH  FR  SA  SU  12 1 2 3 4 5 6 7 8 9 10 11 A P MIN/S  FUNCTIONS
-- --  --  --  --  --  --  -- - - - - - - - - - -- -- - - ------ -----------
 *  *   *   *   *          *  * * * * * * * * *  *  * * * 13:00  IN JN EX 01
-- --  --  --  --  --  --  -- - - - - - - - - - -- -- - - ------ -----------

SU 10:43:50 PM                                   MESSAGES:  SET TIME?
 UD FD -- --                                                DELETE ENTRY?
SU 11:13:10 PM                                              ENTRY MISSING
 UD -- -- --                                                MEMORY FULL
MO 01:00:00 AM
 ST -- EX 08
MO 01:13:00 AM   <EDIT      DAY?
 IN JN EX 01             or HOUR?
MO 01:20:00 AM              MIN?
 LV EX 02 --                SEC?
MO 02:13:00 AM              A/P?
 IN JN EX 01                                        EVENTS AVAIL = 0094
MO 02:20:00 AM
 LV EX 02 --
```

FIGURE 3-20 TIME EDIT DISPLAY



```
EVENT  SEQUENCE                  ERRORS     STATUS

0501   PLAY 12      <AIR                    ON AIR
0502   PLAY 13      <NEXT                   STOP REQ
0503   *RTN                      0395 SS
0026   PLAY 01 15                0020 CL    INSERT NEXT
0027   LINK 02 35                           0950 PLAY 12
0028   AVAL
0029   *SUB 0504                            UPDATE HOLD
0504   PLAY 14
0505   PLAY 12                              EDIT BUSY
0506   *GO 0500                             TIMEGATE OFF
0500   PLAY 11                              NEXT NOT READY
0501   PLAY 12                              LISTING
0502   PLAY 13                              LOADING
0503   *RTN                                 ***ALARM***
0030   ;UPD 01 28                           ERROR
0031   PLAY 01 02                           POWER FAIL
0032   PLAY 02 15                           LOGGER FAIL
0033   *SUB 0508                            XMIT OFF
0508   PLAY 12                              CLEAR MEMORY?

0025   *SUB 0500                            SS = 01
                                            CL = 01
```

System "on the air".

System to STOP at end of current source.

Insert Source scheduled next.

Time Update requested but "LINK" event is next.

Another terminal is in use editing program.

Real Time Function Disabled (CMD 0011).

Source scheduled next is in "PLAY" mode.

Program listing to terminal.

Program loading from terminal.

Close Loop or Silence error has occurred.

Power Failure.

Logger Failure.

Transmitter Silence detected.

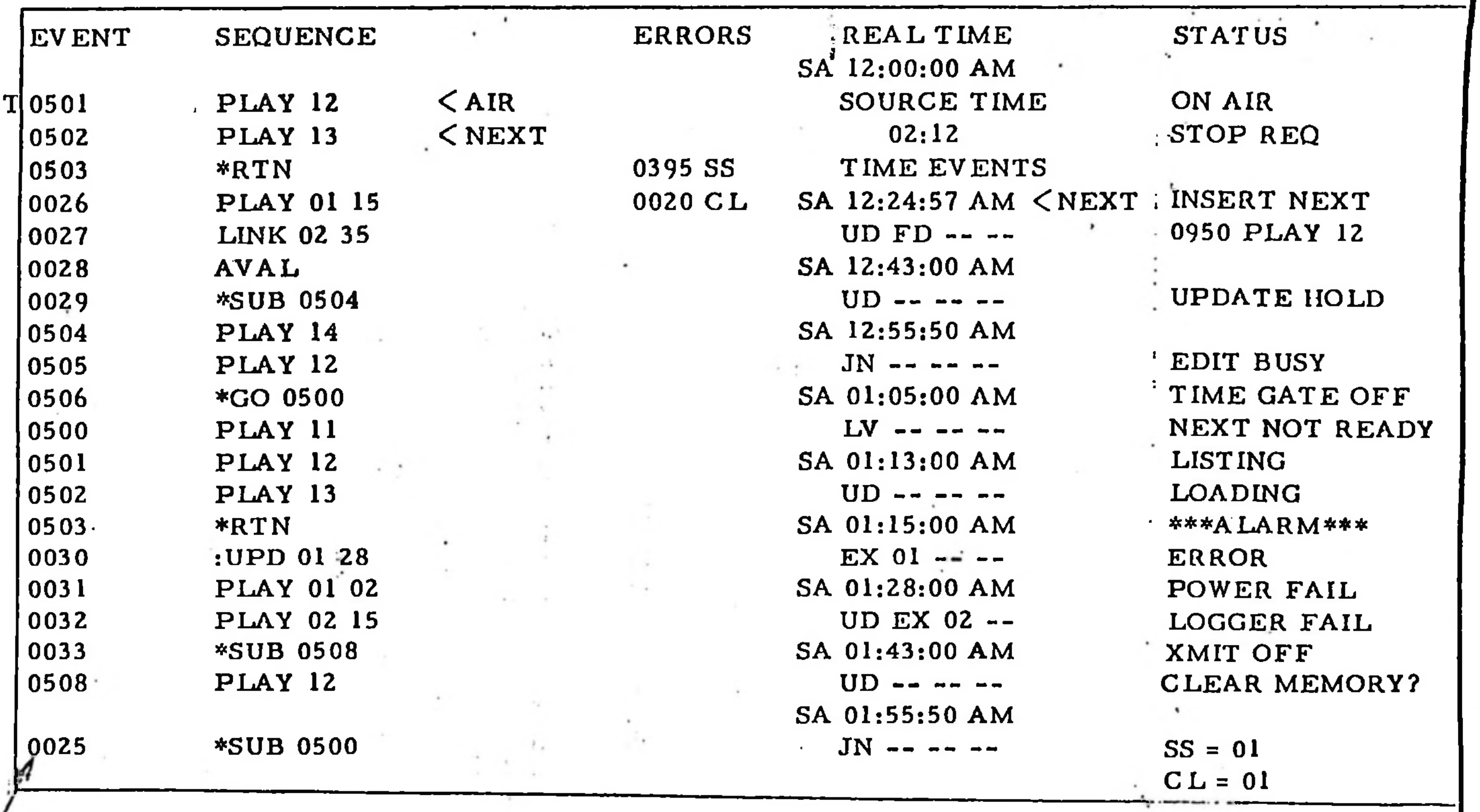
"Reset Memory" (CTRL "R") has been activated.

Silence Sense errors.

Close Loop errors.

System is in Subroutine called by Event 0025.

FIGURE 3-21 OPERATE DISPLAY (NO TIME FUNCTIONS)



