Model 5550

Universal Film Data Decoder

Operating Instructions

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Rev. 1.0, August 1998

KeyKode is a trademark of Eastman Kodak

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	Preliminary issue	August 98

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Installing the Evertz Touchless Reader Head

The Evertz KeyKode touchless reader head system is capable of reading from 16mm and both edges of 35mm film. The touchless head is designed so that the film does not need to be in contact with the head for proper alignment to the film path. Adjusting the knurled knob on the top of the head sets the film path alignment.

Follow the instructions in the 5550 manual for mounting the bracket on your telecine. The mounting bracket is typically fastened to the collar of the last roller on the telecine before the film enters the gate. The reader head is fastened to the mounting bracket by a quick release thumbscrew.

When mounting the head on your telecine, the following procedure should be used to ensure that the head is properly aligned with the film path.

1. Using the hex key tool provided, loosen the binding screw. Hold the bracket with the alignment post facing towards you, and the adjusting screws towards the telecine deck plate.

2. **Rank Cintel Telecines:** Slide the large hole of the mounting bracket over the last roller before the gate and onto the shaft that supports the roller. You will have to position the bracket on the gate side of the roller. Tighten the binding screw finger tight to hold the bracket in place.

   BTS Telecines: Remove the last roller before the gate, from its mounting shaft. Slide the large hole of the mounting bracket over the shaft that supports the roller. Insert the adapter rings that were supplied with the mounting bracket between the roller shaft and the mounting bracket. Tighten the binding screw finger tight to hold the bracket and adapter rings in place. Re-install the roller onto the shaft.

3. Slip the reader head over the alignment pin on the mounting bracket and tighten the plastic thumbscrew to hold the head in place. The head should be positioned such that the film enters and leaves the reader head rollers at approximately the same angle.

4. Thread some negative film into the telecine as you would normally, making sure that it passes over the reader's rollers. If you will be using both 16mm and 35mm film, align the head with 16mm film, as the 16 mm alignment is more critical. Set the height of the mounting bracket so that the film is aligned approximately with the reader head rollers. Rotate the bracket such that the film does not touch the rollers and is midway between the LED housing and the Sensor Housing of the head. Once you are satisfied with the position, tighten the binding screw with the hex key tool supplied. Using a small screwdriver, turn the adjusting screws so that they make contact with the deck plate of the telecine. This ensures that the height can be guaranteed if the bracket needs to be moved in the future.

5. After connecting the head to the decoder unit, set the decoder to the correct film gauge. Put the film in play. You can turn the knurled knob, just below the hold down to adjust the height of the head with respect to the film path. If the decoder is not reading KeyKode, turn the knurled knob until it begins reading. Continue adjusting the height until it stops reading again, then turn the knob the other direction until you find the mid point of the reading range. If desired you can use the KK VALID READ display give you an indication of how well the KeyKode is reading. (Press SHIFT+DISPLAY several times until the you see this display)

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Evertz Technical Bulletin
Dated: 94/8/09
Revised: 94/8/09
Filename: B_INTENS.DOC
Product Software Version:
Engineer: GDW

Product: 5500 KeyKode Reader
Topic: LED Intensity Control

Comments: Tutorial

The Evertz model 5500 Key Code Reader controls the brightness of the illuminating LED in order to accommodate for the various exposure densities of the keykode on the film. The LED intensity control can be either manually controlled by the user or automatically controlled by the 5500.

Manual control can be selected by:

1) Use the SETUP key to enter the SETUP menu mode.
2) Use the up and down arrows to find the item that shows either "KK AUTO INTENS" or "KK MAN INTENS".
3) Use the left or right arrows to select "KK MAN INTENS".
4) Use the up and down arrows to find the item that shows something similar to "KK INTENS= 321".
5) Use the left and right arrows or the shift+left and shift+right arrows to alter the 3 digit intensity value. These values will range from a maximum of 999 to a lower limit which will probably be somewhere in the 100-250 range and will show as "KK INTENS =LIMIT". (See Note 1)
6) When the film is traveling over the pickup head, adjust the intensity setting until the 5500 beeps or blinks to indicate keykode is being read.
7) Press the display key until the display shows something similar to "BARCOD ASYM +20%", which stands for bar-code asymmetry. Adjust the KK INTENS value (as above) until the asymmetry approaches 0%. The LED intensity is now at the optimum value for reading this particular bar-code. Automatic control falls into two categories: 1) when the bar-code is illuminated enough to be readable but not necessarily optimal and 2) when the keykode is not readable at all (the 'hunt' range).

Whenever "KK AUTO INTENS" is selected (see above) the 5500 evaluates each bar-code that is read and adjusts the illumination for the next bar-code in an attempt to find the optimal intensity setting. This can be seen by watching the KK INTENS item of the SETUP menu. This value will wander around a small range as it adjusts for variations in film density, film position, film direction and film velocity.

This auto activity can be enhanced by:

1) Use the SHIFT+SETUP key to enter the Engineering SETUP menu mode.

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2) Use the up and down arrows to find the item that shows either "EXTENDED AUTO ON" or "EXTENDED AUTO OFF".

3) Use the left or right arrows to select "EXTENDED AUTO ON".

With extended auto turned on, the 5500 can recover the optimal setting over a wider range of intensities.

When the keykode is no longer recognizable the 5500 may use one of two 'hunt' routines to search for an illumination level which will produce readable bar-code.

The best 'hunt' routine is based on the biphase from the telecine to measure when a reasonable amount of film has gone by with no keykode reads (typically 2 bar-codes worth). Provided that "TACH HUNT ON" is selected in the Engineering SETUP menus, the 5500 will then adjust the intensity down to the next major zone in search of readable bar-code. The 5500 will cycle through the entire intensity range within approximately 6 to 8 feet of film and will continue to do so until bar-code is read.

When biphase is not available the next 'hunt' routine (edge hunt) will take over - provided the "EDGE HUNT ON" item is selected in the Engineering Setup menus. This routine counts the changes in the detectable image to 'guesstimate' when a reasonable amount of film has gone by with no keykode reads. The 5500 will then adjust the intensity down to the next major zone in search of readable bar-code. The biphase based 'tach hunt' is much more reliable than the 'edge hunt' routine.

Sometimes the 'hunt' routines can be activated inappropriately. The most obvious example is when the film spools off the reels. The tach wheel on the telecine may keep spinning and fool the 5500 into hunting for the correct intensity setting for the missing keykode.

Each 'hunt' routine can be disabled from the Engineering Setup menus while still leaving the main auto routine enabled. When "KK MAN INTENS" is selected all auto and hunt systems are disabled. When "KK AUTO INTENS" is selected the LED intensity can still be manually adjusted from the KK INTENS menu, however the auto or hunt routines may change this value whenever they are triggered. This feature can be used to manually adjust the intensity until a bar-code is read, whereupon the auto routines (if "KK AUTO INTENS" is selected) will take over and find the optimal setting.

The 5500 measures the combination of the density of air and the performance of each LED and sensor and sets the lower limit accordingly. This occurs once after a factory reset and appears as a "AIR READY N<>Y ?" prompt. If the right arrow is pressed, the 5500 will evaluate and remember each lower limit. This will normally have been done at the factory and this prompt will not be seen by the user.

---------- NOTES ----------

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Technical Bulletin

Issue Date: October 23, 1996
Revision Date July 18, 1997
Revision Date: August 10, 1998

Product: 4015, 4025, 5500, 5550, 5150

Subject: Question Marks in the KeyKode

Author: Alan Lambshead

If you are seeing a question mark in place of the film manufacturer or film type when reading and displaying KeyKode (see note 1), the reason is as follows. The film bar-code has a human readable component which shows the film manufacturer as a letter ('A','K' or 'F' for Agfa, Kodak and Fuji) and the film type as a letter (ex. 'J' for Kodak 5296 type film). The actual bar-code contains only numbers and so the manufacturer and type must be encoded as a numeric code. For clarity and the convenience of the user, Evertz has chosen to display these codes exactly as shown in the human readable portion of the film. We translate the codes into the alphabetic characters as established by each film manufacturer.

From time to time new film types with new codes are introduced by the film manufacturers. When these new films are read or displayed by existing Evertz software, they may show as a question mark ('?') in place of either the film manufacturer or film type or both. The rest of the bar-code is read and handled correctly. The actual codes are internally used by the software, and the KeyKode foot and frames are completely accurate. Only the display of the codes is affected.

Evertz takes great pains to ensure that the code translation tables are up to date and accurate and we endeavor to obtain the information from the film manufacturers in advance of the release of new film products. The film manufacturers and film products currently supported are shown below on the following chart.

