MODELS S623, S623-VIR, S623-EDL

TIME CODE READER with SERIAL I/O

INSTRUCTION MANUAL

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INFORMATION TO USERS IN EUROPE

NOTE

CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

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

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

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

WARNING

Changes or Modifications not expressly approved by Evertz Microsystems Ltd. could void the user’s authority to operate the equipment.

Use of unshielded plugs or cables may cause radiation interference. Properly shielded interface cables with the shield connected to the chassis ground of the device must be used.

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original issue - preliminary release	7/88
	1.0.1 Manual Change Sheet S623-1	6/89
1.1	Reformatted, schematic up-dates	1/91
1.1.1	Schematic revisions as follows: **OLD DWG.** **NEW DWG.** 611-80K 6110-80L 6110-30K 6110-30L **ADDITION** 6111-80F Component Layout	4/93

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1. INTRODUCTION

This microcontroller (MCU) based module contains a full speed (1/30 to 70 times play) longitudinal time code (LTC) reader and LTC translator/phase restorer. Installing the optional plug-in VITC submodule gives the reader tremendous additional capabilities. It can now read VITC at speeds from still frame to in excess of 40 times play speed. The front panel mode switch allows the LTC/VITC reader pair to operate in either an LTC or VITC only mode or in an automatic switchover mode. The powerful MCU firmware automatically selects valid code from either source and provides accurate time code reading from still frame to 70 times play speed.

A fully decoded and regenerated play speed LTC output is provided, using whatever source is currently being read (indicated by the LTC and VITC LED's). In many VTR's the tie code head position with respect to the video signal can vary quite considerably from machine to machine causing a code phase shift relative to the video frame. When the incoming code is at normal play speed, the output code is properly synchronized to the video, thus compensating for any LTC code misalignments from the video, and providing an LTC translation of the incoming VITC.

The recovery of recorded LTC time code at other than play speed has always presented some degree of difficulty, particularly with low end 3/4" recorders lacking a separate address track. The high speed reader in the S623 employs sophisticated input conditioning and clock/data separator circuits to reliably recover LTC over the full shuttle and wind speed range of most VTR's.

The VITC reader sub-module contains a full wind speed (still to over 45 times play speed) VITC reader, designed for use with non time base corrected video signals. Although the use of time base correctors will enhance the recovery range of the VITC reader, the amount of improvement is dependant on the type of TBC and transport being used. The module contains all the necessary video processing circuits and therefore, requires no external signals other than the video signal itself. Recovered VITC data is transferred to the companion LTC reader module for validation and further processing. If the VITC reader is selected, the data will then be presented to the LTC translator output.

A serial data port provides time code data for interface to an editor or other computer device. Both RS-232-C and RS-422 levels are supported. Reader data may be sent continuously, or on request only. In addition, the computer can set up various operation modes.

The S623 reader module is available in three versions:

1. Model S623: LTC Reader
2. Model S623-VIR: LTC/VITC Reader
3. Model S623-EDL: LTC/VITC Reader with Edit Decision List Output

All versions of the S623 are equipped with a regenerated LTC output from the incoming code, and a serial I/O port for connection to a computer or printer.

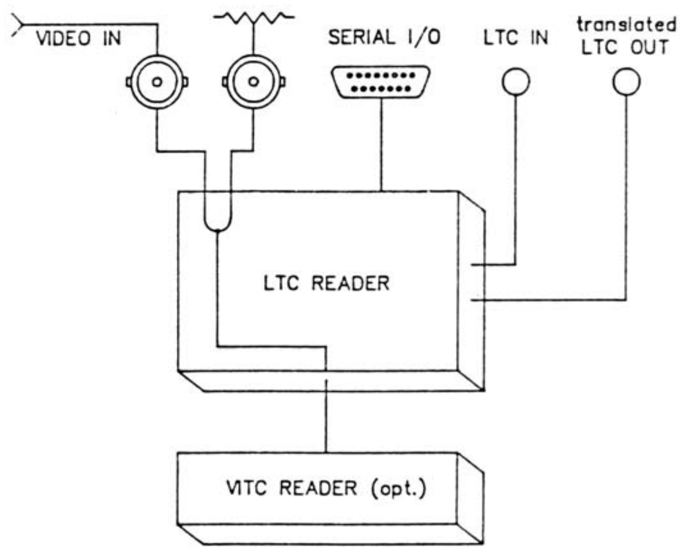

Figure 1-1: Model S623 Block Diagram

2. INSTALLATION

Each S623 module is housed in a compact enclosure suitable for table or shelf mounting. An external 12 VDC (300 mA) power adapter must be connected to provide power to the S623 reader. All the necessary connectors are on the rear panel.

2.1. LTC INPUT AND OUTPUT

A ¼" stereo phone jack is provided as an input to the LTC reader. When using an unbalanced input to the reader, the signal should be applied to the tip of the phone plug. Normally, the unused input (ring) should be connected to ground (sleeve).

A ¼" stereo phone jack is provided as an output from the LTC translator. This output is play speed regenerated code from whichever code source is being read (indicated by the LTC and VITC indicators). When the incoming code is at normal play speed, the output code is properly synchronized to the input video, thus compensating for LTC code misalignment from the video, or providing an LTC translation of incoming VITC.

2.2. READER VIDEO INPUT

Video associated with the LTC code or video with VITC recorded on it is connected to the VIDEO IN loop. The internal sync separator has a high impedance input tapped off the loop through, therefore, the input must be terminated with 75 ohms at the end of the line.

When using the LTC translator output, video must be connected as a reference for phasing the output code. The VITC LED will flash on momentarily every four seconds when no video is connected.

2.3. SERIAL REMOTE CONTROL

A nine pin subminiature "D" connector is provided for remote control of the reader functions and data output. This serial port provides both RS-232-C and RS-422 levels as shown below:

Pin	Name	Description
5	TX	RS-232 Transmit
9	FG	Frame Ground
4	RC	Receive Common
8	RA	Receive “A” & RS-232
3	RB	Receive “B”
7	TB	Transmit “B”
2	TA	Transmit “A”
6	TC	Transmit Common
1	FG	Frame Ground

When pin 8 is connected to an RS-232-C level signal, pin 3 should be connected to ground (pin 4)

The default data format used is 9600 Baud, 8 data bits, even parity, one stop bit. The baud rate and data format may be customized by changing the EPROM. (See section 6.5 for more information about changing default values.)

3. OPERATION

3.1. LTC/VITC SELECTION

A three position toggle switch mounted on the front panel (LTC/AUTO/VITC) selects the reader operating mode. The user may select either an LTC or VITC only mode or the AUTO switch-over mode. The automatic mode allows the microcontroller to dynamically switch to the other reader if the transport speed exceeds the recovery range of the currently selected reader. The recovery range of the reader is limited by the tape machine electronics and tape handling capabilities. If there is no video signal connected to the module this switch is ignored and the switch-over defaults to the LTC reader.

Two front panel LED's (LTC, VITC) indicate which reader is currently selected. These LED's will be illuminated only when the following two conditions are met.

1. The particular reader is selected by the microcontroller in either a manual or automatic mode.

2. The reader is continually receiving valid time code.

If the reader is not selected or if it has not received a valid time code data within the last 50 milliseconds, its LED will be extinguished. At very slow transport speeds (1/5 play speed and below) this will cause the LTC indicator to continually flash on and off. This is normal and is not indicative of a reader error

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4. SERIAL PORT OPERATION

4.1. COMMUNICATION PROTOCOL

The communications protocol is described in the state diagram below. There are two states in the protocol. The continuous broadcast state sends time and user bit data once per frame. The select state awaits commands and issues appropriate responses to the commands. These two states are described more fully below.