```
EVENT    SEQUENCE               ERRORS    REAL TIME                STATUS
                                       SA 12:00:00 AM
0501     PLAY 12      <AIR                SOURCE TIME              ON AIR
0502     PLAY 13      <NEXT                  02:12                 STOP REQ
0503     *RTN                   0395 SS   TIME EVENTS
0026     PLAY 01 15             0020 CL SA 12:24:57 AM <NEXT       INSERT NEXT
0027     LINK 02 35                       UD FD -- --              0950 PLAY 12
0028     AVAL                           SA 12:43:00 AM
0029     *SUB 0504                        UD -- -- --              UPDATE HOLD
0504     PLAY 14                        SA 12:55:50 AM
0505     PLAY 12                          JN -- -- --              EDIT BUSY
0506     *GO 0500                       SA 01:05:00 AM             TIME GATE OFF
0500     PLAY 11                          LV -- -- --              NEXT NOT READY
0501     PLAY 12                        SA 01:13:00 AM             LISTING
0502     PLAY 13                          UD -- -- --              LOADING
0503     *RTN                           SA 01:15:00 AM             ***ALARM***
0030     :UPD 01 28                       EX 01 -- --              ERROR
0031     PLAY 01 02                     SA 01:28:00 AM             POWER FAIL
0032     PLAY 02 15                       UD EX 02 --              LOGGER FAIL
0033     *SUB 0508                      SA 01:43:00 AM             XMIT OFF
0508     PLAY 12                          UD -- -- --              CLEAR MEMORY?
                                        SA 01:55:50 AM
0025     *SUB 0500                        JN -- -- --              SS = 01
                                                                   CL = 01
```

"ON AIR" EVENT

NEXT EVENT

System is in Subroutine called by Event 0025.

FIGURE 3-22 OPERATE DISPLAY (WITH TIME FUNCTIONS)

3.10 ENCODE RECORD PROCEDURE

3.10.1 CRT SETUP

3.10.1.1 ON REAR OF CRT

a. BAUD to "5".

b. CABLE to "MODEM".

c. POWER to ON.

3.10.1.2 FRONT OF CRT

a. CAP LOCK to ON.

NOTE: With CAP LOCK set to ON, all letters will be in Upper Case. To print Lower Case letters, set CAP LOCK to OFF.

3.10.2 PREPARING MESSAGE FOR ENCODING

a. Place Encode Center mode select switch to PLAY ONLY.

b. Erase CRT by pressing SHIFT and CLEAR simultaneously.

c. Type desired message (up to 45 characters including spaces).

d. Press RETURN.

e. Press LINE FEED.

NOTES:

1. If more than 45 characters are required, type an * somewhere in the first line. This will defeat the RETURN lockout in the VEL software which does not allow further logging after a RETURN is sensed.

2. In determining message length, note that the encoding is not sent to the cart for approximately 2.5 seconds, and then data is transmitted at a rate as established by the BAUD rate as follows:

BAUD	CHARACTERS PER SECOND
110	10
300*	27

* Normal rate for 7000 Encode Centers

3.10.3 ENCODING A CARTRIDGE

a. Place curser at beginning of line following last line of message. (It is suggested to use HOME key followed by ↓ key as required.)

b. Place Encode Center mode select switch to RECORD & CRT VERIFY PLAY.
c. Place Cartridge to be encoded in recorder.
d. If audio is to be recorded simultaneously with Encoding, press RECORD switch on recorder.
e. Press Recorder START switch. After approximately 2.5 seconds, the Curser should jump to the beginning of the message and start scanning the message, coming to rest at the beginning of the line following the last line of the message.

3.10.4 VERIFYING THE ENCODING

a. Place the Encode Center mode select switch to PLAY ONLY.
b. Erase the CRT by pressing SHIFT and CLEAR keys simultaneously.
c. Place cartridge in recorder.
d. Press recorder START switch. After approximately 2.5 seconds, the message should begin printing on the CRT (assuming cart was cued properly).

3.11 DUMP AND LOAD PROCEDURE

3.11.1 GENERAL REQUIREMENTS - Dumping to hard copy or tape and loading from tape (TTY punch tape or digital cassette tape) is done by means of a Serial I/O board. Thus the peripheral device used to receive the dump or to load the system memory must be an RS232 or 20ma loop device. Additionally, the Serial I/O switches and jumpers must be correctly set for the peripheral device and U12 switches 1 through 4 must be set up for the Load/Dump Terminal (reference Section 6.0 of this manual).

3.11.2 DUMP PROCEDURE -

a. Start the recording device.

b. On the main Control Video Terminal, simultaneously press the "CTRL" and "D" keys. This starts a dump of the entire memory to the recording device.

c. If it is desired to abort the dump, press "ESC" on the main Control Video Terminal.

3.11.3 LOAD PROCEDURE

a. Prepare the loading device so that data is ready to be sent as soon as the device is started.

b. On the main Control Video Terminal, simultaneously press "CTRL" and "F".

c. Start the loading device. Note that if data is not sent within 5 seconds, the system will abort the Load mode. Additionally, if for any reason there is a 2 second gap in data, the Load mode will be aborted.

d. If it is desired to abort the Load mode, press "ESC" on the main Control Video Terminal.

3.12 EMERGENY "MANUAL OVERRIDE" MODE

3.12.1 GENERAL - In the event of a failure which results in the loss of ability for the system to properly schedule Audio Sources, a MANUAL OVERRIDE mode may be used to allow Audio Sources to be started and placed "ON THE AIR" manually. The following describes the steps to get into MANUAL OVERRIDE mode, and the operating procedures.

3.12.2 SETTING THE SYSTEM IN MANUAL OVERRIDE MODE

a. Open the Monitor Panel at the top of the Control Rack.
b. Set /AUTO/MAN switch on the Audio Control board (located at far left of rack) to MAN (see Figure 3-23).

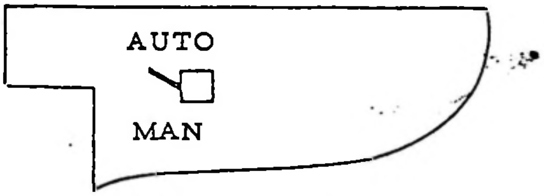


FIGURE 3-23

3.12.3 OPERATING PROCEDURES

a. Set the SOURCE select switch on the Monitor Panel to the "TYPE" of source to be placed on the air as follows:

CUE - All normal sources (those which do not fit the following categories)
TIME - Audio Clock
NETWORK - Network or Studio Sources
AUX 1 - Source connected to AUX 1 input
AUX 2 - Source connected to AUX 2 input

b. Manually start the desired source. Note that the source will stop itself in the normal manner.
c. Continue to start new sources as each source comes to an end of each selection. Note that if a new source "TYPE" is to be aired, the SOURCE select switch on the Monitor Panel must be set to the correct position before that source will go "ON THE AIR".

3.12.4 ADDITIONAL NOTES

a. Do not audition sources while in MANUAL OVERRIDE mode, as they will be placed "ON THE AIR".
b. Silence Sense is not active in this mode.

c. In Manual mode, the Video Terminal is placed in a "TEST" mode which disables the normal EDIT interl tests (Valid Source, Tray, adjacent tray, does Source require tray data, etc.). See Section 7.0 Addendum for more details.

3.12.5 RETURN TO AUTO MODE - Place the AUTO/MAN switch (see Figure 3-23) to AUTO to return to normal automation control.

NEXT ASSY	USED ON	REVISIONS			
		REV.	DESCRIPTION	DATE	APPR.

5.0 THEORY OF OPERATION

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THEORY OF
OPERATION

DWN. Ralph Smith	DATE 10/21/78
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PROJ. ENG.	
APPR.	

Cetec Broadcast Group

Cetec Corporation
1110 Mark Avenue, Carpinteria, California 93013

SERIES 7000 AUTOMATION TECHNICAL MANUAL

SECTION 5.0 THEORY OF OPERATION

SIZE		DRAWING NUMBER	REV
A	SHEET 5-1 OF 93	049-7007	

5.0 THEORY OF OPERATION

5.1 SYSTEM BLOCK DIAGRAM (Reference System Block Diagram, 114-700-001). The main elements of the system are the Control Chassis, Audio Chassis, Expansion Audio Chassis (optional), Power Supply, Local Status Panel, and Video Terminal. A single 60 wire cable from J1 on the CPU board to J1 on the Audio Control Board ties the Control Chassis to the Audio Chassis. The Power Supplies connect to each chassis via the Power Distribution Board which contains three terminal blocks wired in parallel. The Local Status Panel connects to the Audio Chassis via J4 on the Audio Distribution Board. Details of the Control and Audio Chassis are discussed in paragraphs 5.2.1 and 5.3.1 respectively. A general discussion of each major system element follows.

5.1.1 CONTROL CHASSIS - This chassis contains the microprocessor electronics, memory, and electronics for interfacing Video Terminals or Monitors, Printers, Remote Controls, and Remote Clocks.

The backplane is a "bus" type (pin 1 of each connector is tied to pin 1 of all other connectors and likewise for pin 2, etc.) allowing any board to plug into any available slot. Connection to peripheral devices (Video Terminals, etc.) is made via connectors mounted to the edge of appropriate boards toward the front of the rack cabinet.

5.1.2 AUDIO CHASSIS - This chassis contains circuitry to determine which audio source to air, schedule next, or preroll. Additionally all audio processing and switching is controlled by this chassis as well as monitoring for silence sense, loss of air signal, and verifying that a source actually started. Each audio source requires a Universal Source Board which controls starting and stopping the source as well as decoding random select data, detecting switching tones, and switching audio.

5.1.3 EXPANSION AUDIO CHASSIS (Optional) - This optional chassis is in all respects the same as the Audio Chassis (paragraph 5.1.2). It is used to expand the audio source capability from the sixteen (16) available with a single Audio Chassis to as many as thirty-two (32). The two Audio Chassis are tied together via a cable connected to J3 of each Audio Distribution Board (location XA19). Two additional Expansion Audio Chassis may be added bringing the total system capability up to sixty-four (64) audio sources.

5.1.4 POWER SUPPLY - The Power Supply consists of four (4) modular Power Supplies (+5V, +15V, -15V, and +24V) as well as a battery charger and +5V Regulator used in conjunction with the battery to power the memory elements of the CPU, RAM, and Real Time Clock boards in the event of loss of normal +5V by means of the +5VH (HELD) power line.

5.1.5 LOCAL STATUS PANEL - This panel, normally located at the top of the control rack, contains two VU Meters for monitoring audio levels. A MODE switch selects L + R, NORMAL, or L-R audio for display on the meters. L-R is displayed on Channel A only. A SOURCE select switch selects PROGRAM (source "on air"), CUE (sources not "on air"), TIME (audio clock), NETWORK, or one of two available auxiliary sources to display on the VU Meters as well as on the audio monitor speakers. The audio monitor VOLUME control is also located on this panel. Light emitting diodes (LED's) located on the Audio Control board display on the left side of the panel if a "Silence Sense" or "Closed Loop" condition occurs. This is in conjunction with a push button ALARM switch which lights when an alarm condition occurs. Additional LED's indicate when "Silence Sense" is DISABLED or FADE is enabled. Additional LED's on the Universal Source boards display through the panel to indicate which source is ON AIR, NEXT, and if any sources are in a PRE-ROLL condition.

5.1.6 VIDEO TERMINAL - The Video Terminal is the device normally used to input data to the system and display data from the system. It interfaces to the system through a Serial I/O board. Detailed operating procedures for the Video Terminal are discussed in Section 3.0 (OPERATION) of this manual.

5.2 CONTROL CHASSIS

5.2.1 BLOCK DIAGRAM (reference drawing 114-700-002).

5.2.1.1 GENERAL - The Control Chassis is the main thinking element for the system. It contains eight (8) basic boards whose responsibilities are outlined below. Note that depending on the system configuration, there may be more than one RAM, ROM, Parallel I/O, or Serial I/O board.

*CPU BOARD - This is the main system control board where all system decision making occurs and control signals originate. It contains the Central Processing Unit (CPU), scratch pad Random Access Memory (RAM), user RAM on level 1 systems, and a Vectored Priority Interrupter Encoder.

*ROM BOARD - The Read Only Memory board contains the non-changeable memory which causes the Microprocessor based system to act uniquely as a Broadcast Automation system. Each system has at least one (1) ROM board which allows the system to perform all the standard tasks. Additional ROM boards may be installed to add additional capability to the system.

*RAM BOARD - The Random Access Memory board contains the changeable memory where the unique information such as Audio Source number, Tray Data, and special instructions are stored. Additional RAM boards may be installed to expand the memory capability.

*PARALLEL I/O BOARD - This board is utilized to drive or receive data from remote devices. Eight (8) SPDT relays (K1 through K8) are provided for driving the remote devices. Four (4) photo isolated inputs (U1 through U4) are provided to allow the remote device to send data to the system. Additionally four (4) SPST relay outputs (K9 through K12) and eight (8) photo-isolated inputs (U1 through U8) are provided for interfacing Remote Control Devices to the system.

*SERIAL I/O BOARD - This board interfaces devices requiring serial RS232 or 20ma current drive. It allows for automatic or manual BAUD RATE selection as well as device "type" coding by means of dual in line (DIP) switches.

*REAL TIME CLOCK - This board controls time oriented functions, program updates, and drives remote clocks. It contains a 6502 microprocessor, a 4 meghz crystal controlled clock, a Peripheral Interface Adapter, and the user RAM for real time functions.

*VEL BOARD - The Verified Encoded Logging board interfaces the system to the logging device. It contains a 3.5KHz detector to convert the 3.5KHz amplitude shift keying (ASK) logging signal from the Audio Source tape to digital form. Additionally the board contains RAM for storing changing data, (time, source number, tray number, special codes, etc.), ROM for fixed messages (Music, News, etc.), a baud rate timer, and a driver for serial RS232 or 20ma current driven devices.

*DEBUG BOARD - The Debug Board is essentially a ROM board with a program that allows the user to interrogate and/or test a specific memory location or group of memory locations.

5.2.1.2 BUS STRUCTURE - The Control Chassis backplane is of a "bus" nature. That is pin 1 of all connectors are tied together. Likewise for pin 2 and all other pins. Thus the pin assignments shown for P1 of the CPU board apply for all ot boards in the chassis. The Control Chassis Block Diagram indicates which signals are actually used by each board even though all signals go to all boards. This bus structure allows any board in the Control Chassis to plug into any available slot.

5.2.1.3 ADDRESS BUS - Pins 18 through 25 and V through $\overline{C}$ are allocated for the sixteen bit Address bus (A0 through A15) used primarily for addressing specific memory locations within the system. Since each line represents one binary bit, up to 65,536 memory addresses can be accessed (see explanation of binary and hexadecimal in the Appendix). A0 through A9 are generally used to locate a specific memory address within a specific memory IC while A10 through A13 are used to identify the specific memory IC (i.e. U5) and A14 and A15 identify the specific board desired (i.e. RAM Board).

5.2.1.4 DATA BUS - Pins 14 through 17 and R through U are allocated for the eight bit Data bus (D0 through D7), on which data is transferred between system elements. Most boards can both be written to or read under CPU control. The exception to this is the ROM board which can only be read.

5.2.1.5 PERIPHERAL EQUIPMENT - Peripheral equipment such as Teletypes, Printers, Video Terminals, etc., are tied to the Control Chassis via connectors mounted near the edge of the specific board associated with that board. Cables are accessed from the front of the Control Rack.

5.2.1.6 CONNECTION TO AUDIO CHASSIS - The Control Chassis is connected to the Audio Chassis by a single 60 wire cable from J1 of the CPU board to J1 of the Audio Control board.

5.2.2 CPU BOARD (Reference 100-700-115)

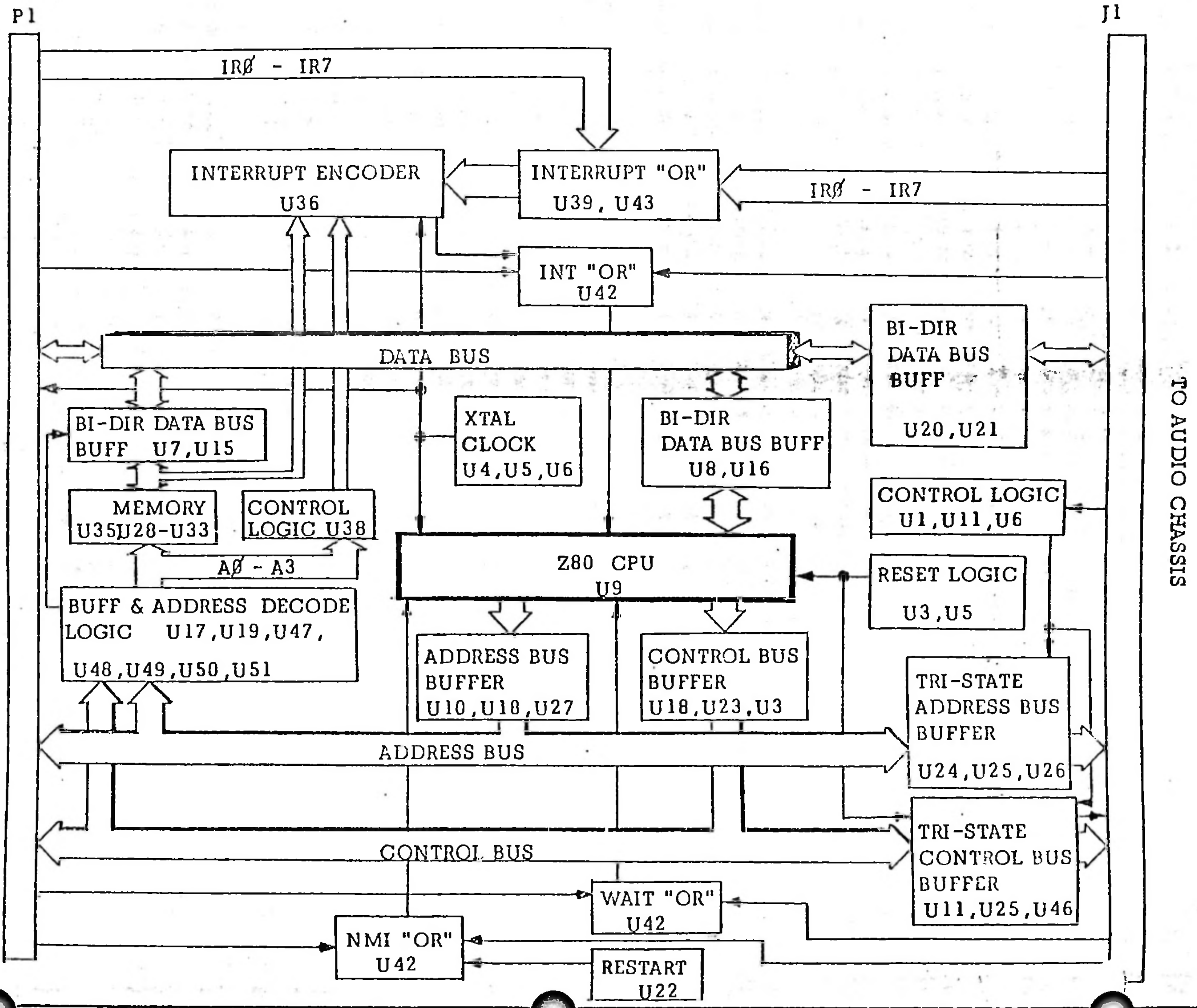
5.2.2.1 GENERAL - The Central Processing Unit (CPU) board is the control center for the system. It contains the Zilog Z80 microprocessor unit with its associated buffers and crystal controlled clock, ROM and RAM needed for basic program execution, an interrupt priority encoder, and bi-directional buffers to allow communication to and from the audio chassis.

5.2.2.2 MICROPROCESSOR BASICS - For those who are not familiar with microprocessor techniques, the following discussion should help in understanding basic operation and terminology. The following basic elements make up a microprocessor system:

CPU - The Central Processor Unit (CPU) is the control element of the microprocessor system. It determines where in memor instructions are to be placed or from where they are to be fetched. It responds to interrupts from system peripherals by going to a specific location in memory for instructions dealing with interrupts after first storing necessary data such as what location in the program it is leaving and the status of decision "flags" within the CPU Thus after dealing with the interrupt, it can return to the program it left.

ROM - Read Only Memory (ROM) is a type of memory into which information has been permanently placed. Therefore no new information can be placed in it

CPU Board BLOCK DIAGRAM



NUMBER:
131-700-007

and each time a memory location within the ROM is interrogated, it will always give out the same data. Thus they are unaffected by power failures and are used to store the unchanging system program (firmware). Most ROM's begin as Programmable Read Only Memories (PROM) which are programm (by special programming devices) for the specific location within the system where they are used. Thus ROM's cannot generally be interchanged.

RAM - Random Access Memory (RAM) is a type of memory which can be changed. It will place the current contents of a memory location on the Data bus when addressed and told the CPU wishes to "read" the data. When addressed and told that the CPU is "writing", it will replace what was stored in the addressed location with new data presente on the Data bus.

ADDRESS BUS - (Reference paragraph 5.2.1.3)

DATA BUS - (Reference paragraph 5.2.1.4)

FIRMWARE - This term refers to the specific list of instructions which have been permanently programmed into the ROM's. Most programs consist of many small programs called subroutines.

The basic operation of a microprocessor is to step sequentially through memory addresses gathering or transferring data, making decisions based on data received, jumping to different subroutines, and responding to interrupts. The microprocessor is always busy doing something, though it may spend most of the time in a general housekeeping routine updating the operating display, checking the ready status of sources, and sending out Random Access Data.

The following example illustrates a simple operation. The microprocessor is in a normal housekeeping routine when an interrupt occurs. It then fetches a vector address relating to the specific interrupt line causing the interrupt. For our example, assume it was IR3 which responds whenever a 150Hz tone switch closure or 25Hz tone is detected for the source which is "on the air". Determining this, it then goes to a routine in memory starting at the vector address which causes the next audio source to start. The microprocessor then returns to the housekeeping routine.

5.2.2.3 CPU - U9 is a Z80 CPU. All decisions and control originate from this IC. The following list defines the function of the Input/Output pins. Note that with the exception of the address (A0 through A15) and data (D0 through D8) pins, all lines go "low" when activated.

A0 through A15 - Output, 16 bit address bus ("high"= true).

D0 through D7 - Input/Output, 8 bit data bus ("high"= true).

$\overline{\text{BUSRQ}}$ (Bus Request) - Input, used to cause Address bus, Data bus, and Control bus to go to high impedance state so another device can control these buses.

$\overline{\text{NMI}}$ (Non-Maskable Interrupt) - Input, highest priority interrupt.

$\overline{\text{WAIT}}$ (Wait) - Input, used to place the CPU in a wait state in the event memory or I/O device is not ready for a data transfer.

$\overline{\text{INT}}$ (Interrupt Request) - Input, used to cause the CPU to go to the interrupt program when a device needs service. Interrupt request is ignored if internal interrupt enable flip flop is not enabled or if BUSRQ is "low".

$\overline{\text{RESET}}$ (Reset) - Input, used to initialize the CPU to start address 0000.

$\overline{\text{MREQ}}$ (Memory Request) - Output, indicates that a valid memory address is on the Address bus.

$\overline{\text{IORQ}}$ (Input/Output Request) - Output, indicates that the lower half of the Address bus holds a valid I/O address. Also goes "low" with $\overline{\text{M1}}$ when an interrupt is being acknowledged.

$\overline{\text{RD}}$ (Memory Read) - Output, indicates the CPU wants to read data.

$\overline{\text{WR}}$ (Memory Write) - Output, indicates the CPU data bus holds valid data to be transferred to memory or I/O device.

$\overline{\text{M1}}$ (Machine Cycle 1) - Output indicates that the current machine cycle is the OP code fetch cycle of an instruction execution.

$\overline{\text{RFSH}}$ (Refresh) - Output, used in conjunction with MREQ to create a refresh read cycle for "dynamic" memories.

NOTE: At the time this manual was written, only "static" memory (which does not require refresh) was used in the system.

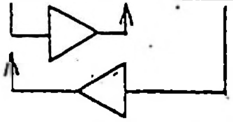
$\overline{\text{HALT}}$ (Halt State) - Output, indicates a software (or firmware) HALT instruction has been executed and that the system needs an interrupt before operation can resume.

BUSAK (Bus Acknowledge) - Output, used as a handshake signal after a BUSRQ to acknowledge to an external device that the Address bus, Data bus, and Control bus have gone to a high impedance state allowing the external device to control these buses.

5.2.2.4 CRYSTAL CLOCK GENERATOR - U6 in conjunction with R7, R11, C23, C24, and the 3.6864 MHz crystal make up the basic crystal controlled oscillator. The network is designed to be unstable and thus to oscillate. Note that as U6-13 goes "high" so does U6-10. This brings U6-2 "low" which brings U6-13 "low". U6-13 being forced "low" starts the cycle in the other direction. R7 and R11 form a voltage divider which allows U6-2 to pull U6-13 no higher than 2.4VDC on the "high" cycle. 2.4V is in the unstable region for TTL gates. The addition of the 3.6864MHz crystal which has a very low impedance at that frequency reinforces and stabilizes the oscillations at 3.6864MHz. U5 sharpens up the waveform and clocks U4 causing U4-15 to change state each time U5-12 goes positive. Thus the CLOCK frequency at U4-15 is 1.8432MHz.

5.2.2.5 CPU BUFFER CIRCUITRY - U10, U18, U23, and U27 are tri-state non-inverting buffers for the Address and Control busses. Normally the buffers are enabled but if BUSAK at U9-23 goes "low", U1-11 goes "low" forcing U6-4 "high" disabling the buffers. Additionally if RFSH and MREQ go "low" simultaneously (dynamic RAM refresh cycle), U2-6 will go "low" and if the "STEAL EN" jumper is installed, U1-11 will go "low" forcing U6-4 "high". Note that each tri-state buffer has only two control lines. Pin 1 controls gates A through D while pin 15 controls gates E and F.

U8 and U16 are tri-state non-inverting bi-directional buffers used to control exchange of data between U9 and the Data bus. The following chart shows the data flow direction for the varying states of pins 1 and 15.

Control Pins		Input/Output
1	15	D0 R0 DI
Lo	Lo	
Hi	Hi	
Hi	Lo	Hi Z Open State
Lo	Hi	Invalid State

Normally the two control pins follow each other due to U1-8 tracking U1-9. However, during a BUSAK or RFSH cycle, U1-11 goes "low" forcing U1-8 "low" while U1-9 will be "high" setting U8 and U16 to the high impedance open state.

5.2.2.6 MEMORY - The CPU board contains one ROM (U35) and six RAMS (U28 through U33). The ROM contains the instructions required to initialize the CPU (U9), and a basic diagnostic program called "ROM O" (Ref. DEBUG PROCEDURE, Para. 7.5 in TROUBLESHOOTING Section). The RAMS are used for temporary storage of data needed by the CPU and all or part (if system contains expansion RAM of the user Program.

Address lines A0 through A9 determine the desired memory location while A10 and A11 determine which Memory IC is desired. A12 and A15 in conjunction with DECD1 (held "HI" by backplane pull-up resistor or controlled by other RAM board(s) if installed) verify that the address is for the CPU board. U50 decodes address lines A10 through A12 to determine which memory IC is desired and asserts the appropriate Chip Select ($\overline{CS}$) Line "low". In order for U50 to decode the address, pins 4 (G2A) and 5 (G2B) must be "low". Pin 4 will be "low" as long as DECD1 at P1-$\overline{M}$ is "high" and address line A15 is "low". Pin 5 is pulled "low" when IRD (read) or IWR (write) and IMREQ (memory request) go "low" simultaneously. The following chart illustrates the selection code.

A9	A10	A11	A12	Y0	Y1	Y2	Y3	Select Chip(s)
L	L	L	L	L	H	H	H	U35
X	H	L	L	H	L	H	H	U28 & U31
X	L	H	L	H	H	L	H	U29 & U32
X	H	H	L	H	H	H	L	U30 & U33

L = Low
H = High
X = Irrelevant

The above chart points out that the RAMS work in pairs with one RAM dealing with Data bus lines D0 through D3 while the other deals with D4 through D7. The state of pin 10 of each RAM determines whether the CPU is to read from or write to the RAM ("high" = read, "low" = write)

5.2.2.7 INTERRUPT CIRCUIT - Interrupt signals come into this board either from the Control chassis by way of P1 or from the Audio chassis by way of J1. The following chart indicates the assignment for each of the eight interrupt lines:

IR0	- Not used
IR1	- 1 PPS (from Real Time Clock or SIO)*
IR2	- VEL or LOAD/DUMP (Rx/Tx Rdy)
IR3	- EOM (End of Message)
IR4	- Not used
IR5	- PIO (Parallel I/O)
IR6	- Source Interrupt Request (ISRIR)
IR7	- Video Terminal (Rx/Tx Rdy) & other SIO boards.

* IR1 comes from Serial I/O board only if system does not contain a Real Time Clock board.

These are all normally "high" signals which go "low" when asserted. They are presented to U39 and U43 whose output goes "low" if either input goes "low". A "low" at any of the P0 through P7 inputs of U36 causes U36-9 (INT REQ) to go "low". This causes U42-3 to go "low" creating an interrupt to the CPU U9. U9 in turn, when available to service the interrupt, will assert IORQ and M1 "low" requesting a vector address from U36. This causes U51-8 (sheet 1) to go "low". Since U51-13 is being held "low" by the INT REQ output of U36, U51-11 goes "low" causing U47-8 to go "low" enabling the "Instruction Inputs" (I0 through I3) to U36. Additionally, multiplexer U38 outputs (Za through Zd) look at the inputs I0A through I0D which are either tied to ground or +5V. This forces a vector address (determined by which interrupt is requesting service) to be set up on the V0 through V2 lines. The CPU reads this vector address and proceeds directly to that address to service the interrupt.

5.2.2.8 RESTART and RESET CIRCUITS - There are two momentary push button switches located on the edge of the CPU board. The one located nearest the 60 pin edge connector is the RESTART which when pressed creates a Non-maskable interrupt (NMI) which causes the microprocessor to vector to a "monitor" routine allowing simple debugging. U14, R3, and C11 (sheet 1) serve to debounce switch S2 while schmidt trigger U22 sharpens the pulse.

The RESET switch (located near the top edge of the board) not only resets the CPU to address 0000, but also resets all system logic in both the Control and Audio chassis to an initialized state. U14, R1, and C1 (sheet 2) serve to debounce switch S1 while U5 sharpens the pulse. U3 buffers the RESET pulse to the CPU (U9) and the Control and Audio chassis. Note that when power is first applied, U5-1 will be "low" and will rise relatively slowly as C1 charges. Thus when power is first applied, all RESET lines are "low" causing the system to go to an initialized state. Additionally, should +5V be lost momentarily, C1 will rapidly discharge through R1 and CR1 to create RESET as soon as power is restored.

5.2.2.9 AUDIO CHASSIS BUFFERS - U20 and U21 are bidirectional Data bus buffers which transfer data to and from the Audio chassis under control of U1 and U11. Referring to the chart in paragraph 5.2.2.5, note that when IRDBE (Read Bus Enable) at J1-34 goes "low", U11-5 goes "low" causing U20 and U21 pins 1 and 15 to go "low" allowing the CPU chassis to read Data from the Audio Control chassis. When IRDBE is "high", pin 1 of U20 & pin 1 of U21 are "high" & pin 15 is under the control of U47-6 and the state of 3RD causing U20 and U21 to be in the Hi Z open state (3RD "low") or to write data to the Audio chassis. If the I/O DISABLE switch (S3) is switched to ground, U20 and U21 pins 1 go "high" (U11B is disabled by U6-8 going "high"), and pin 15 goes "low", setting the buffers to the "hi" impedance open state. This switch would only be used to block data from the Audio chassis during test conditions.

U11, U25, and U46 buffer the Control bus, while U24, U25, and U26 buffer the Address bus to the Audio chassis. They are tri-state buffers which are normally enabled by U6-8. The are disabled if the I/O DISABLE switch is switched to ground.

5.2.3 ROM BOARD (Reference 100-700-004)

5.2.3.1 GENERAL - The ROM board is a general usage board, however the ROM chips are specifically programmed for the specific IC location where they are placed.

CAUTION: Do not exchange ROM chips with ROMS on its own or any other ROM board, unless specifically directed to do so by Cetec Broadcast Group.

Since its data cannot be changed, it is equipped only to place data on the Data bus when the CPU requests a "read".

Since the ROM board is general purpose, it may not have IC's in all ROM locations (U1 through U16).

5.2.3.2 ADDRESSING - The following chart shows the assignments for the 16 Address lines.

Address	Thousands 1000-FFFF				Hundreds 100-FFF				Tens 10 - FF				Units 0 - F			
Address Line	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Binary Weight	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
	Board		Chip Select				Chip Address									

Address lines A0 through A9 address the specific memory location desired within each ROM chip. Address lines A10 through A13 further define which specific ROM chip is desired by means of the 4 line to 16 line decoder U25 which, when enabled by having pins 18 and 19 both "low" pulls only one output "chip select" line "low" depending on the binary input at pins 20 through 23 (reference Truth Table for 74LS154 in "IC Substitution Charts" in Appendix). Address lines A14 and A15 further define on which ROM board the desired ROM chip is located. This is accomplished by means of jumpers on header U22 in conjunction with exclusive or gates U20 C and D. The jumpers are factory-wired and should not be changed without first noting their positions. When the Address line inputs to U20C and D match the jumper line states, U20-8 and U20-11 both go "low" pulling U27-3 "low" enabling U23-4 (G2A) and U25-19 (G2). . When the CPU asserts the 1MREQ and 1RD lines "low" simultaneously, U27-6 goes "low" enabling U23-5 (G2B) U25-18 (G1). With

G2A and G2B both "low" and G1 "high", U23 is allowed to look at the status of Address lines A11 through A13 and pull its appropriate output (Y0 through Y7) "low". Each output refers to a pair of ROM chips (see table below). U28 senses th "low" signal if the jumperassociated with that output is installed (jumper would be normally installe if the board has that ROM pair installed). Any U28 input going "low" causes U28-8 to go "high" forcing U20-6 "low" enabling output buffers U17 and U18 to transfer ROM data to the Data bus.

U23-Output Jumper	Y0 1	Y1 2	Y2 3	Y3 4	Y4 5	Y5 6	Y6 7	Y7 8
ROM Chip	U1, U2	U3, U4	U5, U6	U7, U8	U9, U10	U11, 12	U13, 14	U15, 16
A11	0	1	0	1	0	1	0	1
A12	0	0	1	1	0	0	1	1
A13	0	0	0	0	1	1	1	1

0 = Low
1 = High

5.2.3.3 POWER REGULATORS - VR-1 converts the +15V line to +12V and VR-2 converts the -15V line to -5V as required by the ROMS.

5.2.4 RAM BOARD (Reference 100-700-105)

5.2.4.1 GENERAL - The RAM board is a general usage board which may or may not contain the maximum possible number of RAM chips. This is a function of the specific system capabilities. All RAM chips are alike and may be freely interchanged. The RAM chips are 4 bit output chips and thus to drive the 8 bit Data bus they are operated in pairs with one driving Data bus lines D0 through D3 and the other D4 through D7.

5.2.4.2 ADDRESSING - The following chart shows the assignments for the 16 Address lines.

Address	Thousands 1000 - FFFF		Hundreds 100 - FFF		Tens 10 - FF	Units 0 - F
Address Line	15 14	13 12	11 10	9 8	7 6 5 4	3 2 1 0
Binary Weight	8 4	2 1	8 4	2 1	8 4 2 1	8 4 2 1
	Board	Chip Select		Chip Address		

Address lines A0 through A9 address the specific memory location desired within each RAM chip. Address lines A10 through A13 further define which specific RAM chips are desired by means of the 4 line to 16 line decoder U41 which, when enabled by having pins 18 and 19 both "low", pulls only one output "chip select" line "low" depending on the binary input at pins 20 through 23 (reference Truth Table for 74LS154 in "IC Substitution Chart" in Appendix). Address lines A14 and A15 further define on which RAM board the desired RAM chips are located. This is accomplished by means of jumpers W10 & W11(U51)in conjunction with exclusive or gates U52A and B. The jumpers are factory-installed & should not be changed without first noting their position. When the Address line inputs to U52A and B match the jumper line states, U52-3 and U53-6 both go "low" pulling U44 enable input "G1" "high" and U41 enable input "G1" "low", U44 is only fully enabled in the "read" mode. U41 enable input "G2" is pulled "low" when the CPU asserts 1MREQ (P1-39) "low" and either 1WR (P1-L) or 1RD (P1-32) is asserted "low" and both lines are stable. Exclusive or gate U52-C holds U49-4 and 5 "low" until stability is reached when switching from a

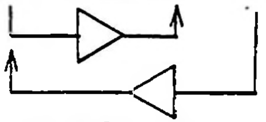
"Read" to "Write" or "Write" to "Read" mode. Thus U49-6 cannot go "low" until this stable state is reached. Once both G1 and G2 enable inputs to U41 are "low", it pulls "low" one of the "chip select" lines selecting the appropriate memory chips as determined by Address bus lines A10 through A13.

5.2.4.3 . READ MODE - If the memory is selected for the purpose of reading its contents, 1RD (P1-32) will go "low". This brings U44-5 "low" enabling U44 to decode Address lines A11 through A13 and pull its appropriate output (Y0 through Y7) "low". Each output refers to two sets of RAM chips as controlled by two "chip select" lines from U41 (see table below). U46 senses the "low" signal if the jumper associated with that output is installed (jumper would be normally installed if the board ha that RAM set installed). Any U46 input going "low"

U44 Output	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Jumper	1	2	3	4	5	6	7	8
Chip Select	0, 1	2, 3	4, 5	6, 7	8, 9	10, 11	12, 13	14, 15
A11	0	1	0	1	0	1	0	1
A12	0	0	1	1	0	0	1	1
A13	0	0	0	0	1	1	1	1

0 = Low
1 = High

causes U46-8 to go "high". In the Read mode, 1WR is "high", thus U23 and U24 pins 1 and 15 will both be "high" putting these bi-directional buffers in a state to transfer data from the memory board to the Data bus as shown in the following chart.

Control Pins		Input/Output
1	15	D0 R0 DI
Lo	Lo	
Hi	Hi	
Hi	Lo	Hi Z Open State
Lo	Hi	Invalid State

5.2.4.4 WRITE MODE - In the Write mode 1WR goes "low" and 1RD remains "high" thus U44 is disabled and all inputs to U46 must be "high" pulling U46-8 "low". Therefore both pins 1 and 15 of U23 and U24 are "low" putting U23 and U24 in a state to load data from the Data bus into the selected memory location (see chart above).

5.2.5 PARALLEL I/O BOARD (Reference 100-700-006)

5.2.5.1 GENERAL - The Parallel I/O board serves as an interface between the system and customer defined remote functions such as alarms, tower lights, remote power switching devices, etc. Additionally, this board interfaces a system manual Remote Control Box. The primary elements on the board are:

- Address Decoding Logic
- Bi-directional Data Bus Buffers
- Peripheral Interface Adapter (PIA)
- Output Drive Relays and Relay Drivers
- Input Signal Photo Isolators

5.2.5.2 ADDRESS DECODE LOGIC - This board is treated similarly to a memory cell with the exception that if the address refers to an I/O device (such as this board), the CPU will pulse the 1-IORQ line instead of the 1MREQ. That is the CPU will set up an address on the Address bus and pull 1-IORQ "low", and this board will respond by receiving or sending data just as if it were a memory cell. The switch pack U18 allows each Parallel I/O board to have its own unique address. Exclusive or gate U16 compares address line A4 through A7 with the state of the switch controlled input and if only one is "high", the output goes "high". When all U16 outputs are "high" and A2 and A3 are "high" and 1-IORQ (P1-K) goes "low", U19-8 goes "low" enabling the chip select 2 (ICS2) input to PIA U11. Additionally U19-8 going "low" allows U21 to determine the data direction of U12 and U13 based on the state of 1RD (P1-32).

Address lines A0 and A1 determine which of the PIA registers are to be addressed (see paragraph 5.2.5.4).

5.2.5.3 DATA BUS BUFFERS - U12 and U13 are bi-directional buffers whose data direction is determined by the state of pins 1 and 15 as controlled by U21-13. If the CPU wishes to "write" data to the Parallel I/O board, 1RD (P1-32) will be "high" making U21-13 "low" causing data to go from D0 to R0. When the CPU wishes to "read" data from the Parallel I/O board, 1RD goes "low" causing U21-13 to go "high". This causes data to go from DI to D0.

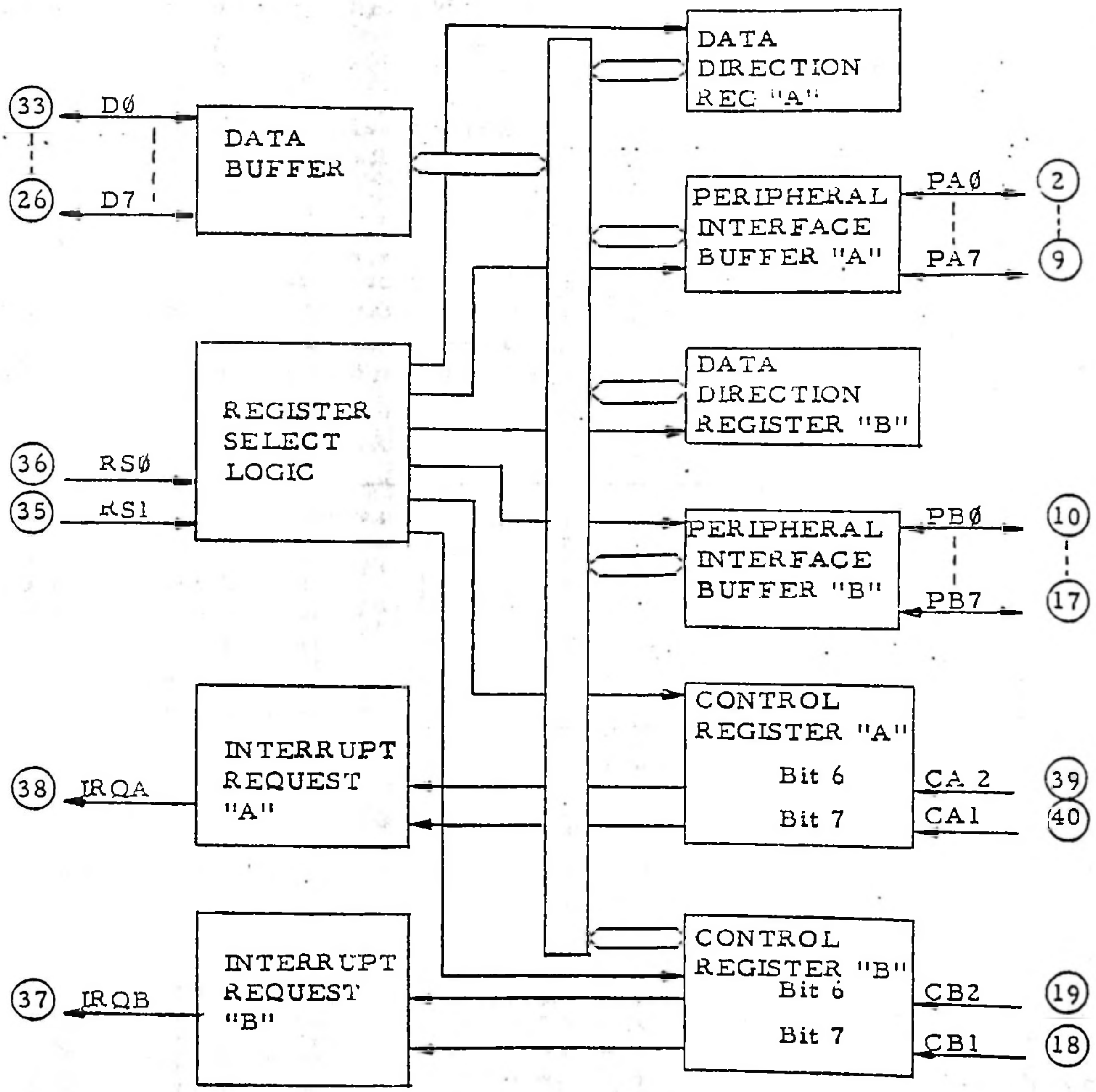
5.2.5.4 PERIPHERAL INTERFACE ADAPTER (PIA) - The PIA (U11) serves as the transfer point for data exchange between the CPU and the peripheral devices. Within the PIA are three sets (or pairs) of registers:

- Data Direction Registers A and B
- Peripheral Interface Buffers A and B
- Control Registers A and B

The individual registers are addressed by Address lines A0 and A1 to U11 register select lines RS0 and RS1 in accordance with the following chart. Note that the state of Bit 2 of the Control registers affects whether the Data Direction or the Peripheral interface register is selected.

RS0	RS1	CRA-2	CRB-2	
0	0	1	X	Peripheral Interface A
0	0	0	X	Data Direction Register A
0	1	X	X	Control Register A
1	0	X	1	Peripheral Interface B
1	0	X	0	Data Direction Register B
1	1	X	X	Control Register B

1 = High
0 = Low
X = Irrelevant



MC6820 (PIA) SIMPLIFIED BLOCK DIAGRAM

During system initialization, the Control registers bit 2 is set to 0 and Data Direction registers are then addressed and data is sent which sets all Peripheral Interface B lines (PB0 through PB7) and four Peripheral Interface A lines (PA0 through PA3) as Outputs while PA4 through PA7 are set as Inputs. The Control registers A and B bit 2 is then set to 1 so that from that point on, address data at RS0 and RS1 will refer to the Peripheral Interface Buffers A and B.

REMOTE INPUTS

FUNCTION	INPUT	STROBE
START	PA4	CA1
STOP	PA5	CA1
STEP	PA6	CA1
FADE	PA7	CA1
ADVANCE	CB1	-
JOIN	PA4	CA2
UPDATE	PA5	CA2
LEAVE	PA6	CA2
INSERT	PA7	CA2
SPARE	CB2	-

PB0 through PB7 are user defined outputs which drive relays K1 through K8 via darlington drivers U9 and U10. PA0 through PA3 are assigned for driving the Remote Box Indicators via relays K9 through K12. PA4 through PA7 & CB1 & CB2 are for Remote Box & Remote Clock inputs. Each input is photo isolated by U1 through U4. U17 inverts the state of pin 5 of the photo isolator and presents that to the PIA. For example, when current flows through the photo diode in U1, PA4 goes "high". The 2.2Kohm resistors limit the current through the photo diodes. The value is picked for a voltage difference at the positive to negative inputs at J2 or J3 of typically 24V. Should voltages other than 24V be used, it is recommended that the resistor be changed as follows:

5V - 470 ohms 1/4 watt
12V - 1.2K ohms 1/4 watt
48V - 4.8K ohms 1 watt

CA1 and CA2 are strobe inputs which are assigned to the Remote Box. CB1 & CB2 are direct inputs. Whenever any of these inputs go "high" an interrupt is created by U11-37 or 38 going "low" signaling the CPU that action is required. Additionally CA1 and CB1 set bit 7 of their respective Control registers "high" while CA2 and CB2 set bit 6 "high". The CPU addresses the board and reads the Control registers to determine which bit is "high" thereby determining which input was activated.

Whether the PIA is to "read" or "write" is determined by the status of the write control line 1WR. If the CPU is to "write" to the PIA, 1WR will go "low" causing U11-21 to go "low". If 1WR is "high", U11-21 will be "high" and the CPU will read data from the PIA. Note that the PIA "ENABLE" line (U11-25) goes "high" when either 1WR or 1RD goes "low".

5.2.6 SERIAL I/O BOARD (Reference 100-700-009)

5.2.6.1 GENERAL - This board is used to interface to all RS232 or 20ma current loop peripheral devices such as Video terminals or Teletypes. A Universal Synchronous/Asynchronous Receiver Transmitter (USART) chip is used to interface to the CPU. Baud rate can be set by DIP switches or automatically by the CPU. Eight (8) switches on a DIP pack are used to identify the board for verification purposes. Four (4) of the switches on U12 are used to program a unique address for each Serial I/O board.

5.2.6.2 ADDRESS DECODING - Address lines A4 through A7 are decoded by U18 in conjunction with the setting of 4 of the switches on U12. When only one input to each exclusive or gate is "high" all inputs to U22 will be "high" bringing U22-8 "low". If 1-IORQ is also "low", U23-3 goes "low" enabling read/write buffers U23C and D. Address line A1 must be "high" making U13- 12"low" to enable U9 through its chip select input (U9-11). Address line A2 goes "high" if board status is to be read or changed making U13-8 "low" enabling U20C and D to respond to read and write signals. Address line A0 is used to advise U9 if Data or Control information is being sent or is desired by the CPU ("Low" = Data, "High" = Control).

5.2.6.3 DATA BUS BUFFERS - U7 and U8 are bidirectional buffers whose data direction is determined by the state of pins 1 and 15 established by the state of the "read" (1RD) signal. Assuming U23-9 is "low" (the board has been properly addressed) and the CPU wishes to "read" data from the Serial I/O, 1RD (P1-32) will go "low" causing U23-8 to go "low" and U13-10 to go "high". With both pins 1 and 15 of U7 and U8 "high" data goes from DI to D0. If the CPU wishes to "write" to the Serial I/O, 1RD will be "high". Thus U23-8 will be "high" and U13-10 "low". Both pins 1 and 15 of U7 and U8 being "low" causes data to go from D0 to R0.

5.2.6.4 SERIAL I/O "ID" - Switch pack U2 allows a unique identification code to be programmed for each Serial I/O board. Reference section 6.0 for details on setting switches.

5.2.6.5 "ID" AND BOARD STATUS READ - If the CPU wishes to read the "ID" code (paragraph 5.2.6.4) or the baud rate and "clear to send" (1CTS) status, it must address the board and assert address line A2 "high" (paragraph 5.2.6.2) as well as asserting 1RD (P1-32) "low". This brings both U20-9 and 10 "low" enabling U20A and B. If the ID switches are to be read, A0 will be "low" thus U20-3 goes "low" enabling tri-state buffers U3 and U5B placing the switch status on the Data bus. If A0 is "high", U20-6 goes "low" enabling U10 and U5A placing the "baud rate" code from U11, the "Auto Baud" status, the 1CTS status, and one U2 switch status on the Data bus.

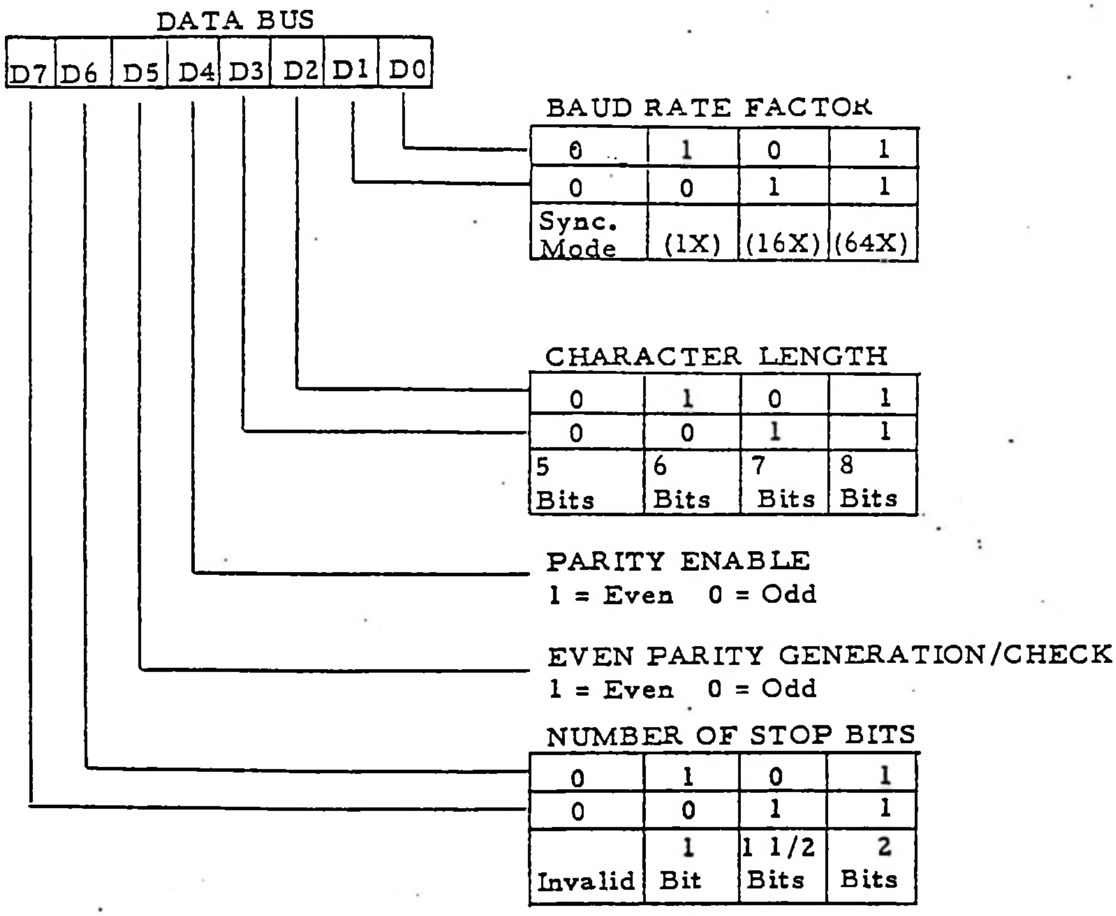
5.2.6.6 BAUD RATE (MANUAL) - Four (4) of the switches on U12 are used to code for Manual baud rate. If Jumper W5 on U27 has not been installed or if installed and U21-11 has been set "high" by the CPU, the board will be in a manual baud rate mode. Thus, "BE" is "high", making U11-1 "high". U11 is a data selector which, when pin 1 is "high", looks at the inputs tied to the U12 switches. Thus, the output pins (ZA through ZD) assume the state of corresponding switch inputs (IOA through IOD). U15 decodes the U11 outputs and divides the 921.6K (J21 divides the 1.8432MHz 2 Clock 01 frequenc by 2) in accordance with the following chart to establish the baud rate output at U15-3.

U15				Output Frequency (KHz)	Baud Rate
11	10	9	8		
0	0	0	1	0.8	50