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Manufacturer			Emulsion		Film Type
	Code	Letter	Code	Char	
Agfa	01	A	20	N	XT 100
	11		24	M	XTR 250
			83	F	XT 320
			84	S	XTS 400
Kodak	02	K	00	P	5600
	12		20	Y	5620 Prime Time
			22	E	5222/7222
			24	L	5224 (obsolete stock)
			31	H	5231/7231
			34	D	5234/7234
			43	A	5243/7243 (obsolete stock)
			44	V	5244/7244
			45	K	5245/7245
			46	I	5246/7246 Vision 250D
			47	B	5247/7247
			48	M	5248/7248
			49	O	5249 (obsolete stock)
			72	S	5272/7272
			74	Z	5274/7274 Vision 200T
			77	Q	5277/7277
			79	U	5279/7279
			87	W	5287/7287
			89	R	5289 Vision 800T
			92	N	7292 (obsolete stock)
			93	L	5293/7293
			94	G	5294/7294 (obsolete stock)
			95	F	5295
			96	J	5296/7296
			97	C	5297/7297
			98	T	5298/7298
Fuji	03	F	01	I	FCI (8501, 8601, 8701)
	13		02	I	FCI (8502, 8602, 8702)
			10	N	F-64 (obsolete stock 05/95)
			13	I	FCI (obsolete stock)
			14	N	F-500 (obsolete stock)
			20	N	F-64D (obsolete stock 05/95)
			21	N	F-64D (8521, 8621, 8721)
			22	N	F-64D (8522, 8622)
			30	N	F-125 (obsolete stock 05/95)
			31	N	F-125 (8531, 8631, 8731)
			32	N	F-125 (8532, 8632)
			50	N	F-250 (obsolete 05/95)
			51	N	F-250 (8551, 8651, 8751)
			60	N	F-250D (obsolete stock 05/95
			61	N	F-250D (8561, 8661, 8761)
			70	N	F-500 (8570, 8670, 8770)
			71	N	F-500 (obsolete stock)
			91	N	RP (8691 16 mm B/W neg)
			92	N	FG (8592 35mm B/W neg)

Film Manufacturers and Film Types (as of August 10, 1998)

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If the question marks show up when you work with a certain film product, check the above table to see if this code is currently supported. If it is, then you can obtain updated software for your Evertz product which will correct the problem. You may arrange this by requesting that the Software Upgrade Info form for your particular Evertz product be faxed to you. Alternatively, you may download the form from the relevant area of our BBS.

Complete the form with the required information and mark it as a request for a software upgrade. For clarity, add the words "KeyKode question mark fix for -- " and add the particular manufacturer and film type you are having troubles with. This will allow us to ensure that this particular code is in the current version of the software for your Evertz equipment. Fax the form back to us and arrange shipment and payment (if any) details with our office staff. (Sorry, you cannot upload the form to us.)

If it appears that you have stumbled across a new manufacturer code or type that is not in the above table, try to determine the codes being used. The Evertz 5500 KeyKode reader provides a display mode which will show the actual numeric manufacturer and type codes. Request or download the form as above. Mark the numeric codes on the form if this information is available. Fax the form back to us and contact Evertz to determine when the updated software will be available.

The most current software for many of our products is also available via our web page and from our BBS. This will provide a quicker update of your equipment and at no charge. The Evertz models 5500 and 5150 can be updated by via a serial link from a PC which is running our loader program. Other Evertz products such as the 4015 and 4025 require that you have a 'EPROM burner' which can handle Intel Hex files and can program EPROMS of type 27512 and smaller. The appropriate instructions are available in the relevant areas of our BBS.

1: KeyKode is a registered trademark of Kodak. This document uses KeyKode to refer to the film bar-code of all film manufacturers.

---------- NOTES ----------

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Evertz Technical Bulletin
Dated: 94/10/12
Revised: 94/10/12
Filename: B_RESET.DOC
Product Software Version:
Engineer: GDW

Product: 5500 Keykode Decoder
Topic: Factory Resets

Comments: Engineering Note

The 5500 Keykode Reader may be reset to factory default parameters by the following procedure.

1. Make sure that the reader head is connected to the 5500.
2. Turn DEBUG MODE ON. Use SHIFT + FORMAT keys to enter the engineering setup menus. Use the DOWN arrow key until the display shows "**debug mode on**" or "**debug mode off**". Use the left or right arrow keys to select "**debug mode on**".
3.
4. Find the NOVRAM debug display. Use the SHIFT + DISPLAY keys to cycle through the various displays until something resembling "00n 040001FF0000" is shown. The actual numerical values are unimportant but there must be a lower case letter "n" as the third character.
5. Trigger the factory reset. Press the SHIFT + UP ARROW keys to start the factory reset. The message "!COMPLETE RESET!" will be displayed briefly and then the 5500 will start into the normal power up sequence.
6. Evaluate the new limits. After completing the power up sequence of events the display will show "AIR READY N<>Y ?". Check that the reader head has no film or obstructions under the LED's. Use the right arrow key to trigger the evaluation of the LED's and sensors. The software will rapidly cycle through each sensor and determine a practical lower limit for the LED intensity. If you choose to skip this test (by using the left arrow key) the lower limit will be set to 000 and the "AIR READY..." message will be displayed on every power up. The lower limit must be properly set to prevent the auto intensity routines from getting stuck at inappropriately low values.

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Evertz Technical Bulletin
Dated: 94/9/19
Revised: 94/9/19
Filename: B_ENGMNU.DOC
Product Software Version:
Engineer: GDW

Product: 5500 KeyKode Reader
Topic: Engineering Menu Items

Comments: Addendum to Manual

The Evertz model 5500 KeyKode Reader has a number of Engineering controls which are accessed by pressing SHIFT+SETUP. The following gives a brief description of the engineering controls which are currently available.

1. **log pos'n n< >y**
   If the right arrow is pressed, corresponding to the "yes" option, the 5500 will transmit the current keykode number out the serial port. This can be used to verify the communications. The 5500 will flash the "comm" light. If the 5500 is correctly connected to an Evertz model 4015 or 4025 Film footage encoder, there will be a corresponding flash of the keykode light on the 4015 or 4025. If the 5500 is connected to a computer, a correct connection should result in the reception of an ASCII string (example: "j0296123456123400") followed by a carriage return and linefeed characters.

2. **edge hunt on** **edge hunt off**
   This item controls how the automatic intensity system will operate. It is described in more detail in Evertz Technical Bulletin B_INTENS.DOC.

3. **tach hunt on** **tach hunt off**
   This item controls how the automatic intensity system will operate. It is described in more detail in Evertz Technical Bulletin B_INTENS.DOC.

4. **extended auto on** **extended auto off**
   This item controls how the automatic intensity system will operate. It is described in more detail in Evertz Technical Bulletin B_INTENS.DOC.

5. **biph: 10 p/frm** **1 p/frm, 2 p/frm, 5 p/frm**
   The left and right arrows select which biphase frame rate (in cycles per frame) will be used for the biphase inputs. See section 2.3.2 of the 5500 manual regarding the biphase inputs.

6. **baud: 9600 bps** **baud: 38400 bps**
   This item controls the baud rate at which the 5500 communicates through the serial port. Most connecting devices (such as the Evertz 4015 and 4025) expect a 9600 baud rate. The 5500 is preset to 7 bits, even parity, regardless of the baud rate. The 38400 baud rate may be used when loading new software from a computer into the 5500. This will result in a faster software update.

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7. **kk head compat'l** **ev head compat'l**
This item sets the 5500 for compatibility with the keykode pickup head. The original Evertz pickup heads were designated EV35 and EV16 etc., and were commonly used with the RIM DIGISYNC. The new pickup heads are designated KK35 and KK16 etc. These heads typically have fine slits cut into the body and were designed to work with the 5500. Use the right and left arrows to select the operating mode which corresponds to your particular pickup heads.

8. **debug mode off** **debug mode on**
When debug mode is on, several debug displays are added to the extended displays. These are listed in figure 3-4, in the manual. Debug mode should be left off unless you are otherwise directed by Evertz staff.

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Figures

1. OVERVIEW

Latent edge numbers have been present on motion picture negative film stocks for many years in human readable form. The edge numbering format has been specific to various manufacturers and film stock types. In 1988, Eastman Kodak, in conjunction with the Society of Motion Picture and Television Engineers devised a new edge print that not only standardizes the numbering format, but is also printed as a machine readable barcode. Kodak calls this numbering system KeyKode. Other film manufacturers have adopted this numbering standard and have each given their version a proprietary name. For the sake of clarity we shall refer to all of these implementations as KeyKode.