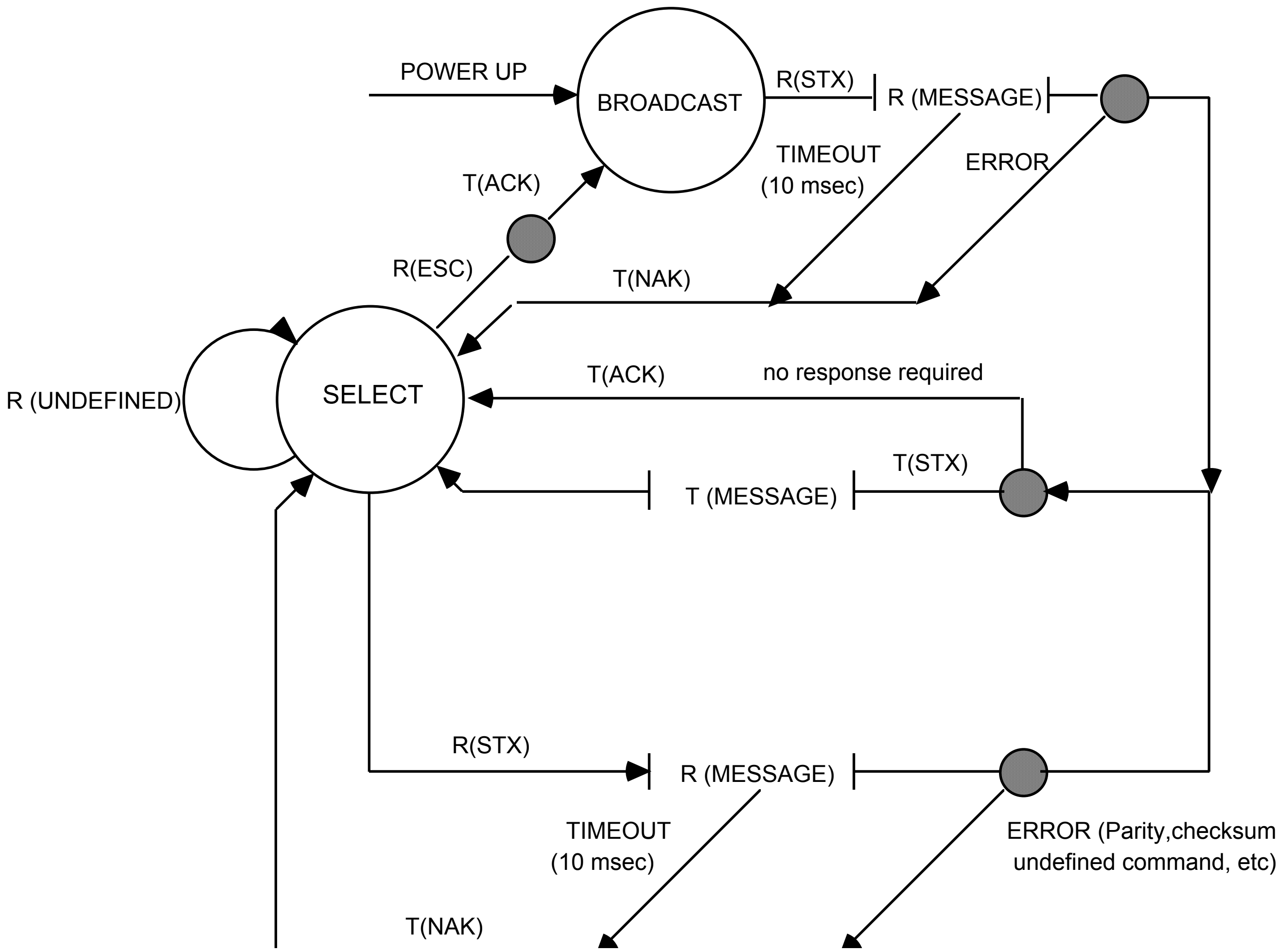

Figure 4-1: Serial Protocol State Diagram

4.2. CONTINUOUS BROADCAST MODE

The S623 reader immediately enters the continuous broadcast state upon power-up. In this mode, the S623 reader sends a response message once per frame in the same format as the READ BCD TIME/USER BITS command below.

The S623 reader remains in the continuous broadcast mode unless directed by a valid command to the SELECT state by issuing a command. When the command is executed, the reader will return to the SELECT state.

To re-enter the continuous broadcast mode, send an **ESC** (03 hex) character. The S623 responds with an **ACK** (04 hex) character and enters the broadcast mode.

For example, if the current LTC reader time code was 12:45:30:00 and the user bits were all zero, the response message would be received as follows:

STX			02
BYTE COUNT			0B
COMMAND			0B
MESSAGE:			
	FRAMES	00	
	SECONDS	30	
	MINUTES	45	
	HOURS	12	
	USER BITS 1	00	
	USER BITS 2	00	
	USER BITS 3	00	
	USER BITS 4	00	
	STATUS 1	00	
	STATUS 2	40	
CHECKSUM			23

4.3. MESSAGE FORMAT

The S623 reader responds to several commands requesting time/user bit data in several formats and controlling its operating mode.

Each control message starts with the STX character and ends with a checksum. The purpose of the checksum is to verify that all the bytes in the message that contain variable data have been received properly. The STX is the only byte that has a fixed value, so it is the only byte not included in the checksum calculation. The checksum is calculated by adding all the variable bytes together. The least significant byte of this sum is then subtracted from 100 hex to compute the checksum. To verify that the checksum is computed correctly, add all the bytes including the checksum but excluding the STX together. The least significant byte of the sum should be zero if the checksum is computed correctly.
Command messages are structured as follows:

STX start of message character (02 hex)

BYTE COUNT number of bytes in command message not including the STX, BYTE COUNT or CHECKSUM
MESSAGE variable length command message, maximum 2 bytes
CHECKSUM the two's complement of the one byte sum of the MESSAGE and the BYTE COUNT.

The MESSAGE consists of a command and one optional argument byte which provides specific data required by the command. It is structured as follows:

COMMAND single byte command as outlined below
ARGUMENT single byte of data only if required by COMMAND

If the command message was not accepted by the S623 reader due to a checksum error, parity error or an invalid command, the S623 reader will respond with a **NAK** (05 hex) character and re-enter the SELECT state.

If the command message is accepted by the S623 reader it will respond with an **ACK** (04 hex) character and re-enter the SELECT state to await a further command.

If the command message requires data, the S623 reader will transmit a response message structured as follows:

STX start of message character (02 hex)
BYTE COUNT number of bytes in response message not including the STX, BYTE COUNT or CHECKSUM
COMMAND single byte corresponding to the command which requested the data
MESSAGE maximum 10 bytes, data requested by the command
CHECKSUM the two's complement of the one byte sum of the COMMAND, MESSAGE and the BYTE COUNT

For example, to request the current time code data in BCD format the command message would be transmitted as follows:

STX		02
BYTE COUNT		01
MESSAGE		
COMMAND	0A	
CHECKSUM		F5

If the current LTC reader time code was 12:45:30:00, the response message would be received as follows:

STX		02
BYTE COUNT		07
COMMAND		0A
MESSAGE		
FRAMES	00	
SECONDS	30	

MINUTES	45	
HOURS	12	
STATUS 1	00	
STATUS 2	40	
CHECKSUM		28

4.4. DATA FORMATS

4.4.1. BCD Time Data

BCD time data is transmitted as four packed BCD bytes with the frames byte transmitted first. The time code status flag bits (i.e.: drop frame, colour frame etc.) are extracted before transmission but are available in the STATUS flags data.

FRAMES		SECONDS		MINUTES		HOURS	
1X	10X	1X	10X	1X	10X	1X	10X

4.4.2. Status Flags

The status flags are transmitted as two bit-mapped bytes. They contain the code status flags from the time code data as well as other status information.