0	0	1	0	1.2	75
0	0	1	1	1.76	110
0	1	0	0	2.152	134.5
0	1	0	1	2.4	150
0	1	1	0	4.8	300
0	1	1	1	9.6	600
1	0	0	0	14.4	900
1	0	0	1	19.2	1200
1	0	1	0	28.8	1800
1	0	1	1	38.4	2400
1	1	0	0	57.6	3600
1	1	0	1	76.8	4800
1	1	1	0	115.2	7200
1	1	1	1	153.6	9600
0	0	0	0	External Frequency	

0 = Low
1 = High

5.2.6.7 BAUD RATE (AUTO) - If Jumper W5 on U27 is installed, the CPU can set the baud rate. It does this by addressing the board, asserting Address line A2 "high" and 1WR (P1-L) "low". This pulls U20-11 "low" which clocks U6 (a quad latch) setting output pins 2, 7, 10, and 15 to the state of the Data lines D0 through D3 respectively. Additionally, Data line 2D5 would be asserted "high" and U21 is clocked by the pulse at U20-11 setting U21-11 "low". Thus "BE" is "low" and U11-1 is "low". This forces U11 to look at the U6 outputs instead of the U12 switches. Therefore U15 gets its baud rate instructions from U6. Refer to paragraph 5.2.6.6 for operation of U15.

5.2.6.8 UNIVERSAL SYNCHRONOUS/ASYNCHRONOUS RECEIVER/TRANSMITTER (USART) INITIALIZATION - Before any transfer of data can occur, USART U9 must be initialized. This is done by the CPU during the system initialization process. The following are the Mode Instruction formats for both ASYNCHRONOUS and SYNCHRONOUS modes.



BAUD RATE FACTOR

0	1	0	1
0	0	1	1
Sync. Mode	(1X)	(16X)	(64X)

CHARACTER LENGTH

0	1	0	1
0	0	1	1
5 Bits	6 Bits	7 Bits	8 Bits

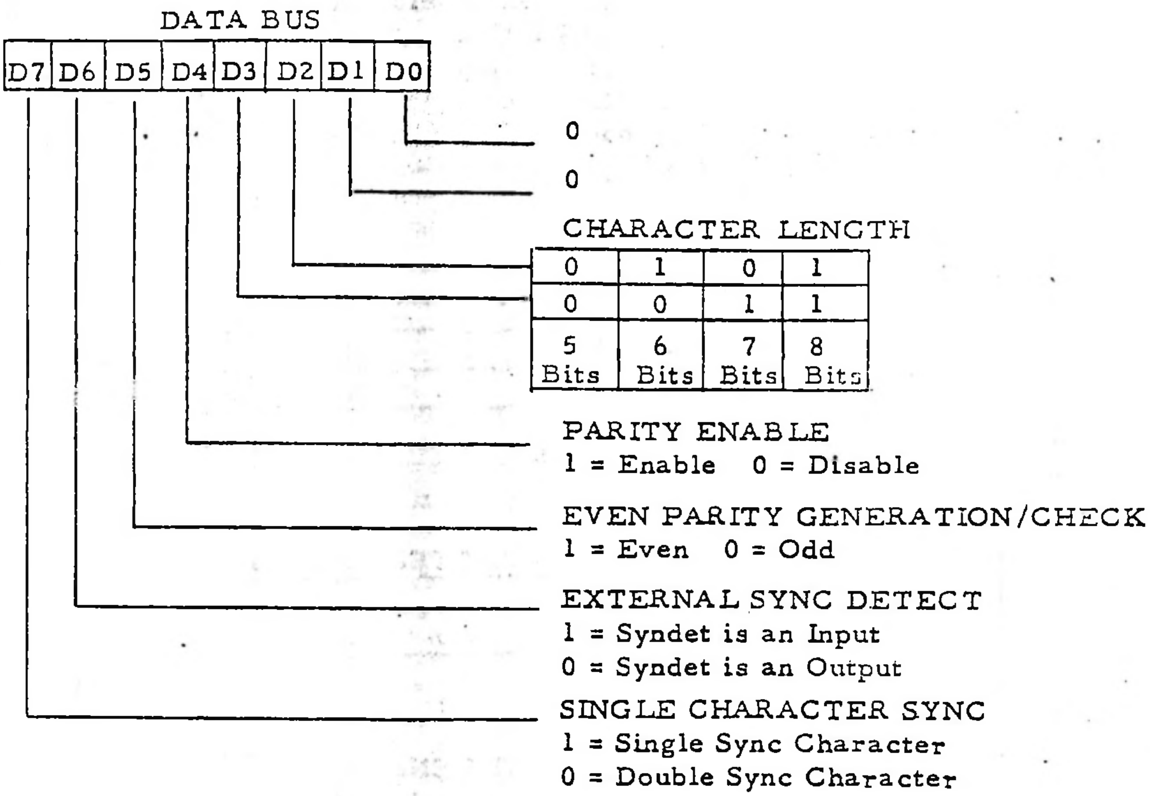
PARITY ENABLE
1 = Even 0 = Odd

EVEN PARITY GENERATION/CHECK
1 = Even 0 = Odd

NUMBER OF STOP BITS

0	1	0	1
0	0	1	1
Invalid	1 Bit	1 1/2 Bits	2 Bits

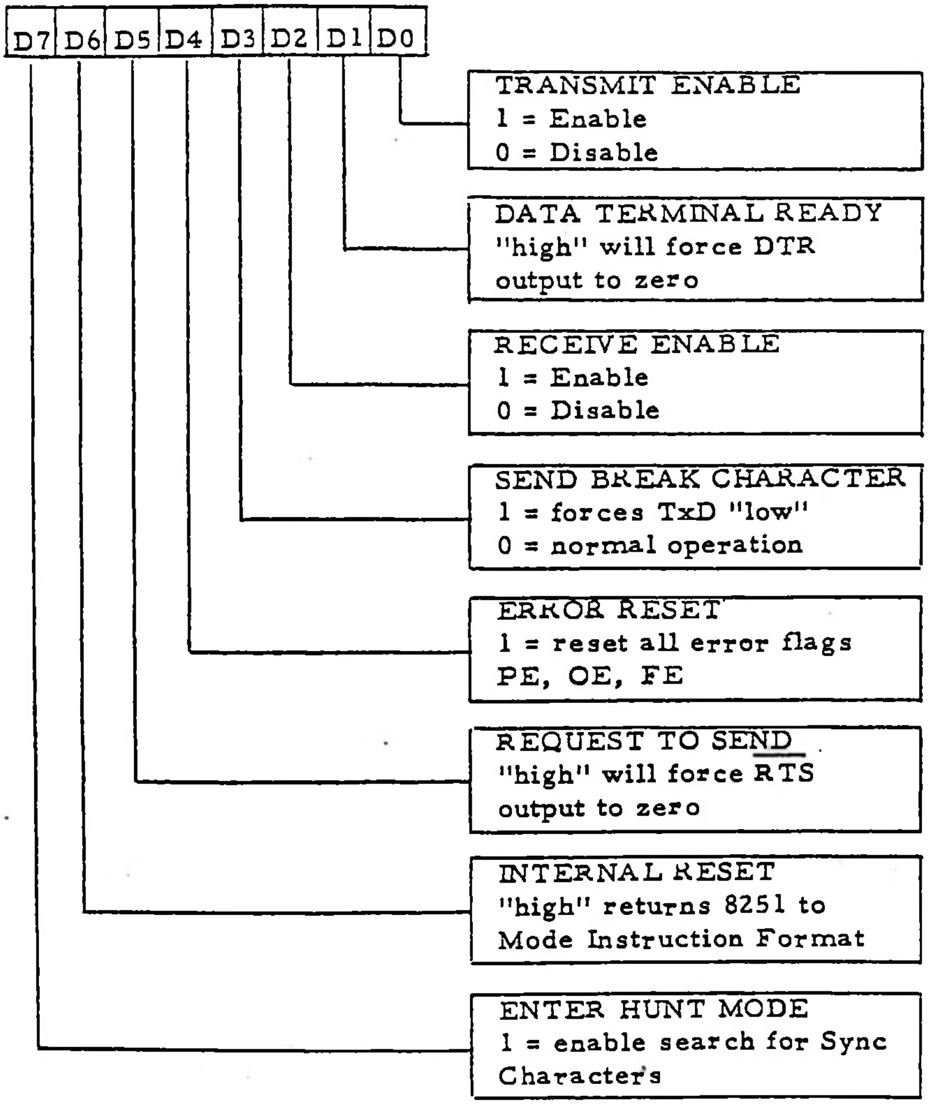
ASYNCHRONOUS MODE INSTRUCTION FORMAT



SYNCHRONOUS MODE INSTRUCTION FORMAT

After the Mode instruction has been sent, the CPU is free to send or read data or commands.

5.2.6.9 DATA/COMMAND DETERMINATION - The USART U9 is capable of receiving data or commands (such as "set request to send" [RTS]) or sending data or status on the Data bus (D0 through D7). If U9-12 is "low", data is being sent or received. If U9-12 is "high", command information is being sent or status is being read. The following is the Command Instructions Format.



TRANSMIT ENABLE
1 = Enable
0 = Disable

DATA TERMINAL READY
"high" will force DTR output to zero

RECEIVE ENABLE
1 = Enable
0 = Disable

SEND BREAK CHARACTER
1 = forces TxD "low"
0 = normal operation

ERROR RESET
1 = reset all error flags PE, OE, FE

REQUEST TO SEND
"high" will force RTS output to zero

INTERNAL RESET
"high" returns 8251 to Mode Instruction Format

ENTER HUNT MODE
1 = enable search for Sync Characters

COMMAND INSTRUCTION FORMAT

5.2.6.10 SENDING DATA (CPU TO TERMINAL) - Before discussing the data sending process, a brief discussion of four (4) general purpose lines which may or may not be required (depending on what type of terminal is used) is in order. The lines are:

-$\overline{\text{RTS}}$ (Request to Send) - Asserted "low" by CPU setting data line D5 "high" when sending Command word. Advises terminal that CPU has data to send.

-$\overline{\text{CTS}}$ (Clear to Send) - This line is assered "low" at U9-17 by the Terminal when it is ready to receive data, advising the CPU that it can proceed with transmitting data. Note that a jumper (W2) can be installed so that the RTS line going "low" will set this input "low".

-$\overline{\text{DTR}}$ (Data Terminal Ready) - General purpose output which can be asserted "low" by CPU setting data line D1 "high" while sending Command word. If DTR goes "low", U14-11 goes "high" and U26 pins 4 and 6 go "low". The output of U26 could be used as a motor start signal for a teletype or printer.

-$\overline{\text{DSR}}$ (Data Set Ready) - General purpose input which can be tested by the CPU reading the status of U9 data output D7. Can be used by terminal to advise CPU that it is ready for data. Note that this input must be true (DSR "low") or the CPU will bypass the port and discontinue servicing it until a character is received from the port.

The procedure for sending data varies somewhat depending on the type terminal used, however basically the CPU must set up Address Lines A4 through A7 such that U18 will decode that this board is the port to be acted on. Additionally Address line A1 must go "high" to pull U9 "chip select" (C/S) "low" and A0 must be set to determine if the data word is a Command or Data ("high" = Command, "low" = Data). Lastly, 1WR (P1-L) must go "low" pulling U9-10 "low". The Data bus will now contain an 8 bit Command word (see Command Instruction Format - paragraph 5.2.6.9) or an 8 bit data word corresponding to the ASCII code for a letter, number, or character. If data rather than a Command is presented, U9 starts shifting the data out pin 19 (TxD) one bit at a time at each falling edge of the pulse at U9-9. If the terminal is an RS232 device, data is shifted out at J1-2 (TxD). If the terminal is a 20ma loop device, data flows through U16, U25, U26 and Q1 and out at J2-23 (RCVR+). Note that in the quiescent state U26-12 will be "low" holding Q1 on pulling the collector to +24V and suppling 20ma of current to the terminal.

When all data bits have been shifted, TxRDY (U9-15) goes "high" turning on DS2 and if Jumper W6 is installed, an interrupt pulse will be generated at the falling edge of the CLOCK 2 pulse. This lets the CPU know that it can send another character. Note that some systems may not require an interrupt as the CPU will establish a rate at which it sends data to the board.

5.2.6.11 RECEIVING DATA (TERMINAL TO CPU) - Data from RS232 devices comes in at J1-3 or J2-2 and is sent via U19, U22, and U25 to U9-3 (RxD). 20ma loop devices bring data in at J2-24. Note that for 20ma devices, J2-9 is tied to J2-24 and in the quiescent state the terminal holds J2-24 "low". When data is transmitted by the terminal, U9-3 falls "low" with the first character. This alerts U9 that data is coming in. U9 verifies that it is a valid start bit by checking pin 3 status about half way through the normal bit width. If it is still "low" U9 assumes it to be valid data and starts clocking in the serial data setting it up to load the output buffers. When all data is set up, it is loaded on to the eight output buffers (D0 through D7) and RxRDY (U9-14 is set "high" turning on DS1 & if W7 is installed creating an interrupt on the falling edge of CLOCK 2. This alerts the CPU that U9 has a data word to send.

The CPU responds to the interrupt by reading the status of U9 (U9-12 "high" for Command and U9-13 "low" for "read") and determines from data bit D0 that RxRDY is ON. Having made this determination, it readdresses the board this time asserting A0 "low" (data) and reads the data.

5.2.6.12 1 PULSE PER SECOND (1PPS) GENERATOR - In order to accomplish certain periodic housekeeping tasks, it is necessary to create an interrupt pulse to the CPU(IR1) at approximately a 1 second rate. Normally this task is handled by the Real Time Clock board; however, a circuit has been provided on the Serial I/O board which can be enabled to accomplish this task in systems which do not contain a Real Time Clock board.

Normally U29-11 is "low" holding timer U4-3 "high" which places tri-state buffer U5-7 in the high impedance state. Should it be necessary to utilize timer U4 for the 1PPS interrupt function, Data bus line D6 would be set "high" bringing

U29-9 "high" and U29 would be clocked by the pulse created by U13-6 when the board is addressed, 1-IORQ goes "low", 1WR goes "low", and A2 goes "high". This sets U29-11 "high" allowing U4 to function as an astable multivibrator producing a very narrow negative going pulse approximately once each second.

The timer is disabled if Data bus line D7 is set "high" and U29-6 is clocked setting U29-11 "low".

5.2.6.13 VOLTAGE REGULATORS - VR2 and VR1 are 12V regulators which convert the ± 15V to ± 12V respectively.

5.2.7 REAL TIME CLOCK BOARD (Reference 100-700-108)

5.2.7.1 GENERAL - The main purpose of this board is to keep track of real time and store real time data such as functions and audio sources to be scheduled by real time. Time updating is accomplished by microprocessor U4 in conjunction with memory in ROM U10 which together keep a memory word in peripheral interface U3 updated. Real time data is stored in RAMS U19 and U33.

Initial time information is loaded from the main video terminal by means of a memory program in U10 as controlled by the CPU board. Once the initial time is loaded, U4 updates time every second. As time is updated, an interrupt (IR1) to the CPU is created by U7-6 causing the CPU board to interrogate U19 to determine if any time oriented function or source is to be scheduled.

5.2.7.2 INITIAL RESET - At initial power up, U1 creates a negative going pulse at pin 3. This resets U3 and U4 causing U4 to go into an initialize routine which sets the time word to zero, conditions U3 outputs PB0, PB1, PA0, and PA1 to be outputs and PA7 to be an input, and clears all memory cells in U19. After the initial reset pulse, U3-8 (PA0) is pulsed negative every 8 ms.

This pulses Q1 "on" discharging C3.
If a pulse is ever missed, C3 is allowed to charge to the firing potential of U1 and a reset pulse is generated. This causes U4 to repeat the initialization routine including setting the time word to zero. Thus real time and all real time data would require reloading.

5.2.7.3 ADDRESS DECODING - Address lines A0 through A9 are used to address memory cells within U3, U19, U33, & U10. A11 and A12, in conjunction with the ENA line which is driven by the 6502 CPU (U4-39) if U4 has control of the bus or either a "write" or "read" request if the CPU board has control, select which chip is to respond to A0 through A9 as outlined below:

A11	A12	ENA	SELECT
0	0	X	U3
1	0	1	U10
0	1	1	U19, U33

0 = Low
1 = High
X = Irrelevant

Address line A15 must go "high", while A10, A13, A14 and either A11 or A12 must go "low" causing U20-8 to go "low", if the CPU board wishes to address this board.

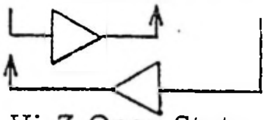
5.2.7.4 ADDRESS BUS CONTROL - Since both U4 and the CPU board require access to the Address bus, control is required to insure they do not try to drive the bus simultaneously. Unless the CPU board specifically addresses this board, U4 will have access to the bus (2BA will be "low"). Additionally, if U4 is in control, all READ/WRITE instructions come from U4 via U23-3 which is enabled when 2BA is "low", and disabled when 2BA is "high".

If the CPU board desires access to the bus, it must properly address the board (Paragraph 5.2.7.3), bringing U26-12 "low", making U7-8 "high". Immediately U7-3 (1 wait at P1-42) goes "low", putting the Z80 CPU in a wait state until the 6502 CPU (U4) goes to a "READ" state (U4-34 "high").

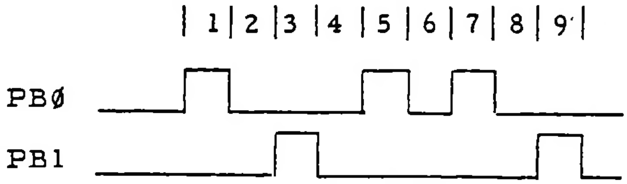
The logic for the bus acquisition by the Z80 CPU is as follows: Upon addressing the board, ZBREQ at U26-10 goes "high". DMAOK at U26-9 will be "high" except during the brief reset pulse provided for U1 by U3-8 approximately every 8 ms. Thus, U9-11 will go "high" (pulsing "low" only when DMAOK pulses) and at the PHI1 clock pulse U18-9 will set "high" while U18-8 sets "low". This brings U4-2 (RDY) "low" flagging U4 that it is to go into a standby mode which it will do at the next "READ" cycle. At that time U4-34 goes "high", causing U8-8 to go "high". At the next PHI-1 clock pulse, U18-5 goes "high". Since U29-8 was set "high" at the time U18-8 was set "low", U24-3 goes "low". Thus, IBA goes "low", enabling the Z80 buffers U13, U14, and U23B, while 2BA goes "high", disabling U4 buffers U11, U12 and U23A. On the next PHI1 pulse U18B is reset (U18-8 goes "high"), causing U9-8 to go "low" and U7-3 to go "high", releasing the "WAIT" state.

The Z80 CPU now controls the bus, and when it completes its "READ" or "WRITE" instruction, it breaks off addressing the board, causing U26-12 (1BREQ) to return "high". This in turn causes 2BREQ to return "low" resetting U29-8 "low", causing IBA to return "high" and 2BA to return "low", switching control of the bus back to U4. At the next PHI1 pulse, U18A is reset to its quiescent state (U18-5 set "low") and U4-2 returns "high", allowing U4 to continue processing.

5.2.7.5 DATA BUS BUFFERS - U5 and U6 are tri-state bi-directional buffers under control of U25. The buffers are set to their high impedance open sta if U4 has control of the board. This prevents a data from getting to or from the board since U4 operates independently of the CPU. This is determined by the fact that 2BA will be "low" forcing both U25-3 and U25-11"high" thus U5 and U6 pin 1 will be "high" and pin 15 will be "low" (see chart below for state truth table). If the CPU board has control, 2BA will be "high" enabling U25 to respond to the state of the 1RD and 1WR inputs. If 1WR ("write") goes "low" U27-10 goes "high" bringing U25-3 "low" thus both U5 and U6 pins 1 and 15 will be "low" allowing data to flow from D0 to R0. If 1RD ("read") goes "low", U27-12goes "high" bringing U25-11"low" thus both pins 1 and 15 of U5 and U6 will go "high" allowing data to go from DI to D0.

Control Pins		Input/Output
1	15	D0 R0 D1
Lo	Lo	
Hi	Hi	
Hi	Lo	Hi Z Open State
Lo	Hi	Invalid State

5.2.7.6 REMOTE CLOCK DRIVE - Each second after the time memory word in U3 is updated, U4 executes a program to update the remote clock(s) if connected. It does this by controlling the state of U3-23 (PBI) and U3-24 (PB0) which are normally "low" when data is not being sent. Serial data to the remote clock is sent in a format that allows only one output to be "high" at any time and requires that both be "low" on every other cycle as shown below.



U17-5 and 9 buffer the signal without inverting it while pins 6 and 8 invert it.

5.2.8 VEL BOARD (Reference 100-700-118)

5.2.8.1 GENERAL - The VEL (Verified Encoded Logging) board is responsible for interfacing the system to a printing device used to print out the logging data. The board contains address decoding logic, data direction steering logic, a detector circuit for the 3.5KHz encoding signal, baud rate generators for both transmitting to the printer and receiving the 3.5KHz encoding, and a Universal Synchronous/Asynchronous Receiver/Transmitter (USART) for converting the parallel system data to serial data for the printer. Additionally there is a ROM chip (U10) which contains the firmware required by the board plus the standard messages ("music", "news", "xmtr off", etc.) which are used on the log. There is also a RAM chip (U6) where logging data is stored until the CPU can conveniently se it to the printer.

The basic operation is as follows: when the CPU has data for the logger (such as when a new audio source starts or a malfunction occurs), it starts loading data into RAM U6. Each character of data contains eight (8) bits but since U6 is a four bit RAM, data must be loaded four bits at a time in successive memory addresses. Each time the CPU loads data, a memory cell which acts as a pointer is updated to show where the last data word is located. Conversely, each time data is outputed to the printer another memory cell is updated showing from where the last character came. Thus when the last character is outputed, the pointers will be equal and the CPU by comparing the pointers knows there is no more data to send.

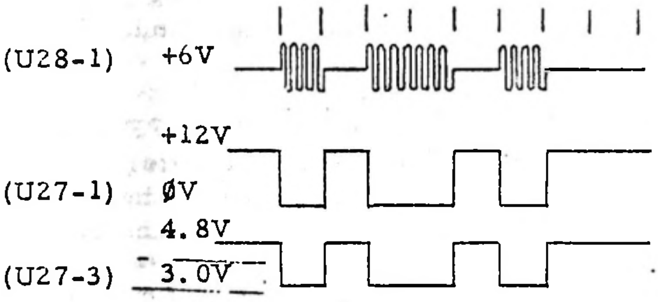
When the CPU is ready to send data to the printer, it starts pulling data from the RAM (U6). It reads two adjacent addresses (getting 4 bits of data fr each) and reconstructs an 8 bit word which is th sent to the USART (U9) for transmission to the printer in serial form.

3.5KHz encoding is filtered and digitized and sent to the USART (U9) peripheral input (RxD). When eight (8) bits have been read and loaded on the data buffer (D0 through D7), and interrupt is created and the CPU responds by taking the data from the USART and storing it in RAM (U6) so that the encoded data will be printed in the proper sequence.

5.2.8.2 ADDRESS DECODING - Note that RAM (U6) and ROM (U10) are considered as memory devices by the CPU and thus 1-MREQ must be asserted "low" when they are addressed. USART (U9) is considered an I/O device, and, therefore, requires 1 IORQ to be asserted "low", when it is addressed. Address bus lines A0 through A9 are used to select memory addresses within RAM (U6) and ROM (U10). Address line A10 in conjunction with 1-MREQ selects the RAM (A10 "lo or the ROM (A10 "high"). USART (U9) is selected whenever A0 is "low". However, in order to decode READ/WRITE instructions, A4, A5, and A7 must be "low", and A6 must be "high", causing U21-6 (1AD40) to go "low". Additionally 1-IORQ (P1-$\overline{K}$) must go "low", bringing U22-3 "low" enabling U22C and D. Thus when a read command is sent, 1RD (P1-32) goes "low" pulling U22-11 "low" commanding U9 to "read" data. Likewise U22-8 goes "low" when a write instruction is sent (1WR goes "low"). Address lines A11 through A15 are used to enable U17 to decode READ/WRITE data for RAM (U6). If A12 and A14 are "low" and A13 and A15 "high", U21-8 goes "low" and U16-10 goes "high". Then if A11 is "high", and 1-MREQ (P1-39) is "low", U17-6 goes "low" bringing U16-8 "high" enabling U17 to decode the state of 2A10 and 3RD. If 2A10 is "high", RAM (U6) is selected; if "low", ROM (U10) is selected. See Para. 5.2.8.3 for 3RD logic.

5.2.8.3 DATA BUS BUFFERS - U7 and U8 are bi-directional buffers whose data direction is determined by the state of pins 1 and 15 which is established by the state of the "read" (1RD) signal from U17-11. U17 is driven by U22-11 when the USART (U9) is being addressed and U17-8 when the RAM (U6) or ROM (U10) is addressed. If either input to U17-12 or 13 goes "low" the instruction is to read data. U17-11 goes "high" causing data at U7 and U8 to go from D1 to D0. If neither input is "low", U17-11 will be "low" causing data to go from D0 to R0.

5.2.8.4 3.5kHz DETECTION - (Reference Sheet 2) - U27B buffers the incoming 3.5 kHz tone burst encoded logging signal from P1-43. U27B divides the input signal by approximately 3 to prevent overdriving the band-pass filter U28. Both sections of U28 are wired as 3.5 kHz band-pass filters. Thus, all frequencies other than 3.5 kHz are rejected. The 3.5 kHz signal from U28-1 is detected by CR3 and CR4, and filtered by C7. R13 allows C7 to discharge during an absence of positive voltage from U28. U27 is a threshold detector. As long as the peak signal at U28-1 remains below approximately 5.4V, U27- will be "high" (approximately +11.5vdc). The reference voltage at U27-3 is approximately +4.8vdc in the absence of sufficient input signal. When the signal at U28-1 is large enough to charge C7 to 4.8V or greater (voltage drop across CR3 requires signal at U28-1 to be at least 5.4V peak), U27-1 goes "low" (0V). This causes the reference voltage at U27-3 to drop to approximately 3.0vdc due to R17 effectively paralleling R18 by CR5 being forward biased. Thus C7 must discharge to a level below 3.0vdc before U27-1 can return "high" (see timing diagram below).



The output from U27-1 is then sent to U19-4 (sheet 1) which converts the digitized signal to standard TTL levels for use by U9. Note that the signal to U19 is divided by R11 and R10 and also that R10 is referenced to -12V. This sets the voltage extremes at U19-4 to +4.5vdc and (-) 3.75vdc.

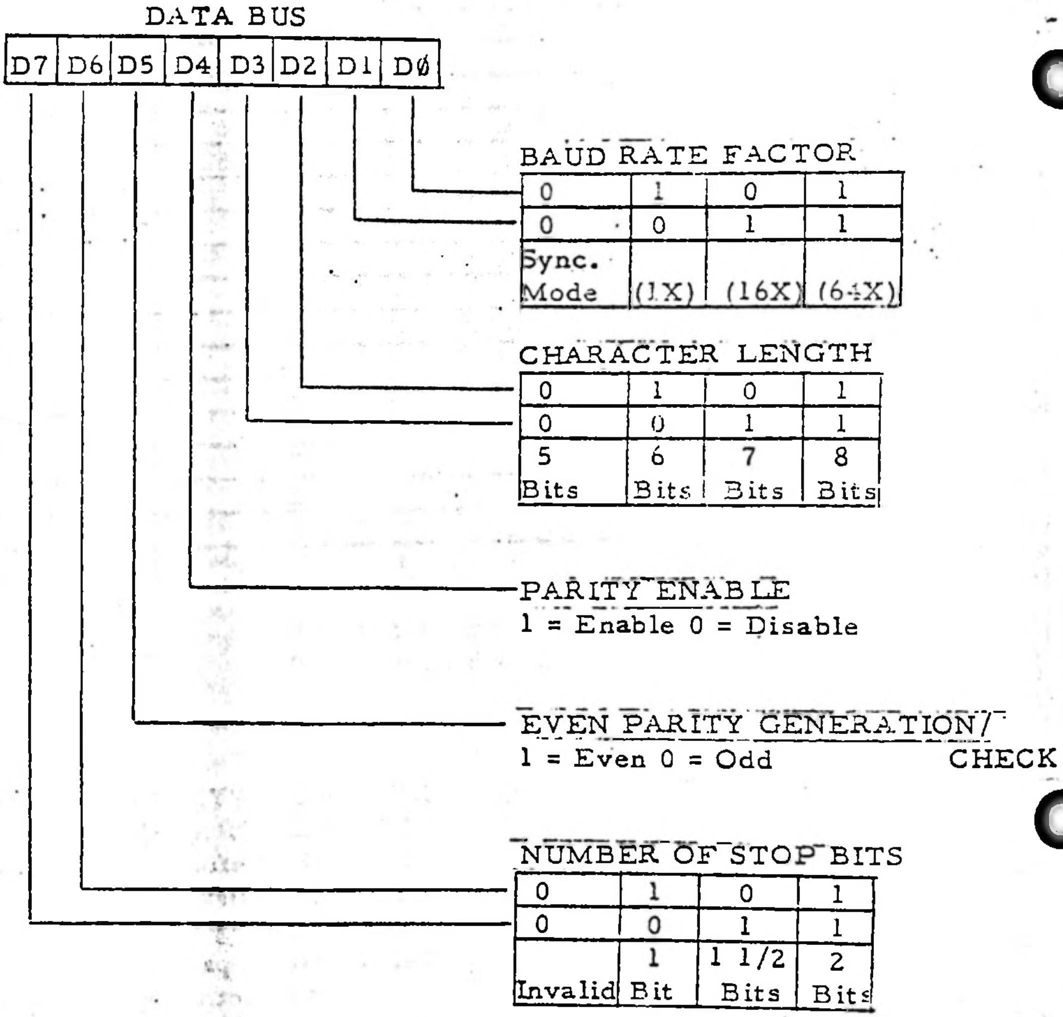
5.2.8.5 BAUD RATE GENERATORS - There are two baud rate generators. U4 controls the rate at which data is sent to the logging printer and U5 controls the rate at which the encoded logging data is clocked into U9. The baud rate is determined by the position of switches on switch pack U3 in accordance with the chart below. U1 divides the input 2 clock 01 signal by 2 (921.6KHz) and clocks both U4 and U5.

U4/U5				Output Frequency (KHz)	Baud Rate
11	10	9	8		
0	0	0	1	0.8	50
0	0	1	0	1.2	75
0	0	1	1	1.76	110
0	1	0	0	2.152	134.5
0	1	0	1	2.4	150
0	1	1	0	4.8	300
0	1	1	1	9.6	600
1	0	0	0	14.4	900
1	0	0	1	19.2	1200
1	0	1	0	28.8	1800
1	0	1	1	38.4	2400
1	1	0	0	57.6	3600
1	1	0	1	76.8	4800
1	1	1	0	115.2	7200
1	1	1	1	153.6	9600
0	0	0	0	External Frequency	

0 = Low = Switch "ON"
1 = High = Switch "OFF"

5.2.8.6 UNIVERSAL SYNCHRONOUS/ASYNCHRONOUS RECEIVER/TRANSMITTER (USART) INITIALIZATION - Before any transfer of data can occur, USART U9 must be initialized. This is done by the CPU during the system initialization process. The following pages list the Mode Instruction formats for both Asynchronous and Synchronous modes.

After the Mode instruction has been sent, the CPU is free to send or read data or commands.



DATA BUS

D7	D6	D5	D4	D3	D2	D1	D0

BAUD RATE FACTOR

0	1	0	1
0	0	1	1
Sync. Mode	(1X)	(16X)	(64X)

CHARACTER LENGTH

0	1	0	1
0	0	1	1
5 Bits	6 Bits	7 Bits	8 Bits

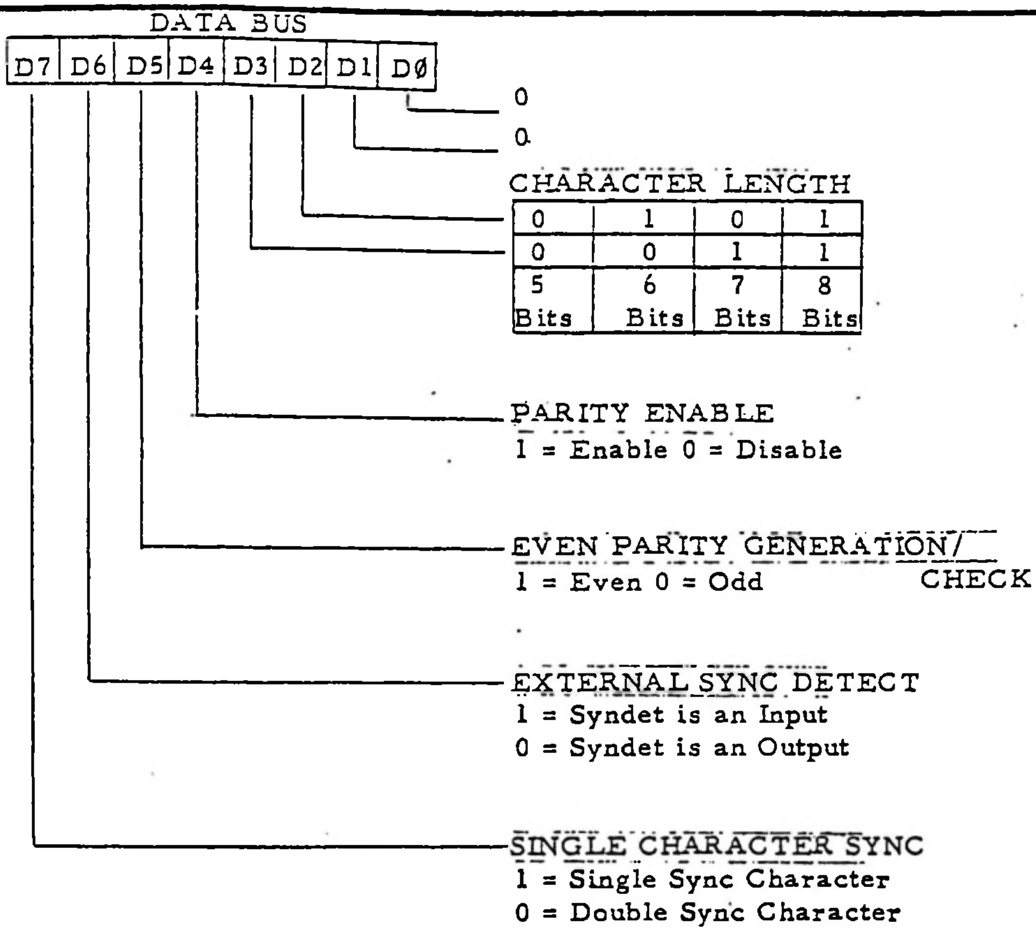
PARITY ENABLE
1 = Enable 0 = Disable

EVEN PARITY GENERATION/CHECK
1 = Even 0 = Odd

NUMBER OF STOP BITS

0	1	0	1
0	0	1	1
Invalid	1 Bit	1 1/2 Bits	2 Bits

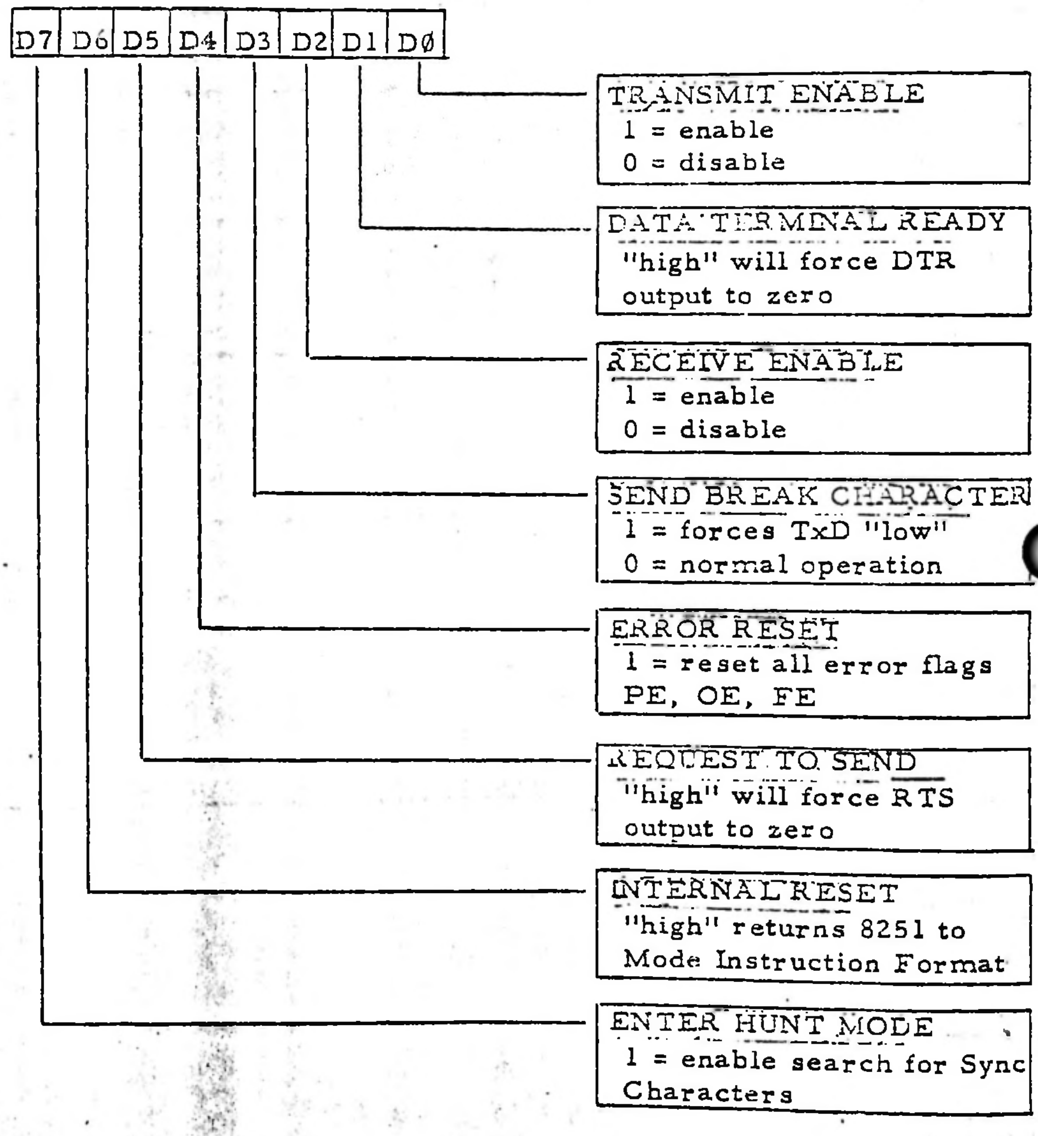
ASYNCHRONOUS MODE INSTRUCTION FORMAT



0	1	0	1
0	0	1	1
5 Bits	6 Bits	7 Bits	8 Bits

SYNCHRONOUS MODE INSTRUCTION FORMAT

.2.8.7 DATA/COMMAND DETERMINATION - The USART U9 is capable of receiving data or commands (such as "set request to send" [RTS]) or sending data or status on the Data bus (D0 through D7). If U9-12 is "low", data is being sent or received. If U9-12 is "high", command information is being sent or status is being read. The following is the Command Instruction Format.



COMMAND INSTRUCTION FORMAT

5.2.8.8 SENDING DATA (CPU to TERMINAL) - Before discussing the data sending process, a brief discussion of four (4) general purpose lines which may or may not be required (depending on what type of terminal is used) is in order. The lines are:

- $\overline{\text{RTS}}$ (Request to Send) - Asserted "low" by CPU setting data line D5 "high" when sending Command word. Advises terminal that CPU has data to send.

- $\overline{\text{CTS}}$ (Clear to Send) - This line is asserted "low" at U9-17 by the Terminal when it is ready to receive data. Note that a jumper (W2) can be installed so that the RTS line going "low" will set this input "low".

- $\overline{\text{DTR}}$ (Data Terminal Ready) - General purpose output which can be asserted "low" by CPU setting data line D1 "high" while sending Command word. If DTR goes "low", U14-11 goes "high" and U26 pins 4 and 6 go "low". The output of U26 could be used as a motor start signal for a teletype or printer.

- $\overline{\text{DSR}}$ (Data Set Ready) - General purpose input which can be tested by the CPU reading the status of U9 data output D7. Can be used by terminal to advise CPU that it is ready for data.

The procedure for sending data varies somewhat depending on the type terminal used however basically the CPU must set up Address lines A4 thru A7 such that U21 will decode that this board i the port to be acted on. Additionally address line A0 must go "low" to pull U9 "chip select" ($\overline{\text{C/S}}$) "low" and A1 must be set to determine if the data word is a Command or Data ("low" =

Command, "high" = Data). Lastly, IWR (P1-$\overline{L}$) must go "low" pulling U9-10 "low". The Data bus will now contain an 8 bit Command word (s Command Instruction Format - paragraph 5.2.8. or an 8 bit data word corresponding to the ASCII code for a letter, number, or character. If data rather than a Command is presented, U9 starts shifting the data out pin 19 (TxD) one bit at a time at each falling edge of the pulse at U9-9. If the terminal is an RS232 device, data is shifted out at J1-2 (TxD). If the terminal is a 20ma loop device, data flows through U18, U20, U26, and Q1 and out at J2-23 (RCVR+). Note that in the quiescent state U26-12 will be "low" holding Q1 on pulling the collector to +24V and supplying 20ma of current to the terminal.

When all data bits have been shifted, TxRDY (U9-15) goes "high" turning on DS2 and creating an interrupt pulse at the falling edge of the CLOCK 2 pulse. This lets the CPU know that it can send another character.

5.2.8.9 RECEIVING DATA FROM THE PRINTER - If the printer is equipped with a keyboard, data can come in at J2-24. This data signal is routed right back to the printer via U19, U20, U26, and Q1. No other involvement from the VEL board is required.

5.2.8.10 VOLTAGE REGULATORS - VR1, VR2, and VR3 convert the ±15V power supply inputs to +12V, -5V, and -12V respectively.

5.2.9 DEBUG BOARD (Reference 100-700-004)

The Debug Board is a ROM Board containing the Debug diagnostics program. Refer to the ROM Board theory of operation (Paragraph 5.2.3) for hardware operation. Paragraph 7.5 in the TROUBLESHOOTING section discusses use of the Debug features in diagnosing problems.

5.3 AUDIO CHASSIS

5.3.1 BLOCK DIAGRAM (Reference Drawing 114-700-003)

5.3.1.1 GENERAL - The Audio chassis is responsible for all Audio source switching and all audio processing. While the Control chassis determines which source should be "on the air", it is the responsibility of the Audio chassis to start the source and get its program audio on the air. Selection of audio for cue monitoring is also handled by this chassis in conjunction with the AUDIO MONITOR switch on the Local Status Panel. There are four (4) basic boards in this Chassis whose responsibilities are outlined below.

* AUDIO CONTROL BOARD - This board interfaces the Audio chassis to the Control chassis via a 60 wire cable from J1 on this board to J1 on the CPU board. It contains Audio Source decode logic; Audio Source control logic; logic for Silence Sense delay and control, Close Loop and Fade control; as well as drivers for Silence Sense, Close Loop, and Fade status LED's. Additionally the 3.5KHz encoded logging signal is buffered prior to being sent to the Control chassis VEL board.

* AUDIO DISTRIBUTION BOARD - This board is the main audio processor. It contains both a compressed and uncompressed audio amplifier; Cue or Program selection logic for monitor speakers and VU meters; and final Line audio amplifiers, drivers, and transformers. Additionally the Silence Sense audio detector, Fade down logic, and Alarm driver reside on this board. All Local Status Panel signals come to or from this board via J4. Should there be an

Expansion Audio Chassis in the System, J3 on this board couples necessary signals to J3 of the Audio Distributio board in the Expansion chassis.

* MONITOR AMP BOARD - This board contains monitor speaker amplifiers as well as two (2) stereo auxiliary signal amplifiers and selection logic for selecting one of the two to be placed on the Cue bus. Additionally, the Auxiliary #2 input is routed to an audio level detector which will bring the EXTDET line "low" should audio go below a set level for more than a set period of time (typically -25db for 3 seconds). Normally an air monitor output would be tied to this input.

* UNIVERSAL SOURCE BOARD - This is the Input/Output (I/O) board for the Audio sources. There is one Universal Source board for each Audio source. The location of the board determines its Source number. The board contains logic for Starting and Stopping the Audi source. Note that normally only Reel-to-Reel sources require the Stop signal. Additionally there are four (4) photo-isolated inputs for Audio source response signals such as a signal to indicate that a source is "playing". Random access tray number decoding is also determined on this board. There is an audio preamp with gain control as well as switching logic to determine if audio is to be placed on the Program or Cue bus. The board can detect a switch or relay closure or a 25Hz tone on either the left or right channel to create a source switching signal. Additionally there is logic to

allow audio fade up and/or down. Indicator LED's reside on this board which show through the Local Status Panel to indicate if a source is "on air", "next", or in a "pre-roll" state.

5.3.1.2 BUS STRUCTURE - Though most signals are bussed to all connectors on the backplane, physical constrains require boards to be installed as shown below:

Connector	Board
XA1	AUDIO CONTROL Board
XA2 thru XA17	UNIVERSAL SOURCE Boards
XA18	MONITOR AMPLIFIER Board
XA19	AUDIO DISTRIBUTION Board

The Source Select bus (1SEL1 through 1SEL16) fans out from the Audio Control board (XA1) as follows:

1SEL1	A2-Y	1SEL9	A10-$\overline{C}$
1SEL2	A3-21	1SEL10	A11-$\underline{2}$5
1SEL3	A4-Z	1SEL11	A12-D
1SEL4	A5-$\underline{2}$2	1SEL12	A13-$\underline{2}$6
1SEL5	A6-A	1SEL13	A14-E
1SEL6	A7-$\underline{2}$3	1SEL14	A15-$\underline{2}$7
1SEL7	A8-B	1SEL15	A16-F
1SEL8	A9-24	1SEL16	A17-28

5.3.2 AUDIO CONTROL & BUFFER BOARD (Reference 100-700-007)

5.3.2.1 GENERAL - Through J1, this board is the interface between the Control chassis and the Audio chassis. Additional responsibilities include audio source selection, established by decoding Address bus data, and specific control functions as determined by the state of the Data bus lines. Silence Sense, closed loop, fade, and end of message logic all reside on this board. Additionally there is a buffer amplifier for the 3.5KHz encoded logging signal.

5.3.2.2 **ADDRESS DECODE/SOURCE SELECTION** - The Audio Chassis is considered by the CPU to be a memory address. Therefore the Audio Control board must decode that the Address bus is calling on it to "write" or "read" data. The Address bus is divided into specific responsibilities as shown below:

A0 through A3 - Audio source selection.

A4, A5 - Specific Audio chassis selection (4 possible).

A6, A7 - If both "high", disables Audio source selection.

A8 through A15 - If A8 = "low" and A9 through A15 = "high", address is for Audio chassis.

As noted above, if A8 is "low" and A9 through A15 are all "high", this card determines that the address pertains to an Audio Chassis. This condition brings all inputs to U18 (sheet 2) "high" causing U18-8 to go "low". When 1MREQ (J1-9) goes "low", U5-1 goes "low" enabling U23 (sheet 1) the "Chassis Select" decoder portion of the "Source Decoder" circuit.

U23 determines which of four (4) possible Audio chassis has been selected by decoding Address lines A4 and A5. The following chart shows the decode truth table and proper jumpering for the four possible Audio chassis.

		U23					
A4	A5	15	14	13	12	Sources	Jumper To
0	0	0	1	1	1	1-16	A
1	0	1	0	1	1	17-32	B
0	1	1	1	0	1	33-48	C
1	1	1	1	1	0	49-64	D

0 = Low
1 = High

Assuming the board is jumpered for the selected Audio chassis, the jumpered output of U23 goes "low" enabling U16 to decode the source select address lines A0 through A3. This is assuming address lines A6 and A7 are not both "high". If they are, U12-8 goes "low" forcing U16-19 "high" which disables U16. Again assuming U16 is enabled, it decodes the address lines and pulls one of the sixteen (16) "select" lines "low". The select lines (1SEL1 through 1SEL16) go to the individual Universal Source connectors (see paragraph 5.3.1.2).

An additional action that occurs when the jumpered output of U23 goes "low" if the "wt del" jumper is installed is that U4 produces a 1usec positive pulse creating a negative "WAIT" pulse at J1-5. This signals the CPU to wait until J1-5 goes "high" before advancing to the next step.

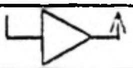
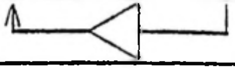
5.3.2.3 CONTROLLER DECODE (Sheet 1) - If data is to be transferred but no source is to be selected, Address lines A6 and A7 will both go "high". Assuming Address lines A8 through A15 are properly set for addressing an Audio chassis, 1ADDC to U8-11 (Sheet 1) will go "low" thus bringing all inputs to U12A "high" forcing U12-8 "low". This causes U8-12 to go "high" disabling source decoder U16. Additionally U5B and U9A (sheet 2) are enabled to respond to write (1WR) and read (1RD) instructions for control decode purposes.

If a "write" instruction is sent, 1WR (J1-18) goes "low" causing U9-1 to go "high". If 2D6 is "high" U3-8 goes "high" bringing U5-11 "high" which pulls U9-4 (3PGMCLR) "low". This resets FADE flip flop U11 (sheet 1) and sends a low going 1PGMCLR signal to the Universal Source boards. Additionally 1WCDC clocks the Closed Loop, Fade, and Silence Sense flip flops U11 and U7.

If a "read" instruction is sent, 1RD (J1-17) goes "low" causing U5-6 to go "low". This enables tri-state buffers U2 and U15, setting the follow data on the Data bus.

2D0 - Silence Sense F/F Status (U7-15) Sheet 1
2D1 - Silence Sense Disable F/F Status (U7-11) Sheet 1
2D2 - Close Loop F/F Status (U11-15) Sheet 1
2D3 - Fade Control F/F Status (U11-11) Sheet 1
2D4 - Silence Sense Extend Control Status (U3-3) Sheet 1
2D5 - Override (ORIDE) Status (U22-3) Sheet 2
2D6 - Aux 2 Audio (EXT DET) (P1-K) Sheet 2
2D7 - Set "low" by U2-9 (Sheet 2)

5.3.2.4 DATA BUS BUFFER CONTROL - (Sheet 1) If either "Controller Decode" (1CDC) or the jumpered output of U23 go "low", U21-3 goes "low". If "write" is requested, 5RD at U9-12 will be "high" causing U9-13 to be "low". Since both inputs to U5C are "low" U5-8 will go "low". Thus both pins 1 and 15 of U6 and U10 will be "low" allowing data to flow from D0 to R0 (see chart below). If 1CDC alone is "low", this is the only condition U6 and U10 can be in. If U9-11 is "low" and "read" is requested, 5RD goes "low" bringing U9-13 "high". This causes both pins 1 and 15 of U6 and U10 to be "high" allowing data to go from DI to D0. If neither 1CDC nor the jumpered output of U23 is "low", pin 1 of U6 and U10 will be "high" and pin 15 will be "low" putting U6 and U10 into an open high impedance state.

Control Pins		Input/Output
1	15	D0 R0 D1
Lo	Lo	
Hi	Hi	
Hi	Lo	Hi Z Open State
Lo	Hi	Invalid State

5.3.2.5 SILENCE SENSE CIRCUIT (Sheet 1) -

ALARM MODE - Normally pins 1, 2, and 4 of U12 are "high", and pin 5 is "low". This puts U12-6 "high", U8-6 and U19-2 "low". This condition holds timer U28-3 "high" and also turns on the yellow "DISABLED" LED (DS3). If Silence occurs, SS DRIVE (P1-32) from the Audio Distribution board goes "high", forcing U12-6 "low". Thus, U19-2 goes "high", allowing U28 to start timing out and turning off DS3. If Audio returns before U28 times out, U19-2 returns "low", discharging timing capacitor C1 through R8. If Audio fails to return, U28 times out (total time is determined by setting of R1 and the state of U3-3), clocking U7 as U28-3 goes "low". This sets U7-15 "high". This condition is noted during the normal Audio Control status check by the CPU which then sets U26-11 "high", causing U9-10 to go "low" turning on the alarm lamp. U26-10 is set "low", turning on the red SILENCE LED.

RESET - The circuit can be reset in two ways. One is to press the ALARM switch on the Local Status Panel which pulls U4-8 and, thus, U3-6 "low". This resets U7-15 and U26-11 "low" and U26-10 "high". It also pulls U19-2 "low" so that when the ALARM switch is released, U28 can start timing again if Audio has not returned. The second way is for the CPU to set U7-9 "low", U7-12 "high' and clock U7. This sets U7-11 "low" duplicating the function of the ALARM switch. The CPU would then reset U7 and U26 by setting pin 9of each IC "high", pin 12 "low", and clocking pin 6. The CPU reset occurs when the ALARM switch is activated on the Video Terminal.

SILENCE SENSE DISABLE - If it is desired to disable Silence Sense, U7-11 is set "low" by the CPU holding U12-6 "high", regardless of the state of pins 1, 2, or 5.

EXTENDING THE DELAY - Some Audio sources, such as a live studio or network, require a longer delay, due to uncontrolled pauses in speech. Normally both inputs to U3 (pins 1 and 2) are "high" and thus R24 and R9 effectively parallel R4 making that portion of the charging leg approximately 4.4K ohms. However if 1SSEXT 1 (P1- from the Universal Source board or 1SSEXT 2 (J1-32) from the CPU board goes "low", U3-3 goes "low" back biasing CR2 and thus effectively removing R24 and R9 increasing the resistance value to 1meg.

5.3.2.6 FADE CIRCUIT (Sheet 1) - 1/2 of U11 is used as the FADE status latch. It is totally controlled by CPU firmware. If U11-11 is set "high", FADE is enabled and U11-10 being "low", turns on DS4 (green FADE LED).

5.3.2.7 CLOSED LOOP CIRCUIT (Sheet 1) - 1/2 of U11 is used as the CLOSED LOOP status latch. In the event of a Closed Loop fault, U11-15 will be set "high" by the CPU. This causes U9-10 to go "low" turning on the ALARM lamp. U11-14 being "low" turns on DS1 (red LOOP LED).

5.3.2.8 END OF MESSAGE CIRCUIT - When an End of Message (EOM) tone is detected by the Universal Source board, it brings 1EOMB at P1-P (Sheet "low". This pulls U25-12 "low" creating an interrupt (1R3) to the CPU. When 1EOMB returns "high", U14-2 goes "low" clocking timer U1 which produces a 10usec positive pulse at U1-3. This in turn pulses U9-4 and U24-3 "low" clearing FADE flip flop U11 (Sheet 1) and sending a 1PGMCLR pulse to the Universal Source boards.

5.3.2.9 OVERRIDE (ORIDE) CIRCUIT (Sheet 2) - If 1ORIDE (J1-31) goes "low" or the OVERRIDE switch S1 is actuated, U22-3 and U22-13 both go "low". 3 ORIDE goes to the Audio Distribution and the Universal Source boards. U15 is a tri-state buffer. U15-3 will present the state of U22-3 when 1RCDC at U15-1 (Sheet 1) goes "low". Override would typically be used in an emergency situation where normal control functions have failed and it is desired to control sources manually. Reference Paragraphs 5.3.3.4 & 5.3.5.12 for operation on Audio Distribution and Universal Source boards respectively.

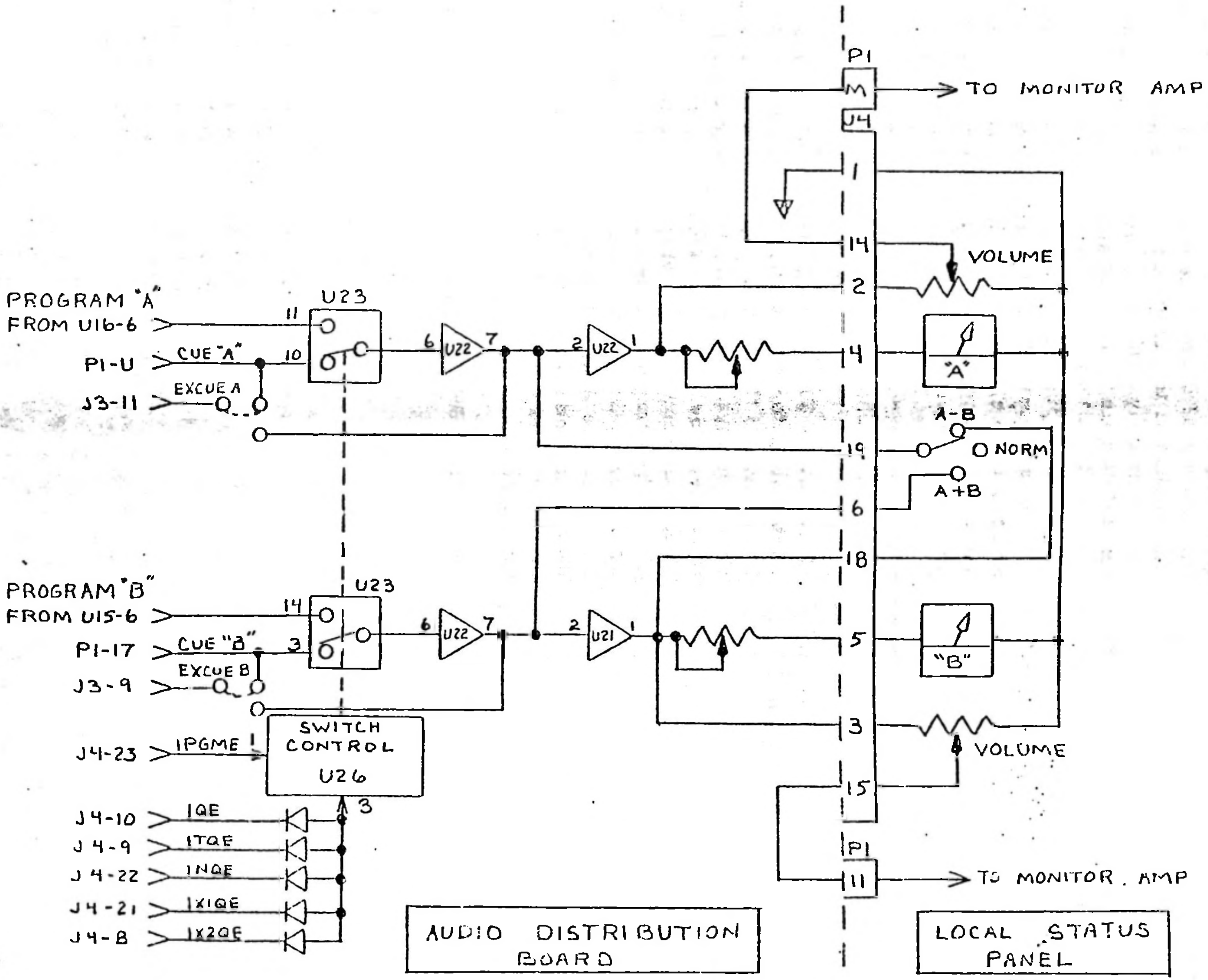
5.3.2.10 ENCODING (3.5KHz) BUFFER (Sheet 2) - 3.5KHz encoding enters the card at P1-43 (Sheet 2) from the Universal Source boards. Since the output impedance of the Universal Source board is approximately 10K ohms, buffer U27 has approximately a gain of 1. R21 and R23 set the bias point at U27-3 to approximately 3.0V to allow for maximum input voltage swings. Note that since U27-2 is a current summing point, very little AC voltage can be seen at this point. AC input must be measured prior to the 10K output resistor (R60) on the Universal Source board.

5.3.3 AUDIO DISTRIBUTION BOARD (Reference 100-700-016 Schematic, and 114-700-004 Audio Signal Block Diagram)

5.3.3.1 GENERAL - The Audio Distribution board is responsible for final audio processing of the Program and Cue audio. Program audio can be routed through a compressed or uncompressed amplifier. Selection is based on jumpers on the Universal Source board which routes the audio to either the compressed or uncompressed amplifiers. Other functions controlled by the board include Audio fade control, Silence Sense detection, and alarm drive. Additionally, all signals to and from the Local Status Panel route through this board.

5.3.3.2 CUE AUDIO PROCESSING (Sheet 2)

5.3.3.2.1 CHANNEL A - Cue "A" audio from the Universal Source board or the Monitor Amplifier board comes in at P1-U. Cue A audio from an expansion Audio chassis comes in at J3-11. If the Audio Distribution board is in the main Audio chassis, "C" is jumpered to "M" to bring audio in from the expansion chassis. If the board is in an expansion chassis, "C" is jumpered to "EX"



CUE AUDIO SCHEMATIC (SIMPLIFIED)

to feed audio from U22-7 to the main Audio chassis.

Either Program or Cue audio can be fed to Cue amplifier U22. Selection is based on which FET in U23 is turned "on" as controlled by the SOURCE switch on the Local Status Panel. If PROGRAM is selected, 1PGME (J4-23) is "low" turning on the Program FET (upper) selecting audio from U16-6. If the SOURCE switch is in any other position than PROGRAM, one of the Q inputs will be "low" as shown below"

CUE	1 QE	J4-10
TIME	1 TQE	J4-9
NETWORK	1 NQE	J4-22
AUX 1	1 X1QE	J4-21
AUX 2	1 X2QE	J4-8

Any of these inputs being "low" pulls U26-4 "low" turning on the Cue FET feeding Cue bus audio to U22-6. Audio from U22-7 is then sent to buffer amp input U22-2 and also is sent to the arm of the MODE select switch (Local Status Panel) via J4-19 (FEED). If "A+B" or "A-B" is selected, Cue A audio is returned to this board via J4-6 or J4-18 respectively. The mixing process is discussed further in paragraph 5.3.3.2.2. The final Cue audio out at U22-1 is split and both paths go to the Local Status Panel. J4-4 (AVU+) goes to the left VU meter while J4-2 goes to the VOLUME potentiometer returning to the board at J4-14 and then sent on to the Monitor Amplifier board via P1-M.

5.3.3.2.2 CHANNEL B - Cue B audio is processed primarily the same as Cue A audio with the exception th Cue A audio is mixed with Cue B audio if the MODE selector switch on the Local Status Panel is in either the A+B or A-B positions. If in A+B Cue A audio is fed to U21-2 in phase with Cue B audio, thus the two signals add. If A-B is selected, the Cue A audio is fed to the output of U22-1 and mixed with the "inverted" Cue B audio and thus the two signals cancel. Note that both VU meters and both monitor speakers will respond to the mixing if A+B is selected while only the A channel responds properly if A-B is selected.

5.3.3.3 PROGRAM AUDIO PROCESSING - Since both the PROGRAM A and PROGRAM B audio circuits are identical, only Channel A will be discussed. The discussion is in three parts: Uncompressed pre-processing, Compressed pre-processing, a final audio processing.

5.3.3.3.1 UNCOMPRESSED PRE-PROCESSING (Sheet 1) - AUDA1 (P1-P) is the uncompressed audio input from the Universal Source board(s). EXAUDA1 (J3-19) is the audio input from the expansion Audio chassis if the board is in the main Audio chassis ("C" is jumpered to "M") or it is the audio output to the main Audio chassis if the board is in an expansion Audio chassis ("C" is jumpered to "EX"). U9 is a unity gain buffer (Universal Source board output impedance = 4.75K ohms) which buffers the signal to J2-5

(AUDA1O). This output goes to the Audio Interface Terminal board (TB3-2) where it can be routed to user audio processing equipment or jumpered to TB3-3 to be returned to this board at J2-11 (AUDA1IN).

5.3.3.3.2 COMPRESSED PRE-PROCESSING - (Sheet 1) AUDA2 (P1-S) is the Universal Source board audio to be fed to the compressed pre-processor. EXAUDA2 (J3-15) is the audio input from the expansion Audio chassis if the board is in the main Audio chassis ("C" is jumpered to "M") or it is the audio output to the main Audio chassis if the board is in an expansion Audio chassis ("C" is jumpered to "EX").

There are basically two modes of compression available. The setting of the MAN and AUTO switches determine which mode is selected. The following chart outlines the two modes.

	SWITCHES		TYPICAL SOURCE		
MODE	MAN	AUTO	AUD1	AUD2	COMPRESSION MODE
AUTO	OPEN	CLOSED	VOICE	MUSIC	AUD2 (music) is compressed when audio (voice) is also on AUD 1.
MANUAL	CLOSED	CLOSED	MUSIC	VOICE	AUD 2 (voice) is compressed at all times.

MODE 1 is used primarily when voice announcements are played over music thus compressing the music only when voice is present on the AUD 1 channel. Mode 2 is used primarily when it is desired to al music to have full dynamic range while compressing voice material. If both the MAN and AUTO switches are open, neither audio channel (AUD1 or AUD2) is compressed.

Turning the compressor on in AUTO mode is accomplished as follows. Audio from U9-6 and U10-6 is fed to U6-2 which amplifies the mixed signal. The first audio peak at U6-1 which exceeds approximately +1.3V turns on Q13 pulling its collector to ground. This triggers timer U3 setting U3-3 "high". Thus U30-10 goes "low" turning on FET U4 which then is allowed to feed AUD 2 audio to compressor amplifier U6 from U7 and U8. Timer U3 has a time out of approximately 1 second as set by R5 and C1. Thus as long as audio peaks continue to turn on Q13 in less tha 1 second intervals, U3-3 will rema "high". This is due to the fact that each time Q13 turns on, C1 is discharged through CR1. Once audio is absent for 1 second, U3-3 will return "low" shutting off FET U4.

In MANUAL mode U1 MAN switch is closed setting U3-3 "high" continuously thus holding FET U4 on continuously.

Returning to the compressor section, audio fed to U6 is amplified by U6. The amplification factor determines the compression level and is determined by potentiometer R24. C4 is rapidly charged negative by negative peaks from U6-7. The higher the incoming signal is, the more negative C4 charges. The setting of R4 determines how fast C4 is allowed to discharge during the absence of audio and consequently how fast the compressor shuts off when audio level drops. U2 is a unity gain non-inverting buffer whose output tracks the voltage level on C4. Since C4 is referenced to ground, U2 has an output range from 0vdc to -14vdc. The yellow "GATE" LED serves as an analog indicator of the compression level.

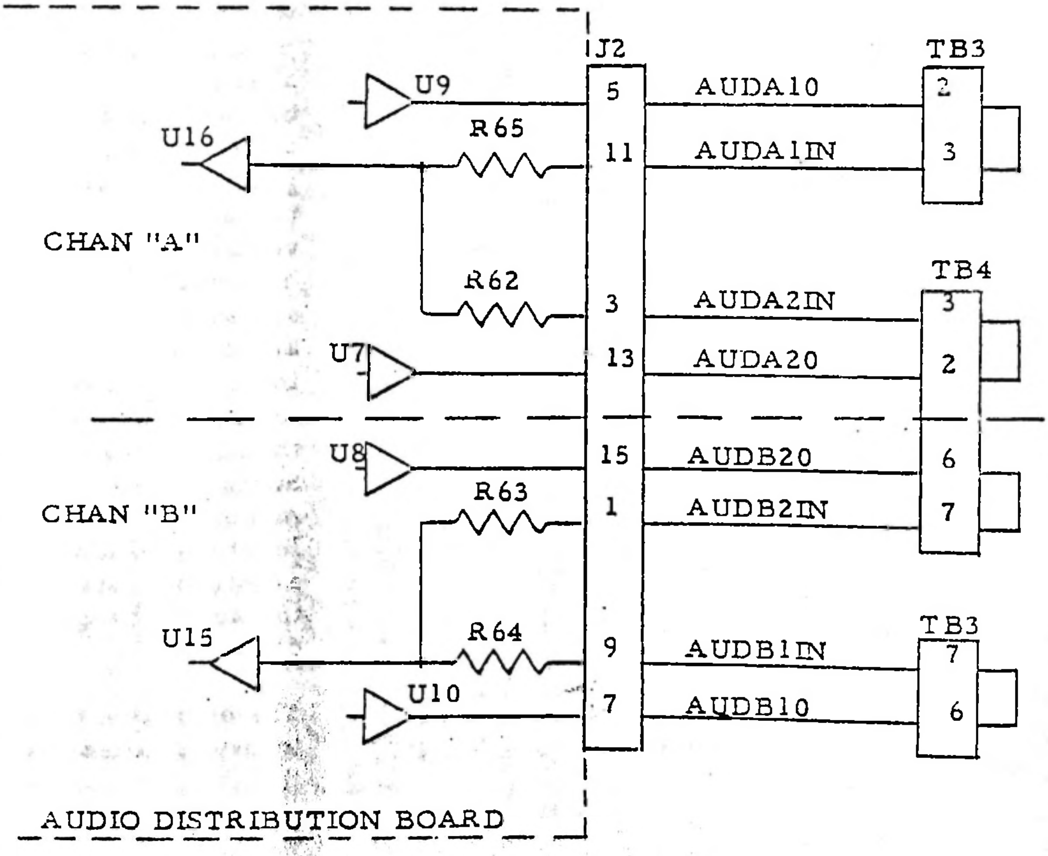