The Evertz Universal Film Data Decoder system consists of a bar code reader pickup head, and a decoder device. The pickup head transforms the optical dark and light bar code into electronic signals and is designed to mount on the telecine feed roller just before the film enters the gate. The decoder receives these electronic signals from the pickup head, and interprets them into the actual numeric equivalent of the barcode.

The decoder uses sophisticated algorithms to track varying film densities and distortions in the film barcodes. Reader sensitivity is automatically adjusted to give optimal reading.

The serial communications port allows it to communicate with remote devices such as Evertz Film Footage Encoder, or other computer device.

The reader heads are available in four versions; one for ARRI, one for 35mm film, one for 16mm film and a combination head that reads KeyKode from either 16mm or 35mm film. The reader heads are attached to the telecine mounting bracket

The decoder uses the latest state of the art microcomputer technology to provide the ultimate in functionality and flexibility. Electrically erasable read-only program memory allows the decoder to be easily reprogrammed when updated firmware versions become available. Updates are shipped to the user on diskette or may be downloaded from our Customer Support Bulletin Board system. A program is run on a personal computer to upload the new firmware to the keykode decoder.

The following sections describe the installation and operation of the Universal Film Data Decoder system. In addition to the physical installation, there are calibration procedures for the KeyKode decoder (Model 5550). If you are using the Universal Film Data Decoder with an Evertz Film Footage Encoder, there are calibration procedures required in order for the Film Footage Encoder to generate accurate KeyKode displays. Consult the Film Footage Encoder manual for your for specific information.

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2. INSTALLING THE EVERTZ UNIVERSAL FILM DATA DECODER SYSTEM

2.1. MOUNTING

The 5550 Universal Film Data Decoder 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.

2.2. POWER REQUIREMENTS

2.2.1. Selecting the Correct Mains Voltage

Power requirements are 115 or 230 volts AC at 50 or 60 Hz, switch selectable on the rear panel. Power should be applied by connecting a 3 wire grounding type power supply cord to the power entry module on the rear panel. The power cord should be minimum 18 AWG wire size, type SVT marked VW-1, maximum 2.5 m in length.

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.

The power entry module combines a standard IEC 320 power inlet connector, voltage selector switch, two 5 x 20 mm fuse holders (one active, one spare) and an EMI line filter.

To change the mains voltage setting, open the cover of the power entry module using a small screwdriver. Remove the drum selector switch, and re-insert it so that the desired voltage is visible through the opening on the mains connector cover. Check that the correct fuse is in use as shown below.

2.2.2. Changing the Fuse

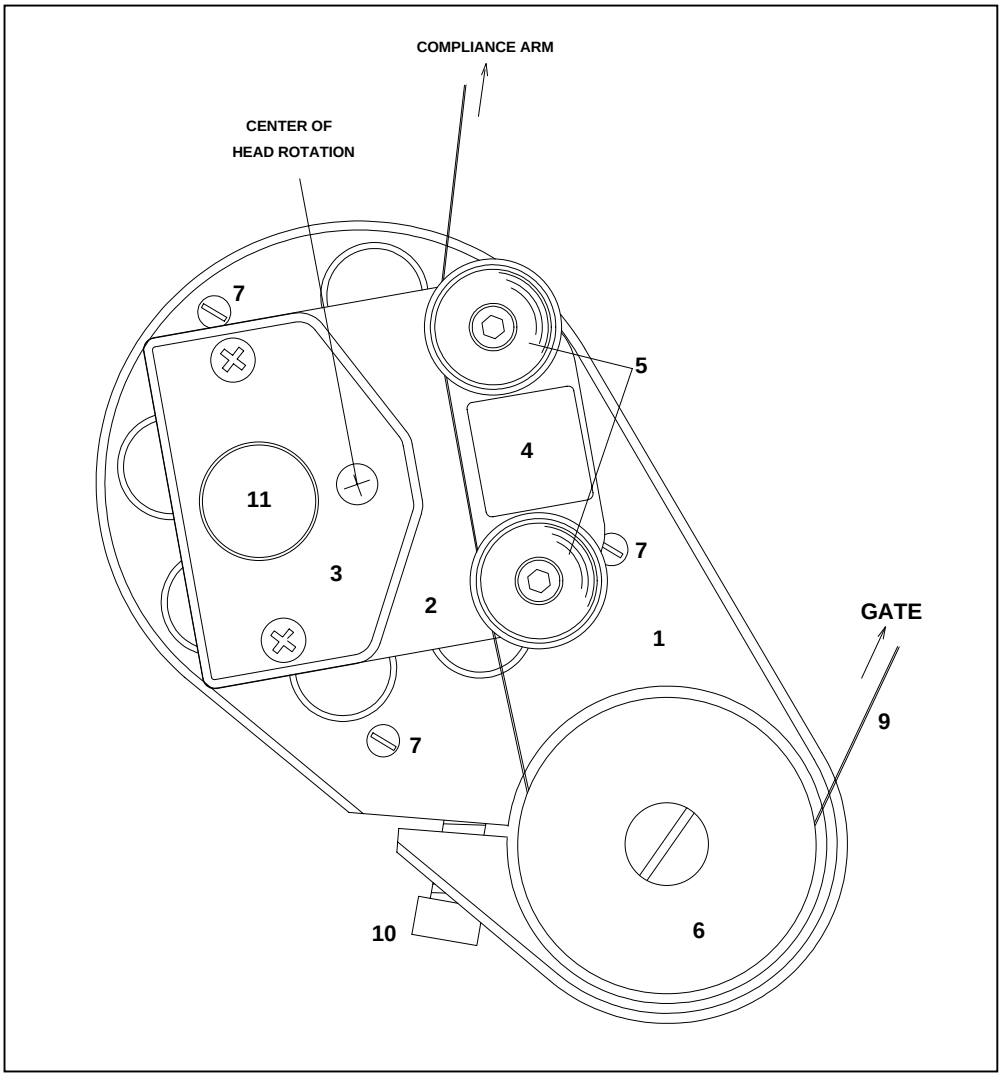
The fuse holder is located inside the power entry module. To change the fuse, open the cover of the power entry module using a small screwdriver. The fuse holder on the bottom contains the active fuse. The one at the top contains a spare fuse. Pull the bottom fuse holder out and place a fuse of the correct value in it. Use slo blo (time delay) 5 x 20 mm fuses rated for 250 Volts with the following current ratings:

For 115 Volt operation	250 mA
For 230 Volt operation	125 mA

Make sure that the arrow is pointing up when you replace the fuse holder. Close the door on the power entry module and connect the mains voltage.

Never replace with a fuse of greater value.

2.3. MOUNTING THE READER HEAD



1	Mounting Bracket	6	Rank Fixed Roller
2	Reader Head Base	7	Adjusting Screw
3	Main Housing	8	Telecine Deck Plate
4	LED Housing	9	Film Path
5	Film Rollers	10	Binding Screw
		11	Quick Release Screw

Figure 2-1: Reader Head and Bracket - Top View

The Evertz KeyKode combination reader head system is capable of reading from 16mm and both edges of 35mm film. Single film gauge versions of the head are available for those who only deal with one film gauge. The floating head is designed so that it is self aligning to the film path. This is especially critical in 16mm applications. All that is necessary is to locate the bracket so the film passes approximately over the rollers. The head then follows the exact film motion, finding the optimal position for KeyKode reading.

The mounting bracket is typically fastened to the collar of the last roller on the telecine before the film enters the gate. The reader head is fastened to the mounting bracket by a quick release thumb screw. The head mounts over an alignment pin on the bracket. The angle of the head can be adjusted over almost 180 degrees, and should be set so that the film enters and leaves the head at about the same angle. A set screw on the side of the bracket can secure the angle of the head should you need to remove the head. Removing the head may be accomplished by merely loosening the thumb screw and disconnecting the cable. Figure 2-1 shows the proper installation of the reader head assembly onto the telecine feed roller collar. Figure 2-2 shows a side view of the reader head and bracket, and the film path.

When mounting the head on your telecine, the following procedure should be used to ensure that the head does not interfere with the film path.

1. Using the hex key tool provided, loosen the binding screw (10) Hold the bracket with the alignment post facing towards you, and the adjusting screws towards the telecine deck plate.

2. **Rank Cintel Telecines:** Slide the large hole of the mounting bracket over the last roller before the gate (6) and onto the shaft that supports the roller. If you are mounting the model UV head, you will have to position the bracket on the gate side of the roller (6). Tighten the binding screw finger tight to hold the bracket in place.