STATUS 1		STATUS 2	
bits	0-7	bits	0-7

Status Flags 1

bit 0 STOP - Indicates time code is not running
bit 1 PLAY - Indicates time code is at play speed
bit 2 DIR - Indicates time numbers are decreasing when 1, increasing when 0
bit 3 FFWD - Indicates transport in fast forward mode
bit 4 REW - Indicates transport in rewind mode
bit 5 not used, always 0
bit 6 not used, always 0
bit 7 not used, always 0

Status Flags 2

bit 0	DROP FRAME - Indicates time code is in drop frame format	
bit 1	COLOUR FRAME FLAG - Indicates time code is colour framed	
bit 2	PAL units:	Binary Group Flag 1
	NTSC units:	Bi-phase parity flag (LTC)
		Field Mark Flag (VITC)
bit 3	PAL units:	Binary Group Flag 2
	NTSC units:	Binary Group Flag 1
bit 4	PAL units:	Bi-phase parity flag (LTC)

		Field Mark Flag (VITC)
	NTSC units:	Not used at this time
bit 5	PAL units:	Not used at this time
	NTSC units:	Binary Group Flag 2
bit 6	LTC FLAG - Indicates longitudinal time code being read	
bit 7	VITC FLAG - Indicates vertical interval time code being read	

The Binary group flag bits are defined as follows:

	Bin Grp Flg 1	**Bin Grp Flg 2**
Character set unspecified	0	0
Eight bit Alpha-numeric Character set	1	0
Unassigned	0	1
Unassigned	1	1

4.4.3. User Bit Data

User bit data is transmitted as four bytes with two user bit groups packed into each byte. The first user bit group is transmitted first.

UB1		UB2		UB3		UB4	
1X	10X	1X	10X	1X	10X	1X	10X

4.4.4. Binary Time Data

Binary time data is transmitted as a 24 bit (3 byte) unsigned binary number of frames with the least significant byte transmitted first.

Binary time data is the absolute number of frames after 00:00:00:00. In NTSC systems, if the time code number was originally in DROP FRAME format the binary time data will have the number of dropped frame numbers subtracted from it.

bits 0-7	bits 8-15	bits 16-23

4.5. COMMANDS

Following is a list of the commands understood by the S623 reader. If invalid commands are sent to the S623, it will respond with a **NAK** (05 hex) character.

08	**READ BINARY TIME DATA**	Returns the current time code data in binary format and the status flags
09	**READ BINARY TIME/USER BIT DATA**	Returns the current time code data in binary format, the user bit data and the status flags
0A	**READ BCD TIME DATA**	Returns the current time code data in BCD format and the status flags
0B	**READ BCD TIME/USER BIT DATA**	Returns the current time code data in BCD format, the user bit data and the status flags
0C	**READ USER BIT DATA**	Returns the user bit data and the status flags
0D	**READ STATUS FLAGS**	Returns the status flags
10	**READ OPERATING MODE**	Returns one byte containing the current operating mode flags of the time code reader as below:

S623 OPERATING MODE FLAGS

bit 0	LTC Reader Enable
bit 1	VITC Reader Enable
bit 2	Local Lockout Enable
bit 3	EDL Output Format (EDL Option) 0=Editor Format 1=Evertz Format
bits 4-7	not used, set to 0

11 READ LINE NUMBER

Returns one byte containing the current line number which the VITC Enable is being activated. (See 'Set Line Number' command below). (Not implemented on all versions)

14 SET OPERATING MODE

Presets the operating mode of the reader. Expects one byte of operating mode flags. (See command 10 for details of operating mode flags).

15 SET LINE NUMBER

Sets the VITC Read Enable to the according line number. Expects one byte containing the line number code as follows:

ENTER CODE	FIRST LINE (PAL)	FIRST LINE (NTSC)
00	06	10
01	07	10
02	08	10
03	09	10
04	10	10
05	11	11
06	12	12
07	13	13
08	14	14
09	15	15
0A	16	16
0B	17	17
0C	18	18
0D	19	19
0E	20	20
0F	21	20
10	1	5

18 ENABLE LTC READER

19 DISABLE LTC READER

Enables or disables the LTC reader

1A ENABLE VITC READER

1B DISABLE VITC READER

Enables or disables the VITC reader

Enabling both the LTC and VITC time code readers enables the AUTO mode where time code will be decoded from which ever source is valid.

1C	**ENABLE LOCAL LOCKOUT**	Disable front panel reader mode selection switch
1D	**DISABLE LOCAL LOCKOUT**	Enable front panel reader mode selection switch

Local lockout is enabled automatically by issuing the enable/disable reader mode commands

1E	**ENABLE EVERTZ FORMAT**	Model S623 & 623-VIR: In Broadcast Mode outputs the current time code data in BCD format, the user bit data and the status flags Model S623-EDL: Selects Evertz edit decision list output format
1F	**DISABLE EVERTZ FORMAT**	Model S623 & 623-VIR: In Broadcast Mode outputs the current time code data, the user bit data and the status flags as ASCII characters. Model S623-EDL: Selects editor edit decision list output format

An ESC (03 Hex) character is required to return the module to Broadcast mode after a switch of formats has been performed.

5. EDIT DECISION LIST

5.1. OVERVIEW

The Model S623-EDL LTC/VITC Reader detects breaks in the VITC or LTC time code and generates an Edit Decision List on the RS-232 output. The continuous broadcast mode described in section 4.2 is replaced with the edit decision list mode as described below:

The S623-EDL reader immediately enters the Edit Decision List mode upon power up. In this mode, the S623-EDL reader detects discontinuities in the time code and uses the time code and user bit numbers before and after the edit to form a specialized edit decision list in one of two formats. To be detected as valid edits, the tape segments must have continuous code of at least (12) readable frames duration. (This default value may be changed) (See section 6.5). Time code dropouts or reading errors are automatically compensated for in the software. Edit out points are one (1) frame greater than the last number before the edit, following the convention that the out point is not included in the edit.

Although the S623-EDL can detect the edit points from either the LTC or VITC, the best results are usually obtained by using VITC as it is not disturbed during the editing process.

The S623-EDL remains in the edit list mode unless directed by a valid command to a selected state by issuing a command. When the command is executed, the reader will remain in the SELECT state. To re-enter the Edit list mode, send an ESC (03 HEX) character and returns to the edit list mode.

To properly detect edit points, the S623-EDL must be referenced to the video from the source VTR. Connect the video output from the VTR to the video input of the S623-EDL and provide a 75 ohm termination. This must be done even if you are using LTC from the VTR.

The S623-EDL begins looking for edit breaks in the code ONLY after the VTR is placed in PLAY mode and is properly servo locked. Therefore the S623-EDL must be locked, in PLAY mode and reading valid time code **before** the first edit or else the first “in” point (and thus the first edit) will not be detected. To detect the first edit in time for the source material, there should be a leader with time code on it. When using VITC, make sure the leader VITC is on the same lines as the edited VITC is on.

The S623-EDL has the ability to bypass the reading of the continuous VITC on the lower line numbers and read only the dicontinuous VITC (which identifies the edits) on the higher line numbers. (See section 5.4)

5.2. TWO EDIT DECISION LIST FORMATS

The S623-EDL software generates Edit Decision Lists in two formats:

1) Editor Format
2) Evertz Format

These formats have been designed so as to increase the amount of information extracted from the edited record tape while presenting the information in a format which can be directly interfaced with most editors and edit decision list management software.

The S623-EDL defaults to Editor format on power up, but may be placed into the Evertz Format by issuing the appropriate command via the RS-232 port. (See section 4.3) The power up default may be changed to Evertz format by changing the EPROM. (See section 6.5 for information about changing the power up default parameters).

5.3. EDITOR FORMAT

In the Editor format mode, source in and out points are detected as discontinuities in the time code. The user bits of the code are used to carry auxiliary information such as reel numbers, edit modes, edit types, transition duration times, etc. The user bit information must be appropriately encoded at the time of editing. The editor format in which this information is displayed is CMX compatible and may be used by most editors and edit decision list management software. Other editor formats will be supported in the future. Figure 5-1 below shows an example of the editor format output.

EVENT #	REEL #	EDIT TYPE	EDIT MODE	DURATION	SOURCE IN	SOURCE OUT	RECORD IN	RECORD OUT
001	BL	V	C		10:06:46:01	10:07:42:23	01:03:16:04	01:04:13:01
002	BL	V	C		10:07:42:23	10:07:42:23	01:04:13:01	01:04:13:01
002	008	V	D	030	20:13:39:04	20:13:45:17	01:04:13:01	01:04:19:14
003	003	AA/V	C		20:09:47:10	20:09:48:18	01:04:19:14	01:04:20:15
004	003	V	C		20:09:48:18	20:09:48:18	01:04:20:15	01:04:20:15
004	010	V	W010	056	20:16:35:24	20:16:38:07	01:04:20:15	01:04:22:23
005	201	A2/V	C		10:07:54:17	10:07:59:17	01:04:22:3	01:04:27:23

Figure 5-1: Editor Format Output

Spacing between entries not to scale
Headings are not output, but are shown here for clarification only

5.4. USER BIT ENCODING IN EDITOR FORMAT

In the Editor mode, the user bits during the edit segment are decoded to provide auxiliary information such as Reel number, edit type and mode, and duration of the transition at the beginning of the edit segment. The format used for the user bits is as follows: (‘hours” user bits are on the left).