As U2-1 goes more negative, U5-2 is pulled in a negative direction which causes U5-1 to go in a positive direction. (Note that in the absence of any audio signal, U5 is biased such that pin 1 will be at approximately (-) 10vdc). As U5-1 goes more positive, FET Q1A is turned on harder. Q1A acts as a variable resistor which has a very high resistance at low audio levels and very low resistance at high audio levels. Thus as audio levels increase, U5 turns on Q1A harder to shunt more signal to ground and thus lowering the level out at U7-6. Some audio is fed to U5-3 which modulates U5-1 around the bias level established by U5-2. This allows the gate of Q1A to track with the audio changes to minimize distortion.

The operation of the B channel is identical to the A channel.

To summarize, as audio at U7-6 tries to increase, U2-1 goes more negative which causes U5-1 to g more positive which turns on Q1A harder which shunts more of the U7 input signal to ground thus lowering the output level at U7-6.

5.3.3.3.3 FINAL AUDIO PROCESSING

(Sheet 2) - Since Channel A and B are identical circuits, only channel A will be discussed. Audio from the Uncompressed (AUD1) and Compressed (AUD2) channels is sent out J2 to the Audio Interface Terminal board and then returned to the Audio Distribution board as "AUD1IN" and "AUD2IN" signals as shown below.



Audio is then fed to FET switch U13 which is ON unless OVERRIDE mode is activated and then to U16 which has a precise gain of 3.16 (10db). Note that the FET (U13C) in the feedback network for U16 adds resistance to the feedback circuit which compensates for the resistance added to the input by FET U13B. U17 amplifies the signal from the A OUT LEVEL potentiometer (R116) by a factor of approximately 100. Audio is then passed through a two stage band reject filter composed of U19, U27, and their associated circuitry. The components are selected to reject only 25Hz. Two stages are used to broaden the reject bandwidth to allow rejection of switching tones which are not exactly 25Hz. R92 and R150 further degrade the circuit Q slightly to keep the circuit from oscillating. U27-6 then drives output transistors Q3 and Q6. CR8 and CR9 maintain the base of Q3 at 1.2V greater than the base of Q6 to compensate for the base to emitter drops across Q3 and Q6 and thus keeping the transistors balanced. Q4 and Q5 provide protection against overdriving Q3 and Q6. Should excessive current (approx-20ma) be drawn the voltage drops across R83 and R86 will be sufficient to turn on Q4 and Q5 to effectively shunt the base to emitter junctions of Q3 and Q6 thus shutting them down to a safe level.

5.3.3.4 OVERRIDE MODE (Sheet 2) - In the event of a loss of control functions, it may be desired to manually control audio sources. If so, the MAN/

AUTO switch (S1) on the Audio Control Board would be placed in MAN which causes SORIDE (P1-29) to go "low". Additionally the SOURCE selector switch on the Local Status Panel must be set to one of the Cue positions (the one desired to be on the air). This enables the Cue output of the proper Universal Source board(s) and also brings U26-4 on this board "low". Thus U30-4 goes "high" shutting "OFF" the program audio switching FETS U13A and B. Simultaneously U30-1 goes "low" turning "ON" FETS U14C and D allowing Cue audio to be fed to U17 and U18. Note that FETS U14 A and B which normally shunt Cue audio to ground are shut "OFF" by the same line that shut "OFF" the Program audio FETS U13 A and B.

5.3.3.5 AUDIO FADE LOGIC (Sheet 2) - When a FADE command is executed, 1FADE (P1-30) goes "low". This pulls U26-10 "low" causing U24-1 to start going in a positive direction at a rate determined by R122 (FADE RATE). As U24-1 ramps in a positive direction, FETS Q2A and B are driven harder into conduction causing the audio level to U17 and U18 to gradually decrease. FET THRESHOLD potentiometer (R138) should be set at a point which biases Q2A and B "off" with no FADE command but allows conduction to begin as soon as U24-1 starts to move in a positive direction.

As soon as the level at U24-6 becomes more positive than the bias voltage at U24-5, U24-7 drives to (-) 15V triggering timer U25. This creates a 0.1msec positive pulse at U25-3 which in turn produces a 0.1msec negative pulse at P1-$\overline{\text{P}}$ (1EOMB) causing the system to advance to the next source.

As soon as the FADE command is released (1FADE goes "high"), U24-1 rapidly goes negative due to the low impedance shunting action of

CR10 and CR11. Thus Q2A and B are shut off and audio is restored to full level.

5.3.3.6 SILENCE SENSE DETECTOR (Sheet 2) - Audio from Program audio amplifiers U16 and U15 is fed to U29-2 whose gain is a function of the setting of R114 (SS LEVEL). R114 is normally set such that the signal level at U29-2 will not produce sufficient output at U29-1 to drive Q11 for a signal at the Program Output (J1-5 to J1-11) below 25db. As long as audio above that level is present, Q11 collector will be driven "low" by positive peaks at the base. This in turn drives the SS DRIVE signal "low" at P1-32. As long as P1-32 pulses "low" at least once every 3 seconds (typically the time delay of the Silence Sense timer on the Audio Control board), the Silence Sense timer will not trip.

5.3.3.7 ALARM DRIVE (Sheet 1) - When a Silence Sense or Close Loop alarm occurs, 1ALDR (P1-M) goes "low". This turns on Q12 pulling J4-25 "low" turning on the ALARM lamp.

5.3.4 MONITOR AMPLIFIER BOARD (Reference 100-700-017)

5.3.4.1 GENERAL - This board contains the Monitor speaker driver; buffer amplifiers, gain controls, and selection control for the two AUX audio inputs; and circuitry to detect a transmitter off air condition.

5.3.4.2 MONITOR SPEAKER AMPLIFIER - U1 is a dual 4 watt audio amplifier. Cue audio from the Audio Distribution board comes in at P1-M (Channel A) and P1-11 (Channel B), is amplified by U1 which has a gain of 5, and is then capacitively coupled to J2 which then sends the signal to the Monitor Interface Terminal board (A2-TB4). Reference Fig. 2-20 in Installation Section for wiring instruction

5.3.4.3 AUXILIARY INPUTS - Provision is made to bring in two stereo Auxiliary audio inputs by way of TB1 and TB2 on the Monitor Interface Terminal board (A2-TB1). Each input is provided with a level control (R4, R6, R8, and R10) and an amplifier with a gain of 10 (U2 and U3). All outputs go through FET switches (U6) which are only "on" when one of the AUX inputs is selected by the SOURCE selector switch on the Local Status Panel. If AUX 1 is selected, P1-R (1X1QE) goes "low" turning on the upper pair of FETS, sending the AUX 1 Audio (XAIN1 and XBIN1) to the Cue bus. If AUX2 is selected, P1-N (1X2QE) goes "low" turning on the lower pair of FETS.

5.3.4.4 "OFF AIR" DETECTION - Two methods may be employed to monitor whether the transmitter is "on the air". One method is to monitor the AUX2 audio inputs which are fed to U4-2. The AUX2 inputs would be fed by a receiver output. The gain of U4 is set by R1 which would be set such that if the audio signal fell below a set level, the circuit would assume the transmitter was "off the air". Positive peaks from U4-6 turn on Q1 pulling its collector "low". The first time Q1 collector goes "low", timer U5-3 goes "high". This turns on DS1 and sets P1-K "high". P1-K (EXTDET) goes to the Audio Control board where its status is placed on the data bus (2DB6) at appropriate times for testing. Each time a positive audio peak occurs, Q1 collector goes "low", discharging C10 through R31 and CR1. Should audio go below the threshold for a period longer than the time out set for U5 by R2, U5-3 will return "low", signaling a transmitter "off" condition.

An alternate method of detecting an "off air" condition is to use an "air monitor" with a normally closed relay or transistor output which is tied across J2-1 and J2-16 by way of the Monitor Interface Terminal board (A2-TB4). Reference Fig. 2-20 in Installation section for wiring instruments. As long as the relay remains closed (or transistor is "on"), J2-1 will be pulled to ground, turning on the photo diode in photo isolator U8. This pulls U8-5 "low" which holds U5-2 "low", holding U5-3 "high". If the relay or transistor in the air monitor opens, U5-2 goes high allowing C10 to start charging through R2. If the transmitter does not come back on before C10 charges to +3.3vdc, U5 times out and U5-3 returns "low" signaling an "off air" condition.

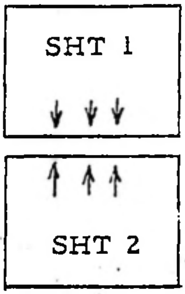
5.3.5 UNIVERSAL SOURCE BOARD (Reference 100-700-014)

5.3.5.1 GENERAL - This board is the interface between the audio source and the system. There is one Universal Source board for each audio source. As its name implies, the board can interface with any type of source provided switches and jumpers as outlined in section 6.0 are properly set.

The board is responsible for:

a. Starting the audio source.
b. Setting the "NEXT", "ON AIR", and "ROLL" lamps.
c. Processing audio and determining if audio is to be on the Program or Cue bus.
d. Detecting 25Hz switching tones from Reel-to-Reel sources (from either the right or left channel as determined by system programming) or End of Message (EOM) switch signals from Cartridge sources, Network or Studio sources.
e. Stopping Reel-to-Reel sources.
f. Scheduling Random Access Tray assignments.
g. Transferring encoded logging when the source is "on the air".

NOTE: Several signal lines on schematic 100-700-014 go directly from sheet 1 to sheet 2. Thus by placing sheet 1 above sheet 2, these lines are easily followed. Additionally some points are common to more than one sheet and thus flags are shown which direct where that signal is found on another sheet. For example, a symbol ⟨3⟩⟨A⟩ on sheet 1 indicates that signal will be found on sheet 3 point A. The symbol on sheet 3 would be ⟨1⟩⟨A⟩



Basically control of the board is by means of the Data bus (D0 through D7). Individual Data bus lines have been assigned to control specific functions. However more than one function has been assigned to each Data bus line so program controlled "clock" signals are generated by U55 (as determined by the 2A6 and 2A7 Address lines and the "write" (3WR) status) to load the data into the proper registers. Additionally, the status of these registers can be read by the Data bus under control of U55. The Data bus map on the following page outlines the assignments for both Commands and Status for the Data bus.

In order for the system to command or read the status of any Universal Source board, it must address the Audio Control board to pull "low" the select line for the desired Universal Source board (1SEL 1 through 1SEL 16) which comes to this board as 1SELX. This in turn enables U55 by pulling U55-4 "low". The other enable input (U55-5) is set "low" when either "read" (1RD) or "write" (1WR) goes "low". Then one of the outputs of U55 is set "low" based on the status of 2A6, 2A7, and 3WR as shown on the Data bus map. This output going "low" loads or reads data to or from the appropriate register. Additionally 1SELX going "low" enables U53 and U54 to decode the status of 1RD and 1WR to properly set the Data Bus direction buffers U43 and U47 as shown in the following chart.

CONTROL (WRITE)

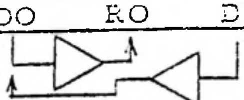
U55 OUTPUT "LOW"	2A7	2A6	3WR	DATA BUS							
				7	6	5	4	3	2	1	0
CNT 1WR	0	0	0	"Roll" Off*	"Roll" On*	"Next" Off	"Next" On	Not Used	Start Source	"On Air" Off	"On Air" On
CNT 2WR	0	1	0	"Fade" Enable	HSO 2	HSO 1	HSO 0	Eominh Off	Eominh On	Lft. Ch. Tone En	Rt. Ch. Tone En
TYWR	1	0	0	Tray Data 7	Tray Data 6	Tray Data 5	Tray Data 4	Tray Data 3	Tray Data 2	Tray Data 1	Tray Data 0
				*If both Bit 7 and 6 are "high", interrupt latch (U32) is reset							

STATUS (READ)

U55 OUTPUT "LOW"	2A7	2A6	3WR	DATA BUS							
				7	6	5	4	3	2	1	0
CNT 1RD	0	0	1	HSI 3	"Roll"	HSI 2	"Next"	HSI 1	Not Used	HSI 0	"On Air"
CNT 2RD	0	1	1	Fade Enable	HSO 2	HSO 1	HSO 0	GND	EOM INH	GND	RT/LFT Ch. Tone
IDRD	1	0	1	ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0

0 = Low
1 = High

UNIVERSAL SOURCE BOARD
DATA BUS ASSIGNMENTS

CONTROL PINS		INPUT/OUTPUT		
1	15	DO	RO	DI
Lo	Lo			
Hi	Hi			
Hi	Lo	Hi Z Open State		
Lo	[illegible]	Invalid State		

The following paragraphs detail the actual control operations.

5.3.5.2 SETTING THE "NEXT" LED - To set the "NEXT" LED, the CPU addresses the source scheduled next which sets the select line (1SELX) "low" only on the source selected. Simultaneously 2A6 and 2A7 (P1-31 and P1-33) and 3WR (P1-S) will go "low" causing U55-15 (CNT 1WR) to go "low". Data bus line D4 is set "high" and thus when U32-6 goes "low", U32-10 is set "low" turning "on" DS2 (NEXT). If Data bus line D5 is "high" when U32-6 is clocked "low", DS2 is turned "off". Additionally if 1PGMCLR (P1-35) from the Audio Control board goes "low", U32-10 is reset "high" turning "off" DS2. This occurs whenever an EOMB pulse occurs.

5.3.5.3 STARTING A SOURCE - To start a source, the CPU addresses the source to be started setting the select line (1SELX) "low". Simultaneously 2A6 and 2A7 (P1-31 and P1-33 and 3WR (P1-S) will go "low" causing U55-15 (CNT 1WR) to go "low". Data bus line D2 must go "high" while Data bus lines D0, D1, and D4 through D7 will be set as shown below depending on whether the source is to dead roll or go on the air.

	ON AIR		NEXT		ROLL	
	D0	D1	D4	D5	D6	D7
ON THE AIR	1	0	0	0	0	0
DEAD ROLL/NEXT	0	0	1	0	1	0
DEAD ROLL ONLY	0	0	0	0	1	0

1 = High
0 = Low

When U55-15 (CNT 1WR) returns "high" U32B, U33A, and U20A are clocked. Thus if the "on the air" condition is being commanded, U32-10 is set "high" turning "off" DS2 (NEXT), U33-14 is set "high" insuring that D33 (ROLL) is "off", and U20-15 is set "high". This sets U7-8 "high" and if 3ORIDE (P1-29) is "high", U26-3 goes "low" causing U18-6 to go "low". This turns "on" DS1 (ON AIR) and also the program output FETS U25A and D. Additionally U10-11 goes "high" turning "off" Cue output FETS U25B and C. Note also that U20-14 is set "low". This both turns "on" the 3.5KHz encoding output FET U16 (sheet 3) if the EOM INHIBIT latch has not been set (U20-11 "low") and, if the SIL SENSE EXT jumper is installed, P1-L will go "low" causing the Silence Sense time out to go to the long (extended) mode.

If the Dead Roll mode is commanded and the source is to air NEXT, U32-10 is set "low" turning "on" DS2 (NEXT), U33-14 is set "low" turning "on" DS3 (ROLL), and U20-15 is set "low" insuring that DS1 (ON AIR) is "off".

The process for actually starting the source is as follows. Data line D2 is set "high" and when U55-15 (CNT 1WR) goes "low", U53-6 goes "low" forcing U45-6 "low". This clocks timer U55 creating a positive pulse at U55-3. The pulse width is a function of whether the LONG/SHORT START jumper is installed (jumper installed pulse = 165 msec, jumper not installed pulse 7.5 sec). This pulse is inverted by U44 which causes K1 to energize. Depending on the source the start lines may be tied to the relay contacts or to the open collector driver U40-6 (J2-10). Note that the reset input to the timer (U52-4) is held "low" momentarily during power up to prevent the timer from firing and starting the source.

5.3.5.4 UPDATING A SOURCE WITH A RIGHT CHANNEL END TONE - Some formats utilize a voice track source and a fill music source which must be updated periodically so that the voice track source will be in sync with the other music sources. These formats typically utilize a right channel 25Hz tone to signify the end of a block of voice tracks or fill music. To update the source under automation control it is necessary to set the Right/Left Channel Enable Flip Flop (U33 B) by setting Data line D0 "high" and clocking U33-B with a CNT 2WR pulse from U55-13. This sets U33-10 to "low" turning "on" FET U16 D (sheet 3) which passes right channel ("B") audio to the 25Hz detector. Additionally, DS3 (ROLL) is turned "on". The next step would be to set Data line D0 "high" and clock U55-15 (CNT 1WR) "low" to start the source (reference paragraph 5.3.5.3).

To manually accomplish this task, a push button switch can be wired from jumper pins "RCHUPDATE" and "C" provided on the Universal Source board. When the switch is pressed, U33-10 is set "low" by U33-7 going "low". Additionally the source is started by U45-4 going "low". Additionally a second switch can be wired from jumper pins "UPDATE CANCEL" and "C" which when pressed resets U33-10 "high" and U33-11 "low" which returns the 25Hz detector to sensing tones from the left ("A") channel (FET U16 C is turned "on"). The source however, continued to run until stopped by a left channel tone.

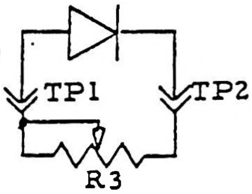
5.3.5.5 AUDIO PROCESSING (Sheet 2) - Audio from the source comes in at J2-14 (Chan A) and J2-3 (Chan B) and is fed to amplifiers U48 and U49 which each have a gain of 10. Jumpers are provided which allow jumpering Chan A audio to Chan B for Mono sources (jumper "M" to "C"). Stereo sources would have "C" jumpered to "S". Audio is then fed to U50 and U51 which each have a gain of 100 and is then fed to output FETS U25 D and A. The outputs of U25D and A are jumpered to either AUDA1 which drives the uncompressed audio amplifier or AU DA2 which drives the compressed audio amplifier on the Audio Distribution board. Note that dual FET Q4 is used as a voltage divider to fade audio in or out (see paragraph 5.3.5.6). Note also that program audio can be jumpered to the Cue output (CUE SEL "C" jumpered to "N"). If the deck has its own Cue output "C" would be jumpered to "E".

Cue output FETS U25 B and C are turned on when the SOURCE selector switch on the Local Status Panel is set to the proper position for the source to be auditioned. The source type for cue purposes is determined by the positioning of the CUE DE FEA jumper shown on Sheet 3 as follows:

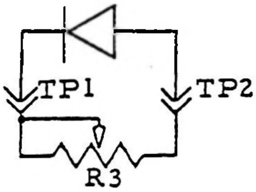
SOURCE TYPE		Jumper "C" to
Standard	-	Q
Network	-	N
Time Announce	-	T
AUX 1	-	1
AUX 2	-	2

When the proper line is selected, U10-13 is pulled "low". If the source is not "on the air", U10-12 will also be "low", thus U10-11 will be "low" and FETS U25 B and C will be "on". When the source is "on the air", U18-5 will be "low" and Program FETS U25 A and D are turned "on".

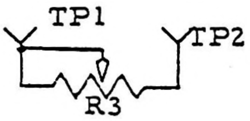
5.3.5.6 FADING AUDIO (Sheet 3) - Audio can be made to fade on at the beginning of a selection of fade off at the end of a selection or both. If fade is desired in only one direction, a diode must be added from TP1 to TP2 as shown below:



Fade Off Only



Fade On Only



Fade Both Directions

The Fade control circuit can be enabled by installing the FADEN jumper which sets U54-12 and U10-5 "low" or under CPU control by setting Da line D7 "high" and creating a CNT 2WR (paragraph 5.3.5.1) which sets U42-14 (sheet 1) "low" which also pulls U54-12 and U10-5 "low" via U19.

Assuming Fade is enabled, fading audio "on" is accomplished as follows. When the source is placed "on the air", U54-3 (from U26-3 on Sheet 2) goes "high" pulling U54-1 "high". This causes C2 to start charging at a rate set by R3. Thus U6-1 starts going in a negative direction gradually turning "off" audio shunt FETS Q4A and B (sheet 2) as controlled by R2. As U6-1 goes below (-) 0.9vdc, U6-7 goes "high", U4-6 goes "low", and thus U10-6 goes "low". U10-6 goes to U18-4 (sheet 2) and, as will be seen, is used to hold on the audio output FETS during fade "off."

At the end of the End of Message (EOM) tone, U54-3 returns "low". This sets U54-1 "low" which in turn causes C2 to start discharging through R3. Thus U6-1 starts going in a positive direction turning on FETS Q4A and B gradually shunting more and more audio to ground. As so as U6-1 becomes more positive than (-) 0.9vdc, U6-7 goes "low" causing U10-6 to go "high" which shuts off Program output FETS U25D and A (note that U18-5 went "high" at the end of the EOM tone).

One other circuit note is that since voltage swings at U6-7 are approximately ± 15vdc, diodes CR4 and CR5 are required to limit the voltage to U4-5 to 5.6V and (-) 0.6vdc.

5.3.5.7 END OF MESSAGE (EOM) DETECTION

5.3.5.7.1 25Hz REEL TO REEL TONES

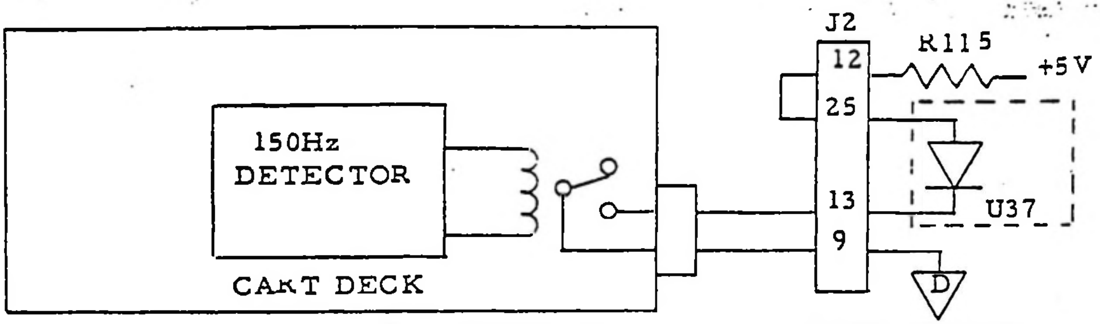
(Sheet 3) - 25Hz tones can be from either the right or left channel.

Normally however, they are on the left ("A") channel. The state of U33 (sheet 1) determines whether FET U16C (left channel) or U16D (right channel) is "on". U17 buffers the audio and rolls off the higher frequencies. The next two stages (U5) form a 25Hz bandpass filter. The output at U5-5 is fed to schmidt trigger U4 which digitizes the 25Hz signal if its amplitude is sufficient.

U4-8 feeds U18 which can be enabled in one of two ways. If the jumper is from "A" to "C", U18 is enabled whenever U23-9 (sheet 1) is "high". This will occur whenever the photo isolator U30 is being driven by the audio source. This "hand shake" input (HSI 0) is generally tied to a signal which will supply current to the photo diode in U30 when the audio source is playing. If "C" is jumpered to "B" U18 will be enabled at all times unless the source is in high speed Wind or Rewind with the tape on the heads. In this case the audio from channel "A" coming into U5-11 at a high level due to the fast tape speed, causes U5-10 to go "low". Capacitor C9 integrates the varying audio maintaining U5-10 "low". This in turn pulls U8-10 low disabling U18.

Assuming U18 is enabled, digitized 25Hz from U4-8 is fed to U5 which integrates the signal bringing U5-4 "low" thus bringing U4-4 "low". This causes U45-11 (sheet 2) to go "low" which in turn brings timer U13-3 "high". This triggers timer U2B creating a 0.1msec EOM pulse at pin 8. If the EOM inhibit flip flop U20B has not been set (U20-10 "high") the EOM pulse is inverted and sent to P1-P. Note that when U2-8 returns "low", timer U2C creates a 0.1msec pulse at U2-9 which pulses U1-10 "low" resetting the "EOM inhibit" register U20B to the enable state and clears the "on the air" register U20A. Note also that as long as the EOM signal is present, U45-11 is held "low" preventing timing capacitor C1 from charging due to CR2. Thus U13-3 is held "high" which maintains U26-3 "low" holding the program audio "on" (even though the "audio on air" register (U20A) is reset) until the 25Hz tone ends. When the tone ends, U45-11 goes "high" allowing U13 to time out. If the EOM OVERLAP jump is installed, the time out is approximately 0.75 seconds; if removed approximately 7.5 seconds. When U13 times out, U13-3 returns "low" shutting off the Program audio FETS U25A and D and turning on Q1 which hold U13 in a reset state until the "on the air" register U20A is again set (U20-15 "high").

5.3.5.7.2 EOM SWITCH CLOSURE (CARTRIDGE DECKS, ETC.) - Cartridge decks typically have a relay closure or transistor output which turns on when the 150Hz switch tone is detected. This circuit (or any switch closure such as from a studio source) can be tied to photo isolator U37 via J2-25 and J2-13. When the photo diode in U37 is supplied current, U37-5 goes "low" triggering timer U13 just as discussed in paragraph 5.3.5.7.1 for 25Hz tones. Note that R115 is provided as a pull up resistor for U37 if needed. The following shows a typical hook up.



5.3.5.8 STOPPING A SOURCE (REEL TO REEL) (Sheet 3)

When the 25Hz tone ends, U4-2 goes "low" triggering timer U3. The duration of the positive pulse is set by R1. As U3-3 returns "low", U9 is triggered producing a 1.1 second positive stop pulse which is inverted by U8 which drive U15 which pulls in K2. Additionally U8-8 pulls U18-11 (sheet 2) "low" which resets the "Right/Left Channel Tone" register U33B to the left channel state.

5.3.5.9 RANDOM ACCESS TRAY DATA (Sheet 1) - Random Access tray data is set up on the Data bus in BCD form as follows:

D0 - Tray Units 1
D1 - Tray Units 2
D2 - Tray Units 4
D3 - Tray Units 8
D4 - Tray Tens 1
D5 - Tray Tens 2
D6 - Tray Tens 4
D7 - Tray Tens 8

Simultaneously 2A6 and 2A7 go "high" as 1WR goes "low" causing U55-11 (TYWR) to go "low". This clocks the Tray data on D0 through D7 int U41 and U46. Additionally J1-28 (1DWR) pulses "low". This output may be used to alert the RAS device that new tray data is available.

5.3.5.10 HANDSHAKE INPUT/OUTPUT (Sheet 1) - With some audio sources it is necessary to assert control signals and hold that signal until the audio source responds to it. These are called "handshake" signals. Three (3) output (HSO 0 through HSO 2) and four (4) input (HSI 0 through HSI 3) handshake signals are provided. The inputs and outputs are universal in nature with the exception of input HSI 0 which is generally used as a "playing" signal input to indicate to the CPU that the source is rolling. For this reason HSI 0 comes in on J2 (J2 carries the normal control signals) while the other handshake signals are assigned to J1 since J1 carries the random access data and since handshake is most commonly required with RAS sources. A check of the J1 cable drawing for a specific source will reveal which, if any, signals are used and what their function is.

The OUTPUT handshake signals are set by asserting Data bus lines D4 through D6 as required and creating a CNT 2WR signal at U55-13 (reference paragraph 5.3.5.1). This loads the status of D4 through D6 into register U42. Note that D7 is used to enable the FADE circuit (sheet 3).

The INPUT handshake signals drive photo isolators U21, 22, 29, and 30 which in turn drive timers U23 which serve to debounce the inputs.

However, note that diodes CR12, 14, 16, and 18 hold timing capacitors C27, 28, 30, and 31 from charging as long as the diodes cathode is held "low". Thus if the photo transistor of a photo isolator is "on" (collector "low"), the output of its associated timer will be "high". Note that HSI 3 creates an interrupt if it is activated. It does this by clocking U32A setting U32-14 "low". This in turn pulls P1-J (ISR1R) "low". Note that the interrupt can be created at the beginning or end of the signal at HSI 3 as determined by the INTERRUPT POLARITY jumper. If the jumper is installed, U32A is clocked as U23-8 goes "low" if not installed, as 23-8 goes "high". U32A is reset when Data bus lines D6 and D7 are both asserted "high" forcing U26-6 and U53-8 and U45-3 "low". Note that 1CNT1WR must also go "low" to enable U53-10. Since 1CNT1WR also clocks ROLL register U33A causing it to toggle (both the J and K inputs will be "high"), U33A must be reset to its original state. System firmware handles that task.

5.3.5.11 ENCODED LOGGING BUFFER (Sheet 3) - Cue track audio which contains the 3.5KHz encoding comes in at J2-8, passing through Level control R4 to amplifier U17. U17 has provision for two gain levels. For most sources with relatively high Cue track levels, the HI/LOW LEVEL jumper would go from "C" to "H" providing a gain of 100. For sources with relatively low Cue levels, jumpering "C" to "L" provides a gain of 1000. The output of U17-7 then goes to FET switch U16B which is only "on" when the source is "on the air" (U20-14 "low"). Thus data from "cueing" sources is not sent to the VEL board. Data from P1-43 is sent to the VEL board via the Audio Control and CPU boards.

5.3.5.12 OVERRIDE (ORIDE) MODE (Sheet 2) - If the OVERRIDE mode is selected, P1-29 (3 ORIDE) goes "low" forcing U26-3 "high" turning "off"

DS1 (ON AIR) and the Program output FETS U25A and D. This forces the board into a Cue mode assuming U10-13 is held "low" by the SOURCE select switch on the Local Status Panel.

5.3.5.13 SOURCE ID SWITCHES (Sheet 1) - U27 is a switch pack used to identify the source and tray configuration of the source with which it is being used. Thus it is imperative that they be set as shown in Section 6 of this manual if the source is to operate correctly. S0 through S2 determine the Tray configuration while S3 through S7 determine the source type or function (music, jingle, etc.).

5.4 ACCESSORIES

5.4.1 ENCODE CENTER BOARD (REFERENCE 100-700-151)

5.4.1.1 GENERAL - The Encode Center Board acts to interface a CRT or TTY with a cartridge recorder for encoding. It contains a 3.5kHz oscillator, a start character generator, steering and decode logic.

5.4.1.2 CRT or TTY DATA to ENCODE CENTER - CRT data enters at J2-3 while TTY data enters at J2=23. Unless data is being sent, Q2 is held OFF (Collector = +12VDC). When data is being sent, Q2 is gated ON and OFF by the input data. U4 inverts the data to present it in the proper state to Steering Logic U6, U7, and U8. Note that for 20 ma Current Loop input data CRI require the input voltage to exceed approximately 6 volts before Q2 will turn ON. Additionally R2, R7, C1, and C4 filter the input to eliminate teletype switch noise.

5.4.1.3 ENCODE CENTER to CRT or TTY - Data from Steering Logic U7-6, 9, and 10, U8-6, and the Start Character generator circuit (U4-2 on Sheet 2) is sent to OR gate U9. U4 inverts the data, and it is then split and sent to U10 for output to a CRT or to Q7 and Q9 for output to Current Loop devices such as teletypes. Note that when no data is being sent, U4-6 should be "high" and, thus, J2-2 should be "low" while Q7 and Q9 should be ON (Q7 collector = .2VDC and Q9 collector = +24VDC). Note also that even with Q9 ON, voltage at J2-24 will be quite low due to the low impedance of the 20 ma load being driven. Thus it is best to monitor the circuit at Q9 collector.

5.4.1.4 DATA to RECORDER - In any Encode mode other than PLAY ONLY, Steering gate U6-5 will be "hi allowing data from U4-12 to be sent to the recorder Cue track. Data is fed to Q3 which controls FET Q4. During no data periods (or "MARK" or Logic 1 states) Q3 will be ON, shutting OFF Q4. During data transmission, whenever a "SPACE" (or Logic 0) occurs, Q3 turns OFF, allowing Q4 to be driven by the 3.5 kHz signal from U13-2. This 3.5 kHz signal is coupled to U18-6 which buffers and attenuates the signal for transmission to the recorder input. Thus, the signal seen at J3-7 (or TP5) will be a tone burst modulated representation of the data from the CRT or teletype.

Note that in order to record the data, the BIAS ENABLE must be ON (Reference Para. 5.4.1.5).

5.4.1.5 BIAS ENABLE - In all modes except PLAY ONLY, U6-1 will be "high". Thus, when the recorder goes into PLAY mode, U6-2 will also go "high" (Reference Para. 5.4.1.7). This sets U4-15 "high", allowing the 2.5 second timer U12 to start timing out. At the end of the 2/5 seconds, the Start Characte is sent, and at the beginning of first start characte U8-13 goes "low", setting U8-10 "high". C18 then charges rapidly through R51 and CR8. Thus, U3-2 rapidly goes "high", turning on Q8 and Q10 (Q10 collector = 24 VDC). Note that, as long as data is being sent to U8-8, Q10 will remain on, as C18 cannot discharge enough to cause U3-4 to change state. When data ceases, C18 discharges slowly through R52, eventually allowing U3-4 to change state, shutting OFF Q10.

5.4.1.6 MODE SELECT and STEERING LOGIC - There are three (3) Encode modes which operate as follows:

a. PLAY ONLY - In this position, U4-10 is held "low", disabling the "BIAS ENABLE" circuit by holding U8-1, 2 "low". Additionally, U6-5 is held "low", blocking data from being sent to the recorder.

U7-2 is held "high", allowing data from the CRT or TTY to be echoplexed back to the device as long as the recorder is not in

PLAY mode (U7-8 not "low").

U7-13 is also held "high" so that when the recorder is put in PLAY mode, data from the 3.5kHz detector circuit (U3-6) which is the decoded cart data is transmitted to the CRT or TTY.

b. RECORD and TTY VERIFY PLAY - In this position, U7-5 is set "high", allowing decoded cart data from U3-6 to be transmitted to the TTY. Thus, immediate verification is made that data from the teletype, which is transmitted to the recorder by way of U6-4, has been correctly encoded.

NOTE: If a CRT is used, the jumper across the "CRT" test points disables U7 and U8. Thus, no verification of data is made. The cart must be played with the mode select switch in PLAY ONLY to verify proper encoding.

c. RECORD and TTY VERIFY DIRECT - In this position U8-3 is set "high", allowing data from the TTY to be transmitted directly back to the TTY. See note in paragraph "b" above.

5.4.1.7 RECORDER "PLAY" SENSING - A signal from the recorder is brought to J3-3. This signal may be "high" or "low" when the recorder is is PLAY mode, depending on which model recorder is used. Jumpers from J3-5 and J3-6 to J3-17 and J3-18 ar wired such that when the recorder is in PLAY mode, J3-17 will be "high" and J3-18 will be "low"

5.4.1.8 START CHARACTER GENERATOR (Reference Sheet 2) - U17 is a freerunning multivibrator used to clock counter decoders U14, 15, and 16. Pulse should occur every 9.1 msec for 110 Baud TTY's or CRT's or every 3.3 msec for 300 Baud CRT's.

When power is first applied, a "high" going reset pulse from U6-11 (Sheet 1) to U14-15 resets U14 outputs all "low". U14 then counts up to 9 at which point output 9 (U14-11) goes "high", stopping the count due to the fact that U14-13 (count enable) must be "low" to allow counting. A similar sequence occurs for U15 and U16 until all are in a "count disable" state.

When the recorder is put in PLAY mode, the 2.5 sec timer is initiated (Reference Para 5.4.1.9). At the end of the 2.5 seconds, a "high" going reset pulse is sent to U14-15. This causes U14 to start counting up. The following pin assignments apply to U14, 15, and 16, and will aid in understanding the circuit operation.

PIN	OUTPUT COUNT	
3	0	(not connected)
2	1	
4	2	
7	3	
10	4	
1	5	
5	6	
6	7	
9	8	
11	9	

At each clock pulse from U17, U14 counts up setting the next count output "high" and the previous count output "low", until count 9 is reached (Pin 11 "high"). This sets Pin 13 (Count Enable) "high", stopping the count. Note that two (2) 8 bit start characters must be generated for some CRT's and, thus U15 is reset at count 8 for U14. U15's first used output is count 3 (Pin 7), and, thus, a space equivalent to three (3) counts is placed between characters. When U15 counts to 6, U16 is reset and starts counting. Note that as U15 counts 7, U16 counts 0, and on the next clock pulse U15 counts 8 (not connected), and U16 counts 1. Thus, between U15 and U16 a contiguous 8 bits are clocked out.

UA and UB are headers containing jumpers which have been installed for the particular CRT or TTY used by the system (Reference Section 6.0 SWITCH and JUMPER SETTING TABLES for correct installation). As each output from U14 through U16 goes "high", that condition is transferred to U4-

through the diode network if the header jumper is installed. If it is not installed, the condition is interpreted as a "low". The output at U4-2 is transmitted to the CRT or TTY via U9 (sheet 1).

5.4.1.9 2.5 SECOND DELAY - After the cart is started, it is desired to delay encoding for approximately 2.5 seconds. This is to allow time for the Timer, Source, and Tray to print on the log prior to the encoded message. Timer U12 is normally held off by U4-15 being "low". In any mode except PLAY ONLY U4-15 goes "high" as soon as the recorder goes into PLAY mode setting U6-2 "high" At the end of 2.5 seconds, U12-3 goes "low", producing a "low" going pulse to U3-14. U3-12 goes to U6-13 which produces a reset pulse to the Start Character Generator (Sheet 2), which causes the CRT or TTY to start sending data.

5.4.1.10 3.5kHz OSCILLATOR - U13 is a free running oscillator set to 3.5kHz by R47. U13-2 outputs a sinewave used to modulate the data to the recorder. U13-9 outputs a squarewave used to drive Q5 and Q6 of the -12V supply.

5.4.1.11 3.5kHz DETECTOR - Cue track audio from the recorder comes in at J3-12 and is amplified by a factor of 3.3 by U5. The signal then goes through U1, which first rolls off frequencies below 3kHz and then passes only a narrow band centered around 3.5kHz.

U2 then charges C13 rapidly through CR2 on positive going signals as long as a 3.5kHz signal is present. The second half of U2 is a voltage comparator whose reference at Pin 5 is set to about 8VDC. As soon as C13 charges to above 8VDC, U2-7 goes "low", setting U3-6 "high". As long as 3.5kHz signal is present, C13 will not be allowed to discharge below 5VDC (the new threshold due to hysterisis resistor R49 and CR7). However, when the 3.5kHz signal ends, C13 discharges through R40 setting U2-7 "high" (+24VDC) as soon as it goes below 5VDC. Since U2-7 swings "high" to +24V, CR6 blocks the output of U2-7 on positive transitions and allows U3-7 to be pulled "high" to +12VDC by R54.

5.4.1.12 TEST MODE - A continuous 3.5kHz signal to the recorder Cue track can be produced by jumperin the "TEST" test points together. This brings U6 "low", which turns OFF Q3 putting Q4 in the "ENABLE" state, allowing it to be driven by the output of U13-2.

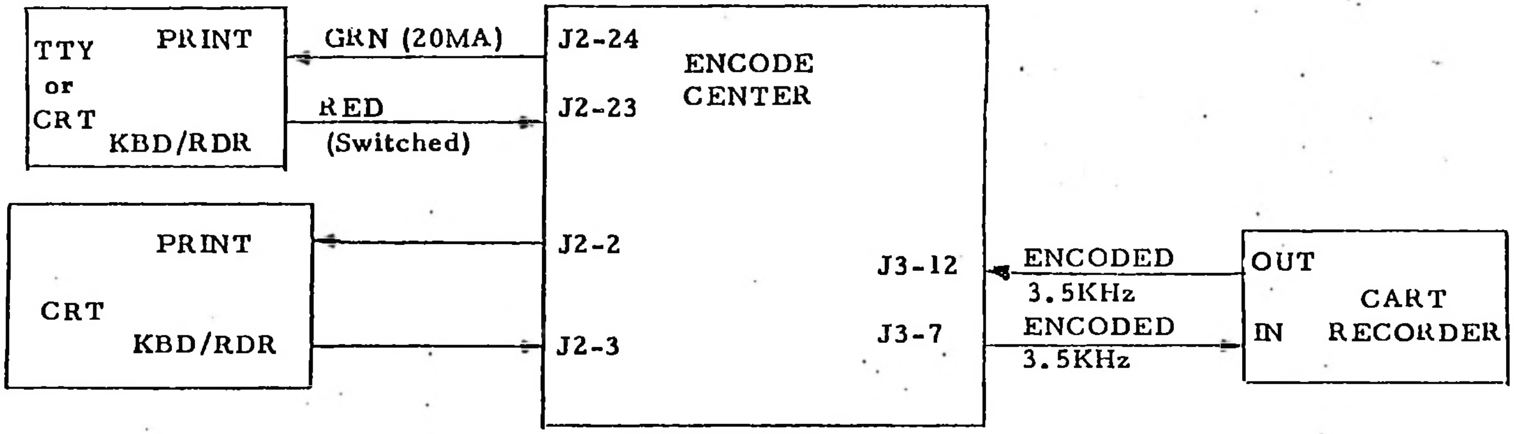
5.4.1.13 -12V SUPPLY - The squarewave output from U13-9 is used to drive complementary drivers Q5 and Q6, which produce a squarewave at their common emitter junction. C24 couples this waveform, which is clamped by CR9 so as not to allow it to go more positive than +0.6VDC. CR10 passes the negative transisions which are filtered by C26, producing a smooth -12VDC out to U10-5.

5.4.1.14 24V SUPPLY (Sheet 2) - 115 VAC is brought to T1 which steps the voltage down to 28V. It is then rectified by bridge network CR28, filtered by C37 and regulated to +24VDC by VR2.

5.4.1.15 +12V SUPPLY - VR1, fed by the regulated +24VDC, produces a regulated +12VDC.

5.4.1.16 POWER ON RESET - U11 produces a "low" going pulse upon initial power application to reset Start Character generator counter U14 (Sheet 2).

5.4.1.17 DATA FLOW SUMMARY - The following page illustrates the data flow for the various Encode modes.



SWITCH POSITION	DATA FLOW
1. Play Only (Cart Off) --------------------	KBD/RDR to Encode Center to Print
2. Play Only (Cart Playing) ----------------	Cart Out to Encode Center to Print
3. Record & TTY Verify Play --------------	KBD/RDR to Encode Center to Cart In (CRT &TTY)and Cart Out to Encode Center to Print (TTY only)
4. Record & TTY Verify Direct ------------	KBD/RDR to Encode Center to Cart In (CRT & TTY) and Print (TTY only)

5.4.2 INSTACART INTERFACE (Reference 100-700-023)

5.4.2.1 PURPOSE - The purpose of the Instacart Interface is to decode binary tray data from the Universal Source Board and start the appropriate tray.

5.4.2.2 TRAY DECODING - Tray data in binary form from the Universal Source board comes in at J1-20 through J1-27 (TRD0 through TRD7). U20 decodes the status of TRD4 through TRD7 (TRD6 and TRD7 are normally "low") and sets one of three outputs "low" to enable either U16, U17, or U18. The enabled IC then decodes TRD0 through TRD3. HS01 then goes "low" producing a "low" going pulse at U14-11 which clocks one of the 16 output lines "low". U5 through U12 invert the outputs of U16 through U18 thus producing positive "start" pulses to the Instacart.

Thus for trays 1-16, both TRD4 and TRD5 will be "low" enabling U18. For trays 17-32, TRD4 will be "high" enabling U17; and for trays 33-48, TRD5 will be "high" enabling U16.

5.4.3 CAROUSEL INTERFACE (Reference 100-700-022)

5.4.3.1 PURPOSE - The Carousel Interface is responsible for interfacing SMC Carousels (Series 250 and 350). It decodes BCD tray data from the Universal Source board. Additionally it provides a Start and Tray eject signal as well as coupling audio and logging signals.

5.4.3.2 TRAY DECODING - BCD Tray data from the Universal Source board comes in at J1-20 thru J1-27. U12 buffers the BCD 1 through BCD 4 data while U11 decodes the BCD 10 through BCD 80 data (note that BCD 40 and BCD 80 will always be low for Carousel data) setting one of its three outputs "low" to enable either U13C and D, U14A and B, or U14C and D to decode the BCD 4 and BCD 8 data. U15, U16, and U17 do the final decoding setting one output "low" while the 23 other outputs remain "high".

The outputs from U15, U16, and U17 go to the random select switch on the Carousel. The arm of the switch goes to J3-45 (1TRSELA). When the arm passes the wiper tied to the "low" output of U15 through U17, 1TRSELA goes "low" causing Q7 to turn OFF. This in turn actuates U10 which turns on Q6 pulling J3-23 (SEQ) to 24VDC on Model 250 or +5VDC on Model 350 units. This signals the Carousel that it has found the correct tray, allowing it to tray in.

5.4.3.3 CART IN DETECTOR - When the cart is fully seated ready to play, J3-42 goes "low" actuating U1. This causes U2-2 to be held "low" which in turn holds U2-3 "high". Thus U6-5 and U6-9 will be held "low" allowing pins 6 and 8 to control the state of pins 4 and 10 respectively.

5.4.3.4 START LOGIC - When a Carousel is to be started, J2-10 (1START) pulses "low" causing U6-10 to pulse "low". Note that with Series 350 Carousels U6-9 must be held "low" by logic detecting a properly seated cart (paragraph 5.4.3.3). U8 is actuated causing Q2 to turn ON producing a negative going Start pulse at J3-21 (1REMST).

5.4.3.5 TRAY EJECT LOGIC - When the tray data changes, U6-1 will go "high" causing U3 to produce a positive 1 second pulse at U3-3. Assuming a cart is seated, U6-4 will pulse "low" actuating U9 creating a positive tray REJECT signal at J3-20 causing the tray to eject.

5.4.3.6 FAIL LOGIC - If no tray is found within approximately one minutes time (approximately two (2) revolutions), timer U2 will time out (U2-3 goes "low") causing the Carousel drum to stop rotating. Manually switching S1 to "ON" and back to "OFF" will initiate a new search cycle. Note that if S1 is left in the "ON" position, the fail logic is disabled (Carousel will continually search). A new search cycle is also initiated should the system attempt to start a Carousel which has no tray in the play position.

5.4.4 REMOTE CONTROL BOX (Reference 7025) - The Remote Control box contains 8 push button switches whose functions are as follows:

START -	Start system
STOP -	Put system in Stop Request mode
STEP -	Step system from current "ON AIR" source to next scheduled source. If in Stop Request mode, step to full stop mode.
FADE -	Fade current "ON AIR" source and step to next scheduled source at end of fade. If in Stop Request mode, fade current "ON AIR" source and step to full stop mode at end of fade.
ADVANCE-	Advance program one event but do not disturb current "ON AIR" source.
LEAVE -	If "NETWORK" source is "ON AIR", steps to next scheduled source. Otherwise has no effect.
INSERT-	Causes source scheduled at last memory location to be scheduled next.
SPARE -	Not used on 7000 systems.

Four of the switches (START, STOP, FADE, and INSERT) contain active indicator lamps.

NOTE: Certain functions may be disabled by removing diodes in the Remote Control Box wired to the switch desir to be disabled.

Outputs and inputs to P3 connect to J3 on the Parallel I/O (PIO) board. The on board power supply provides voltage to drive photo isolators on the PIO board and also the Remote Control box indicator lamps through relays on the PIO board.

5.5 POWER SUPPLY (Reference 100-700-024)

The Power Supply assembly is generally mounted at the bottom of the Control Rack and consists of four (4) modular power supplies plus a battery driven 5vdc supply used to hold memory in the event of a power failure.

AC power comes in at J2 (an EMI Filter) and is tied to the four modular power supplies (PS1 through PS4) and the battery charge unit A1. VR2 is a surge suppressor which limits peak surges on the input AC line.

The outputs of VR1&PS1 thru PS4 are fed to connector J1&from there to the Power Distribution board (reference 100-700-010). The output of each supply is monitored by an LED (DS1 through DS5). Note that PS1 is a 6.0vdc supply (set to 5.7vdc) used to drive the +5vdc (J1-3) and +5HELD (J1-4) as long as it is functioning properly. CR4 drops approximately 0.7vdc making the voltage at J1-3 5.0vdc. Should the voltage out of PS1 drop below 5.7vdc, the battery driven +5v regulator VR1 would start supplying current to J1-4. CR3 blocks PS1 should it drop below 5.7vdc.

A1 supplies a continuous trickle charge to batteries BT1 and BT2 (optional). S1 is used to select internal batteries BT1 and BT2 or a customer supplied "EXTERNAL" +12V battery or to shut OFF (disconnect) the battery in the event of a malfunction in this circuit. VR1 is a 5.8vdc regulator. Voltage out is sent to J1-4 via CR2 which drops the voltage to J1-4 to 5.0vdc. As long as voltage is present at VR1 input +, Q1 will be turned "on", supplying current to BATT ON indicator DS1.

NEXT ASSY	USED ON

REVISIONS

REV.	DESCRIPTION	DATE	APPR.

6. 0 BOARD SWITCH AND JUMPER SETTING TABLES

131-700-008

DWN. Ralph Smith	DATE 1/3/78
CHECK	
PROJ. ENG.	
APPR.	

Cetec Broadcast Group

Cetec Corporation
1110 Mark Avenue, Carpinteria, California 93013

SERIES 7000 AUTOMATION TECHNICAL MANUAL

SECTION 6. 0 BOARD SWITCH & JUMPER SETTING TABLES

SIZE		DRAWING NUMBER	REV
A	SHEET 6-1 OF	049-7008	

Switch & Jumper Tables

NEXT ASSY	USED ON	REVISIONS			
		REV.	DESCRIPTION	DATE	APPR.

6.0 BOARD SWITCH AND JUMPER SETTING TABLES

DWN. Ralph Smith	DATE 1/3/78
CHECK	
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SECTION 6.0 BOARD SWITCH & JUMPER SETTING TABLES

SIZE	SHEET	DRAWING NUMBER	REV
A	SHEET 6-1 OF	049-7008	

6.0 BOARD SWITCH AND JUMPER SETTING TABLES

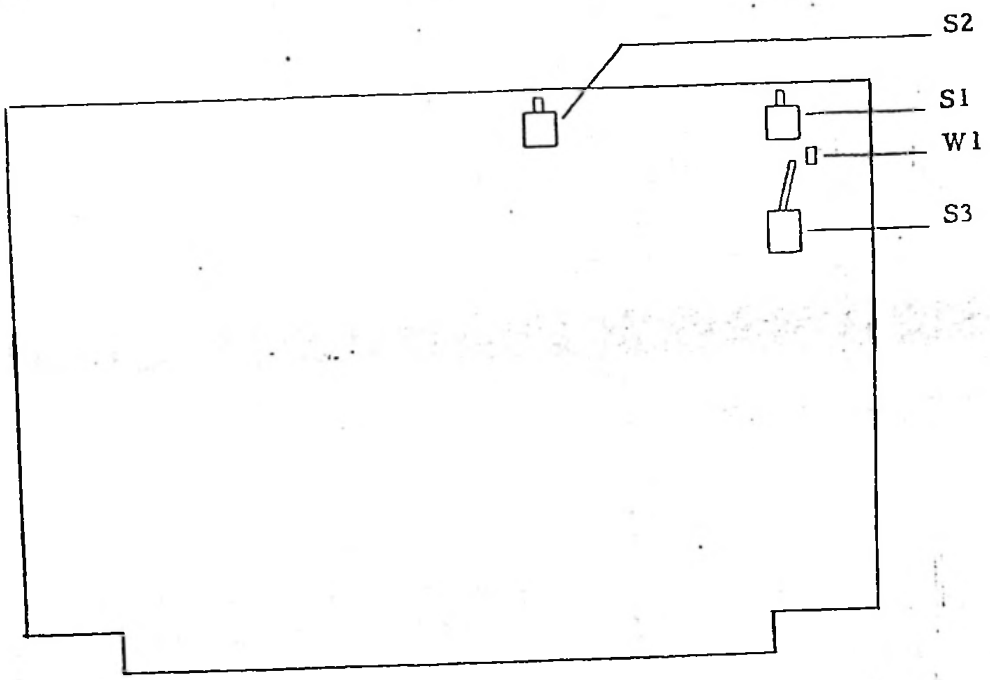