   BTS Telecines: Remove the last roller before the gate, from its mounting shaft. Slide the large hole of the mounting bracket over the shaft that supports the roller. Insert the adapter rings that were supplied with the mounting bracket between the roller shaft and the mounting bracket. Tighten the binding screw finger tight to hold the bracket and adapter rings in place. Re-install the roller onto the shaft.

3. Slip the reader head over the alignment pin on the mounting bracket and tighten the thumbscrew (11) to hold the head in place. The head should be positioned such that the film enters and leaves the reader head rollers at approximately the same angle.

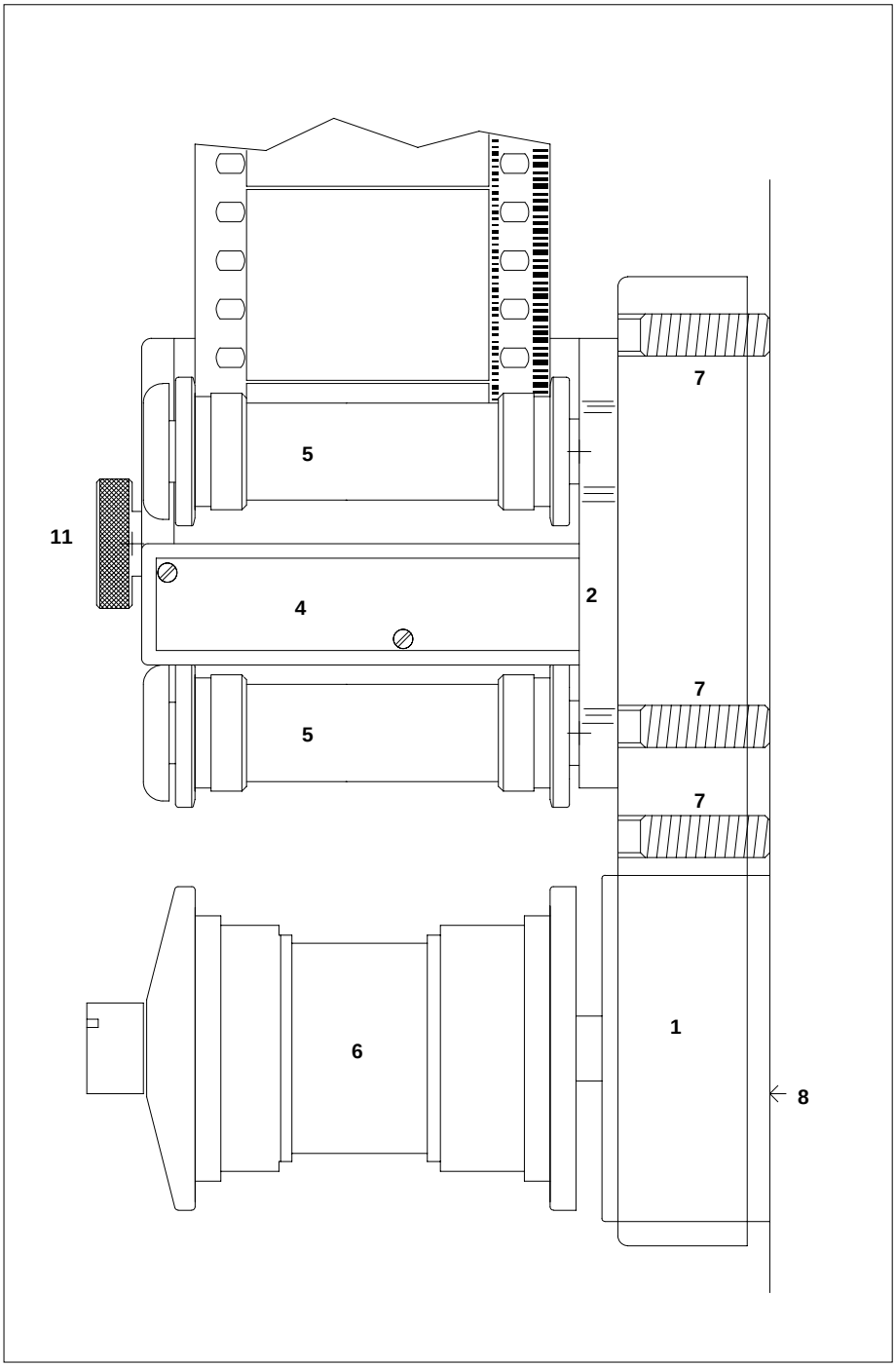


Figure 2-2: Reader Head and Bracket - Side View

4. Thread some film into the telecine as you would normally, making sure that it passes over the reader's rollers. Set the height of the mounting bracket so that the film is running smoothly through the reader head rollers. Rotate the bracket such that the reader head rollers deflect the film by 3 or 4 mm.

When installing the head take care that the film is not deflected too much as it goes through the head. The film may touch the fixed part of the head when tension in not uniform. Too much deflection of the film may also degrade the reading performance.

5. Shuttle the film in both directions. You may find it necessary to modify either the rotational angle or the height of the reader head. Once you are satisfied with the position, tighten the binding screw with the hex key tool supplied. Using a small screwdriver, turn the adjusting screws (7) so that they make contact with the deck plate of the telecine. This ensures that the height can be guaranteed if the bracket needs to be moved in the future.

2.3.1. Connecting the Reader Head to the Decoder Electronics (Model UV-KK, UV-KK/AA, UV-KK/AR, and UV-3 Heads)

A 15 foot long extender cable is supplied to connect the universal reader head to the model 5550 Universal Film Data Decoder. If you wish to mount the console more than 10 feet from the telecine, 50 foot Extender cables may be purchased. The KeyKode Decoder may be located up to a maximum distance of 100 feet from the reader head. Plug the extender cable into the connector on the reader head cable. Connect the other end of the extender cable to the 15 pin D connector on the rear of the decoder electronics.

2.3.2. Connecting the Reader Head to the Decoder Electronics (Model EV, KK, KR, and KD Heads)

A 10 foot long extender cable is supplied to connect the universal reader head to the model 5550 Universal Film Data Decoder. If you wish to mount the console more than 10 feet from the telecine, 50 foot Extender cables may be purchased. The KeyKode Decoder may be located up to a maximum distance of 100 feet from the reader head. Plug the extender cable into the connector on the reader head cable. Connect the other end of the extender cable to the 8 pin mini DIN HEAD connector on the rear of the decoder electronics.

2.3.3. Connecting Biphase from the Telecine

Although the KeyKode reader system can operate without biphase, the best performance of the automatic reader intensity algorithms will be obtained when biphase is connected. With the appropriate settings in the keykode decoder, you can track changes in film density over the complete range, making the operation of the reader system fully automatic.

The 5550 is fitted with a nine pin female 'D' connector (**PARALLEL I/O)** for connection to the telecine biphase tach. The pin connections are shown in Figure 2-3 below.

Pin	Name	Description
5	**TYPE**	↓ Negative ↑ Print
9		
4		
8	**GAUGE**	↓ 35 mm ↑ 16 mm
3	**BIPH 1**	Leading Bi-Phase
7	**BIPH 2**	Lagging Bi-Phase
2		
6	**GND**	Ground
1		

Figure 2-3: Parallel I/O Connector Pinout

The BPH1 and BPH2 inputs (pins 3 & 7 respectively) should be connected to bi-phase quadrature tach pulses from the telecine. The 5550 is factory set to accept biphase at a rate of 10 pulses per film frame. To select another rate use the Engineering Setup menu.

To enter the Engineering SETUP menu press the **SHIFT + SETUP** keys. Press the down arrow key (🡻) until you have selected the **`biph`** menu item. If the biphase rate is incorrect, press the ➔ key to select other rates. When you have made the desired change, press the **SETUP** key to return to the normal display mode.

In order for the 5550 to use the fully automatic reader intensity features you must select **`kk auto intens`** in the SETUP and **`tach hunt on`** in the Engineering SETUP menus. (See section 3.1.4 for more information about the SETUP menus).

2.4. CONNECTING THE KEYKODE DECODER TO THE FILM FOOTAGE ENCODER

A 9 pin D connector on the rear of the KeyKode decoder labeled **SERIAL I/O** provides RS-232 serial data communications with the 4025 or 4025TR Film Footage Encoder. Use the cable supplied (Part No. WA-C67) or wire a longer cable if required. Wiring information for the WA-C67 cable is as shown in Figure 2-4. Maximum suggested length of this cable is 50 feet, although longer cables may be used if the wire size is made larger. Care should be taken to ensure that shielded cable is used, and that the shield is connected through. Connect this cable to the SERIAL I/O connector on the rear of the 5550. Connect the other end of the cable to the AUX I/O connector on the 4025 or 4025TR.