RR RD DD EE

5.4.1. Reel # (Rrr)

The first three digits of the user bits are reserved for encoding a reel number. Reel numbers 000 and 999 are reserved for Black and AUX respectively.

5.4.2. Edit Type And Mode (EE)

The last 2 digits are used to identify the TYPE of edit (CUT, DISSOLVE, etc.) and its MODE (VIDEO only, AUDIO ONE/VIDEO, etc.)

With this convention a total of 100 of the more popular edit identifiers can be used. The S623-EDL uses the first eight codes to identify the MODE of the edit while fixing the TYPE to a CUT. (At first this appears to be an awkward method but upon further examination we see that we are limited to 100 code identifications and this does not allow us to cross-reference every edit TYPE with each of the seven MODES.)

Since most EDIT TYPES are video effects, the S623-EDL convention is to relate them to the VIDEO edit mode, with the exception of the CUT and SPLIT EDIT. Several codes permit encoding of various CUTS (i.e.: V, VA1, etc.), while the SPLIT edit is fixed to a Video with Audio delayed mode.

Figure 5-2 is a table of the edit TYPES and MODES and the corresponding values that must be encoded into the user bits. Any encoded data falling outside the BCD range (i.e.: alphanumerics, hexadecimal digits, etc.) will be treated as invalid code and an error indicator will be displayed.

(* * * * *)

5.4.3. Edit Duration (DDD)

Various edit types such as DISSOLVES, WIPES, and A/V SPLITS require an extra parameter to fully define the edit effect they represent. This value, which is directly related to the edit type is known as the EDIT DURATION number.

USER BIT	EDIT TYPE	SYMBOL USED	EDIT MODE	SYMBOL USED
00	CUT	C	Video	V
01	CUT	C	Video Audio1	B
02	CUT	C	Video Audio2	A2/V
03	CUT	C	Video Audio1 Audio2	AA/V
04	CUT	C	Video Audio3	A3V
05	CUT	C	Video Audio1 Audio3	A13V
06	CUT	C	Video Audio2 Audio3	A23V
07	CUT	C	Video Audio1 Audio2 Audio3	123V
08	DISSOLVE	D	Video	V
09	SPLIT	S	Video Audio1	B
10	WIPE PATTERN 0	W000	Video	V
11	WIPE PATTERN 1	W001	Video	V
12	WIPE PATTERN 2	W002	Video	V

(Add 10 to pattern number for other pattern codes)

94	WIPE PATT'N 84	W084	Video	V
95	KEY	K	Video	V
96	KEY IN	KB	Video	V
97	KEY OUT	KO	Video	V
98	MANUAL	MAN	Video	V
99	SPARE	SPAR	Video	V

Figure 5-2: Edit Modes & Types

The SPARE and the MANUAL codes are left to the users interpretation for any unique applications.

The edit DURATION is the time (measured in video frames) it takes for an edit effect to be completed. The S623-EDL software assigns the digit numbers 4, 5 and 6 of the user bits to the duration of the edit taking place. Edit durations within the range of 0-999 frames can be successfully described.

5.5. EXAMPLE OF USER BIT ENCODING

The events shown in figure 5-2 illustrate a sample of various typical edits. To encode the edit types and modes, the following user bit combinations were used:

EVENT #	USER BITS (RR RD DD EE)
001	00 00 00 00
002	00 80 30 08
003	00 30 00 03
004	01 00 56 20
005	20 10 00 02

5.6. SELECTING VITC LINES FOR THE EDL

Some editing styles require that the source material contain VITC code on the high vertical interval line numbers while the record tape is stripped with continuous VITC on the lower line numbers. The S623-EDL has incorporated a VITC line selection in its reader which allows the reader to read VITC only on certain line ranges.

Location 17H in the PROM contains the line selection number used at power-up. This location can be changed by the user or dealer to have the S623-EDL power up using the line selection number of his choice. The line selection number can also be read and set using commands on the RS-232 serial port. The default setting is for the S623-EDL to read VITC on any line number. (i.e.: the lower line numbers will be read if more than one set of VITC is present) (See section 6.5 for information about changing the power up default parameters).

SOURCE IN POINT	SOURCE OUT POINT	SOURCE IN USER BITS	SOURCE OUT USER BITS	MODE FLAGS		
10:06:46:01	10:07:42:22	00 00 00 00	00 00 00 00	C	N	V
20:13:39:04	20:13:45:16	00 80 30 08	00 80 30 08	C	N	V
20:09:47:10	20:09:48:17	00 30 00 03	00 30 00 03	C	N	V
20:16:35:24	20:16:38:06	01 00 56 20	01 00 56 20	C	N	V
10:07:54:17	10:07:59:16	01 00 56 20	01 00 56 20	C	N	V

(a) Edit List Static Information In User Bits

00:24:31:28	00:24:32:12	00:24:31:28	00:24:32:12	D	C	B1	B2	N	V
01:10:38:14	01:10:39:00	01 10 38 14	01 10 39 00		C			N	V
00:25:03:26	00:25:04:09	00 25 03 26	00 25 04 09	D	C			N	V
01:10:39:14	01:10:39:28	01 10 39 14	01 10 39 28		C			N	V
00:25:39:27	00:25:40:11	00 25 39 27	00 25 40 11	D	C			N	V
01:10:40:14	01:10:40:28	01 10 40 14	01 10 40 28		C			N	V

(b) Edit List With Running User Bits

Note: Mode Flags have the following format: D C B1 B2 N/P L V where
D Drop frame active (NTSC only)
C Colour framing active
B1 Binary group 1 flag active
B2 Binary group 2 flag active
N/P NTSC or PAL standard active
L LTC code active
V VITC code active

- Headings are not output, but are shown here for clarification only
- Spacing between entries not to scale

Figure 5-3: Evertz Format EDL Output

5.7. EVERTZ FORMAT

The Evertz format performs no processing or interpretation of the user bits and is mainly for the user with special applications who wishes to apply the user bits in his/her own unique manner. The format is intended to be used in conjunction with edit list "clean-up" software so as to obtain the data in a format specific to the desired application.

In Evertz format, the in and out points are the first and last frame numbers of the edited material. The in and out user bits, are the user bit values at the in and out frames. Figure 5-3(a) shows the same edit sequence as in Figure 5-1 Evertz Output Format. Figure 5-3(b) shows an example of Evertz Output Format with the user bits containing running time information.

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6. TECHNICAL DESCRIPTION

The S623 reader is a microcontroller based module functionally divided into the following hardware subsystems:

1. Microcontroller & I/O
2. High speed LTC Reader
3. Sync Separator/Video processing
4. High speed VITC Reader

The microcontroller, LTC reader and video processing circuits are contained on the main circuit card (6110). The VITC reader circuitry is optional and is contained on a separate sub-module (6111) which plugs into the main module. Video input buffers, serial I/O receivers/drivers and all input/output connectors are contained on a separate I/O module, (605) which plugs into the rear of the backplane. The relevant schematic drawings are shown in brackets for each section of the circuit.

6.1. MICROCONTROLLER (6110-30)

At the heart of the S623 reader module is an 8031 microcontroller, (MCU) U24. Its three 8 bit bi-directional ports and 8 bit bus provide peripheral interfacing to the rest of the circuits. Program memory is contained on EPROM U23. Scratch pad and data RAM are provided internally by the MCU.

An onboard oscillator, also part of the MCU is crystal controller. Its' 9.206792 Mhz (9.216 Mhz for PAL) is internally divided by 12, resulting in a processor operating frequency of approximately 768 Khz.