6.1 GENERAL - In order to allow the system extensive flexibility and ease in reconfiguring boards to accommodate changing needs, many boards are equipped with Dual In Line (DIP) switch packs, jumpered headers, and/or push-on molded jumpers. The following pages list the various switches and jumpers noting their purpose and settings for varying conditions. Additionally, pictures of each board indicate the location of the switches and jumpers.

6.2 CONTROL CHASSIS

SWITCH	JUMPER	FUNCTION	CONDITIONS
S1		RESET - Resets CPU program to Address 0000 and clears all system registers.	Momentary push button. Press to reset CPU to Address 0000 and reset all system registers.
S2		RESTART - Sends CPU to debug routine.	Momentary push button. Press to set CPU to debug routine.
S3		I/O DISABLE - If closed, disables Address and control line buffers to Audio Control & Buffer board. Should normally be open. Actuated only for test purposes.	Normally OFF. Switch to I/O DISABLE to disable Audio Chassis Buffers for test.
	W1	STEAL EN - If installed, disables CPU Address, Data, and Control Buffers during dynamic RAM refresh cycle.	Not used in current 7000 systems.

CPU BOARD

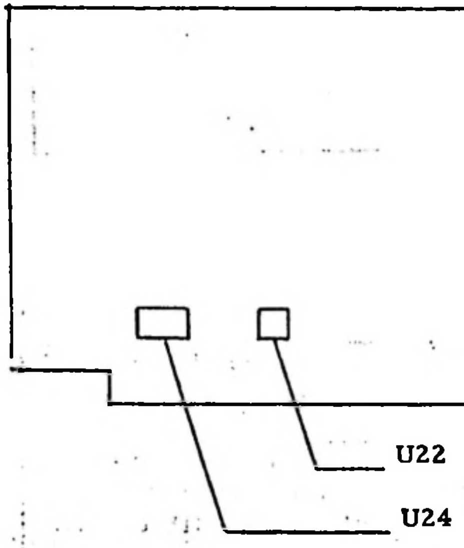
6.2 CONTROL CHASSIS (continued)



CPU BOARD

6.2 CONTROL CHASSIS (continued)

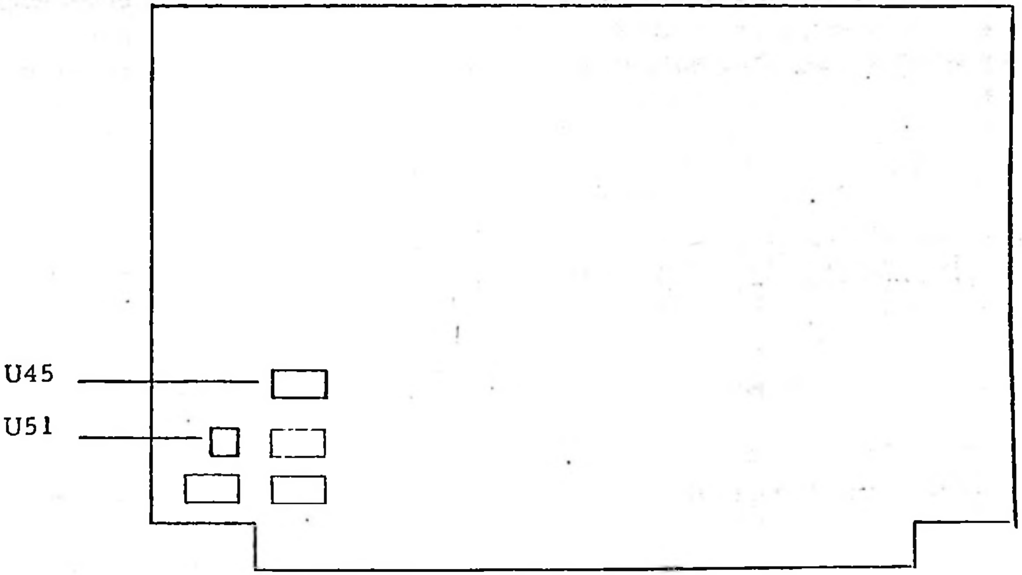
SWITCH	JUMPER	FUNCTION	CONDITIONS
	U22	BOARD ADDRESS - Jumpers define memory addresses which affect this board.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Broadcast Group Service personnel. Normal Settings: Level I(-1) - none installed Real Time Clock (-2) - S3 installed Debug (-4) - S3 installed
	U24	VALID ROM ID - Jumpers define which ROM's are installed in board.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Broadcast Group Service personnel. Normal Settings: Normal ROM (-1) S1-S4 installed; Real Time Clock (-2) S1-S2 installed Debug (-4) S7-S8 installed



ROM BOARD

6.3 CONTROL CHASSIS (continued)

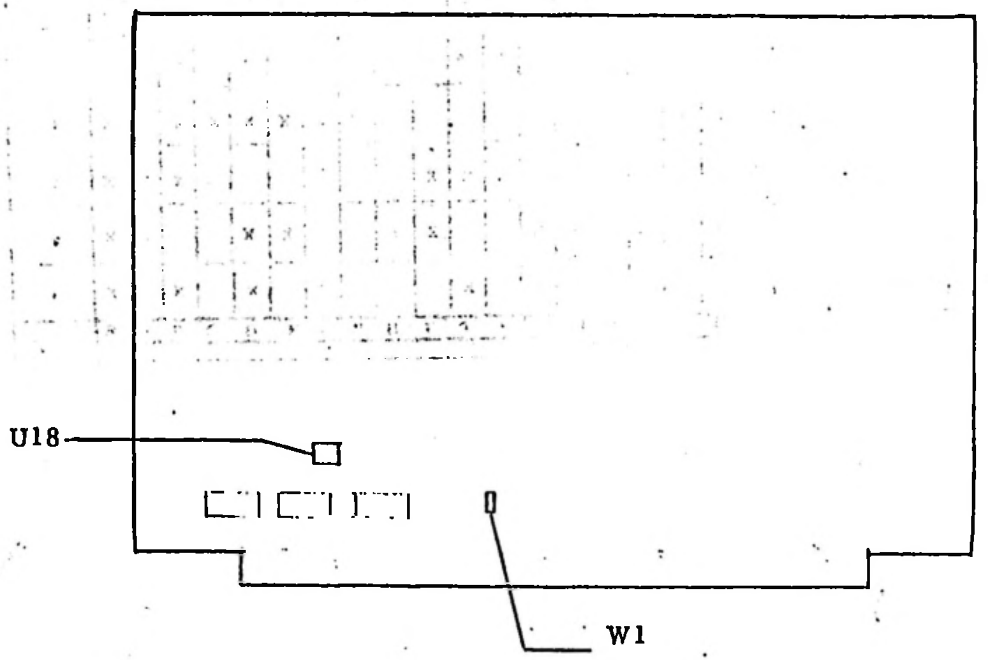
SWITCH	JUMPER	FUNCTION	CONDITIONS
	U51	BOARD ADDRESS - Jumpers define memory addresses which affect this board. .	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Broadcast Group Service personnel.
	U45	VALID RAM ID - Jumpers define which RAM's are installed in board.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Broadcast Group Service personnel.



RAM BOARD

6.2 CONTROL CHASSIS (continued)

SWITCH	JUMPER	FUNCTION	CONDITIONS
	W1	INTERRUPT SELECT - Determines Interrupt level for board.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Broadcast Group Service personnel. Normally A jumpered to D
	U18	BOARD ADDRESS ID - Jumpers define memory addresses which affect this board.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Broadcast Group Service personnel. Normally #3 only installed.



PARALLEL I/O BOARD

6.2 CONTROL CHASSIS (continued)

SWITCH	JUMPER	FUNCTION	CONDITIONS
U2*			

*Not used in current 7000 Systems.

Switch	Character																															
	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	↑	←
1	X		X		X		X		X		X		X		X		X		X		X		X		X		X		X		X	
2	X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X		
3	X	X	X	X					X	X	X	X					X	X	X	X					X	X	X	X				
4	X	X	X	X	X	X	X	X									X	X	X	X	X	X	X	X								
5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																
6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
See Note	SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
6																																

X = ON
BLANK = OFF

Note: For the lower row of characters, set switches 1-5 as shown above character and set switch 6 OFF.

6.2 CONTROL CHASSIS (continued)

Switch	Jumper	Function	Conditions	Switch							
				Address				Baud Rate			
				1	2	3	4	5	6	7	8
U12		Peripheral Address/ID and Baud Rate Switches	1. System Control Console.								
			2. Secondary Program Console.		x						
			3. Modem.				x				
			4. Computer Link.		x		x				
			5. VEL Printer.	x							
			6. General Printer	x	x						
			7. Load/Dump Terminal	x			x				
			*Manual Baud Rate =50						x	x	x
			75					x		x	x
			110							x	x
			134.5					x	x		x
			150						x		x
			300					x			x
			600								x
			900					x	x	x	
			1200						x	x	
			1800					x		x	
			2400							x	
			3600					x	x		
			4800						x		
			7200					x			
			9600								
			Ext. Freq.					x	x	x	x

*Typically set for 9600 for local Peripheral Devices and 300 for Telephone Modem

X = ON
BLANK = OFF

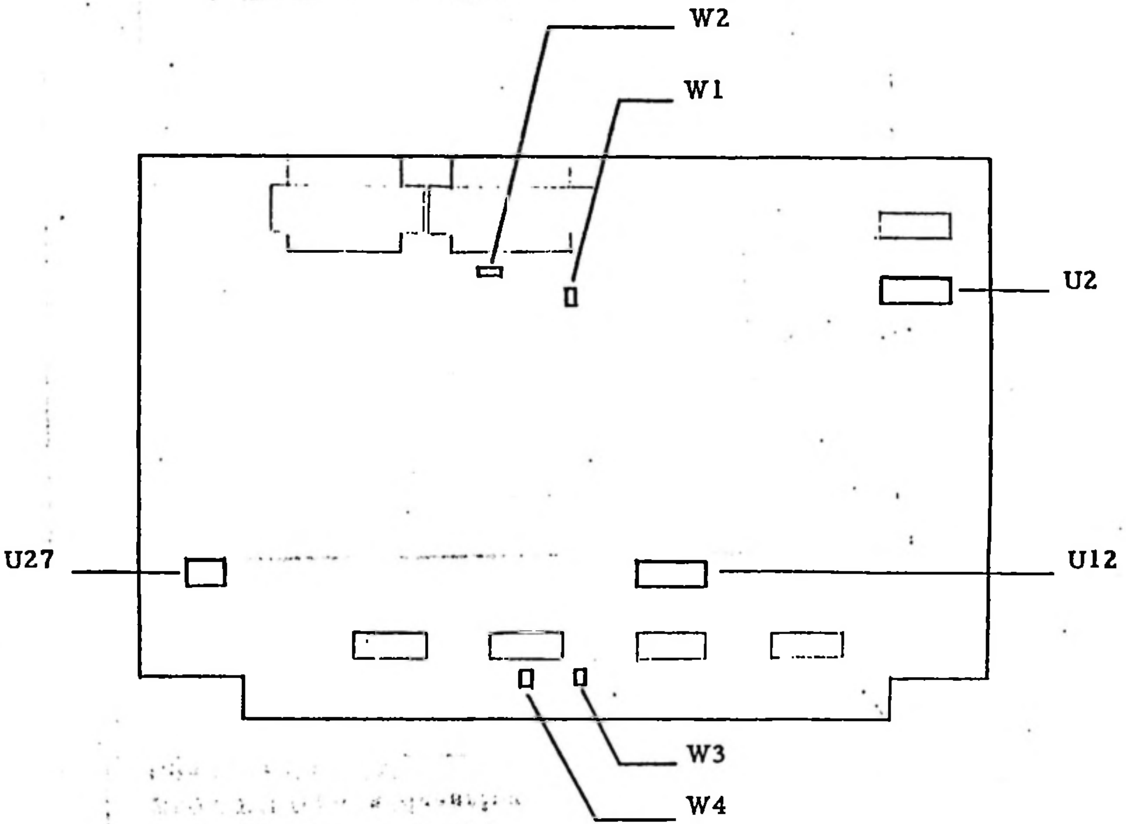
6.2 CONTROL CHASSIS (continued)

Switch	Jumper	Function	Conditions	SWITCH			
				1	2	3	4
U27		INTERRUPT ENABLE and AUTO BAUD ENABLE.	1. Auto Baud Rate Enable	ON			
			2. Manual Baud	OFF*			
			3. TxRDY to cause Interrupt			ON	
			4. TxRDY no Interrupt			OFF*	
			5. RxRDY to cause Interrupt				ON
			6. RxRDY no Interrupt				OFF
			7. LIST and LOAD*			ON	ON
	W1	EXT CLK - If installed, allows external oscillator to drive Baud Rate generator if all Baud Rate select inputs to U15 are "low".	1. If external oscillator is to drive Baud Rate generator - INSTALL. 2. If not - REMOVE (Normal Status).				
	W2	Allows RTS signal to drive CTS input directly.	1. 20ma Loop Terminal - INSTALL(Normal Status). 2. RS232 devices - REMOVE.				
	W3	1PPS Interrupt Select.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Schafer service personnel. Normally "1" jumpered to "7".				
	W4	RxRDY and TxRDY Interrupt level select.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Schafer service personnel. Normally "C" jumpered to "7".				

*Normal Settings.

SERIAL I/O BOARD (continued)

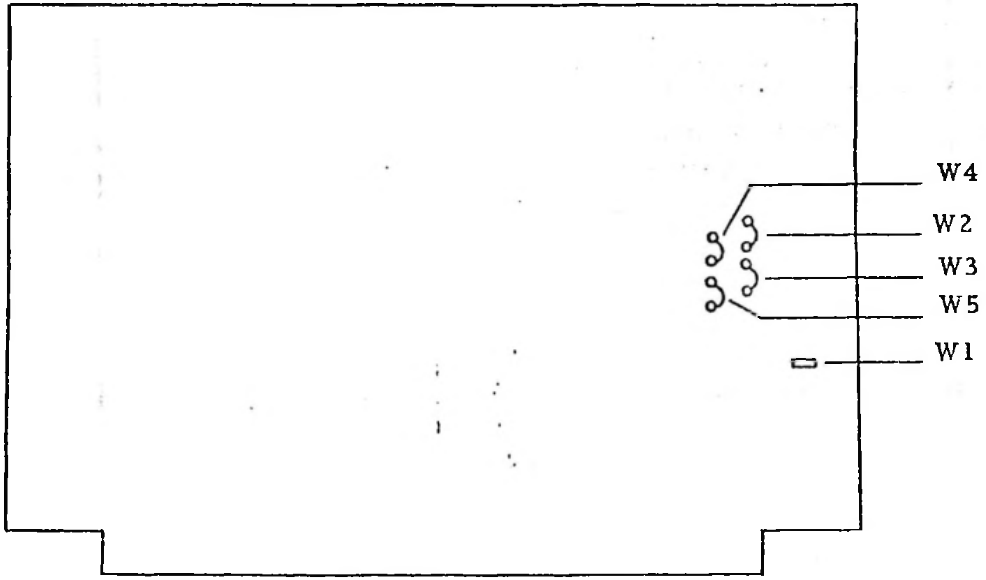
6.2 CONTROL CHASSIS (continued)



SERIAL I/O BOARD

6.2 CONTROL CHASSIS (continued)

Switch	Jumper	Function	Conditions
	W1	AM/PM - Selects 12 or 24 Hour Format	Not used with 7000 Series Systems.
	W2 W3 W4 W5	2708/2716 - Allow use of 2708 or 2716 EPROMS	FACTORY INSTALLED - Do not alter.
	W7	ROM DISABLE - Blocks Z80 CPU from addressing this board's ROM	"ROM" jumpered to "DS".



REAL TIME CLOCK

6.2 CONTROL CHASSIS (continued)

Switch	Jumper	Function	Conditions
U3		Selects Baud Rate for $\overline{\text{TxC}}$ and $\overline{\text{RxC}}$ baud rate generators.	

		SWITCH							
		TxC				RxC			
		1	2	3	4	5	6	7	8
$\overline{\text{TxC}}$	50		x	x	x				
Baud Rate	75	x		x	x				
	110			x	x				
	134.5	x	x		x				
	150		x		x				
(Normal Setting)	300	x			x				
	600				x				
	900	x	x	x					
	1200		x	x					
11-29-88	1800	x		x					
FOR PRINT Buffer	2400			x					
	3600	x	x						
	4800		x						
	7200	x							
for 9600 ANADEX PRINTER	9600								
	Ext. Freq.	x	x	x	x				
$\overline{\text{RxC}}$	50						x	x	x
Baud Rate	75					x		x	x
	110							x	x
	134.5					x	x		x
	150						x		x
(Normal Setting)	300					x			x
11-25-88	600								x
	900					x	x	x	
	1200						x	x	
	1800					x		x	
	2400							x	
	3600					x	x		
	4800						x		
	7200					x			
	9600								
	Ext. Freq.					x	x	x	x

to Printer

Vel Bd SW Settings 9600 all off

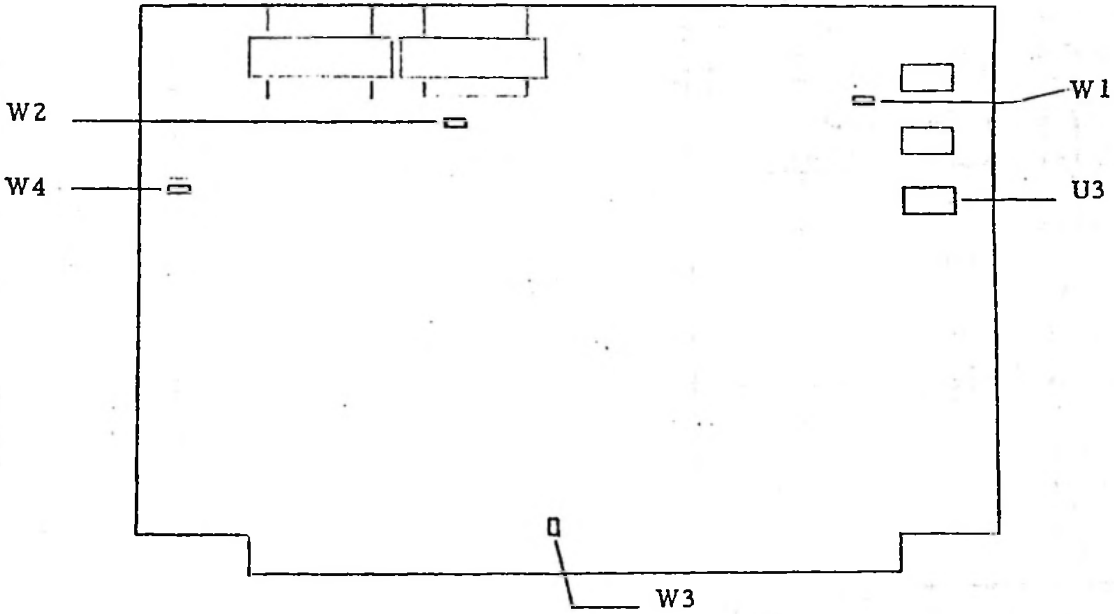
Receive

* X = ON
BLANK = OFF

VEL BOARD

6.2 CONTROL CHASSIS (continued)

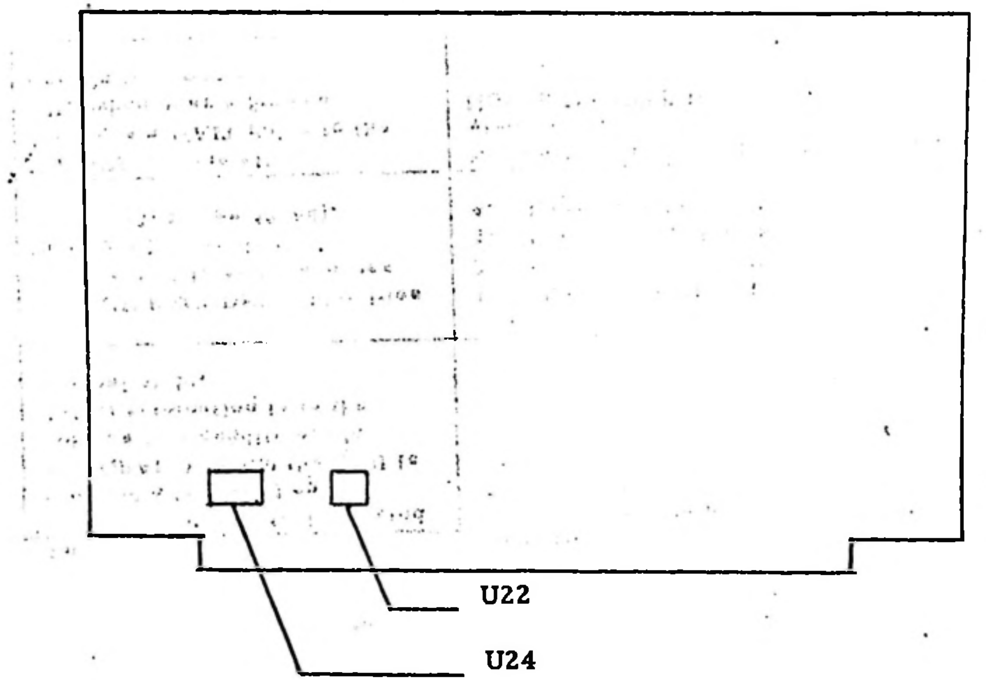
Switch	Jumper	Function	Conditions
	W1	EXT CLK - If installed, allows external oscillator to drive TxC baud rate generator if all baud rate select inputs to U4 are "low".	1. If external oscillator is to drive TxC baud rate generator - INSTALL. 2. If not - REMOVE. (Normal Status).
	W2	Allows CTS to be driven directly by RTS.	1. 20ma Terminals - INSTALL.(Normal Status 2. RS232 Terminals - REMOVE.
	W3	RxRDY and TxRDY interrupt select.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Schafer service personnel. Normally jumper #2 installed.
	W4	STOP BIT - Allows for 1 or 2 stop bits	1. 1 stop bit - INSTALL 2. 2 stop bits - REMOVE (Normal condition)



VEL BOARD (continued)

6.2 CONTROL CHASSIS (continued)

SWITCH	JUMPER	FUNCTION	CONDITIONS
	U22	BOARD ADDRESS - Jumpers define memory addresses which affect this board.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Broadcast Group Service personnel. Normally S3 installed.
	U24	VALID ROM ID - Jumpers define which ROM's are installed in board.	FACTORY INSTALLED - Do not alter unless so instructed by Cetec Broadcast Group Service personnel. Normally S7 & S8 installed.

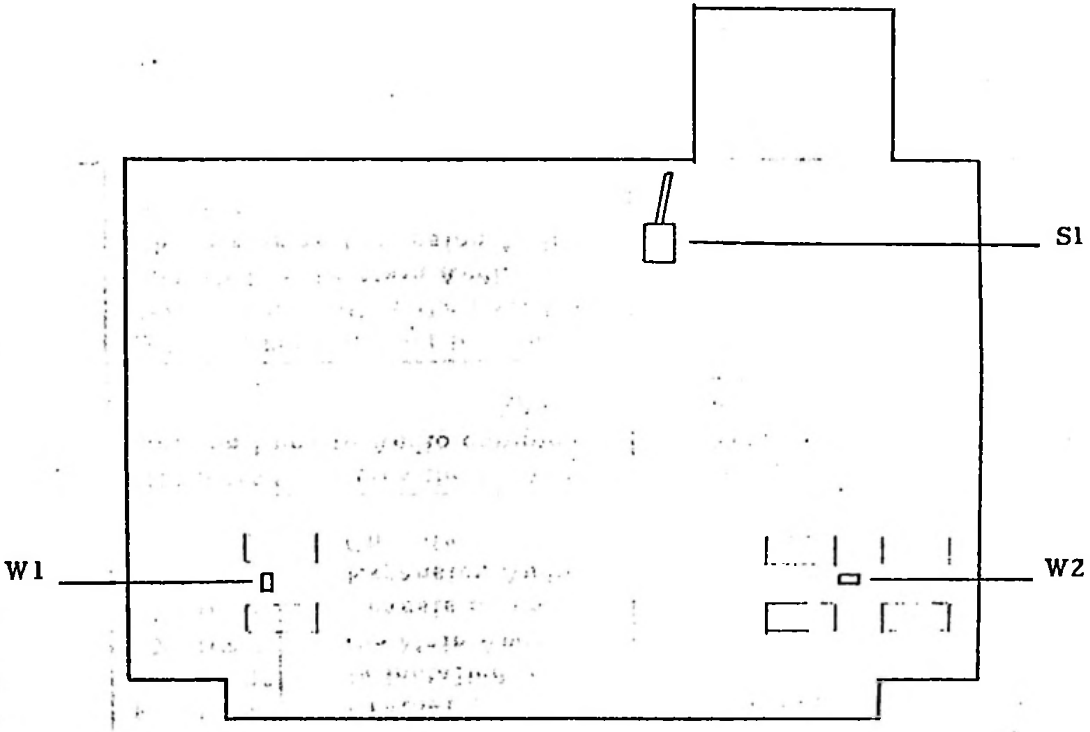


DEBUG BOARD

6.3 AUDIO CHASSIS

Switch	Jumper	Function	Conditions	Jumper	To
S1		MAN/AUTO - In MAN selected Cue audio is placed on the PROGRAM bus and the CPU is put in a test condition. In AUTO automation is in the normal state.	1. Normal Automation - set to AUTO. 2. Manual Overide - set to MAN.		
	W1	SOURCE DECODER - Identifies which set of 16 audio sources this board controls (1-16, 17-32, 33-48, or 49-64).	1. Main Audio Chassis (sources 1-16)	COM	A
			2. Expansion Audio Chassis (sources 17-32)	COM	B
			3. Expansion Audio Chassis (sources 33-48)	COM	C
			4. Expansion Audio Chassis (sources 49-64)	COM	D
	W2	WT DEL - If installed, produces a WAIT pulse to the CPU when ever a Source Decode is produced.	Normally installed only in high noise environments. Normally NOT installed.		

6.3 AUDIO CHASSIS (continued)



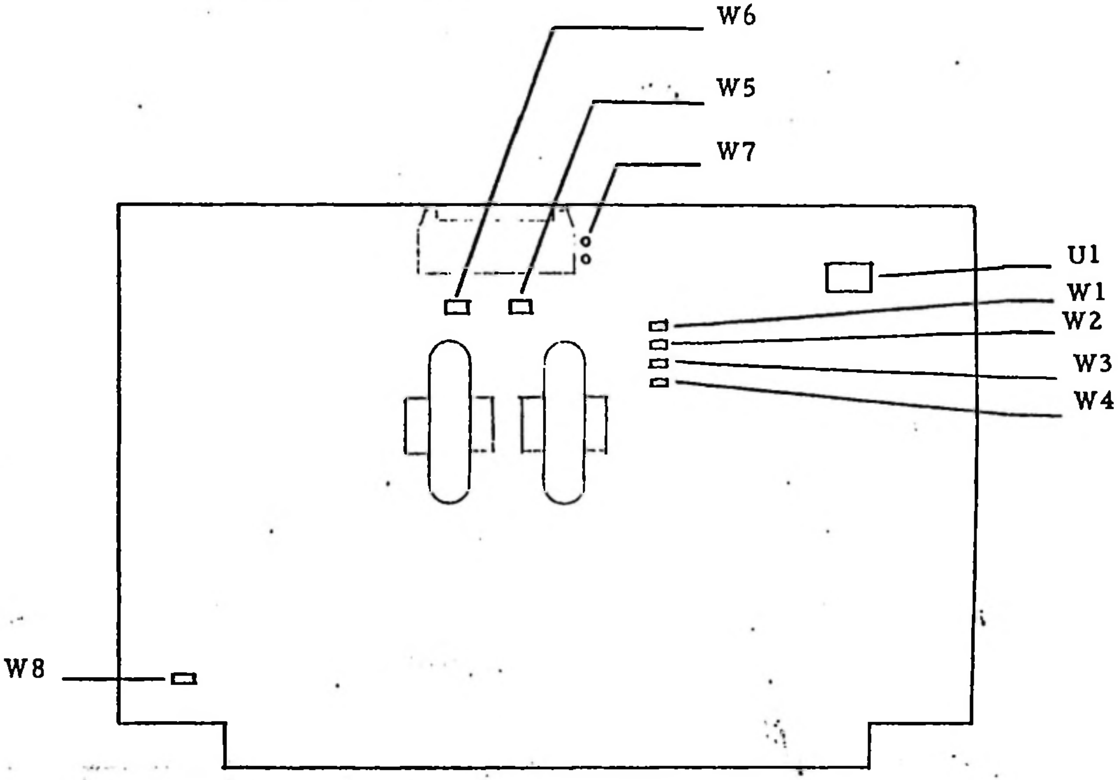
AUDIO CONTROL & BUFFER BOARD

6.3 AUDIO CHASSIS (continued)

<table>
<tr><th>Switch</th><th>Jumper</th><th>Function</th><th>Conditions</th></tr>
<tr><td>U1</td><td></td><td>AUTO/MAN - Determines compression mode.</td><td>1. Music (AUD2) is to be compressed when voice (AUD1) is also present.
2. Voice (AUD2) is to be compressed at all times.
3. No compression.<table><tr><th colspan="4">Switch</th></tr><tr><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><td>ON</td><td></td><td></td><td>OFF</td></tr><tr><td>ON</td><td></td><td></td><td>ON</td></tr><tr><td>OFF</td><td></td><td></td><td>OFF</td></tr></table></td></tr>
<tr><td></td><td>W1
W2
W3
W4
W5
W6</td><td>EXAUDA1
EXAUDB1
EXAUDA2
EXAUDB2
EXCUE A
EXCUE B
Set in accordance with whether the board is installed in the Main Audio Chassis or an Expansion Audio Chassis.</td><td>1. Main Audio Chassis
2. Expansion Audio Chassis<table><tr><th>Jumper</th><th>To</th></tr><tr><td>C</td><td>M</td></tr><tr><td>C</td><td>EX</td></tr></table></td></tr>
<tr><td></td><td>W7</td><td>TERMINATE - Ties the EXAUD common lines to Audio common
A</td><td>1. Main Audio Distribution board - INSTALL.
2. Expansion Audio Distribution board - REMOVE. NOTE: Jumper not required if system does not contain Expansion chassis.</td></tr>
<tr><td></td><td>W8</td><td>QUE CONTROL - Set in accordance with whether the board is installed in the Main Audio Chassis or an Expansion Audio Chassis.</td><td>1. Main Audio Chassis
2. Expansion Audio Chassis<table><tr><th>Jumper</th><th>To</th></tr><tr><td>C</td><td>M</td></tr><tr><td>C</td><td>EX</td></tr></table></td></tr>
</table>

AUDIO DISTRIBUTION BOARD

6.3 AUDIO CHASSIS (continued)



AUDIO DISTRIBUTION BOARD

6.3 AUDIO CHASSIS (continued)

Switch	Jumper	Function	Conditions
RCHUPDATE		RIGHT CHANNEL UPDATE - Momentary push button which, when pressed, updates Audio Source to right channel tone.	CUSTOMER SUPPLIED - Connect as shown on following board layout illustration. Reference 100-700-014 (sheet 2).
UPDATE CANCEL		Momentary push button, which, when pressed, cancels right channel update returning 25Hz detection to left channel.	CUSTOMER SUPPLIED - Connect as shown on following board layout illustration. Reference 100-700-014 (sheet 2).

Switch	Jumper	Function	Conditions
U27		Source and Tray configuration ID switches.	SOURCE TYPE

	SOURCE TYPE	Switch							
		1	2	3	4	5	6	7	8
1.	Undesignated	x	x	x	x	x	x	x	x
2.	"Station ID"	x	x	x	x		x	x	x
3.	"Weather"	x	x	x	x	x		x	x
4.	"Jingle"	x	x	x	x			x	x
5.	"Time Announce Odd"	x	x	x	x	x	x		x
6.	"Time Announce Even"	x	x	x	x		x		x
7.	"Voice Track"	x	x	x	x	x			x
8.	"Net A"	x	x	x					x
9.	"Net B"	x	x	x	x	x	x	x	
10.	"News"	x	x	x	x		x	x	
11.	"Studio A"	x	x	x	x	x		x	
12.	"Studio B"	x	x	x	x			x	
13.	"Studio C"	x	x	x	x	x	x		
14.	"Roll" (Deadroll)	x	x	x	x		x		
15.	"Music"	x	x	x	x	x			

X = ON
BLANK = OFF

NOTE CORRECTION ON NET A

6-21-84

continued...

NOTE: Close loop control has been added to software LEVEL 7823 and later. Activate by placing switch position 4 into OFF on U-27. This will allow normal starting close loop sensing and "ON AIR" close loop monitoring for network and studio sources.

6.3 AUDIO CHASSIS (continued)

Switch	Jumper	Function	Conditions		Switch							
			RANDOM SELECT SOURCES		1	2	3	4	5	6	7	8
U27 (cont.)		Source and Tray configuration ID switches (cont.)	1.	Audiofile - Three Stacks				x	x	x	x	x
			2.	Audiofile - Stack 1 Only		x	x	x	x	x	x	x
			3.	Audiofile - Stack 2 Only	x		x	x	x	x	x	x
			4.	Audiofile - Stack 3 Only	x	x		x	x	x	x	x
			5.	Audiofile - Stack 1 & 2 Only			x	x	x	x	x	x
			6.	Audiofile - Stack 1 & 3 Only		x		x	x	x	x	x
			7.	Audiofile - Stack 2 & 3 Only	x			x	x	x	x	x
			8.	SMC Carousel		x	x	x		x	x	x
			9.	Instacart (12 Tray)		x	x	x	x		x	x
			10.	Instacart (24 Tray)	x		x	x	x		x	x
			11.	Instacart (48 Tray)	x	x		x	x		x	x
			12.	IGM Go Cart (42 Tray)		x	x	x			x	x
			13.	IGM Go Cart (78 Tray)	x		x	x			x	x

X = ON
BLANK = OFF

Jumper W5 set on MC ? | Jumper W5 set on CS ?

FOR Dead ROLL

ON 1234 - 6 - -
- - - - 5 - 78 off

ALL OTHERS

ON 12345
678 off

UNIVERSAL SOURCE BOARD (continued)

6.3 AUDIO CHASSIS (continued)

Switch	Jumper	Function	Conditions
	W1 open	INTERRUPT POLARITY - Determines on which edge of the HSI3 signal an interrupt is created.	1. Interrupt at start of HSI3 signal - REMOVE. 2. Interrupt at end of HSI3 signal - INSTALL. Not used on 7000 systems.
	W2 closed	LONG/SHORT START - Selects either a 680 msec or a 7.5 sec start pulse.	1. 680msec START pulse - INSTALL. 2. 7.5 sec START pulse - REMOVE (used to allow source to play back to back).
	W3 closed	A - Allows for a 635 ohm load on the audio A Channel input.	1. 635 ohm A Channel input load - INSTALL. 2. 10K ohm A Channel input load - REMOVE.
	W4 closed	B - Allows for a 635 ohm load on the audio B Channel input.	1. 635 ohm B Channel input load - INSTALL. 2. 10K ohm B Channel input load - REMOVE.

6.3 AUDIO CHASSIS (continued)

Switch	Jumper	Function	Conditions		
				Jumper	To
	W5	MONO/STEREO - Selects either A Channel or B Channel audio to be sent to the B Channel Amplifier.	1. MONO Audio Source	C	M
			2. STEREO Audio Source	C	S
	W6	CUE SEL A - Selects either source "Program" or "Cue" A Channel audio for output to the A Channel CUE bus.	1. Source has separate Cue output.	2	3
			2. Source does not have separate Cue output.	2	1
	W7	CUE SEL B - Selects either source "Program" or "Cue" B Channel audio for output to the B Channel CUE bus.	1. Source has separate Stereo Cue output.	2	3
			2. Source has separate Mono Cue output.	2	4
			3. Source does not have separate Cue output.	2	1

UNIVERSAL SOURCE BOARD (continued)

6.3 AUDIO CHASSIS (continued)

Switch	Jumper	Function	Conditions		
	W8	AUD BUS SEL A - Routes the A Channel Program audio to either the compressed or umcompressed audio processor.		Jumper	To
			1. Audio A out to be uncompressed.	A	1
			2. Audio A out to be compressed.	A	2
	W9	AUD BUS SEL B - Routes the B Channel program audio to either the compressed or uncompressed audio processor.		Jumper	To
			1. Audio B out to be uncompressed.	B	1
			2. Audio B out to be compressed.	B	2
	W10	SILENCE SENSE EXTEND - Allows Silence Sense delay to be extended for sources with unpredictable periods of Silence such as live studio interfaces.	1. Normal Silence Sense duration - REMOVE. 2. Extended Silence Sense duration - INSTALL.		

6.3 AUDIO CHASSIS (continued)

Switch	Jumper	Function	Conditions		
	W11	EOM OVERLAP - Allows for short (0.75 sec) or long (7.5 sec) audio overlap after End of Message (EOM) tone ends.	1. 0.75 sec EOM overlap - INSTALL. 2. 7.5 sec EOM overlap* - REMOVE. *Used primarily for Network Audio sources when flexability is needed due to variations in time network actually ends and time system is commanded to leave network.		
	W12	CUE DEFEAT - Allows selection of proper cue enable input from Local Status Panel based on type of Audio Source the board is interfacing.		Jumper	To
			1. NETWORK Source.	C	N
			2. AUDIO CLOCK (Time) source.	C	T
			3. AUX 1 source.	C	1
			4. AUX 2 source.	C	2
			5. All other sources.	C	Q
	W13	FADEN - Allows fade to be enabled at all times or only when called for by program.	1. Audio fade enabled at all times - INSTALL. 2. Audio fade to be enabled only when commanded by program - REMOVE. (Normal Status).		

UNIVERSAL SOURCE BOARD (continued)

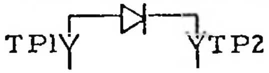
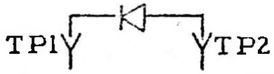
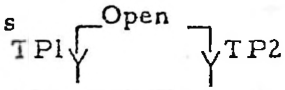
6.3 AUDIO CHASSIS (continued)

Switch	Jumper	Function	Conditions		
	W14	SENSE EN - Allows for selection of either a "playing" signal (HSI0) or a lack of high level audio due to high speed WIND or REWIND to enable the 25Hz detector output.		Jumper	To
			1. 25Hz detector to be enabled by source playing signal. (Normal condition).	C	A
			2. 25Hz detector to be enabled unless source is in high speed WIND or REWIND with tape on heads.	C	B
			3. Disable 25 Hz sensing.	C	D
	W15	HI/LOW LEVEL - Selects gain of 3.5KHz encoding amplifier based on input levels from the audio source.		Jumper	To
			1. Sources with very low level Cue track output	C	H
			2. Sources with moderate level Cue track output	C	L
			3. Sources with high level. Cue track output (normal condition).	No jumper.	

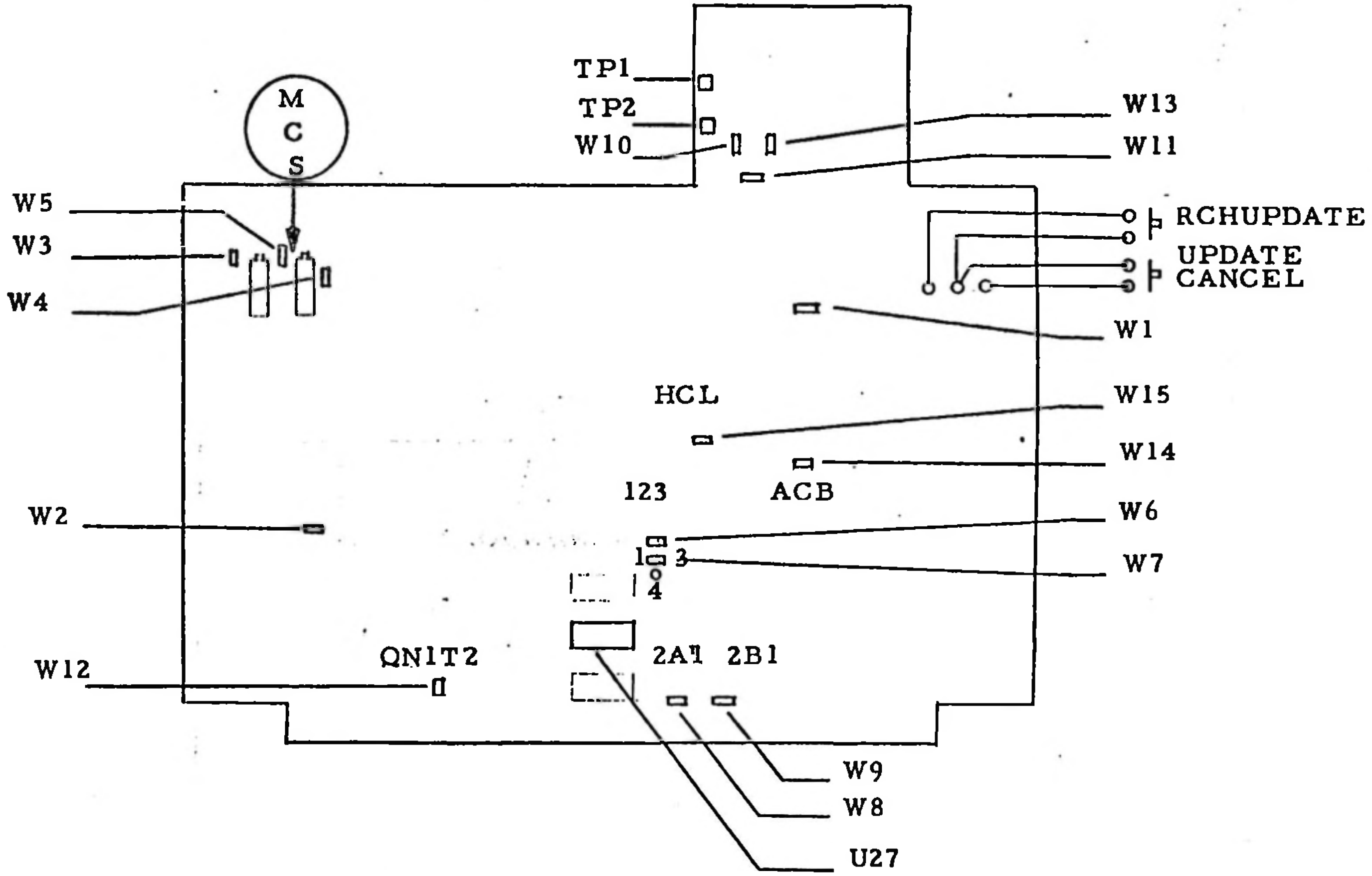
Z0
See →

UNIVERSAL SOURCE BOARD (continued)

6.3 AUDIO CHASSIS (continued)

Switch	Jumper	Function	Conditions
	Fade Direction Diode	CUSTOMER INSTALLED diode. Determines whether audio will fade ON, OFF, or both if fade is enabled (reference jumper W13).	1. Fade OFF only  2. Fade ON only  3. Fade both directions 

UNIVERSAL SOURCE BOARD (continued)

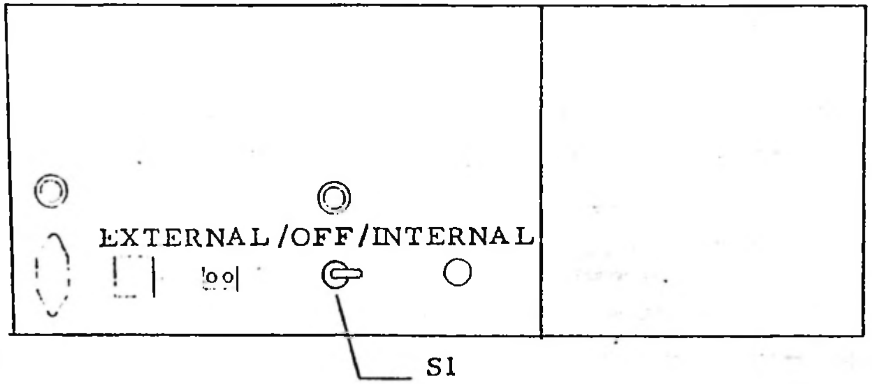


UNIVERSAL SOURCE BOARD

6.4 POWER SUPPLY

Switch	Jumper	Function	Conditions
S1		Selects either the Internal or External Battery or none.	1.* INTERNAL BATTERY - Set to INTERNAL 2. EXTERNAL BATTERY - Set to EXTERNAL 3. Battery disconnect - Set to OFF

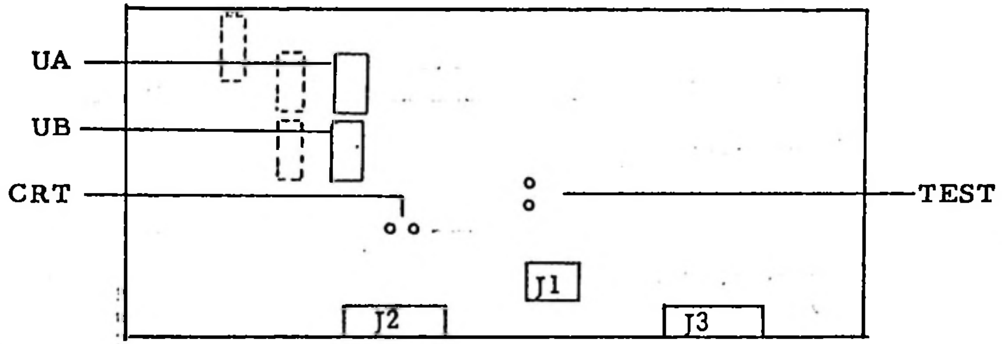
* Normal Setting



POWER SUPPLY

6.5 ACCESSORIES

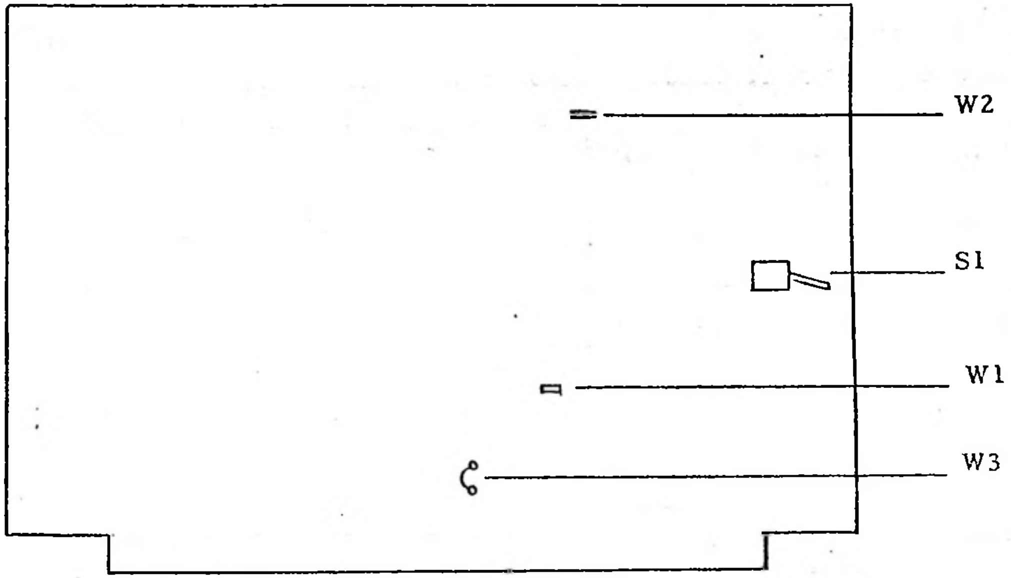
SWITCH	JUMPER	FUNCTION	CONDITION
	UA	1st Start Character	Beehive B-100 or B-150 Jumper 1 2 3 4 5 6 7 _ _ x _ _ x x (ESC) x = installed
	UB	2nd Start Character	Beehive B-100 or B-150 Jumper 1 2 3 4 5 6 7 x x x x _ _ x x = installed
	TEST	Allows continuous 3.5kHz signal at output (J3-7)	1. Continuous 3.5kHz signal at output (J3-7) - INSTALL 2. NORMAL OPERATION - REMOVED
	CRT	Disables echoplexing circuit when using a CRT	1. CRT interfaced to Encode board - INSTALL 2. TTY interfaced to Encode board - REMOVE



ENCODE BOARD

6.5 ACCESSORIES (continued)

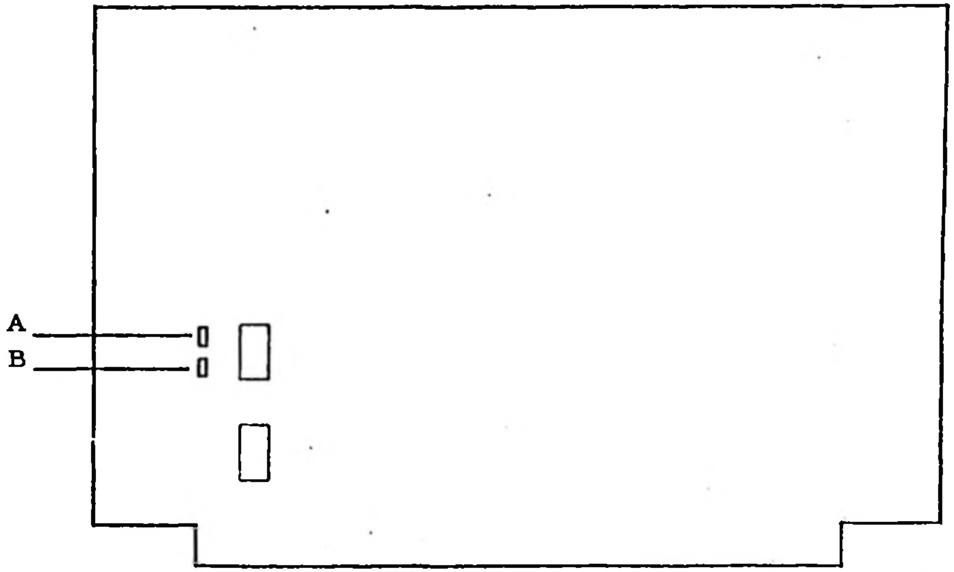
Switch	Jumper	Function	Conditions	Jumper	To
S1		FAIL INHIBIT - If Carousel is stopped due to an empty tray being programmed, setting to ON and then back to OFF will allow Carousel to update to new tray.	NORMAL = OFF If left ON, will allow Carousel to continually search if programmed to an empty tray.		
	W1	250/350 Select	250 Carousel	C	250
			350 Carousel	C	350
	W2	250/350 Run Select	250 Carousel	C	250
			350 Carousel	C	350
	W3	VCC Select	Factory Installed - Do not alter.		



CAROUSEL INTERFACE BOARD

6.5 ACCESSORIES (continued)

Switch	Jumper	Function	Conditions
	A & B	Used for Special modifications	NORMAL - Removed SPECIAL MODS - Installed as required



INSTACART INTERFACE BOARD

NEXT ASSY	USED ON	REVISIONS			
		REV.	DESCRIPTION	DATE	APPR.

ADDENDUM

BOARD SWITCH & JUMPER SETTING TABLES

DWN. R Smith	DATE 9/3/81
CHECK	
PROJ. ENG.	
APPR.	

Cetec Broadcast Group

Cetec Corporation
1110 Mark Avenue, Carpinteria, California 93013

ADDENDUM

BOARD SWITCH & JUMPER SETTING TABLES

SIZE		DRAWING NUMBER	REV
A	SHEET 1 OF	049-7008-10	

LEVEL II SWITCH SETTINGS

1.0 GENERAL

Several new switch and jumper options have been added to the SERIES 7000, LEVEL 1A & II FIRMWARE. These options will be outlined in this section.

1.1 UNIVERSAL SOURCE BOARD

The ID switch (U27) located on each universal source card will have the following modifications (SEE page 6-22 of manual).

1.1.1 The CLOSE LOOP function which was automatically determined by the description chosen in LEVEL I has now been made switch selectable. SWITCH 4 of the ID switch will now control the operation of the CLOSE LOOP monitoring as follows:

CONDITION	FUNCTION
S4 ON	CLOSE LOOP ACTIVATE
S4 OFF	CLOSE LOOP DEACTIVATE

1.2 MAIN CRT PORT (S10)

The PERIPHERAL ID (U2) switch located on the S10 card used for the SYSTEM CONTROL CONSOLE (MAIN PORT) only will have the following modifications (SEE pages 6-8 to 6-10).

1.2.1 SWITCH 1 ON U2 controls the CRT SAVE feature in LEVEL 1A.

SWITCH 1 - ON - CRT will remain in upper intensity.

SWITCH 1 - OFF '- CRT will go into operate mode and switch to lower intensity 5 minutes after the last time a Key on any terminal was pressed. Pressing any Key of any terminal will place all CRTs back in upper intensity.

1.2.2 SWITCH 3 controls whether the FIX DESCRIPTORS in LEVEL II are used. If the DESCRIPTORS are not activated, the USER MEMORY is increased by 40% which represents the memory allotted to the DESCRIPTORS.

NOTE this selection should be made at installation and not changed. THIS IS A LEVEL II OPTION ONLY.

ITCH 3 - ON - FIX DESCRIPTORS off
SWITCH 3 - OFF - FIX DESCRIPTORS on

1.2.3 SWITCHES 7 and 8 control the use of the station ID which appears in the title of each of the different modes to allow stations with multiple systems to know which system is being monitored.

SWITCH 7	SWITCH 8	
ON	ON	- No ID
OFF	ON	- "FM" ID
ON	OFF	- "AM" ID
OFF	OFF	- No ID

1.3 LOAD/DUMP & HIGH SPEED PRINTER BOARD (S10)

The PERIPHERAL ID (U2) switch located on the S10 card used for the LOAD/DUMP or HIGH SPEED PRINTER (LEVEL II ONLY) port will have the following modifications:

1.3.1 SWITCH 8 controls the use of the port as either a controller or communications port. As a controller, the port will activate and deactivate the motor control on the peripheral device.

EXAMPLE: The cassette machine tape motion will be controlled from the CONSOLE terminal. As a communication device, the port will be open to FULL DUPLEX communication with an external device such as BUSINESS SYSTEM. NOTE that there is not incoming data reception from any external device while the port is a controller except when activated by the CONSOLE. Also note if a cassette is connected to a port designated as a communications port, the motors will run all the time.

SWITCH 8 - ON - CONTROLLER PORT (FOR CASSETTE)
SWITCH 8 - OFF - COMMUNICATION PORT (FOR BUSINESS)

1.3.2 If SWITCH 8 is set OFF making it a COMMUNICATIONS PORT, the SWITCHES 1-7 are designated as follows:

SWITCHES 1-7 - These switches may now be set to represent an ASCII character which when received by the port will be interpreted to be a command to begin LOADING memory information from the external computer to the 7000. NOTE the port will echo the character designated to indicate to the external device that the command was received.

Transmission of the NEXT HIGHER CHARACTER in the ASCII code table will cause the 7000 to start LISTING the memory from the 7000 to the external device.

EXAMPLE: A = LOAD, B - next higher character.

EXAMPLE:	7000	EXTERNAL DEVICE	
	← SEND "A"		← External device sends the character "A" as per SWITCHES 1-7 to indicate desire to LOAD.
	"A" →	RECEIVE "A"	← 7000 echos character back indicating LOAD READY.
	← SEND DATA		← External device sends data to 7000.

EXAMPLE:	7000	EXTERNAL DEVICE	
	← SEND "B"		← Request from external device for 7000 to LIST memory.
	DATA →	RECEIVE DATA	← 7000 sends complete memory data to external device.

NEXT ASSY	USED ON

REVISIONS

REV.	DESCRIPTION	DATE	APPR.

Trouble Shooting

7.0 TROUBLESHOOTING

ADDENDUM- MANUAL MODE TROUBLESHOOTING FEATURES

131 700-009

DWN. Ralph Smith DATE 12-13-77

CHECK

PROJ. ENG.

APPR.

Cetec Broadcast Group

Cetec Corporation
1110 Mark Avenue, Carpinteria, California 93013

SERIES 7000 AUTOMATION TECHNICAL MANUAL

SECTION 7 0 TROUBLESHOOTING

SIZE A

SHEET 7.1 OF

DRAWING NUMBER 049-7009

REV

SECTION 7.0 ADDENDUM

1.0 MANUAL MODE TROUBLESHOOTING FEATURES:

1.1 PLACING SYSTEM IN MANUAL MODE
(See Section 3.0 - OPERATION, Paragraph 3.9)

1.2 In MANUAL Mode, the Video Terminal is placed in a "TEST" mode. This is evidenced by the word "***TEST***" displayed on the CRT when normal EDIT functions are performed.

1.3 The normal Program EDIT interlock tests such as:

Is the Source valid?
Is the Tray valid?
Is the Tray an adjacent tray?
Is the Source Random Select?
etc.

are disabled. Thus, the EDIT program will always require a TRAY number before it will allow the data to be ENTERED. Additionally, any Source number (up to 64) and any Tray (up to 99) may be entered. This allows testing of various numbers to verify that the system will accept them and display them.

1.4 Note that the System memory has no control over, nor will it respond to Audio sources in MANUAL mode. Thus, a simulated program may be entered into memory and manually stepped through (press "START" and then use "STEP" key to step through the program.) to verify proper program operation. During testing, the system can still be "ON THE AIR" under manual control (Audio Sources are started manually using their "START" or "PLAY" switches).

NOTE: Silence Sense is still active in Manual mode. To disable it during testing to allow operator control over when the program is stepped, program a CMD 0001 at the beginning of the test program.

CAUTION: Remove all program material used for testing purposes prior to placing the system back to the AUTO mode.

7.0 TROUBLESHOOTING

7.1 AUDIO

7.1.1 GENERAL - The purpose of this section is to aid in isolating Audio problems to the most likely component(s) or P.C. Board. See Section 5.0 (Theory of Operation) for a detailed description of individual P.C. Boards.

The first step in locating Audio problems is to insure that all cables are securely connected.

Audio problems can be classified as follows:

A. Loss of Audio.

B. Cue Audio on Program.

C. Program Audio on Cue.

D. Noise.

E. Distortion.

Each of these are discussed in following paragraphs.

Refer to the Audio Signal Block Diagram (114-700-004) to aid in following audio signal flow.

7.1.2 LOSS OF AUDIO

NOTE: In addition to the possible causes listed, missing or loose jumpers may be responsible for missing or noisy audio.

7.1.2.1 Both "A" and "B" channel missing all sources.

A. PROGRAM ONLY MISSING - Audio Distribution Board (U13, U30, Q2, or U24 defective).

B. CUE ONLY MISSING - Audio Distribution Board (U23, or U26 defective; J4 loose). Monitor Amplifier (U1 defective).

C. PROGRAM AND CUE MISSING - Most likely loss of +15V, -15V, or +24V to Audio Chassis.

7.1.2.2 1 CHANNEL ONLY MISSING - ALL SOURCES

A. PROGRAM ONLY MISSING - Channel "A" - Audio Distribution board (U13, U16, U17, U19, U27, or Q2 defective).

- Channel "B" - Audio Distribution Board (U13, U15, U18, U20, U28, or Q2 defective)

B. CUE ONLY MISSING - Channel "A" - Audio Distribution Board (U22 or U23 defective). Monitor Amplifier (U1 defective).

- Channel "B" - Audio Distribution Board (U21 or U23 defective). Monitor Amplifier (U1 defective).

NOTE: If audio is visible on the VU Meters, PROGRAM audio must be good through U16 on the Audio Distribution Board and CUE audio problems would be most likely found on the Monitor Amplifier Board.

7.1.2.3 1 PROGRAM CHANNEL MISSING - UNCOMPRESSED SOURCES ONLY

A. Channel "A" - Audio Distribution Board (U9 defective).

B. Channel "B" - Audio Distribution Board (U10 defective).

7.1.2.4 1 PROGRAM CHANNEL MISSING - COMPRESSED SOURCES ONLY

A. Channel "A" - Audio Distribution Board (U11, Q1, or U7 defective).

B. Channel "B" - Audio Distribution Board (U12, Q1, or U8 defective).

7.1.2.5 BOTH PROGRAM CHANNELS MISSING - COMPRESSED SOURCES ONLY - Audio Distribution Board (Q1 or U5 defective).

7.1.2.6 "A" OR "B" CHANNEL MISSING - SINGLE SOURCE

A. PROGRAM ONLY MISSING
- Channel "A" - Universal Source Board (U50 or U25 defective).

- Channel "B" - Universal Source Board (U51 or U25 defective).

* - Both Channel "A" and Channel "B" - Universal Source Board (U18 or U25 defective.

B. CUE ONLY MISSING
- Channel "A" or "B" or both - Universal Source Board (U10 or U25 defective).

C. BOTH PROGRAM AND CUE MISSING
- Channel "A" - Universal Source Board (U48 or U25 defective) or defective audio source.

- Channel "B" - Universal Source Board (U49 or U25 defective) or defective audio source.

- Both Channel "A" and "B" - Universal Source Board (U25 defective) or defective audio source.

7.1.3 CUE AUDIO ON PROGRAM - Universal Source Board (U18 or U25 defective).

7.1.4 PROGRAM AUDIO ON CUE - Universal Source Board (U8, U10, or U25 defective).

7.1.5 NOISE

7.1.5.1 ALL SOURCES NOISY - Problem most likely on Audio Distribution Board. However, any Universal Source board can put noise on the Audio bus. To verify if a Universal Source Board is responsible, pull all Universal Source Boards and check for noise. If noise disappears, reinstall Universal Source Boards one at a time to locate defective board(s).

7.1.5.2. SINGLE SOURCE NOISY - Problem would be with audio source (Tape Deck, Phone line feed, etc.) or Universal Source board for noisy source.

7.1.6 DISTORTION

7.1.6.1 ALL SOURCES DISTORTED - Problem most likely on Audio Distribution Board. Possibly low level ±15vdc.

7.1.6.2 SINGLE SOURCE DISTORTED - Problem would be with audio source or Universal Source Board for distorted source.

NOTE: If problem is not with the audio source, the following test can help locate the source of the distortion.

1. Connect an Oscillator set to 700Hz to the audio input of the Universal Source Board (Channel "A" - J2-14 (Hi), J2-2 (Lo); Channel "B" - J2-3 (Hi), J2-16 (Lo)).
2. Adjust Oscillator output for +4dbm (3.5VP at system output measured at the Audio Interface Terminal board A1TB1 (Channel "A" - TB1-2 to TB1-3, Channel "B" - TB1-5 to TB1-6).
3. Check for flatened waveform at each stage of the offending channel.
4. If no distortion is noted at 700Hz, increase frequency to 15KHz and check again. Repeat for 100Hz if required.

7.2 LOGIC

7.2.1 GENERAL - System logic problems are generally unique and difficult to categorize. However this should not cause fear in the one approaching a logic problem as digital logic is considerably easier to troubleshoot for the following reasons:

1. You are dealing primarily with statements of conditions (i.e. "if all inputs go "high", the output will go "low"). Thus, if one input to a two input gate fitting the statement above never goes "high", then obviously the output can never go "low". If the logic calls for that input to go "high", then clearly the next step is to start backtracking to find out why it doesn't.

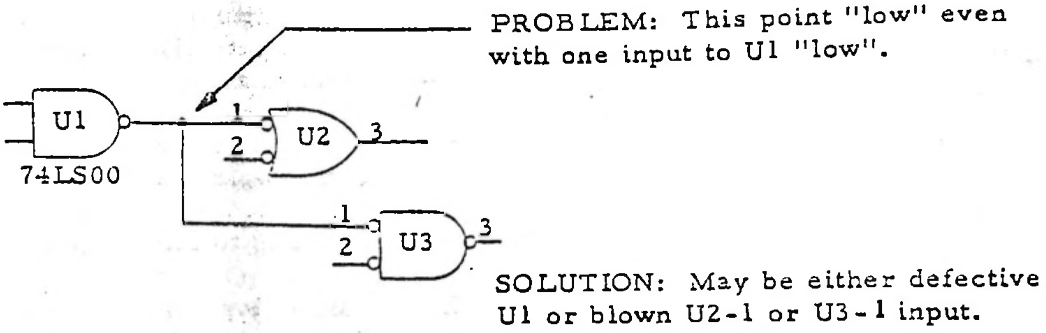
2. Digital logic has only two states, "high" and "low". Anything in between is <u>bad</u>. For TTL logic "high" = 2.4 - 5.0vdc, logic "low" = 0 - 0.8vdc. With CMOS, a "high" is any thing greater than 70% of the supply voltage (VDD) while a "low" is less than 30% of VDD. If you are not familiar with TTL and CMOS integrated circuits, review the IC substitution charts in Section 9.0 (Appendix) of this manual to acquaint yourself with the devices and their truth tables.

There are basically two failure modes which should be kept in mind:

1. A blown internal component or output driver which blocks the output of a gate from assumming the correct state even though the input is correct.

2. A blown input which typically will load the output of the driving gate to ground or at best a half "high" state. Remember, any state which is not fully "high" or "low" is bad.

Note that either of the above conditions can cause the same symptoms; notably, failure of a gate output to respond properly to the input state(s) or failure to achieve a full "high" or full "low" state. Therefore, if replacing the gate which drives a line fails to clear the problem, it it then necessary to start replacing the gates which are being driven. This same analogy applies when looking for missing data signals between P.C. boards.



PROBLEM: This point "low" even with one input to U1 "low".

SOLUTION: May be either defective U1 or blown U2-1 or U3-1 input.

In order to apply what has been discussed thus far, it is necessary to at least have located the general circuit area where the problem is occurring. The following paragraphs outline steps to achieve that end and also discuss tools (both test equipment and information) which are useful in troubleshooting digital problems.

7.2.2 NARROWING THE PROBLEM AREA DOWN - The following are recommended steps in "zeroing in" on the logic problem.

1. Start by gathering (and writting down) as many facts concerning the malfunction as possible (is it related to one or several specific sources?; is it intermittent?; is it time or day related?; does source 10 play when source 14 was programmed?; etc.). Next study the facts to determine if the facts relate to each other. If they do not appear to relate, pick a predominant fact and work on solving it. Quite often in solving for one problem, the relationship of the other facts

will become clear or at least they will vanish when the solution is found. However, the possibility remains that you may be dealing with more than one problem so always verify that all known problems are cleared after solving the first one.

2. After studying the known facts, try to narrow down whether the problem would likely be found in the Audio or Control chassis. Reviewing the System Block Diagram discussion in Section 5.0 should aid in making this determination. Next review the Block Diagram discussion for the appropriate chassis to identify the responsibilities for the various boards in that chassis. After locating the most likely board(s), review the Theory of Operation for the specific circuit within the board(s) to further verify whether the potential problem could be located there.

3. Having located the suspect circuit, check the output of that circuit to determine if it is indeed malfunctioning (the Theory of Operation will give the conditions necessary for it to operate). If it is operating correctly it will be necessary to rethink the problem or go to another likely circuit. If it is malfunctioning, go to the input of the circuit to determine if the input signals are correct. If so, continue to check through the circuit until a discrepancy is found. If input control signals are not found, backtrack to find out why. If the signal comes from another board, use the Block Diagram to locate other boards tied to that line. Though this may seem oversimplified, it is this type of methodical probing that solves logic problems rather than allowing the

apparent complexity of the system to create a feeling of helplessness.

7.2.3 ADDRESS or DATA BUS PROBLEMS - Since the Address Bus (A0 through A15) and the Data Bus (D0 through D7) are continually changing at a high rate of speed, it is necessary to approach problems in this area differently. First determine the normal state of the Address or Data lines to be checked (typically both Data and Address lines will be "low" and go "high" when activated. Next, using a Logic Probe or Oscilloscope,check each line to see if one or more are constantly in the active state (i.e. a data line constantly held "high"), or inactive state (i.e. constantly "low"). If this is the case, most likely one of the components which drives or is driven by that line is defective. If the buffer on the CPU board is not the offender, then it is sometimes possible to locate the offending board(s) by pulling each of the Control Chassis boards (assuming the problem is with the Control Chassis Bus) one at a time, while monitoring the offending bus line, until the bus line returns to normal. The same technique applies the Audio Chassis bus (the Audio Chassis Block Diagram indicates which boards are tied to the bus.

An understanding of "binary" will aid in determining which bus line is most likely to be the offender. For example, if source six (6) is supposed to play but instead source four (4) airs, it would indicate a missing Data bus binary 2 bit. Section 9.0 (Appendix) contains an explanation of binary and hexadecimal.

7.2.4 TOOLS

7.2.4.1 TEST EQUIPMENT -

A LOGIC PROBE is highly recommended for the system. This highly portable tool is inexpensive and will locate most logic problems. With their pulse trapping characteristics they often are easier to use in looking for single isolated pulses than an Oscilloscope.

An OSCILLOSCOPE is generally the best tool for looking at peripheral outputs which are driven by relays or open collector output gates (such as Audio Source START and STOP pulses). The Oscilloscope should have a calibrated DC input and a triggered sweep to be effective in catching pulses and verifying proper voltage excursions (i.e. does it go fully to the supply voltage when OFF and fully to ground [less than 0.8vdc] when activated?).

A DVM, TVM, or VTVM is useful only in measuring the quiescent (non-active) state of logic lines but is of little or no use in looking for logic changes. These meters, however, are recommended for use when measuring power supply voltages.

The optional DEBUG BOARD allows considerable data to be gathered by following procedures outlined in Section 7.5 of this manual.

7.2.4.2 INFORMATION - Section 10.0 (APPENDIX). contains functional drawings and truth tables for most of the Integrated Circuits used in this system. Additionally an explanation of binary and hexadecimal numbers is given. For those that have had no exposure to digital electronics, it is recommended that one of many good books on this subject be acquired. Most retail electronics stores and some public libraries have a supply of these books.

The Theory of Operation (Section 5.0) of the system and individual P.C. boards, in conjunction with the schematics and block diagrams, should aid in locating most system problems.

7.3 MEMORY MAP - The following is a listing of the memory map assignments. The CPU addresses are shown in hexadecimal form, and where applicable, the user event number as is shown on the Vide Monitor is given. The addresses and event numbers are the beginnin addresses for each block of memory assigned to the board and IC o I.C.'s shown to the right of the address. Following the memor[illegible]ap is the I/O memory map used by the Serial I/O, Parallel I/O, a[illegible] VEL boards.

MEMORY MAP

BEGINNING ADDRESS	EVENT #	BOARD	USE	I.C.'S
0000		CPU	ROM	U35
0200		CPU Interrupt Control		U38, U36
0210	Level 1 Level2	Not Used		
0400		CPU	RAM	U28, U31
0458	0000	CPU	RAM	U28, U31
0800	0312	CPU	RAM	U29, U32
0C00	0653	CPU	RAM	U30, U33
1000	0995	RAM #1 (U51 Jumper 3 -installed		U5, U13
1400	1336	RAM #1 4 -installed		U6, U14
1800	1677	RAM #1		U7, U15
1C00	2018	RAM #1		U8, U16
2000	2360	RAM #1		U25, U33
2400	2701	RAM #1		U26, U34
2800	3042	RAM #1		U27, U35
2C00	3384	RAM #1		U28, U36
3000	3725	RAM #1		U29, U37
3400	4066	RAM #1		U30, U38
3800	4408	RAM #1		U31, U39
3C00	4749	RAM #1		U32, U40
4000	5090	RAM #2 (U51 Jumper 3 -removed		U1, U9
4400	5432	RAM #2 4 -installed		U2, U10
4800	5773	RAM #2		U3, U11
4C00	6114	RAM #2		U4, U12
5000	6456	RAM #2		U5, U13
5400	6797	RAM #2		U6, U14
5800	7138	RAM #2		U7, U15
5C00	7480	RAM #2		U8, U16
6000	7821	RAM #2		U25, U33
6400	8162	RAM #2		U26, U34
6800	8504	RAM #2		U27, U35
6C00	8845	RAM #2		U28, U36
7000	9186	RAM #2		U29, U37
7400	9528	RAM #2		U30, U38
7800	9869	RAM #2		U31, U39
7C00		Unused-		
8000		ROM #3 Real Time Functions		U1
8400		ROM #3 (U22 Jumper 3 -installed		U2
8800		ROM #3 4 -removed		U3
8C00		ROM #3		U4

MEMORY MAP (continued)

BEGINNING ADDRESS	EVENT #	BOARD	USE	I.C.'S
9000		RAM #3	Real Time Functions	U5, U13
9400		RAM #3	(U51 Jumper 3 -installed	U6, U14
9800		RAM #3	4 -removed	U7, U15
9C00		RAM #3	(EXPANSION)	U8, U16
A000		RAM #3		U25, U33
A400		RAM #3		U26, U34
A800		VEL	ROM	U10
AC00		VEL	RAM	U6
B000		DEBUG ROM		U13
B400		DEBUG ROM		U14
B800		DEBUG ROM		U15
BC00		DEBUG ROM (EXPANSION)		U16
C000		ROM #1	(U22 Jumper 3 -removed	U1
C400		ROM #1	4 -removed	U2
C800		ROM #1		U3
CC00		ROM #1		U4
D000		ROM #1		U5
D400		ROM #1		U6
D800		ROM #1		U7
DC00		ROM#1		U8
E000		ROM #2	(U22 Jumper 3 - removed)	U9
E400		ROM #2	4 - removed)	U10
E800		ROM #2		U11
EC00		ROM #2		U12
F000		ROM #2		U13
F400		ROM #2		U14
F800		ROM #2		U15
FC00		Unassigned		
FD00		Available for Additional I/O		
FE00		Audio Control Chassis 1 (CNT1)		
FE10		Audio Control Chassis 2 (")		
FE20		Audio Control Chassis 3 (")		
FE30		Audio Control Chassis 4 (")		
FE40		Audio Control Chassis 1 (CNT 2)		
FE50		" " " 2 (")		
FE60		" " " 3 (")		
FE70		" " " 4 (")		
FE80		" " " 1 (TY/ID)		
FE90		" " " 2 (")		
FEA0		" " " 3 (")		
FEB0		" " " 4 (")		
FEC0		Audio Control Read/Write Only		
FEC1		Unused		

NOTE: CPU cannot address U3 on Real Time Clock.

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PG 7-13 OF

I/O PORT MEMORY MAP

ADDRESS	BOARD	USE	IC
00	Serial I/O	System Control Console	U9
10	Serial I/O	Secondary Prog. Console	U9
20	Serial I/O	Modem	U9
30	Serial I/O	Computer Link	U9
40	Serial I/O	VEL Printer	U9
	VEL	USART	U9
50	Serial I/O	Load/Dump Terminal	U9
60	Serial I/O	Level 2 Printer	U9
80	Parallel I/O	(PIO)	U11

NUMBER

131-700-009

7.4 AUDIO CHASSIS DATA BUS ASSIGNMENTS - Figure 7-1 shows the data bus assignments for the Audio Control Board and the Universal Source Boards in the Audio Chassis. In the Control assignments, both the function and IC latch is given while the Status section lists the function and buffer IC.

CONTROL (WRITE)

	USS OUTPUT "LOW"	2A7	2A6	3WR	DATA BUS 7	6	5	4	3	2	1	0
Universal Source Board	CNT 1WR	0	0	0	"Roll" Off* (U33)	"Roll" On* (U33)	"Next" Off (U32)	"Next" On (U32)	Not Used	Start Source (U14)	"On Air" Off (U20)	"On Air" On (U20)
	CNT 2WR	0	1	0	"Fade" Enable (U42)	HSO 2 (U42)	HSO 1 (U42)	HSO 0 (U42)	Eominh Off (U20)	Eominh On (U20)	Left Ch. Tone (U33)	Right Ch. Tone En (U33)
	TYWR	1	0	0	Tray Data 7 (U46)	Tray Data 6 (U46)	Tray Data 5 (U46)	Tray Data 4 (U46)	Tray Data 3 (U41)	Tray Data 2 (U41)	Tray Data 1 (U41)	Tray Data 0 (U41)
					*If both Bit 7 and 6 are "high", interrupt latch (U32) is reset							
Audio Control Board		1	1	0	Not Used	PGM Clear (U3)	"Fade" Reset (U11)	"Fade" Set (U11)	"Loop" Reset (U11)	"Loop" Set (U11)	S. Sense Disable (U7)	S. Sense Enable (U7)

STATUS (READ)

	USS OUTPUT "LOW"	2A7	2A6	3WR	DATA BUS 7	6	5	4	3	2	1	0
Universal Source Board	CNT 1RD	0	0	1	HSI 3 (U24)	"Roll (U24)	HSI 2 (U24)	"Next" (U24)	HSI 1 (U24)	Not Used	HSI 0 (U24)	"On Air" (U11)
	CNT 2RD	0	1	1	Fade Enable (U34)	HSO 2 (U34)	HSO 1 (U34)	HSO 0 (U34)	GND (U11)	EOM INH (U11)	GND (U34)	RT/LEFT Ch. Tone (U34)
	IDRD	1	0	1	ID7 (U35)	ID6 (U36)	ID5 (U36)	ID4 (U36)	ID3 (U36)	ID2 (U36)	ID1 (U36)	ID0 (U36)
Audio Control Board		1	1	1	Audio Control Card Verify (U2)	Extender Detector Set (U2)	Auto/ Manual (U15)	S. Sense Normal/ Extended (U15)	"Fade" Set (U15)	"Loop" Set (U15)	S. Sense Enabled (U15)	S. Sense Alarm (U15)

0 = LOW
1 = HIGH

FIGURE 7-1 AUDIO CHASSIS DATA BUS ASSIGNMENTS

7.5 DEBUG PROCEDURE

7.5.1 GENERAL - All 7000 systems contain a software program called "ROM 0" which allows reading data from and writing data to any memory location or Input/Output (I/O) port.

Systems which contain the DEBUG board option have even further diagnostic capability as discussed in Paragraph 7.5.3.

SPECIAL NOTES:

1. With both ROM 0 and the DEBUG option, actual memory or I/O port addresses (not Event numbers) are read or written to.

2. Familiarization with the MEMORY MAP (Paragraph 7.3) and the AUDIO CHASSIS DATA BUS ASSIGNMENTS (Paragraph 7.4) will aid in getting maximum use of the debug diagnostics.

3. The normal automation program WILL NOT operate while in the ROM 0 or DEBUG diagnostic program.

4. Data read from memory or I/O ports is in hexadecimal format, Additionally, all data written to Memory or I/O ports must be in hexadecimal. Those unfamiliar with hexadecimal should refer to the BINARY and HEXADECIMAL EXPLANATION in the APPENDIX.

5. Prior to returning to normal programming, it is imperative that the program memory (Event 0000 through the end of program) be verified if any memory addresses have been written to.

6. Figures 7-3 and 7-4 give Address and Data information to control Universal Source Board and Audio Control Board functions. Reference Paragraph 7.5.4 for information on how to use these figures.

7.5.2 ROM 0 OPERATION

7.5.2.1 GETTING INTO ROM 0 MODE

1. Open the Control Rack door to gain access to the Control Chassis (see Figures 2-2 or 2-3 in the INSTALLATION section).

2. On the CPU Board (usually located on the far left of the Control Chassis) press the RESTART

switch (see Figure 7-2). The CRT should display " > ▯ " on the left edge of the screen. The actual location is dependent on the CRT mode status.

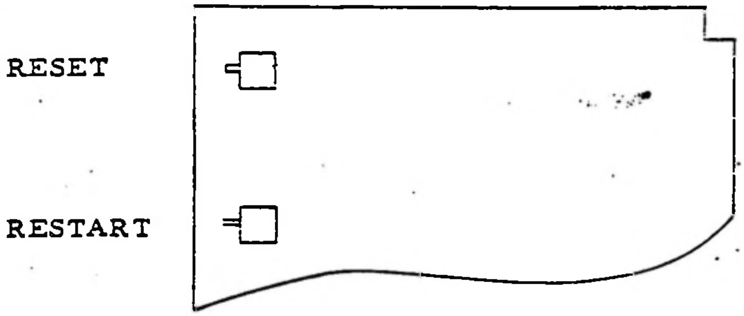


FIGURE 7-2 CPU BOARD

3. On the CRT terminal, press "CLEAR HOME" follower by the "EOS" key to clear the screen.

7.5.2.2 READING MEMORY

1. On CRT terminal, press "D" key.
2. Type desired address (e.g. 0115).
3. Press "ENTER/RETURN" key. The CRT will display:

```
  D0115
0115  CD
|      └──── DATA
└─────────── ADDRESS
```

4. To READ the next address, press "ENTER/RETURN" key again. Display will show:

```
  D0115
0115  CD
0116  1C
```

5. Press "Q" to quit memory display mode. If it is desired to read a different area of memory, press "Q" and repeat steps 1 through 4.

7.5.2.3 WRITING TO MEMORY

1. Perform steps 1 through 3 of Paragraph 7.5.2.
2. Type in new data (in hexadecimal format).
3. Press "ENTER/RETURN" key. Note that the

next address will be displayed. To display the data in the address just changed, type "Q" and perform steps 1 through 3 of Paragraph 7.5.2.2.

NOTE: Data in ROM addresses cannot be changed. See SPECIAL NOTE 5 (Paragraph 7.5.1) if data in memory is changed.

7.5.2.4 READING I/O PORT DATA

1. On CRT terminal, press "P" key.
2. Type desired Port address.

NOTE: Leading zeroes need not be typed (e.g. Port address 0020 may be typed 20).

3. Press "ENTER/RETURN" key. Display will show:

```
    P20
0020 23
|    └──────── DATA
└───────────── PORT ADDRESS
```

4. Pressing "ENTER/RETURN" key again will display the next port address.

5. Press "Q" to quit Port display mode.

7.5.2.5 WRITING TO AN I/O PORT

1. Perform steps 1 through 3 of Paragraph 7.5.2.4.

2. Type in new data (in hexadecimal format).
3. Press "ENTER/RETURN" key.

7.5.3 DEBUG MODE OPERATION

7.5.3.1 SPECIAL NOTES:

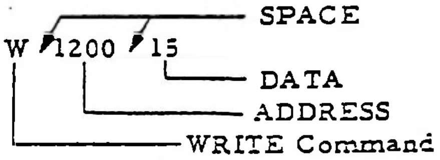
1. To cause a Command to continuously repeat, press "@" key prior to keying in Command. This will allow only error messages to be displayed. If "@@" is keyed in prior to Command, no error messages will be printed.

EXAMPLE: @D 1200 - Read address 1200 repeatedly and print Error messages.

@@D 1200 - Read address 1200 repeatedly. No error messages.

2. Press "Q" or "ESC" key to quit any command mode.
3. To cancel a partially typed line, press "BACK/DEL" key.
4. A space must be keyed in between Command and address and between address and any data.

EXAMPLE:



7.5.3.2 GETTING INTO DEBUG MODE

The steps to getting into the DEBUG mode are the same as for the ROM 0 mode (Paragraph 7.5.2.1), except that the CRT will display "DEBUG 1" followed by prompt ">>".

7.5.3.3 READING MEMORY

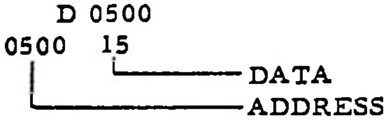
1. On CRT terminal, press "D" key.

2. Press Space bar.

3. To display one (1) memory address, type in the desired address, and then press "ENTER/RETURN" key.

EXAMPLE: D 0500 ENTER/RETURN

CRT will display:



Keying "ENTER/RETURN" again will display the next address.

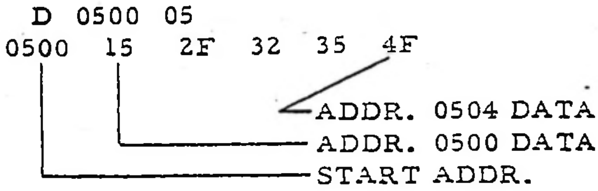
NOTE: Pressing "ADV/LINE FEED" key instead of "ENTER/RETURN" key allows the same address to be displayed again.

4. To display several sequential addresses, type in first address, followed by a "space",

followed by the number of addresses desired, followed by "ENTER/RETURN" key.

EXAMPLE: D 0500 05 ENTER/RETURN

CRT will display:



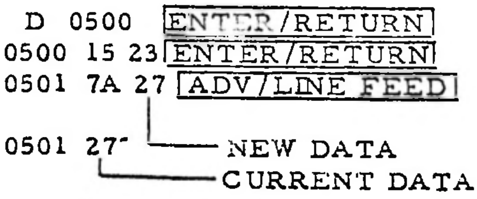
```
  D 0500 05
0500  15   2F   32   35   4F
```

NOTE: To read another block of data, repeat procedure.

7.5.3.4 WRITING TO MEMORY

1. If in the Display mode (Paragraph 7.5.3.3), after an address is displayed, type in new data followed by pressing "ENTER/RETURN" or "ADV/LINE FEED" key ("ENTER/RETURN" enters new data and advances to display next address; "ADV/LINE FEED" enters new data and displays the same address).

EXAMPLE:

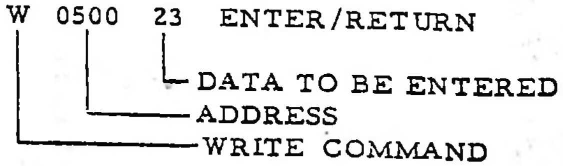