4015/4025 End Male DB 9 Description	Pin No		Pin No	KeyKode Decoder End Male DB 9 Description
Shield		----------		Shield
	2			
	3			
	4			
	5			
Gnd	6	----------	5	Gnd
	7			
RxD	8	----------	2	TxD
	9			

Figure 2-4: 4015 or 4025 to KeyKode Decoder Cable

2.5. FIRST TIME SET-UP

After applying power to the Decoder unit, check to make sure that you are using the correct sensor for the film type you are using by pressing the **MODE** key. The active sensor will be shown in the front panel display.

SENSOR =35mm	lower 35mm KeyKode sensor is active
SENSOR =35mm REV	upper 35mm KeyKode sensor is active (this is used when the film was rewound before loading it into the camera)
SENSOR =16mm	16mm KeyKode sensor is active

To select a different sensor, press the **SHIFT + MODE** keys until the desired sensor is displayed. Press the **DISPLAY** key to return to the normal KeyKode display.

In addition you need to select whether you are reading from negative or print film stock. This is accomplished using the SETUP menu. To enter the front panel SETUP menus, press the **SETUP** key. Press the down arrow key (🡻) until you have selected the **type** menu item. If the film type is incorrect, press the ➔ key to select other film type. When you have made the desired change, press the **SETUP** key to return to the normal display mode. (See sections 3.2 and 3.3 for more information about the SETUP menu system).

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3. HOW TO OPERATE THE FILM DATA DECODER

The 5550 Universal Film Data Decoder is an advanced data decoder that decodes both KeyKode and film time codes in either of ARRI or Matrix format when connected to the universal reader head. Some models of the universal header head are not fitted for either ARRI or Matrix time code so some of the menus and displays may be different, depending on the model of the head connected. In addition the earlier models of KeyKode reader heads such as the KK, KR and KLA heads can be connected to the 5550 decoder for KeyKode only applications.

3.1. AN OVERVIEW OF KEY AND DISPLAY FUNCTIONS

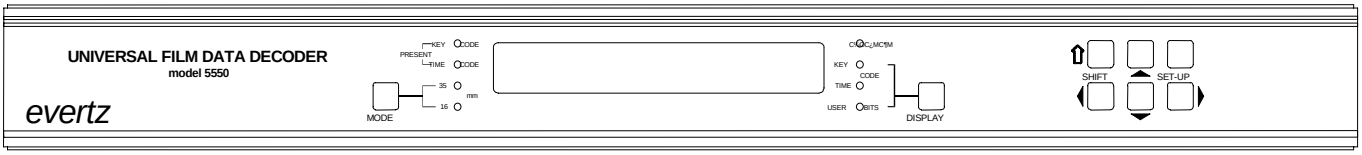

Figure 3-1: Front Panel Layout

The display area consists of a 16 digit alphanumeric display, 8 LED status indicators and an 8 pushbutton keypad.

The keypad is used to control the front panel menu system, and to provide a global Keyer disable. When the **SHIFT** key is held down, the meanings of some of the keys are modified, gaining quick access to a wider variety of functions. (Throughout this manual **SHIFT +** indicates that you should hold down the **SHIFT** key while pressing the second key.)

A front panel setup menu provides a quick and simple method of configuring the Film Data Decoder for your application.

Sections 3.2 and 3.3 give detailed information on the specific operations required to control the Film Data Decoder.

3.1.1. The Setup Pushbutton Group

The format key group consists of the **SETUP** and **←, →, ↑, ↓** keys and is used to navigate the front panel programming menu system.

Press the **SETUP** key to enter the setup mode. Press the **SHIFT + SETUP** key to enter the engineering setup mode. The Engineering Setup Mode provides additional configuration items that should only be used by qualified engineering personnel. The Film Data Decoder will automatically return to the operating mode if no key presses are made for several seconds.

↑ ↓ When in either of the setup modes, the ↑ & ↓ arrow keys are used to move up or down the main items in the menu system. The current menu item choice is also shown.

← → When in either of the setup modes the ← & → keys are used to show the choices for the current item in the menu system.

SETUP Exits the setup mode or the Engineering setup mode and returns to operating mode.

3.1.2. An Overview of the Status Indicators

There are 8 status indicators located on the front panel that show operational status of the Film Data Decoder at a glance.

Two code present LEDs indicate when code is being recovered from the film.

KEYKODE Blinks each time a barcode is successfully read.

TIMECODE Indicates that film timecode is being read.

Two LEDs indicate which KeyKode sensor is active.

35 MM Indicates that one of the 35 mm KeyKode sensors is active.

16 MM Indicates that the 16 mm KeyKode sensor is active.

One LED indicates when the serial communications port is active.

COMM Blinks each time a decoded barcode is sent out the serial communications port.

Three LEDs indicate what is being displayed on the front panel

KEYCODE Indicates that KeyKode is being displayed

TIMECODE Indicates that Film timecode is being displayed

USERBITS Indicates that USER BITS from the film timecode is being displayed

3.1.3. Front Panel Displays

The **DISPLAY** key is used to select what data is being displayed on the front panel. Press it repeatedly to select another display. Press the **SHIFT + DISPLAY** key to access an extended list of displays. Pressing **DISPLAY** while showing an extended display will revert to the KeyKode display. The display items relating to time code (marked with an asterisk *) are only available when a time code capable head is connected and the respective time code mode is selected.

At this time the normal displays available are:

KJ123456 6789+00	KeyKode display (KeyKode LED is ON)
TM = 12:45:30:00	Film Timecode display (Timecode LED is ON) *
UB = 12 34 56 78	Film Timecode User Bits (User Bits LED is ON) *
UB2= 12 34 56 78	Film Timecode Auxiliary User Bits group 2 (User Bits LED is ON) *
UB3= 12 34 56 78	Film Timecode Auxiliary User Bits group 3 (User Bits LED is ON) *
MFR= 02 TYPE= 96	KeyKode manufacturer and Film type codes

Figure 3-2: Normal Displays

At this time the extended displays available are:

p: UV55DB 980626	EPROM Firmware version
F: UV55D4 980812	Flash Firmware version
KK ASYM'Y = +00%	KeyKode bar/space asymmetry
TC ASYM'Y = +00%	Time code bar/space or matrix dot asymmetry *
TC VAL READ= 00%	Time code valid reads *
MATRIX POS'N= 00	Time code matrix position *
MATRIX SIZE = 00	Time code matrix size *
MATRIX LEN = 00	Time code matrix length *
KK16 SENSOR= 210	KeyKode sensor value with no film loaded
TC16 SENSOR= 210	Time code sensor value with no film loaded

Figure 3-3: Extended Displays

When DEBUG mode is ON (see Engineering Setup Menu) several debug displays are added to the extended displays.

SPEED = 000 FR/S	Measured speed of the film
KKERRORS = 00	The number of KeyKode reading errors
KK DIR = FWD	KeyKode direction
BIPHASE = 00000	Biphase hardware counter
ERR CODE = NONE	Error message
TC MAX/MIN=00/00	Matrix TC peak levels
MATRIX ABASE= 70	Matrix TC auto base level
MATRIX STOP = FE	Matrix TC end of Matrix position
MATRIX DBUGO= 00	Matrix TC Debug test signal outputs
HEAD = UV-3 -R1	Head Type and Revision
# = 000000000000	UV head serial number
INPUTS = HHHHHH	State of remote control inputs
DIP = 00000000	DIP switch settings
0000000000000000	KeyKode variables display
00r 0000000000000	RAM debug display
0000x 00000000000	XRAM debug display
00n 0000000000000	NOVRAM debug display

Figure 3-4: Debug Displays

3.1.4. An Overview of the Front Panel Setup Menu

The key to the operational flexibility of the Film Data Decoder lies in the front panel setup menu system. The menu system uses the 16 digit alphanumeric display and provides a quick, intuitive method of configuring Film Data Decoder, guiding you to the correct setup for your application. The five keys in the setup key group (**SETUP** ← → ↑ ↓) are used to cycle through the various items on the programming menu.

The Film Data Decoder menu system consists of a main menu with two or more choices for each menu item. Figure 3-5 is an overview of the front panel menu system, and shows all the menu items and their choices. In addition to the regular **SETUP** items there are some additional Engineering setup items available. Only qualified engineering personnel should use these items. Figure 3-6 is an overview of the engineering menu system, and shows all the menu items and their choices. The items shown in **BOLD UPPERCASE** indicated the menu items you will see when pressing the ↑ or ↓ keys. The items shown in **bold lowercase** are the menu choices for each item that you can select by pressing the ← or → keys.