The serial I/O channel is also part of the MCU. One of the timers internal to the MCU generates the baud rate which defaults to 9600 baud on power up. The default serial data format is one start bit, 8 data bits, one parity bit (even parity) and one stop bit. (See section 6.5 for information on changing the default baud rate and data format)

The time code out for the LTC translator/phase resorter is generated internally by the MCU and is brought out on port lines P14 and P16. Buffer U27 shapes the square wave to the correct rise and fall times.

6.2. HIGH SPEED LTC READER (6110-30)

Incoming code is decoupled and amplified by U8, U7 and U4 and associated components to provide a regenerated reader data signal at U4 pin 4. A series of timing pulses generated by U3 and U5 are used to properly decode 0 and 1 bits from the incoming code. A constant amplitude ramp is generated by U12 and associated components. Three quarters of the peak ramp level is used as a reference on comparator U1 to decode the data from the clock transitions. If the next code bit is a 0 then the ramp will exceed the reference before a transition occurs. If the next bit is a 1, an extra transition will occur before the ramp exceeds the reference, clocking flip flop U5a on. The LTC data is available at U5a pin 1 and is shifted through sync detector U19 and U21 into one half of shift register U1.

Twelve consecutive 1 bits, detected by U13, clock flip flop U15a on freezing the sync word data at the outputs of U19 and U21 and generating an LTC RDY signal to the MCU when it has received one frame of data. Direction information (LTC DIR), derived from the last bit of the sync word is also fed to the MCU. A valid reader sync word toggles flip flop U15b, enabling the other half of shift register U16 to collect data from the next frame while the MCU is unloading data from the frame just completed through switch U17.

6.3. VIDEO PROCESSING (6110-30)

Reader composite video (with VITC or as a reference for the LTC code translator) is buffered on the separate I/O module and fed to the VITC reader header J1. It is also AC coupled into the sync separator by C29. The sync tips are clamped to -0.3 volts by germanium diode D6. Comparator U11 detects the negative sync tips when compared to ground reference and provides a logic level composite sync signal (SYNC) at pin 7. Composite sync is integrated by U18f to derive vertical sync (VSYNC), which interrupts the MCU. A field 2 pulse is generated by U9a and U10 and is provided to the MCU to correctly frame the LTC code output.

6.4. HIGH SPEED VITC READER (6111-30)

The clock and data separator circuitry for the VITC reader is contained on a separate sub-module which connects to the main circuit card via header J1. Composite video, VSYNC and some control signals from the MCU are fed up the header from the main circuit board.

Composite video is buffered and DC restores by Q2, U14 and associated components to provide REF VIDEO to comparator U15 which recovers VITC data from the DC restored video. U16 and associated components provide a reference level to U15 of approximately one half the peak VITC level, to ensure proper extraction of the VITC data regardless of the video level.

At VSYNC, the MCU releases the reset to U7b, enabling the VITC reader circuitry. The first VITC data bit turns on U7a which releases the reset to CRC detector U1 and U3. A phase locked loop consisting of VCO U13 and U12, U17 and U18 provides an 8 times bit rate clock to divider U11 which generates a series of timing pulses at the VITC bit rate (approximately 1.78977 Mhz for NTSC, 1.8125 Mhz for PAL) The actual recovery clock frequency is adjusted to compensate for time base shifts at fast tape speeds. Each positive going transition of the VITC data re-synchronizes the divider so that the VITC recovery clock at U5 pin 13 occurs in the middle of each bit.

Inverted VITC data is shifted into U3 which calculated the cyclic redundancy check (CRS) word for the recovered data. Valid CRC occurring at the end of 90 bits of code is detected by U1 and clocks U7b on, disabling the VITC clock and generating a VITC RDY signal to the MCU. The MCU unloads the VITC data through switch U17 located on the main circuit board.

6.5. CHANGING THE POWER UP DEFAULTS

Certain of the model S623's default operating parameters can be changed by the user by altering one or more locations in the EPROM. These facilities are provided for only in versions of the S623 modules with a 2764 (2764a or 27C64) EPROM type.

This procedure should only be carried out by qualified technicians or damage may result to the EPROM or other devices on the board.

To customize the factory set default parameter is as follows:

1. Obtain a blank 2764A or 27C64 EPROM.

2. Obtain an EPROM programmer capable of editing the EPROM data.

3. Carefully remove the shield cover and submodule from the S623 module. Using a small screwdriver or other device carefully lift the EPROM out of its socket.

4. Copy the S623's EPROM contents into the programmers RAM.

5. Using the programmer's edit function, change the serial port parameters and VITC line selection as below. If the Edit Decision List option is fitted, you may also change the default output format and minimum edit size. **All address and data values are in hexadecimal notation.**

Serial Port Parameters
These parameters stored in location 16 (Hex) in the EPROM allow the user to configure the baud rate and parity type for the serial port. The parameter byte is organized as PB where P represents the parity setting and B represents the baud rate setting.

P is the parity setting as follows:

0	No Parity
1	Odd Parity
2	No Parity
3	Even Parity

B is the baud rate setting as follows:

4	19,200 Baud
5	9600 Baud
6	4800 Baud
7	2400 Baud
8	1200 Baud
9	600 Baud
A	300 Baud

(Example: For even parity, 9600 Baud set to 15)
For odd parity, 19200 Baud set to 34

VITC Line Selection Parameter
This parameter stored in location 17 (hex) in the EPROM allows the user to configure the starting line at which the VITC reader will recognize code. It should be set as follows:

ENTER CODE	FIRST LINE (PAL)	FIRST LINE (NTSC)
00	06	10
01	07	10
02	08	10
03	09	10
04	10	10
05	11	11
06	12	12
07	13	13
08	14	14
09	15	15
0A	16	16
0B	17	17
0C	18	18
0D	19	19
0E	20	20
0F	21	20
10	All Lines	All Lines

Default Output Format

Model S623 & S623-VIR:

This parameter, stored in location 18 (hex) in the EPROM, allows the user to set the default Broadcast mode output format. It should be set as follows:

00	Evertz Format (BCD)
01	ASCII Characters

Model S623-EDL:
This parameter, stored in location 18 (hex) in the EPROM, allows the user to set the default Edit Decision List output format. It should be set as follows:

00	Evertz Format
01	Editor Format -CMX
03	Editor Format - Paltex

Minimum Edit Size

This parameter, stored in location 19 (hex) in the EPROM, allows the user to set minimum edit duration which will be detected in the Edit Decision List software. The factory set value is 12 frames which should give an optimum protection against time code dropouts and misreads due to multi-generation VITC. It may be set shorter with the recommended limit being 4 frames.

Program the blank EPROM with the new information

6. Carefully reinsert the new prom into the socket taking particular care that is oriented correctly.

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4600T INSTALLATION

REAR PANEL

The following connectors are provided on the rear panel for connection into your system. Each slot has the same configuration for its respective module.

Timecode Connectors

LTC OUT: A ¼"stereo phone jack for output of SMPTE/EBU longitudinal time code from generator.

LTC IN: A ¼" stereo phone jack for input of SMPTE/EBU longitudinal time code.

Video Connections

VIDEO IN: A BNC loop for input of program video with vertical interval time code. This input is also used to insert characters onto.

OUT: A BNC output of program video with characters inserted.

Serial/Parallel I/O

SER_PAR I/O A 9 pin female "D"connector for either parallel or serial remote control depending on the module inside the 4600T.

Power Connections

LINE: The unit may be set for either 115v/60 Hz or 230v/50 Hz AC operation. The voltage selector switch is accessible on the top panel. The line voltage connector contains an integral slow blow fuse (and a spare one).

7.2. INSIDE THE 4600T:REMOVING THE FRONT PANEL

During the installation procedure it may be necessary to remove the front panel to gain access to the programming switches located inside the unit. This can be accomplished in a few seconds by turning the quick release fasteners, located at the left and right hand sides of the front panel, several turns counter clockwise. The front panel assembly pulls off showing the three circuit modules that comprise the unit.

The module in the center is the LTC/VITC reader/character inserter for time code, and the one on the right is the LTC/VITC reader/character inserter for Keykode.

To replace the front panel assembly, slide it into place, and turn the quick release fasteners clockwise until they are firmly secured.