```
D 0500     ENTER/RETURN
0500 15 23 ENTER/RETURN
0501 7A 27 ADV/LINE FEED

0501 27
```

2. If it is desired to write to a single address, key in "W", followed by the desired address and new data. Then key in "ENTER/RETURN".

EXAMPLE: W 0500 23 ENTER/RETURN



NOTE: To repeatedly write to a single address, key in @W followed by the address and data.

7.5.3.6 READING I/O PORT DATA

1. Reading from an I/O Port is exactly the same as reading from memory (Paragraph 7.5.5.3); except in step 1 a "P" is keyed in instead of a "D".

2. Note that leading zeroes need not be keyed in when keying in the address.

EXAMPLE: Address 0020
Key in P 20 ENTER/RETURN

7.5.3.6 WRITING TO AN I/O PORT

1. Writing to an I/O Port is the same as writing to memory except that, when writing to a single location as shown in step 2 of Paragraph 7.5.5.4, key in "O" (Output) instead of "W".

EXAMPLE: O 20 48 ENTER/RETURN

DATA to be output
PORT ADDRESS
OUTPUT command

7.5.3.7 ADDITIONAL MEMORY TEST COMMANDS

1. CHA (Changes) repeatedly reads from a single memory location and prints any changes in data that occur.

EXAMPLE: CHA 0200 ENTER/RETURN

ADDRESS
CHANGE command

Type any key to quit this mode.

2. TEST will check a block of memory by the following procedure:

   a. Read first memory location data.
   b. Invert all bits and write to memory.
   c. Read back data.
   d. Compare with data written.
   e. Invert all bits again and write to memory (restores original data).

f. Read data again.
g. Compare with data written.
h. Advance to next memory location.

Any error will be displayed on the CRT.

EXAMPLE: TEST 1500 1550 ENTER/RETURN

END address
START address
TEST command

NOTE: This command would only be used to test RAM (see MEMORY MAP, Paragraph 7.3).

NOTE: If no errors are found, memory will remain unchanged.

3. PAT (Pattern) is used to write a pattern (data) of the operators choosing or an incrementating data pattern (e.g. 58, 59, 5A, 5B, etc.) to a block of memory locations.

CAUTION: This command does alter memory data Thus, after a PAT request is made but before execution, the CRT will display:

MODIFY MEMORY? (Y OR N)

Key in: Y to continue
N to cancel request.

EXAMPLE 1: PAT 1500 1550 FF ENTER/RETURN

PATTERN (data)
END address
START address
PATTERN command

Example 1 would write "FF" (all 1's) to all memory locations from 1500 to 1550, and then read those locations, comparing them to "FF" and list on the CRT any discrepancies.

EXAMPLE 2: PAT 1500 1550 P ENTER/RETURN

INCREMENTING PATTERN request

Example 2 would cause an incrementing pattern (e.g. 50, 51, 52, etc.) to be written from address 1500 to 1550 and then compares each location with the pattern that should have been written there, and displays any errors on the CRT.

In Example 2 only one pass is made and, thus, only some bits in each memory address are changed. Thus, it is possible that a bad bit might go undetected. However, if an "@" is keyed in prior to the "PAT" instruction, the cycle will continue causing the pattern (or number) to increment in each address with each new pass. Thus, after 256 passes every possible combination of bits will have been tested. The longer the test is run, the more each bit is exercised. However, only a second or two is required to make a complete test. Example 3 illustrates how to get into a repetitive pattern test mode.

EXAMPLE 3: @ PAT 1500 1550 P ENTER/RETURN

Pressing "Q" or "ESC" will end the test. Note again that any discrepancies will be printed on the CRT, as long as the test is being run.

NOTE: This command would only be used to test RAM (see MEMORY MAP, Paragraph 7.3).

4. SUM calculates the checksum (all data added together) of a block of memory. A new sum is started at each 1K memory boundry (X000, X400, X800, and XC00). Checksums are listed on the CRT with starting and ending addresses and also stored in a table in memory (up to 20 checksums may be stored).