TYPE:
type: negative **type: print**
KK INTENSITY: 487
KK INTENS:
kk intens: man **kk intens: auto** **kk intens: extd** **kk intens: hunt**
TC READER:
tc reader: off **tc reader: arri** **tc reader: matrix**
TC INTENSITY: 487*
TC INTENS:*
tc intens: man* **tc intens: auto***

Figure 3-5: SETUP Menu Items

To enter the front panel setup menus, press the **SETUP** key. Press the **SHIFT + SETUP** keys to enter the Engineering setup mode. The front panel display will show the last menu item that you had displayed.

The two vertical arrow keys (↑, ↓) allow you to move vertically within the menu tree. When you have selected the desired menu item, press the → key to select other choices for that item. The choice shown is always active. To return to a previous choice press the ← key. If the menu item has a numeric value you can use the ← key to decrease the value or the → key to increase the value.

The SETUP menu items are shown in Figure 3-5. Items marked with an asterisk (*) are available when a time code capable head is connected and the TC reader mode is set to either ARRI or Matrix.

When you have made all the desired changes, press the **SETUP** key to return to the normal display mode.

The Engineering SETUP menu items are shown in Figure 3-6.

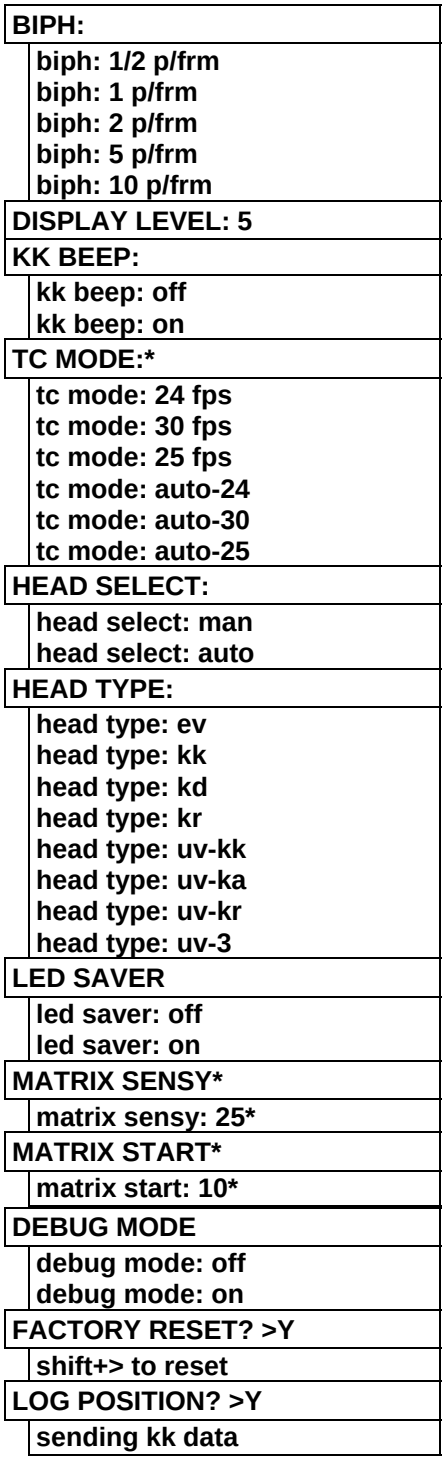

Figure 3-6: Engineering SETUP Menu Items

3.2. PROGRAMMING THE BASIC OPERATIONAL MODES - SETUP MENU

The setup menu is used to configure the basic operational modes of the 5550 such as selecting negative or print film stock, setting the intensity levels, etc. The following sections give detailed descriptions of each of the menu items.

3.2.1. Selecting the Film Type

TYPE
negative
print

type used to select whether you are using negative or print film. This setting allows the 5550 to adjust for the image reversal on the film.

Select **negative** if you are using camera negative film.

Select **print** if you are using print film.

3.2.2. Controlling the Intensity of the KeyKode Sensor Light Source

The model 5550 controls the brightness of the illuminating LED in order to accommodate for the various exposure densities of the keykode on the film. The LED intensity control can be either manually controlled by the user or automatically controlled by the 5550. There are two menu items that are used to control the LED intensity.

KK INTENSITY: 487

kk intensity Is used to display/set the intensity of the KeyKode light source. Normally you will require a higher intensity for darker exposures, and a lower intensity for lighter exposures. The value shown ranges from a lower limit (below which the sensor will not detect anything) and 999.

KK INTENS:
kk intens: man
kk intens: auto
kk intens: extd
kk intens: hunt

kk intens Is used to select whether you want to set the Keykode light source intensity manually or have the 5550 use one of its automatic intensity modes. When you are in one of the three automatic intensity modes, this menu item will show the current value of the Keykode intensity.

Select **man** to adjust the intensity manually.

Select **auto** for the normal automatic mode. In this mode the 5550 is constantly adjusting the LED intensity to achieve optimal reading.

Select **extd** for the extended automatic mode. In extended auto mode, the 5550 can recover the optimal setting over a wider range of intensities.

Select **hunt** for the hunt mode. In hunt mode, the 5550 will search through its entire intensity range when it can not recover any keykode.

In order to use hunt mode the biphase tach from the telecine must be connected and the biphase rate setting of the Engineering menu must be set to the correct number of pulses per film frame.

3.2.3. Manual Adjustment of the KeyKode LED Intensity

When you are in manual intensity mode you can adjust the intensity by using the **kk intens** menu item. Use the ← and → keys to alter the 3 digit intensity value. Holding down the key will adjust the values faster. Holding the SHIFT key and pressing the ← and → keys will adjust the values by tens. These values will range from a maximum of 999 to a lower limit that will probably be somewhere in the 100-250 range and will show as **`kk intens: limit`**.

When the film is traveling over the pickup head, adjust the intensity setting until the 5550 beeps or the KeyKode LED blinks to indicate keykode is being read.

Press the DISPLAY key to exit the format menus until the display shows something similar to **`KK ASYM'Y= +20%`**, which shows the asymmetry between the bar and space elements of the barcode. Adjust the **kk intens** value until the asymmetry approaches 0%. The LED intensity is now at the optimum value for reading this particular bar code.

The other three modes allow the 5550 to automatically adjust the light intensity according to three different algorithms.

3.2.4. Automatically controlling the KeyKode LED Intensity

The 5550 automatically controls the KeyKode LED intensity when the **kk intens** menu setting is set to **auto, extd** or **hunt**. Automatic adjustment of the intensity falls into two categories:

- when the bar-code is illuminated enough to be readable but not necessarily optimal
- when the keykode is not readable at all (the 'hunt' range).

Whenever **kk intens: auto** is selected the 5550 evaluates each bar code that is read and adjusts the illumination for the next bar code in an attempt to find the optimal intensity setting, which you can see by watching the **kk intensity** item of the SETUP menu. This value will wander around a small range as it adjusts for variations in film density, film position, film direction and film velocity.

Selecting **kk intens: extd** can enhance this auto activity. In this mode, the 5550 can recover the optimal setting over a wider range of intensities.

When one of the automatic modes is selected the LED intensity can still be manually adjusted from the **kk intens** menu, however the auto or hunt routines may change this value whenever they are triggered. This feature can be used to manually adjust the intensity until a bar code is read, whereupon the auto routines will take over and find the optimal setting.

The auto and extended auto modes will only adjust the intensity when some of the barcodes are being read. If no barcodes are being read you must either use the hunt mode or manually adjust the intensity into the reading range.

When the **kk intens: hunt** mode is selected and keykode is no longer recognizable the 5550 searches for an illumination level which will produce readable bar code. The hunt routine is based on the biphase from the telecine to measure when a reasonable amount of film has gone by with no keykode reads (typically 2 bar-codes worth). The 5550 will then adjust the intensity down to the next major zone in search of readable bar code. The 5550 will cycle through the entire intensity range within approximately 6 to 8 feet of film and will continue to do so until bar code is read. Once a barcode is read, then the 5550 will revert using the extended auto algorithms to find the optimal intensity value.

Sometimes the 'hunt' routines can be activated inappropriately. The most obvious example is when the film spools off the reels. The tach wheel on the telecine may keep spinning and fool the 5550 into hunting for the correct intensity setting for the missing keykode. As soon as a new roll of film is loaded, the 5550 will find the appropriate intensity value again after a few feet of the new roll pass through the head.

3.2.5. Turning on the Film Time Code Reader

When the one of the universal reader heads with either ARRI or Matrix reader sensors is connected to the 5550 you will be able to enable either the ARRI or Matrix Time code reader portion of the head and decoder. (See section 3.3.5 for information on selecting the correct head type, and details on which head models support ARRI and Matrix reading).