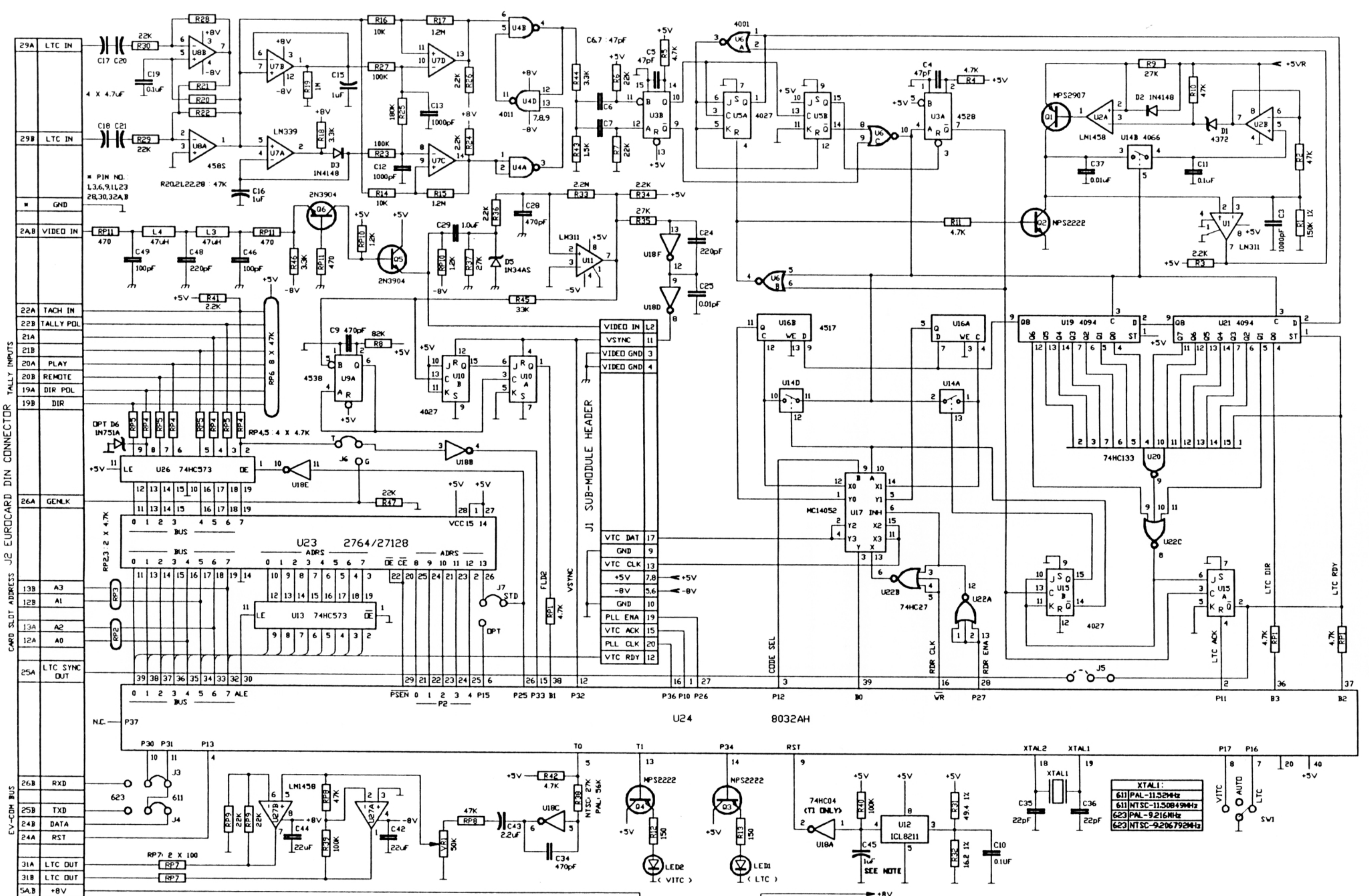
7.3. MOUNTING

The 4600T rackframe is equipped with rack mounting angles and fits into a standard 19 inch by 1 3/4 inch (483mm x 45mm) rack space. The mounting angles may be removed if rack mounting is not desired.

Selecting the Correct Mains Voltage

Power requirements are 115 or 230 volts AC at 50 or 60 Hz, switch selectable on the top cover. Before connecting the line power, be sure to select the proper line voltage. Also, check that the line fuse is rated for the correct value marked on the rear panel.

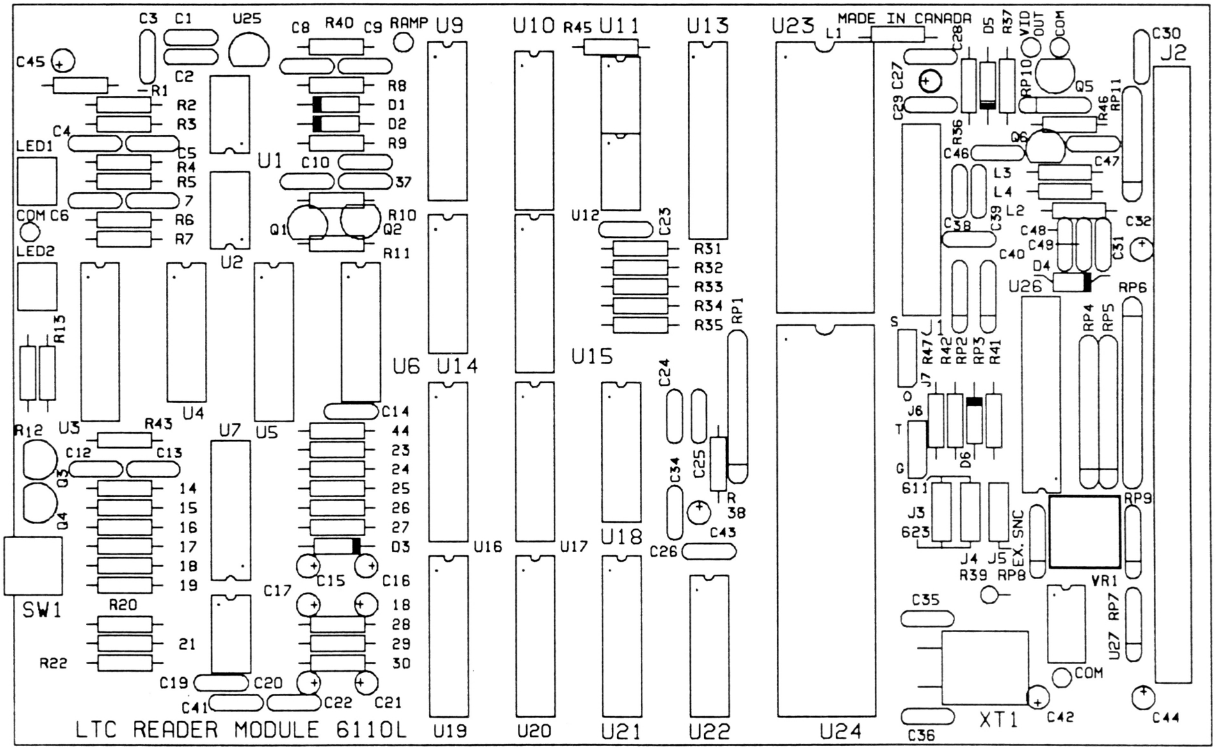
Never replace with a fuse of greater value.



NOTE: FOR G VERSION C45 IS OMITTED AND R40 IS 10K

EVERTZ MICROSYSTEMS LTD			
DATE: 11/11/85	CHK'D:	DRAWN BY: H.N.G.	
REV DATE: 9/21/92	FOR MODEL: 611/623		
TITLE: MAIN SCHMATIC		NO 6110-30L	

evertz	TITLE: 6110 LTC READER MODULE	LEVEL: 8-SCREEN	REV: L
		DATE: SEP 21/92	DWN: I. U.