```
EXAMPLE: SUM C000 C7FF    ENTER/RETURN
          |    |    |
          |    |    +-------END address
          |    +------------START address
          +-----------------SUM command
```

START	END	SUM
C000	C3FF	F016
C400	C7FF	A79B

5. COM (Compare) recalculates checksums for addresses specified with last SUM command and compares with the previous calculations. Any differences are listed on the CRT.

6. INT (Interrupt) causes the CRT to list any interrupts which are recognized by the CPU.

EXAMPLE: INT
IR6
IR4
IR1

Type any key to quit this mode.

7. GO is used to go to a location in memory where a special test program has been written. Under some circumstances, it is desirable to write a special test program in memory. This is normally done with the assistance of the Cetec Broadcast Group Customer Service department as the program must be written in Z-80 machin language. After the program is written, the GC instruction is used to cause the system to run the program.

EXAMPLE: G 0500 ENTER/RETURN

The system will go to address 0500 and run the program which begins there.

7.5.4 UNIVERSAL SOURCE BOARD and AUDIO CONTROL BOARD CONTROL - With the ROM 0 or DEBUG option it is possible to control Universal Source board and Audio Control board functions by writing the correct data to the appropriate address. Figures 7-3 and 7-4 are charts which give addresses for the various audio sources and Audio Control boards and also the DATA which should be written to the desired address to cause the desired function to occur. For example, assume it is desired to START Audio Source 05. Key in as follows:

ROM 0 EXAMPLE:

1. Key in D FE04 ENTER/RETURN
2. Display will show FE04 XX (data varies)
3. Key in 04 ENTER/RETURN
4. Audio source should START.

DEBUG OPTION EXAMPLE:

1. Key in W FE04 04 ENTER/RETURN
2. Audio Source should START.

NOTE: To cause repeated START (or any other function), key in @W followed by correct address and data. The function will repeat until "Q" or "ESC" is keyed. This feature only works if the Debug option is installed.

SOURCE	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
ADDR	FE00	FE01	FE02	FE03	FE04	FE05	FE06	FE07	FE08	FE09	FE0A	FE0B	FE0C	FE0D	FE0E	FE0F

		DATA
"ON AIR"	ON	(01)
"ON AIR"	OFF	(02)
START		(04)
-		
"NEXT"	ON	(10)
"NEXT"	OFF	(20)
"ROLL"	ON	(40)
"ROLL"	OFF	(80)
IRQ RESET*		(C0)

* Also causes "ROLL" to change state (toggle)

NOTE: Sources 17-32 = ADDR FE10 - FE1F
33-48 = ADDR FE20 - FE2F
49-64 = ADDR FE30 - FE3F

ADDR	FE40	FE41	FE42	FE43	FE44	FE45	FE46	FE47	FE48	FE49	FE4A	FE4B	FE4C	FE4D	FE4E	FE4F

Rt Ch Tone En	(01)
Lft Ch Tone En	(02)
EOM Inh	(04)
EOM En	(08)
HSO 0	(10)
HS01	(20)
HS02	(40)
"FADE En"	(80)

NOTE: Sources 17-32 = ADDR FE50 - FE5F
33-48 = ADDR FE60 - FE6F
49-64 = ADDR FE70 - FE7F

ADDR	FE80	FE81	FE82	FE83	FE84	FE85	FE86	FE87	FE88	FE89	FE8A	FE8B	FE8C	FE8D	FE8E	FE8F

TRAY	DATA	0	(BCD 1)
"	"	1	(BCD2)
"	"	2	(BCD 4)
"	"	3	(BCD 8)
"	"	4	(BCD10)
"	"	5	(BCD20)
"	"	6	(BCD40)
"	"	7	(BCD80)

NOTE: Sources 17-32 = ADDR FE90 - FE9F
33-48 = ADDR FEA0 - FEAF
49-64 = ADDR FEB0 - FEBF

FIGURE 7-3 DEBUG UNIVERSAL SOURCE BOARD CONTROL
(MAIN AUDIO CHASSIS)

ADDRESS = FECO (MAIN AUDIO CHASSIS)
FEDO (EXPANSION CHASSIS #1)
FEEO (" " #2)
FEFO (" " #3)

	DATA
S. SENSE ENABLE	01
S. SENSE DISABLE	02
"LOOP" LED ON	04
"LOOP" LED OFF	08
"FADE" LED ON	10
"FADE" LED OFF	20
PGM CLEAR	40

FIGURE 7-4 DEBUG AUDIO CONTROL BOARD CONTROL

7.6 RFI PROBLEMS

7.6.1 ELECTRICAL INTERFERENCE

7.6.1.1 External interference can be traced to two common sources. One is static, the other R.F.I., R.F. being radiated from nearby transmitting equipment, static being high voltage "arcs" (direct or indirectly coupled).

7.6.1.2 Internal interference commonly traced to high speed or high frequency pulses with high enough level to radiate into the atmosphere or surrounding materials or faulty high voltage (or current) "arcing" contacts.

7.6.2 SYSTEM ANTENNA EFFECT

7.6.2.1 Single and multi-element effects are realized with all metal objects, including metal rack cabinets, components, wires, and chassis assemblies. The 7000 system is no exception. It too requires special attention. Each rack is a separate antenna, unless well secured together through paint-free surfaces. Once secured together, the 7000 system becomes one huge antenna which must be well secured to earth or station ground. (Reference paragraph 7.6.4.1 and 7.6.5.1).

7.6.2.2 Ground loop antennas are the most common offenders of interference, especially where low-level solid state circuitry is involved. A simple ground loop antenna would be an insulated length of wire electrically grounded at both ends. A complex ground loop antenna is created with remote devices or objects which are incorrectly terminated. (Reference paragraph 7.6.4.2 and 7.6.5.2.).

7.6.3 INTERFERENCE COUPLING

7.6.3.1 Inductive coupling is the most common R.F. or static coupler. It is a direct coupling through a length of wire or cable which has become an antenna by virtue of length and location. (See paragraph 7.6.4.4.)

7.6.3.2 Capacitive coupling is many times undetected because there is no electrical connection. It is caused by two flat metal surfaces being parallel, insulated, and close in proximity. Best illustrated by a metal remote control box sitting on a metal table or desk insulated by rubber feet. (See paragraph 7.6.4.1.)

7.6.4 RECOMMENDED PRECAUTIONS

7.6.4.1 Grounding can be classified either "Daisy Chain" or "Octopus". Both having good and bad aspects. If racks of equipment are "chained" together at the bottom through strap or braid and not securely bolted together top and bottom a multi-element antenna is created with the end rack furthest from earth ground the most active element. The ground strap or braid becomes an inductive coupler to all "in-between" racks or assemblies. (Reference paragraph 7.6.5.1.)

When the equipment racks are securely fastened together (through paint-free surfaces) top and bottom and the main rack securely strapped to earth or station ground the racks become a "shield" to internal electronics. This "shield" can be further enhanced by strapping the metal (rack cabinet) door to the rack with large wire braid.

7.6.4.2 Remote and auxillary equipment with cables or wires extending from the system become "extended" elements. These cables MUST be shielded and terminated at the 7000 system ONLY.

The shield MUST not be a return path for electronics or inductive coupling through the associated components is created. The remote or auxillary equipment should not be sitting or mounted in or on any metal table, rack or console without considering the capacitive coupling or ground loop antenna problems. (Reference paragraph 7.6.5.2.)

7.6.4.3 Special shielding can be done to reduce the overall R.F. or static fields within any specific room or building. Any long cable runs should be placed in conduit, or wire mesh troughs which have multi-ground connections. An entire room can become a shield by lining the walls, floor and ceiling with regular screen door (aluminum or zinc plated steel) screening all electrically terminated to ground. (Reference paragraph 7.6.5.3.)

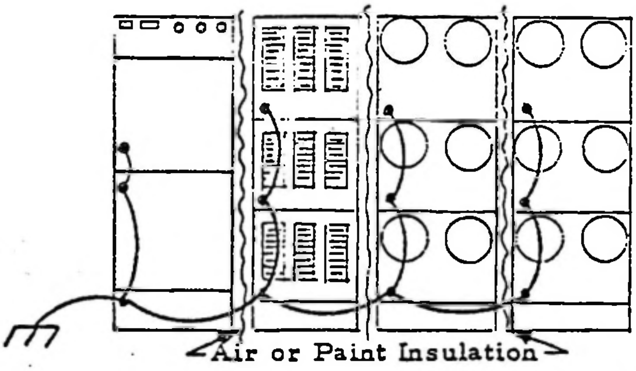
7.6.4.4 Connectors and terminals that are making poor contact can introduce un-wanted resistance in ground and power "runs" thus increasing susceptibility to R.F. and static interference.

It is good practice to assure good contact by verifying all screw terminals are tight and all slip terminals are clean and free of contaminating materials or fluids such as dust, corrosion, finger oils, etc.

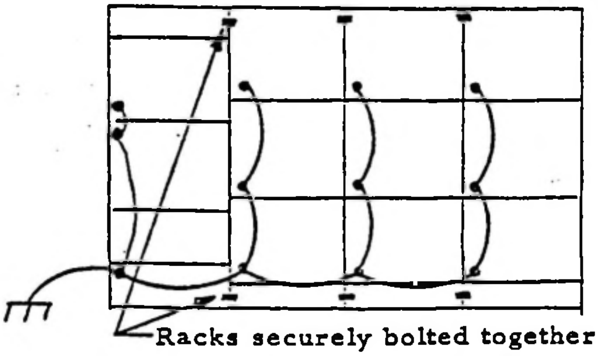
7.6.4.5 Buffers and isolation electronics should be used in all remote or auxillary interfacing when possible to avoid added antenna elements and "complex" ground loops.

7.6.5 ILLUSTRATIONS

7.6.5.1 System Ground



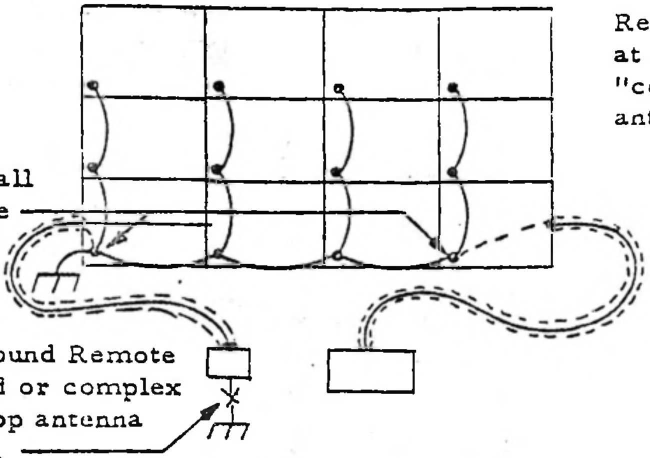
Combination: Daisy-Chain octopus ground with (4) independent "antenna elements" (caused by racks not bolted together through UNPAINTED surfaces).



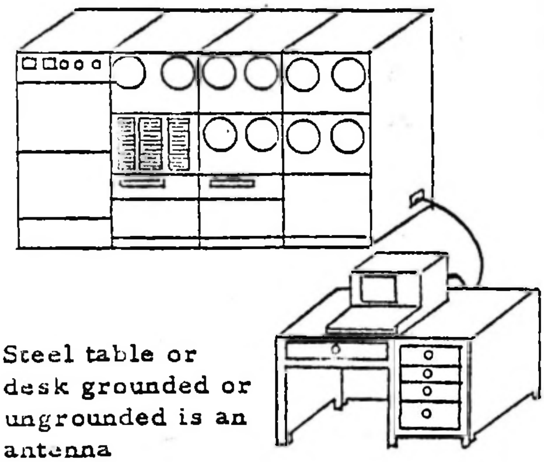
Racks securely bolted together at "paint removed" locations.

Single element "antenna/shield" using combination daisy-chain/octopus ground. Note: The rack nearest the earth ground terminal should be the main control rack.

7.6.5.2 REMOTE & AUXILLARY EQUIPMENT



Remote devices grounded at 7000 systen only; or "complex" ground loop antenna is created.

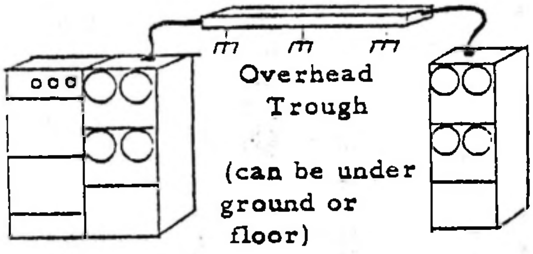


Remote or auxillary equipment mounted in or on metal racks, tables, or desks are capacitvely coupled by parallel surfaces

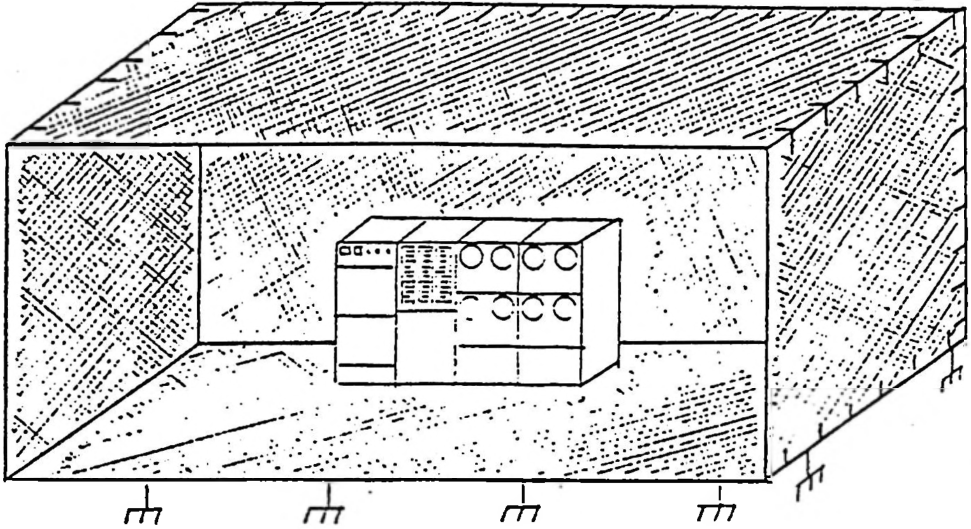
Steel table or desk grounded or ungrounded is an antenna

Remote or auxillary device insulated from steel surface is a "capacitively" coupled "element"

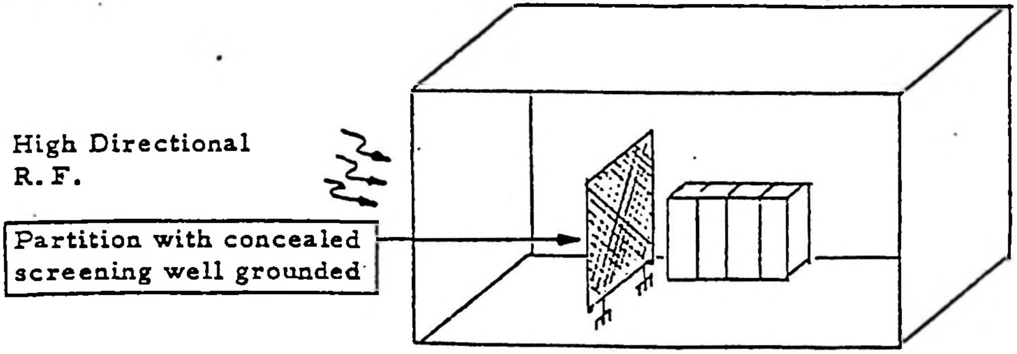
7.6.5.3 SPECIAL SHIELDING



Cables can be shielded by wire mesh troughs or metal conduit with multi-grounds.



"Inside" room R.F.I. shield using screen door screening electrically interconnected and well grounded. Screening can be concealed with acoustical tile, wall paneling or a good grade anti-static carpeting.



Room or building shields can be installed on walls (inside or outside) ceilings, and floors (beneath carpet if used) by using standard screen door aluminum or zinc coated steel screening, electrically interconnected and well grounded. This screening can easily be concealed with paneling or acoustical tile.

NOTE: If extremely high radiated R.F. is present and directional, a single shield partition can be constructed in the path, for added R.F. reduction.

NEXT ASSY	USED ON	REVISIONS			
		REV.	DESCRIPTION	DATE	APPR.

8.0 MAINTENANCE

MAINTENANCE

131-700 010

DWN. Ralph Smith
DATE 12-19-77
CHECK
PROJ. ENG.
APPR.

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Cetec Broadcast Group

Cetec Corporation
1110 Mark Avenue, Carpinteria, California 93013

SERIES 7000 AUTOMATION TECHNICAL MANUAL

SECTION 8.0 MAINTENANCE

SIZE A
SHEET 8.1 OF
DRAWING NUMBER 049-7010
REV

133-100-006 REV A

8.1 GENERAL MAINTENANCE

8.1.1 Systematic maintenance is a major key to reducing failures and down time. The attention given to maintenance will be reflected in total system performance. This outline is a guide to systematic maintenance. It is divided into two sections, Electrical and Mechanical. The Electrical applies primarily to all Cetec Broadcast Group manufactured assemblies. The Mechanical applies to related equipment of a mechanical or electro-mechanical nature that is employed by the 7000 system.

It must be understood that solid state electronics must be maintained. The basic maintenance is: (A) All terminal or slip connections must be clean and free of contaminates. (B) The proper supply voltages must be maintained. (C) Malfunctions. However small, should be repaired as soon as possible.

WARNING - Whenever working on any part of the system, extreme care should be taken to avoid direct contact with the 115VAC to the system Power Supply or Auxillary equipment which can cause injury or death. A general attitude of using caution whenever working on any part of the system should be exercised. Remove primary power to equipment being serviced unless it is required to service that equipment.

8.1.2 ELECTRICAL

8.1.2.1 GENERAL - The 7000 system electrical or electronic network requires maintenance. Lamps, displays, and relays require more frequent attention than the solid state electronics However solid state electronics is not failure proof and will require periodic maintenance to correct a malfunction. To aid in reducing future down time the following three paragraphs are to be considered.

8.1.2.2 PROBLEM LOG - To aid in solving repeated failures, and to assist persons following in time it is recommended that a SYSTEM PROBLEM LOG be generated. This has also proven to be a valuable history to both station personnel and Cetec Broadcast Group.

The simplist log is a small tablet near the 7000 system where operators write down PROBLEMS and the engineer or program director later writes in SOLUTIONS, such as:

PROBLEM	SOLUTION
Deck #2 won't start manually or automatically	Fuse Blown
Take up reel on Deck #6 not working	Shorted Relay

A more comprehensive log would include names, dates, and number in a regular loose leaf binder or notebook, such as:

#	DATE	OPERATOR	PROBLEM	DATE	OPERATOR	SOLUTION
1	4/4/73	Joe	Deck #2 won't start manually or automatically	4/7/73	John	Fuse F2 blown in Deck #2
2	4/9/73	Bill	Take up Reel on Deck #6 not working	4/22/73	John	Shorted relay K1 in Deck 6

8.1.2.3 MODIFICATIONS LIST - If for some reason any or all of the electronics or interfacing is somehow modified it is a good practice to record and adequately document every change. This information should also be kept with the system records.

8.1.3 MECHANICAL

8.1.3.1 GENERAL - The 7000 system employs electromechanical devices which require regularly scheduled maintenance. Each device supplied with a 7000 system has a technical manual which applie to that (or those) specific items and should be consulted for the maintenance cycle and procedure. Aside from the regular maintenance, attention to the following is advised:

8.1.3.2 PLAYBACK DEVICES - It is imperative that all playback devices receive a certain minimum of attention regularly to achieve a constant "good" sound. The basics are:

(A) Clean magnetic heads.
(B) Align Heads (Azimuth and Zenith).
(C) Check equalization.
(D) Check pinch roller tension.
(E) Lubricate as required.

8.1.3.3 TELETYPEWRITERS - The major problems encountered with these mechanical devices are lack of attention. There is a schedule of lubrication and alignment outlined in the applicable documents which should be adhered to in order to maintain a high degree of failure free operation.

8.1.3.4 MECHANICAL ACCESSORIES - Like Tape Players and Teletypewriters, all electo-mechanical devices should receive the manufacturer's suggested maintenance.

8.2 REEL TO REEL DECKS

8.2.1 GENERAL

In order to derive all that is expected from a tape machine, care must be taken that deterioration of its parts be kept at minimum. Many devices are used to insure reliable movement of the tape and stable response to the material recorded on the tape.

8.2.2 CLEANING

Clean the tape guides, the heads, and the capstan shaft daily; the capstan idler wheel weekly. Cleaning solutions should be chosen as recommended by the deck manufacturer, with proper attention paid to the CAUTIONS. Avoid metal swab sticks and solutions which could damage the laminations of the head assembly.

Cleaning is required due to the lubricants found on high quality tape being deposited on all surfaces in contact by the tape. The lubricant will eventually form a coating on all surfaces in the tape path which will cause excessive wow and flutter, drop outs, and a loss of high frequencies.

8.2.3 DEMAGNETIZATION

Due to faults in the electronics of the tape head, improper use of the equipment, or by contact with magnetized objects, the heads can become permanently magnetized. As a result, the signal/noise ratio will decrease greatly and high frequencies will be erased from the tapes.

A head demagnetizer should be drawn no closer than 1/8 inch from the head, then moved up and down the core stack several times. Then remove the demagnetizer slowly away (to about 3 or 4 feet from the head) before turning it off. SLOW removal is important to avoid remagnetizing the head.

8.2.4 ADJUSTMENTS

8.2.4.1 MECHANICAL - As a general rule, the mechanical devices which must be periodically adjusted are the brakes, take up and supply motors (tension), and the pressure roller. Each tape deck differs sufficiently enough to require that the manual provided by the manufacturer be consulted. In essence, spring scales are often used to measure tension exerted by solenoids, brake bands, motors, etc. The force exerted must measure according to the manufacturer's specifications. These adjustments are necessary to avoid excessive wow and flutter of the tape.

8.2.4.2 HEADS AND ELECTRONICS - A tape deck can be adjusted to meet response specifications with the aid of an NAB Standards Frequency test tape, an oscilloscope, and a db meter. By detecting both channels with the "X" and "Y" inputs of the scope (the db meter is sufficient with a MONO deck,) and the db meter, the tones on the tape can be observed and used to align the heads for proper phasing and maximum output. The db meter is used to observe the response of the machine to high and low frequencies. High frequency equalization adjustments are found in the amplifier (as well as low frequency adjustments found on some) to aid in bringing the amplifier into the manufacturers response specifications.

8.3 CARTRIDGE DECKS

8.3.1 GENERAL - To obtain proper performance from cartridge playback decks, attention must be paid to proper maintenance. This section discusses general tape cartridge player maintenance. Refer to the equipment manufacturer's technical manual for specific information, cautions, settings, etc.

8.3.2 TAPE GUIDES - The tape guides in new decks should be checked for height above the base plate. NAB specs the underside of the top guide at .562 ± .002" above the base plate (NAB) Standard, October 1964). A convenient way to check height is with a standard guage block (supplied by manufacturers). All guides should be set at the same height.

Tape guides should also be cleaned periodically and checked for wear (clean the guides when cleaning the heads).

8.3.3 HEADS

8.3.3.1 HEAD POSITIONING - Tape heads in new decks should be checked for absolute height, zenith, cartridge penetration, and azimuth (Figure 8-1). Absolute height may be checked by stretching a piece of clear leader tape between the guides and visually checking to see that the outer edges of the outer pole pieces are equidistant from the tape edges. Zenith may be checked by sighting between the head face and a square gauge block resting on the base plate. The head face should make a 90 angle with the base plate.

Head penetration should be set to the NAB standard. A convenient way to check is with a head insertion gauge (such as the Fidelipac #65328).

Azimuth is perhaps the most critical head parameter, especially for radio stations broadcasting in FM stereo. Azimuth is best checked (after all other positioning is done) by using an azimuth alignment tape and an oscilloscope.
By feeding one channel into the x and the other into the y axis of the scope, and observing the Lissajous pattern, one can check both high and low frequency phasing (on mono heads, the cue track and audio track can be compared). When all frequencies are in phase the head is properly adjusted for azimuth. An alternate method for Mono is to "peak" the audio output.

It is highly recommended that one alignment tape be used to align the studio recorder and that sub masters be made on that machine. Playback machines aligned with the sub masters will show consistent phase response when playing tapes made on the studio deck.

8.3.3.2 HEAD CLEANING & DEMAGNETIZING - Heads should be cleaned often - once a day or once a week depending on use (observe the head manufacturer's cautions on solvents). Heads should be demagnetized slightly less often - once a week or once a month depending on use. Both cleaning and demagnetizing should be done before playing any standard reference tape.

8.3.4 CAPSTAN & PINCH ROLLER - Both the capstan and pinch roller should be cleaned when the heads are cleaned. The pinch roller should be checked for wear, and its shaft oiled periodically (again, observe the manufacturer's caution on solvent on the rubber and oiling recommendations). Roller pressure should also meet the manufacturer's specs.

8.3.5 OUTPUT LEVEL & EQUALIZATION - When replacing heads and periodically as the head wears, the output level and equalization should be checked. This is best done with a standard frequency response tape and a db meter. Standard output for most cartridge players is +4 dbm with a 600 ohm load.

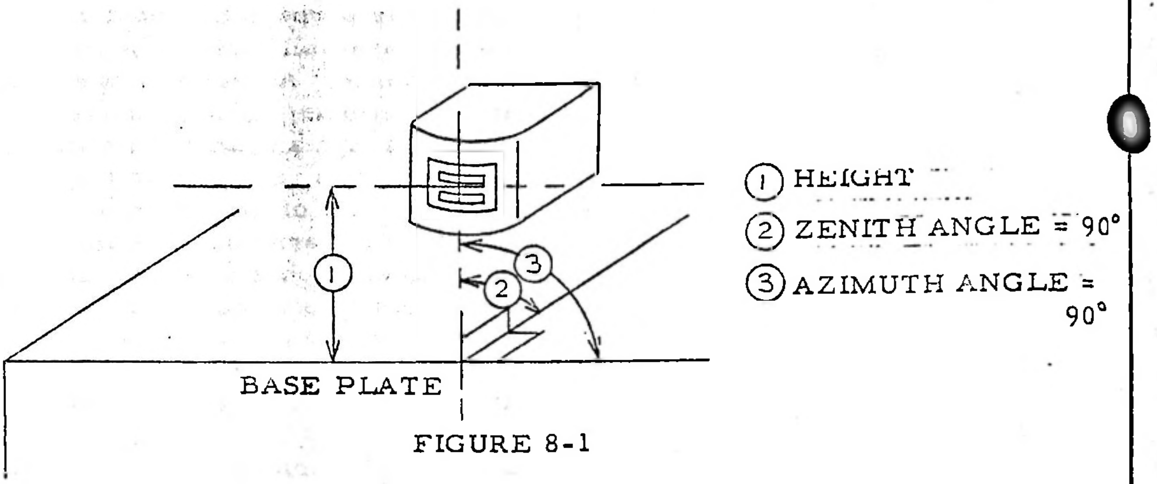


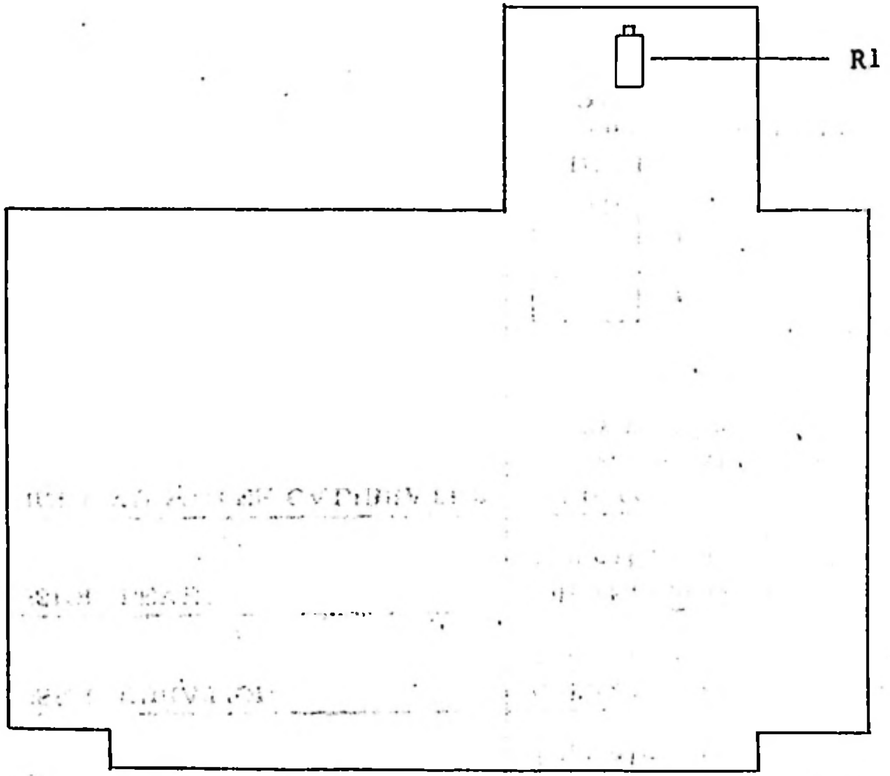
FIGURE 8-1

HEAD POSITIONING

8.4 POTENTIOMETER ADJUSTMENTS - The following tables list the various system control potentiometers and indicate their purpose and normal field adjustment procedure. Note that many pots are set to suit user requirements and thus have no rigid adjustment requirements. Illustrations of each board highlighting the potentiometer position(s) are also provided.

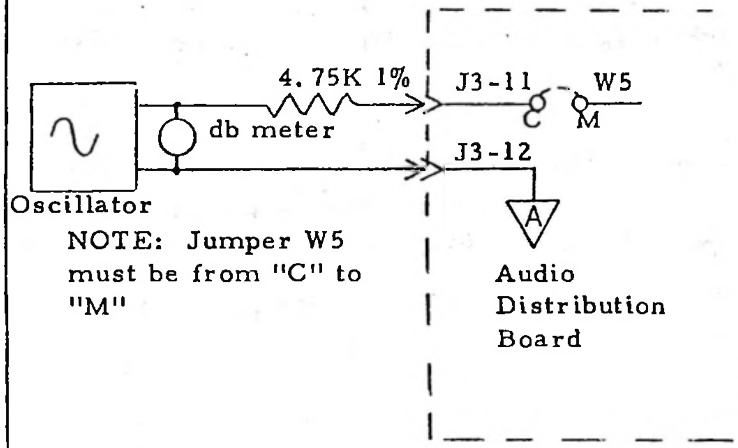
8.4 POTENTIOMETER ADJUSTMENTS (continued)

POT	PURPOSE	ADJUSTMENT
R1	SILENCE SENSE DELAY	Adjust to user requirements. Typically set to 3 seconds from start of Silence to Alarm. Range = 66msec - 15 seconds

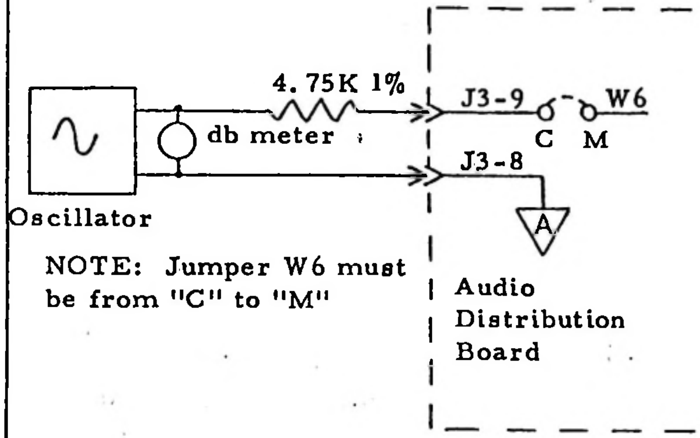


AUDIO CONTROL BOARD

8.4 POTENTIOMETER ADJUSTMENTS (continued)

POT	PURPOSE	ADJUSTMENT
R1	COMPRESSION RELEASE TIME	Adjust to user requirements. Typically set to 0.5 to 1 second release time.
R5	COMPRESSION DURATION	Adjust to user requirements. Typically set for 1 second duration.
R24	COMPRESSION LEVEL	Adjust to user requirements. Typically set for -7db compression.
R111	"A" CHANNEL VU METER CALIBRATION	Set to OVU with +4 db signal to J3-11 as shown below. Local Status Panel SOURCE switch may be in any position except PROGRAM.  NOTE: Jumper W5 must be from "C" to "M"

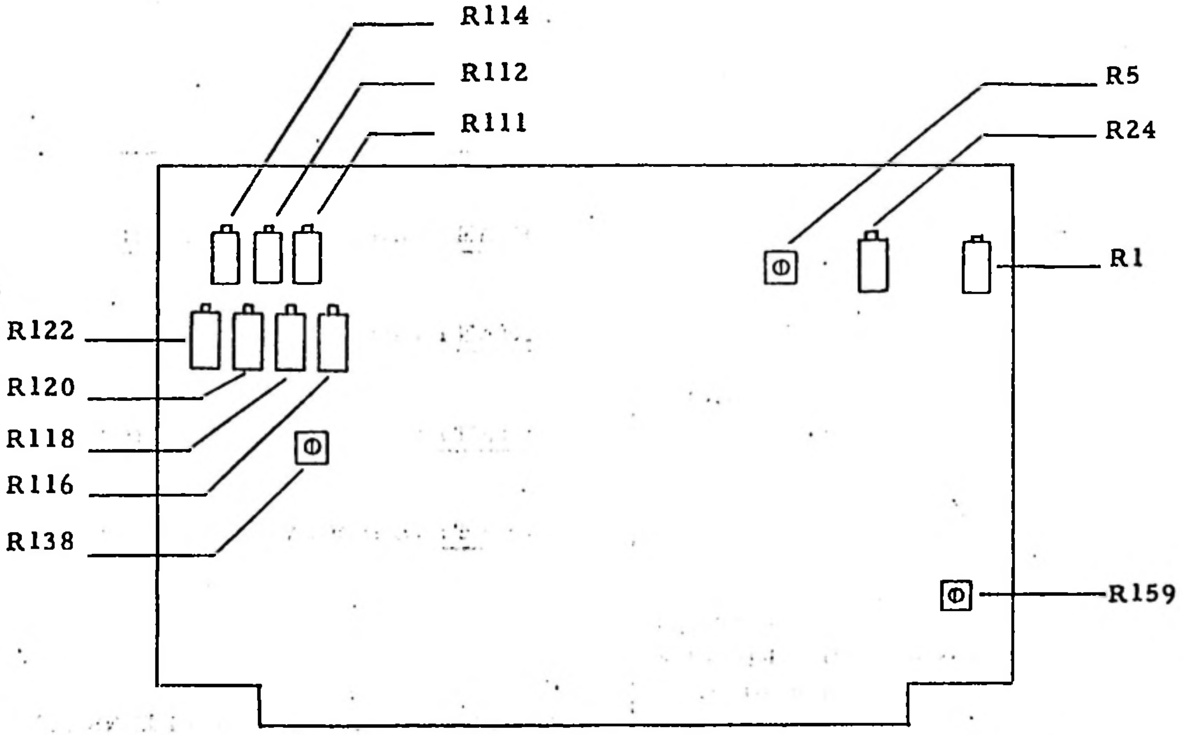
8.4 POTENTIOMETER ADJUSTMENTS (continued)

POT	PURPOSE	ADJUSTMENTS
R112	"B" CHANNEL VU METER CALIBRATION	Set to OVU with +4 db signal to J3-9 as shown below. Local Status Panel SOURCE switch may be in any position except PROGRAM.  NOTE: Jumper W6 must be from "C" to "M"
R114	SILENCE SENSE LEVEL	Adjust to user requirements. Typically set to trip Silence Sense timer at audio levels below -20db.
R116	"A" CHANNEL PROGRAM OUTPUT GAIN	Set for +4 db at system output (Audio Interface Terminal TB1-2 to TB1-3) with OVU signal on VU Meter.
R118	"B" CHANNEL PROGRAM OUTPUT GAIN	Set for +4 db at system output (Audio Interface Terminal TB1-5 to TB1-6) with OVU signal on VU Meter.

8.4 POTENTIOMETER ADJUSTMENTS (continued).

POT	PURPOSE	ADJUSTMENT
R120	EOM TRIP	Adjust to user requirements. Typically set to create EOM signal when Audio fades below -20db. Range = +4 to -25 db.
R122	FADE RATE	Adjust to user requirements. Typically set to fade Audio in 3-4 seconds. Range = 0-8 seconds.
R138	FET THRESHOLD. Sets fade FET's bias such that audio will begin to fade as soon as the FADE command occurs.	Adjust with constant level tone from source that is "On Air". Adjust until audio just starts to drop, then back off until audio just reaches full level.
R159	COMPRESSOR BALANCE: Used to balance the "A" and "B" channel inputs to the compressor.	1. Set U1, S1 and S4 "ON" 2. On Universal Source Board to be used for audio input, jumper A to 2 (W8) and B to 2 (W9). 3. Using audio tape with uniform fixed level tone on both channels, adjust R159 for equal deflection on VU meters on Local Status Panel.

8.4 POTENTIOMETER ADJUSTMENTS (continued)

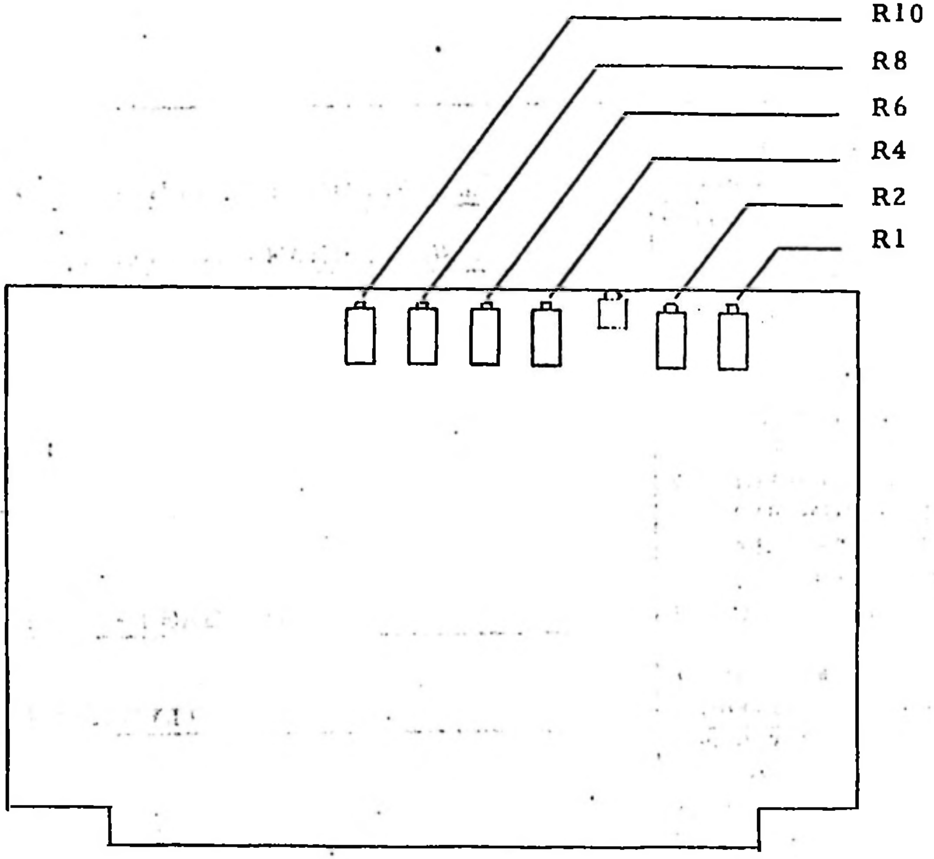


AUDIO DISTRIBUTION BOARD

8.4 POTENTIOMETER ADJUSTMENTS (continued)

POT	PURPOSE	ADJUSTMENT
R1	TRANSMITTER SILENCE SENSE LEVEL	With audio source connected to Aux 2 input, set to turn off "XMIT ON" LED just above noise threshold. Factory set to trip at -20 db.
R2	TRANSMITTER SILENCE SENSE DELAY	Adjust to user requirments. Typically set for 10 seconds from loss of transmitter (Aux 2) audio to "XMIT OFF" indication. Range = 3.5ms - 11 seconds.
R4	AUX 1 CHANNEL "A" AUDIO LEVEL	Set for nominal cue level using VU meters or monitor speakers.
R6	AUX 1 CHANNEL "B" AUDIO LEVEL	Set for nominal cue level using VU meters or monitor speakers.
R8	AUX 2 CHANNEL "A" AUDIO LEVEL	Set for nominal cue level using VU meters or monitor speakers.
R10	AUX 2 CHANNEL "B" AUDIO LEVEL	Set for nominal cue level using VU meters or monitor speakers.

8.4 POTENTIOMETER ADJUSTMENTS (continued)



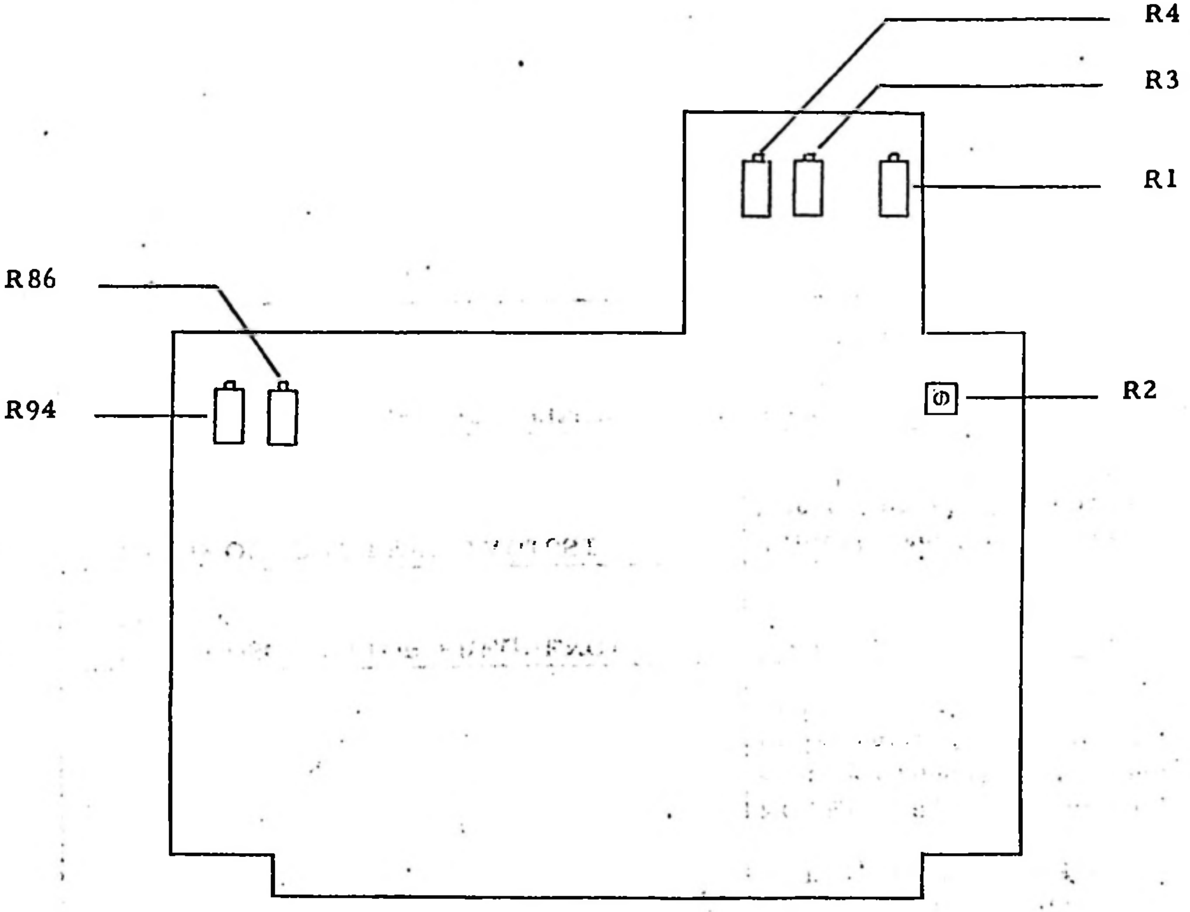
MONITOR AMPLIFIER BOARD

8.4 POTENTIOMETER ADJUSTMENTS (continued)

POT	PURPOSE	ADJUSTMENT
R1	SOURCE "STOP" DELAY	Set for proper dead roll following end of 25Hz tone. Range = 1.5msec - 7.5 sec.
R2	FADE FET THRESHOLD	Using constant level reference tone from audio source (monitor on Local Status Panel VU Meters), adjust R2 until audio level just starts to decrease; then back up R2 until audio level just peaks.
R3	FADE RATE	Adjust to user requirements. Typically set to fade audio in 3 seconds.
R4	3.5kHz LEVEL ADJ	1. Supply a 3.5kHz at 1 VP-P signal to J2-8 (may be supplied by properly encoded cart with continuous encoding made by encoding cart with TEST jumper installed. 2. Placed audio source to be adjusted "ON THE AIR". 3. Adjust R4 until "DATA" LED on VEL board starts to flicker. 4. Check signal level at TP1 on VEL board. 5. Adjust R4 until signal at TP1 on VEL board is twice (x2) that read in Step 4.
R86	CHANNEL "A" LEVEL ADJUST	Using standard level tone on test tape, adjust for OVU on VU Meter.
R94	CHANNEL "B" LEVEL ADJUST	Using standard level tone on test tape, adjust for OVU on VU Meter.

UNIVERSAL SOURCE BOARD

8.4 POTENTIOMETER ADJUSTMENTS (continued)

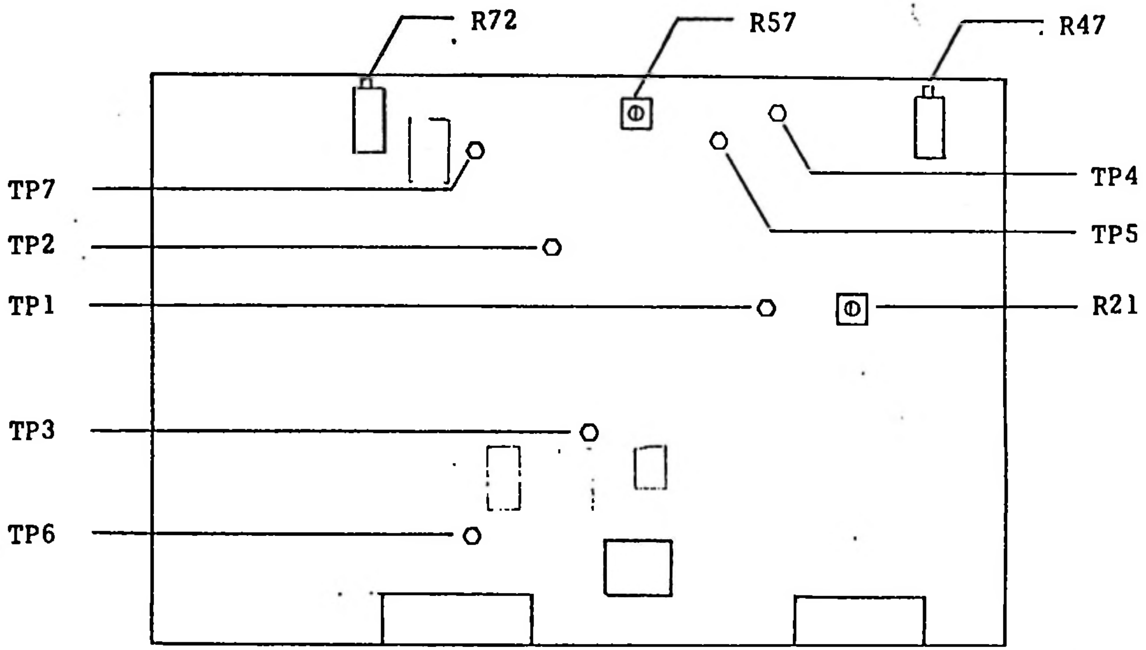


UNIVERSAL SOURCE BOARD

8.4 POTENTIOMETER ADJUSTMENTS (continued)

POT	PURPOSE	ADJUSTMENT
R21	3.5kHz INPUT LEVEL ADJUST	With continuous 3.5kHz signal from cart, adjust R21 CW until TP2 just goes "high". Then monitor TP1 and adjust R21 CW to increase level at TP1, until it is twice (x2) the original reading. NOTE: If R21 requires adjustment, make a test cart by connecting TEST jumper and record entire cart. Care should be taken to time cart to avoid overlapping recording.
R47	3.5kHz OSCILLATOR FREQUENCY ADJUST	Set for 3.5 ± 0.1 kHz signal at TP4.
R57	3.5kHz OUTPUT LEVEL ADJUST	Typically set for 1.41 VP-P signal at TP5. Connecting TEST jumper gives continuous 3.5kHz signal for adjustment.
R72	START CHARACTER RATE TIMER ADJUST	Set for 9.1 (110 baud) or 3.3 ms (300 baud) ± 0.1 msec from positive edge to positive edge of signal at TP7.

8.4 POTENTIOMETER ADJUSTMENTS (continued)



ENCODE BOARD

Schafer SERIES 7000 MEMORY LOAD FORMAT

GENERAL

1.1) THE LOAD PORT FOR THE SERIES 7000 AUTOMATION IS A SEPERATE SLAVE PORT CAPABLE OF LOADING OR DUMPING THE USER MEMORY FROM/TO AN EXTERNAL DEVICE BY WAY OF A EIA R2-232, OR 20 MA CURRENT LOOP SERIAL INTERFACE.

2.0) SERIAL CHARACTERISTICS

2.1) THE SERIAL PORT IS ABLE TO RECEIVE ON ANY STANDARD EIA SPECIFIED BAUD RATE FROM 110 BAUD TO 9600 BAUD

2.2) THE INCOMING SERIAL WORD WILL BE DEFINED AS FOLLOWS:

```
------------------------------------------------------------------
!START!DATA!DATA!DATA!DATA!DATA!DATA!DATA!PARITY!STOP!STOP!
!     ! 0  ! 1  ! 2  ! 3  ! 4  ! 5  ! 6  ! EVEN !    !OPT !
------------------------------------------------------------------
```

2.21) THE SECOND STOP BIT WILL BE UTILIZED ON SERIAL TRANSMISSIONS OF 110 BAUD ONLY.

2.22) PARITY WILL ALWAYS BE TRANSMITTED AS EVEN PARITY AND CHECK FOR CORRECTNESS BY THE SYSTEM.

3.0) FORMAT

3.1) THE SYSTEM WILL ACCEPT AS VALID DATA THE FOLLOWING ASCII CHARACTERS:

"0","1","2","3","5","6","7","8","9","A","B","C","D","E","F"

";",":",","

*** ALL OTHER CHARACTER SENT WILL BE IGNORED. ***

3.2) INPUT CHARATERISTICS

3.21) THE SYSTEM WILL ACCEPT INFORMATION BASE ON EITHER A USER EVENT NUMBER OR AN ABSOLUTE HEX ADDRESS FOR THE INTERNAL RAM.

```
:0000   <-- ":" INDICATES NEW "USER EVENT" ADDRESS
                THE SYSTEM WILL LOAD STARTING AT USER
                ADDRESS 0000 AND INCREMENT ONE RAM LOCATION
                FOR EACH VALID ENTRY THEREAFTER.

;04A0   <-- ";" INDICATES NEW "ABSOLUTE MEMORY" ADDRESS
                THE SYSTEM WILL LOAD STARTING AT HEX
                ADDRESS 04A0H AND INCREMENT ONE LOCATION
                FOR EACH VALID ENTRY THEREAFTER
```

s[illegible]afer SERIES 7000 MEMORY LOAD FORMAT

3.211) A NEW ADDRESS MAY BE SENT AT ANY TIME BY PRECEEDING THE ADDRESS WITH EITHER A ":" FOR USER OR ";" FOR HEX. THE ACTUAL ADDRESS MUST ALWAYS CONTAIN FOUR (4) DIGITS REGARDLESS OF LEADING ZEROS.
AT THE BEGINNING OF TRANSMISSION, NO DATA WILL BE ACCEPTED BY THE SYSTEM UNTIL A VALID ADDRESS IS FEED TO THE SYSTEM.

3.212) A "USER EVENT" IS DEFINED AS THREE, SEQUENTIAL 8 BIT BYTES.

3.22) THE ACTUAL SOURCE / TRAY INFORMATION WILL BE IN THE FOLLOWING FORMAT

01 02 11 <-- ONE USER EVENT

3.221) THE FIRST BYTE REPRESENTS THE SYSTEM FUNCTION CODE.

THESE CODES ARE AS FOLLOWS:

01-PLAY
02-LINK TO "ON AIR" SOURCE
03-DOUBLE START WITH THE FOLLOWING EVENT
04-UPDATE FLAG, STOP UPDATING AT THIS EVENT
05-GO TO THE EVENT IN THE SECOND AND THIRD BYTE
06-GO SUB TO THE EVENT IN THE SECOND AND THIRD BYT
07-RETURN FROM SUB
08-ROLL OFF AIR.
09-COMMAND (INTERNAL FUNCTIONS)
0A-STOP REQUEST

3.222) FOR FUNCTIONS 01,02,03,07 (PLAY,LINK,DSTR,ROLL) THE SECOND BYTE REPRESENTS THE THE REQUESTED SOURCE NUMBER.
EX:
01 12 20 <-- PLAY SOURCE 12

3.223) THE THIRD BYTE REPRESENTS THE REQUESTED TRAY NUMBER (FUNCTIONS 01,02,03,07).
ABOVE EXAMPLE CALLS FOR SOURCE 12, TRAY 20

3.2231) FOR NON-RANDOM SELECT SOURCES (SINGLE PLAY,REEL/REEL THE THIRD BYTE MUST BE SET TO FF.
EX:
01 13 FF <-- PLAY REEL/REEL 13

3.224) FOR USER EVENTS CONTAINING FUNCTIONS 05,06 (GOTO,GOSUB), THE SECOND AND THIRD BYTE REPRESENT THE ABSOLUTE "USER EVENT" ADDRESS REQUESTED.
EX:
05 10 00 <-- GOTO "USER EVENT" 1000

schafer SERIES 7000 MEMORY LOAD FORMAT

3.225) FUNCTIONS 00,07,0A (AVAL,RETURN,STOP) WHICH REPRESEN' 'FUNCTION ONLY' EVENTS SHOULD BE FOLLOWED BY A SECONI AND THIRD BYTE OF "00" AND "FF"
EX:

```
00 00 FF <-- AVAL EVENT
0A 00 FF <-- STOP REQUEST
```

3.226) THE 04 FUNCTION (UPDATE) HAS A NON-ACTIVE SECOND AND THIRD BYTE. ANY BYTE MAY BE ENTERED IN THESE LOCATIONS. RECOMMEND A TIME REFERENCE BE ENTERED HERI IN RELATION TO THE PROGRAM EVENTS WHICH FOLLOW IT.
EX:

```
04 01 30 <-- UPDATE FOR 01:30 CLUSTER
```

3.23) THE END OF LOADING IS SIGNALED WITH THE ASCII CHARACTER PERIOD (".").

4.0) LOADING EXAMPLE

```
:0000 01 01 12 <-- AT USER EVENT 0000, PLAY SOURCE 01, TRAY 12
      01 13 FF <-- AT USER EVENT 0001, PLAY SOURCE 13, NO TRAY
      02 12 FF <-- AT USER EVENT 0002, LINK SOURCE 12, NO TRAY TO "ON AIR"
      06 10 50 <-- GO TO SUBROUTINE AT EVENT 1050
      00 00 FF <-- AVAIL
      04 02 15 <-- UPDATE FLAG FOR 02:15 CLUSTER
      03 01 03 <-- DOUBLE-START SOURCE 01, TRAY 03 WITH NEXT EVENT
      01 08 FF <-- AT USER EVENT 0007, PLAY SOURCE 08, NO TRAY
      0A 00 FF <-- AT USER EVENT 0008, REQUEST STOP MODE
      05 00 00 <-- AT USER EVENT 0009, GOTO USER EVENT 0000
:1000 01 01 40 <-- AT USER EVENT 1000, PLAY SOURCE 01, TRAY 40
      02 05 FF <-- AT USER EVENT 1001, LINK SOURCE 05, NO TRAY TO "ON AIR"
      07 00 FF <-- AT USER EVENT 1002, RETURN FROM SUBROUTINE
      .        <-- END OF LOAD
```

*** NOTE ***

4.1) ALL ASCII "SPACE", "CR", AND "LF" ARE IGNORED BY THE INPUT DRIVER. THE FOLLOWING WOULD REPRESENT THE SAME DATA AS ABOVE:

```
:00000101120113FF0212FF0610500000FF0402150301030108FF0A00FF050000
:10000101400205FF0700FF.
```

4.2) AFTER BEING INITIATED, THE TRANSMITTING DEVICE HAS 5 SECONDS TO BEGIN TRANSMISSION OR THE SYSTEM WILL AUTOMATICALLY DISABLE THE LOAD DRIVER.

4.21) DURING TRANSMISSION, NO DATA PAUSE SHALL EXCEED 3 SECONDS OR THE SYSTEM WILL DISABLE THE LOAD DRIVER

4.22) A ASCII PERIOD "." AT THE END OF TRANSMISSION WILL SIGNAL THE SYSTEM TO IMMEDIATELY TERMINATE THE LOAD DRIVE.