TC READER:*
tc reader: off*
tc reader: arri*
tc reader: matrix

tc reader Selects whether the 5550 will read ARRI or Matrix time code or not. This menu item is only available when the **head model** menu item is set to **uv** and the correct head type is connected.

Select **off** to disable the Film Time Code reader.
Select **arri** to enable the ARRI Time Code reader
Select **matrix** to enable the Matrix Time Code reader

3.2.6. Controlling the Intensity of the Time Code Light Source

The model 5550 controls the brightness of the time code light source in order to accommodate for the various exposure densities of the time code on the film. The light source intensity control can be either manually controlled by the user or automatically controlled by the 5550. There are two menu items that are used to control the LED intensity.

TC INTENSITY:487*

tc intensity Is used to display/set the intensity of the light source. Normally you will require a higher intensity for darker exposures, and a lower intensity for lighter exposures. The value shown ranges from a lower limit (below which the sensor will not detect anything) and 999. When you are in the automatic time code intensity mode, this menu item will show the current value of the time code light intensity.

TC INTENS:*
- **tc intens: man***
- **tc intens: auto***

tc intens Is used to select whether you want to set the timecode light source intensity manually or have the 5550 use its automatic intensity mode.

Select **man** to adjust the intensity manually.

Select **auto** for the normal automatic mode. In this mode the 5550 is constantly adjusting the time code light intensity to achieve optimal reading.

3.3. PROGRAMMING THE ADVANCED OPERATIONAL MODES - ENGINEERING MENU

3.3.1. Setting the correct Biphase Rate

BIPH:
- **biph: 1/2 p/frm**
- **biph: 1 p/frm**
- **biph: 2 p/frm**
- **biph: 5 p/frm**
- **biph: 10 p/frm**

biph The ← and →keys select which biphase frame rate (in cycles per frame) will be used for the biphase inputs. This setting must be correct for the KeyKode Hunt and auto time code intensity routines to work correctly. The supported biphase rates are 1/2, 1, 2, 5 and 10 pulses per frame. (See section 2.3.3 for more information regarding connecting the biphase inputs).

3.3.2. Adjusting the Front Panel Display Brightness

DISPLAY LEVEL: 5

The **DISPLAY LEVEL** menu item is used to adjust brightness of the front panel display. Use the ← and →keys to adjust.

3.3.3. Setting the KeyKode Validation Beep

KK BEEP:
- **kk beep: off**
- **kk beep: on**

kk beep Selects whether the 5550 will sound a beep each time it reads a valid keykode number.

Select **off** to disable the KeyKode beep

Select **on** to enable the KeyKode beep.

3.3.4. Selecting the Counting Modulus for the Time Code Reader

Normally the film time code is recorded at the same frame rate as the film is exposed. (e.g. if the film is exposed at 24 frames per second, the time code will also be recorded at 24 frames per second.) Normally the 5550 can autodetect the counting modulus, but in some instances it may be desirable to manually set it using this menu item.

TC MODE*
- **tc mode: 24 fps**
- **tc mode: 30 fps**
- **tc mode: 25 fps**
- **tc mode: auto-24**
- **tc mode: auto-30**
- **tc mode: auto-25**

tc mode: Is used to select the counting modulus for the ARRI time code reader. Setting it to one of the fixed frame rates will cause it to operate at the corresponding frame rate. Setting it to one of the auto modes will allow the 5550 to autodetect the frame rate of the incoming time code. The detected rate will be shown.

3.3.5. Selecting the Type of Reader Head Connected to the 5550

The 5550 is compatible with all the reader heads that have been manufactured by Evertz over the past several years. However, in order for the 5550 to operate correctly it must be told which type of head is connected.

HEAD SELECT:
- **head select: man**
- **head select: auto**

head select: Is used to select whether the 5550 will autodetect the head type or not.

Select **man** to select the type of head manually using the **HEAD TYPE** menu item.

Select **auto** to enable the 5550's auto head detect function. The **HEAD TYPE** menu item will show the type of head that the 5550 has detected.

HEAD TYPE:
- **head type: ev**
- **head type: kk**
- **head type: kd**
- **head type: kr**
- **head type: uv-kk**
- **head type: uv-ka**
- **head type: uv-kr**
- **head type: uv-3**

head type: Is used to select the model of reader head connected to the 5550. The model of reader head should be clearly shown on the serial number label of the head. Set head model so that it coincides with the first two letters of the head model number on the head serial number label.

When connecting model ev, kk, kd or kr heads, the 5550 will operate in a KeyKode only mode. These heads are connected to the 8 pin DIN connector on the rear panels. Some of the front panel displays and menu items will not be available when these heads are connected.

The new Universal Film Data head is available in one of four versions. This head should be connected to the 15 pin D connector on the rear panel. Each version of the head has different capabilities as shown in Figure 3-7. The time code menu items and front panel displays will not be available when the UV-KK head is installed.

Head Model	KeyKode	ARRI Time Code	Matrix Time Code
UV-KK	✔		
UV-KA	✔		✔
UV-KR	✔	✔	
UV-3	✔	✔	✔

Figure 3-7: Universal Head Capabilities

3.3.6. Enabling the LED Saver

LED SAVER
led saver off
led saver on

led saver The LED SAVER menu item allows you to turn off the light sources when the head is not being used. This mode extends the life of the LED and laser light sources and should normally be enabled.

In order to use the LED saver mode the biphase tach from the telecine must be connected and the biphase rate setting of the Engineering menu must be set to the correct number of pulses per film frame.

3.3.7. Adjusting the Sensitivity of the Matrix Detector

MATRIX SENSY: 25

The **MATRIX SENSY** menu item is used to adjust sensitivity of the time code matrix detector when the auto time code intensity mode is used. To access the **MATRIX SENSY** menu item, you must first turn **DEBUG MODE** on. (See section 3.3.9) Under normal circumstances this value should not need to be changed from the factory default value. Use the ← and → keys to adjust.

You must turn off DEBUG MODE before normal operation of the 5550 can resume.

3.3.8. Adjusting the Sensitivity of the Matrix Detector

MATRIX START: 85

The **MATRIX START** menu item is used to adjust starting position where the time code matrix detector will look for the time code matrix. To access the **MATRIX START** menu item, you must first turn **DEBUG MODE** on. (See section 3.3.9) Under normal circumstances this value should not need to be changed from the factory default value. Use the ← and →keys to adjust.

You must turn off DEBUG MODE before normal operation of the 5550 can resume.

3.3.9. Enabling Extra Debug Displays

DEBUG MODE
debug mode off
debug mode on

debug mode There are some extra debug displays that you may be asked to display by Evertz Factory personnel when troubleshooting problems. When debug mode is on, several debug displays are added to the extended displays. These are listed in Figure 3-4, in the manual.

Debug mode should be left off unless Evertz staff otherwise directs you. Some of the normal functions of the 5550 are not available with DEBUG MODE ON, therefore you must turn DEBUG MODE OFF before normal operation of the 5550 can resume.

3.3.10. Resetting the 5550 to Factory Defaults

FACTORY RESET? >Y
shift+> to reset

factory reset is used to return the 5550 to its factory defaults. When you press the ➔ key, the display shows **`shift+>to reset`**. When you press **SHIFT + ➔** the 5550 will reload its factory defaults and show the message **`Reset done`**

3.3.11. Testing the Serial Communications to the 4025

LOG POSITION? >Y
sending kk data

log pos'n >y If the right arrow is pressed, corresponding to the "yes" option, the 5550 will transmit the current keykode number out the serial port at regular intervals. This can be used to verify the communications with the 4025 Film Footage Encoder. The 5550 will flash the **COMM** LED and the front panel message will be **`sending data`**. If the 5550 is correctly connected to an Evertz 4025TR Film Footage Encoder, there will be a corresponding flash of the KKODE LED on the 4025TR front panel. If the 5550 is connected to a computer, a correct connection should result in the reception of an ASCII string (example: "j0296123456123400") followed by a carriage return and line feed characters.

If the TC MODE is set to ARRI or Matrix, the 5550 will also output the last valid time code value that it read. If the LTC out of the 5550 is correctly connected to an Evertz 4025TR Film Footage Encoder, the LRDR1 LED on the 4025TR front panel should come on.

Press the ↑ or↓ keys or exit the Engineering menu to stop the 5550 sending the data.

3.4. CHECKING THE OPERATION OF THE SENSORS IN THE READER HEAD

During normal operation of the Film Data Decoder head it is possible for dust to build up in the opening to the sensor, blocking the light path, and thereby impairing the reading ability of the head. The KK Sensor and TC Sensor extended displays are provided as a means of verifying the operation of the sensors.