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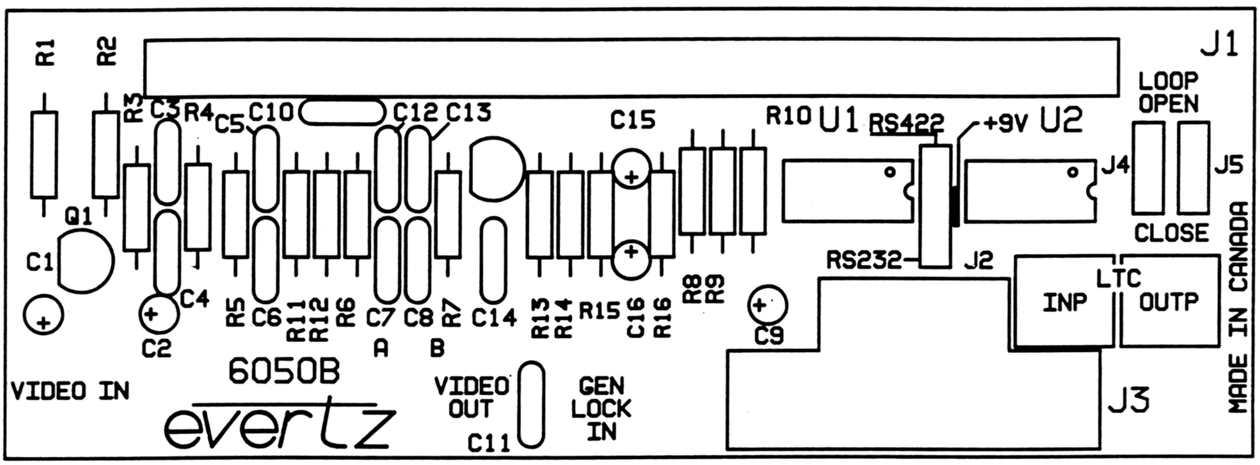
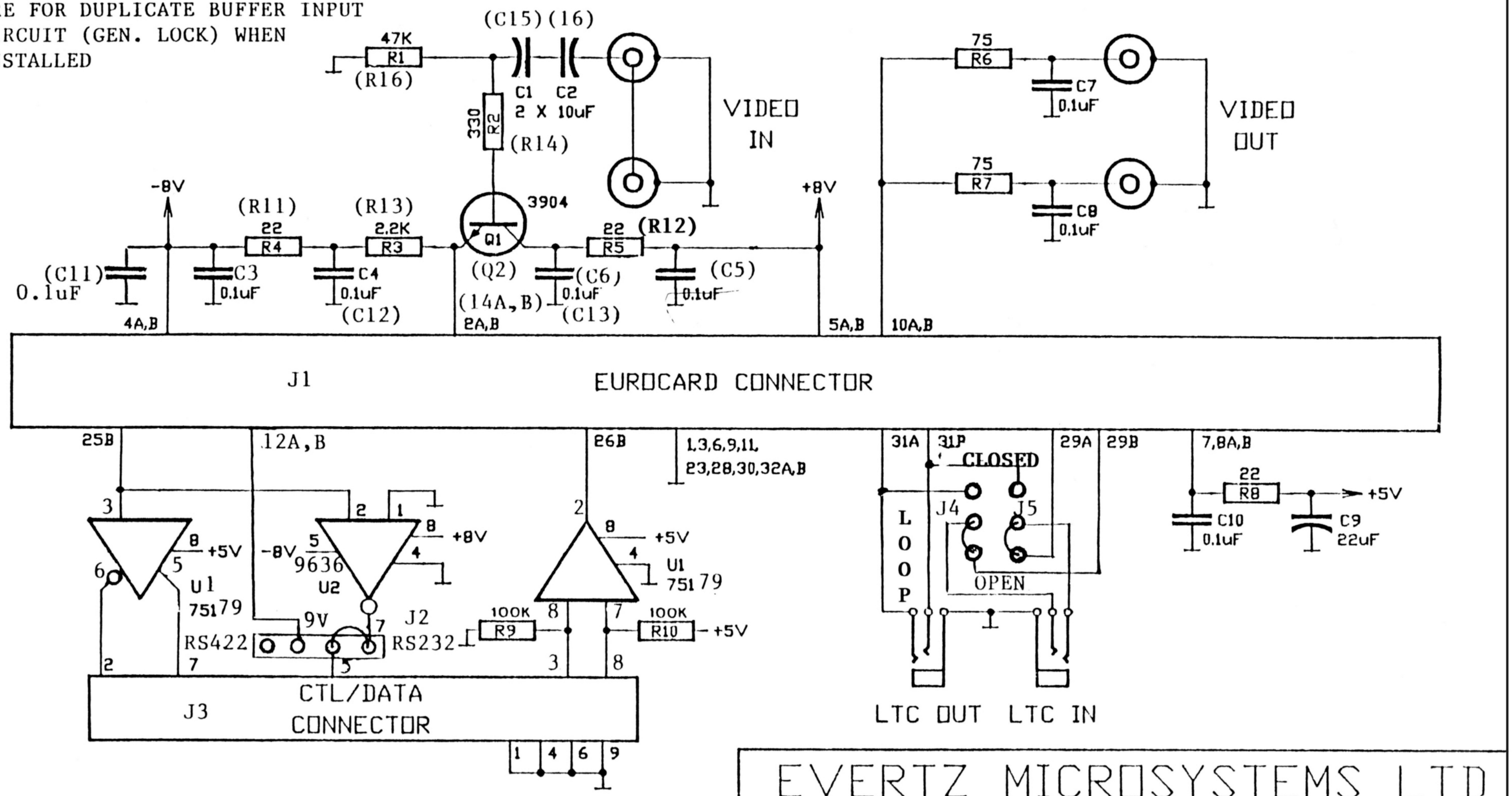
	DWG NO: 6110-80L	



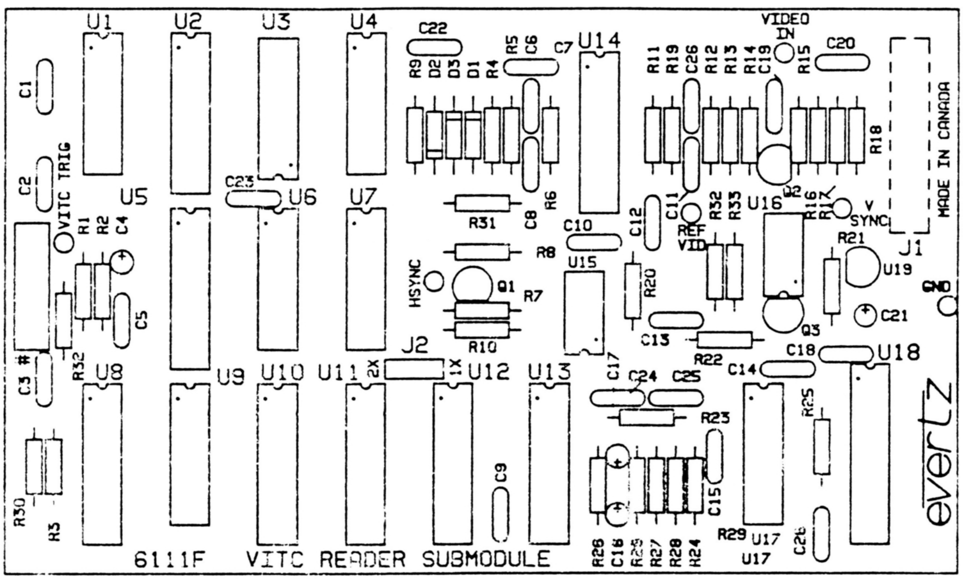
EVERTZ MICROSYSTEMS LTD	DATE :		REV DATE : JUN 17/87
TITLE MODEL 605 COMPONENT LAYOUT	REV: B	DWN : I.U.	DWG No. : 6050-80B

NOTE: NUMBERS SHOWN IN BRACKETS ARE FOR DUPLICATE BUFFER INPUT CIRCUIT (GEN. LOCK) WHEN INSTALLED



EVERTZ MICROSYSTEMS LTD		
DATE: JUNE 14/89	CHK'D:	DRAWN BY: I.U.
SCALE:	FOR MODEL: 605/6051 I/O MODULES	
TITLE: 605/6051 I/O MODULES		NO: S-6050-30B

evertz	TITLE: 6111 VTC RDR SUB-MODULE	LEVEL: 8-SCREEN	REV: F
		DATE: JAN 27/88	DWN: I.U.