You cannot perform the sensor operation on the EV model heads

There are separate sensor displays for the KeyKode and time code sensors. To access the KeyKode sensor display, press the SHIFT+DISPLAY keys several times until you get a display that looks like: **`KK35 SENSOR= 200`**. To access the Time code sensor display, press the SHIFT+DISPLAY keys one more time until you get a display that looks like:

TC35 SENSOR= 200. This is indicating that you are testing the 35 mm sensor. To switch to the 16mm sensor press the SHIFT + MODE keys.

The number shows the current intensity setting required to get a reading from the sensor. If you remove the film from the head the number should be in the range of 150 to 200. If you put a piece of paper in where the film normally goes, the number should go to 999. When you remove the paper it should go back to the original value. If the number is a lot greater than 200 (when there is nothing in the head) that indicates that there may be dirt blocking the sensor and you are not getting the best reading possible. Carefully remove the dirt by blowing compressed air into the sensor openings. You should do this for both 16 and 35 mm.

Do not use fluid cleaners such as alcohol to remove dirt from the head as this may cause damage to the sensor electronics.

3.5. INTRODUCTION TO MATRIX TIME CODE

Matrix time code is a seven by thirteen matrix of dots that are laid down on the margin area of film by Super 16 and 35mm Aaton, Panavision and Moviecam film cameras. There is one matrix associated with each frame of the film. The dots contain production time code and date, and other user bit information set in the camera's hardware. The frame rate of the time code numbers corresponds to the rate that the film was exposed. (i.e. film exposed at 24 frames per second will have 24 fps time code, etc.) On specific frames of film, there is human readable time, date, and user bit text to facilitate identifying the film information by eye.

One 'V' row (perpendicular to the motion of the film) and one 'H' column (parallel to the direction of motion of the film) border the matrix. The V row and H column are alternating on/off dots to indicate where the rows and columns are positioned on the film. Inside the V/H border, is a matrix of seven by twelve dots containing the time code, user bit and checksum information.

On 16mm film the matrix is positioned in between the sprocket holes on the edge of the film where the KeyKode normally is found. On 35mm film, the matrix is located between the perforations and the edge of the film on the opposite side to the KeyKode.

The **TC VAL READ** extended display gives and indication of how well the 5550 is reading the matrix time code from the film. On 35mm film, the human readable Matrix code numbers will reduce the theoretical maximum reading value to approximately 90%. On 16mm film, the human readable Matrix code numbers, and interference from the human readable KeyKode numbers will reduce the theoretical maximum reading value to approximately 70%. See section 3.5.1 for a discussion of the various factors that influence the readability of the matrix time code.

3.5.1. Problems associated with reading matrix code

Depending on the camera type, matrix code burner, camera operator and film processing, there is a wide variation of matrix code. The size, position, contrast, distortion of the matrix and various other artifacts are possible. The Evertz UV heads and 5550 decoders are designed to handle a large variety of these film-to-film differences. Here is a brief description of the types of variations to expect, how we handle the variation and how to identify when there may be a problem.

3.5.1.1. Matrix Width

On 35mm film, the width of the matrix can vary from filling the whole marginal area (between sprocket holes and edge of film) to approximately one half the size. Decoding of a wide matrix is not a problem until a significant amount of the first or last column ends up overlapping the perforation holes or the outer edge of the film.

On 16mm film, the width could be as large as to extend from the KeyKode to the active film area. Decoding of both the KeyKode and matrix code will be affected if the codes overlap. Matrix code decoding errors and active picture artifacts will exist if the matrix overlaps with the active picture.

If the matrix is very narrow (i.e. if the matrix is less than half the width of the area that is available), decoding may be affected due to the limited resolution of the optical pickup device. Poor reading performance, due to narrow code, will also be compounded if the film entrance/exit angle to the head is steep, reducing magnification, or there is excessive side to side film wobble.

The **MATRIX SIZE** extended display shows the width of the matrix that the5550 is detecting.

3.5.1.2. Matrix Position

The left/right registration of the matrix on the film marginal area can also vary depending on how the matrix code writer was installed in the camera.

The 5550 Universal Film Code Decoder, using digital signal processing techniques, finds and tracks the size and position of the matrix so that no setup or calibration is required when the code changes from job to job. In fact, a lab roll created from different cameras will not pose a problem to the decoder because the algorithm will adapt to the different sizes/positions automatically.

The **MATRIX POS'N** extended display shows the horizontal position of the matrix that the 5550 is detecting.

3.5.1.3. Matrix Length

Not only does the matrix width vary in size, but so does the length. On 16mm film there is not much variation because the size variation is limited by sprocket hole spacing. However, on 35mm film the length can vary from between two to more than three perforations in length. This does not pose any problem for the 5550 decoder because it measures the actual size of the rows.

The length of the matrix will, however, affect the maximum rate at which code can be recovered. Code consisting of long, stretched matrices can be read at a much faster shuttle speed than code with short matrices. Short 16mm matrices may only be read as fast as two times play speed, while long 35mm code may be read at the full shuttle speed of the telecine.

The **MATRIX LEN** extended display shows the relative length of the matrix at a given speed. The nominal matrix length value at 24 FPS is approximately 12. As the film speed increases, this number will get lower. When the number approaches 2 or 3 that indicates that the maximum theoretical recovery speed has been reached. As the film speed decreases the number will get larger.

3.5.1.4. Matrix Contrast

Low contrast code (light green in color on negative stock) is inherently harder to recover than higher contrast code (dark green or purple in color). The film edges, dirt and scratches create optical noise, that when added to a low contrast signal makes the recovery of the data harder to perform. The 5550 auto light level routines are designed to maximize the signal to noise ratio for the given code contrast. These auto intensity routines, however, require biphase information to know how much film has gone by when it is not reading so that it can adjust the light level.

In extreme cases of low contrast code, the sprocket holes, on 35mm film, and KeyKode edges, on 16mm film, can start to look like matrix dots, affecting decoding performance. The 5550 'MATRIX START' menu item allows the user to block the decoder's algorithm from detecting these edges. See section 3.3.8 for information on setting the Matrix Start position.

The **TC MIN/MAX** extended debug display gives an indication of the contrast of the matrix.

3.5.1.5. Distortion

If the exposure was not set correctly in the matrix writer of the camera or in the edge lighting during printing, the 'on' dots vs. the 'off' dots will be a different size and the edges between them will become wider. The 5550 decoder will account for this distortion while decoding, but as the distortion

reaches extremes, it will become hard to determine the exact center of the 'small' rows and 'small' columns. Although the whole matrix may be long, the maximum reading speed will be reduced to that of the 'small' rows.

The **TC ASYM'Y** extended display shows the relative symmetry of the 'on' dots to the 'off' dots. A value of 00% indicates that the 'on' and 'off' dots are roughly the same size.

3.5.1.6. Other Data/Marks On Film

Various marks (i.e. human readable text) that happen to overlap a matrix will affect the reading of that matrix if the contrast of the mark is close to the contrast of the matrix. The mark will affect the reading of the frame that it is on, but will not affect other frames.

3.5.1.7. Code Breaks And Acquiring Time (splices and camera stops/starts)

During a camera break (stop and start), the machine readable matrix code is not present on the film a few frames before the camera flash and may not re-appear for up to 40 or more frames after the camera flash. Generally, the decoder does not need much more than a few frames to re-lock to the new shot because it remembers the position, size and speed from the previous shot.

A few seconds may pass from the time that the new matrix code appears, the decoder recovers the new time, the 4025TR jams to the new time and the audio machine chases and locks to the new time. It is common to roll into a new shot, pick up the new time code and roll back to the beginning to give the audio machine (especially if it is a DAT machine) a chance to lock to the new time base.

If two different camera shots are spliced together (i.e. a work print), the speed of locking to the new time code will depend on a number of factors. If there is a position, size and contrast difference between the two spliced shots, then the locking time will be more than if the shots came from the same camera. If the contrast is significantly different, the auto routine must servo the new light level. If the position or size of the matrix is different, the tracking algorithm finds the new position. If the length of the matrix is a different size, the speed algorithm adjusts to the new length. This may sound bad, but all of these adjustments happen simultaneously and without any human intervention! All these adjustments happen automatically within about 30 frames.

3.5.1.8. Reel Short Ends Loaded Backwards

When a 35mm camera is loaded with the KeyKode on the 'wrong' side, the matrix code ends up being applied over top of the KeyKode. This will make

the KeyKode unreadable and will reduce the number of readable matrix codes.

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