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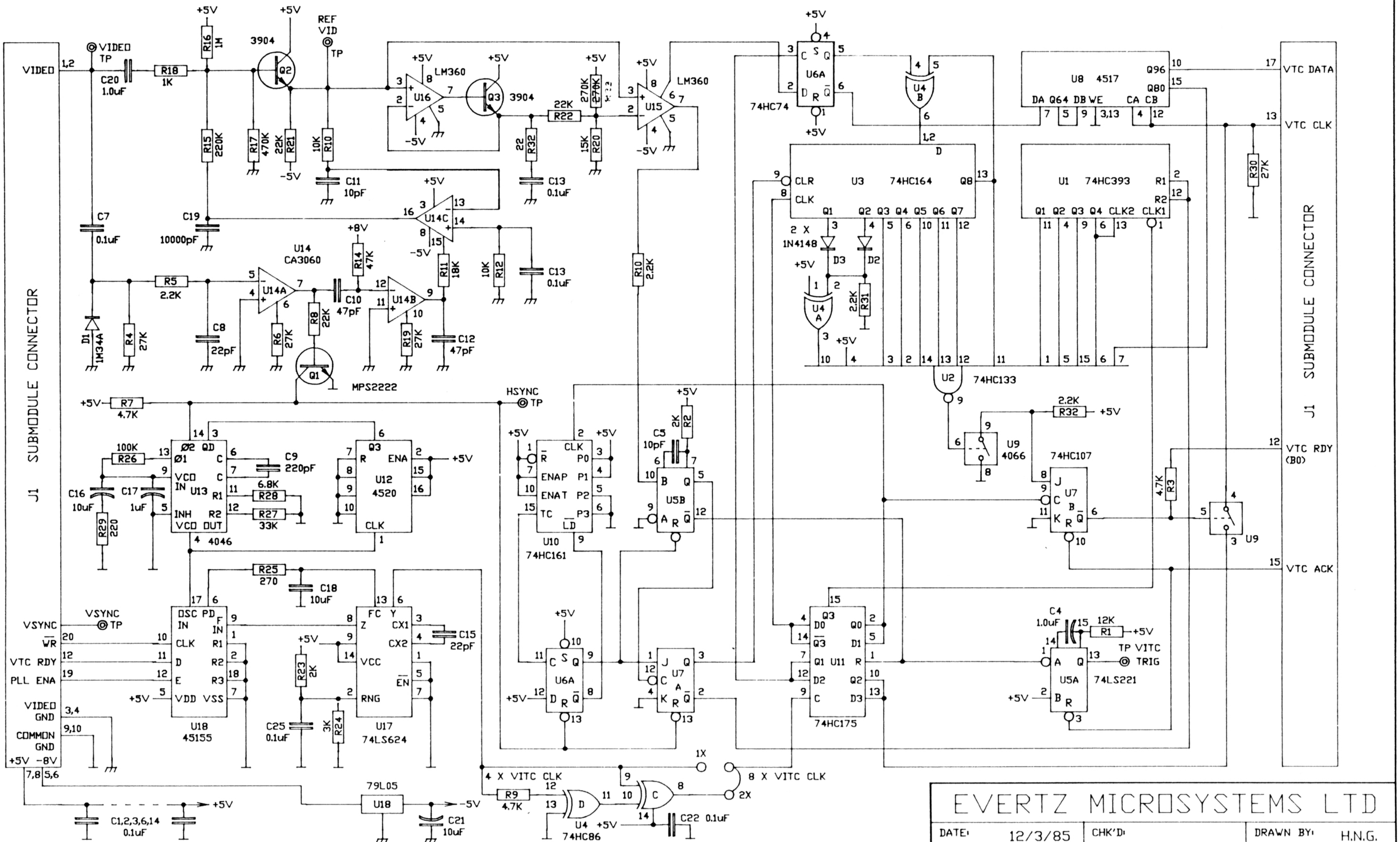
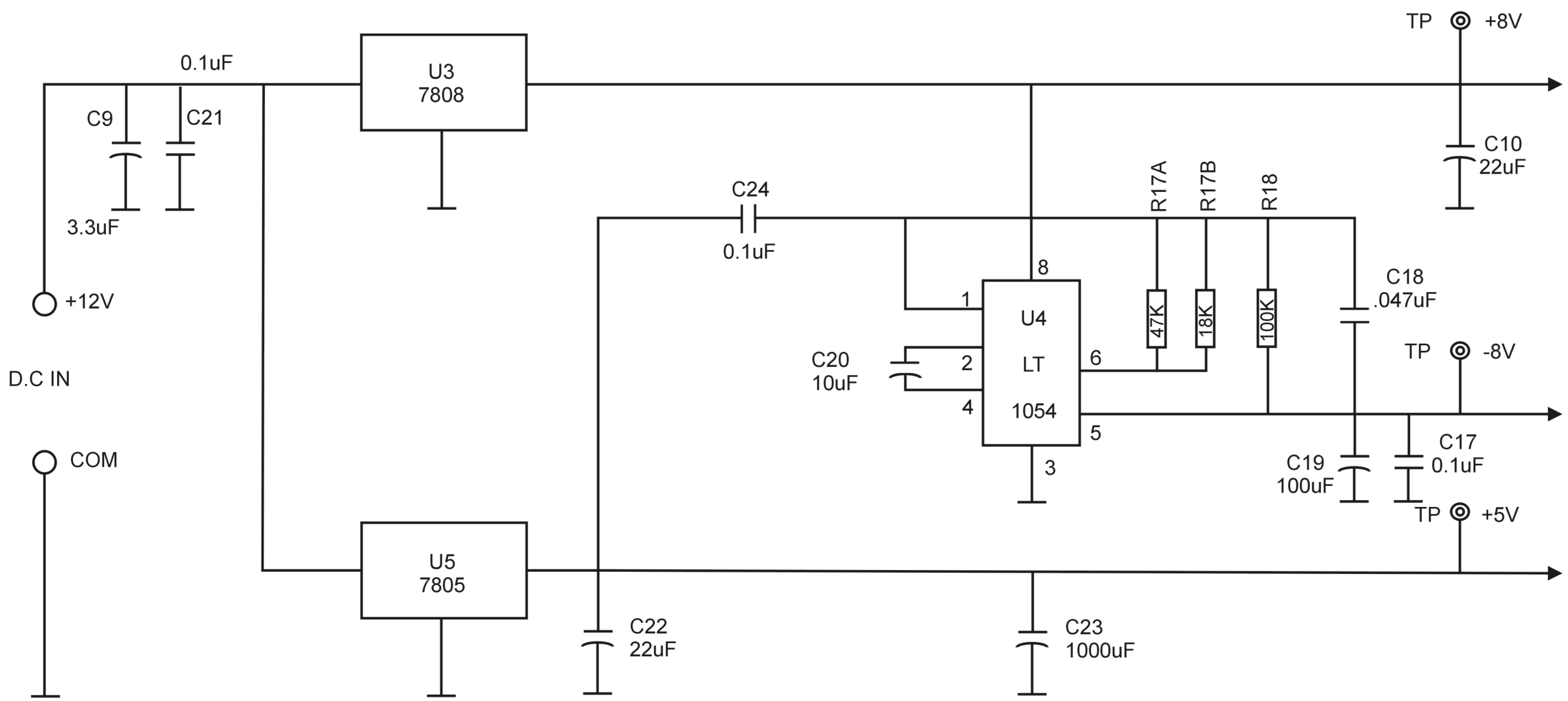
	DWG NO: 6111-80F	



EVERTZ MICROSYSTEMS LTD			
DATE: 12/3/85	CHK'D:	DRAWN BY: H.N.G.	
REV DATE: 5/31/88	FOR MODEL: 611/623		
TITLE: VITC READER SUBMODULE		NO: 6111-30F	



Evertz Microsystems LTD	
Date: June 14/89	DWN BY: IU
Rev Date:	Model: 6051 I/O Module
Title: Power Supply Section	No.: 6051-31A

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