

*Ian Southern*

*Mon → Wed.*

*01-950 1667*

*Home.*

*8-00 platform 7 → Watford*

*Train to Watford*

*Red Cortina Estate  
Small - Guy*

*Mon, Morning ↔*

*Secretary. Anna (Suzanne)*

*← Also →*

*St Albans.*

*34314 (Per)*

This is the Master Technical Manual for the XT-24 INTELOCATOR

relating to the following machine interfaces :-

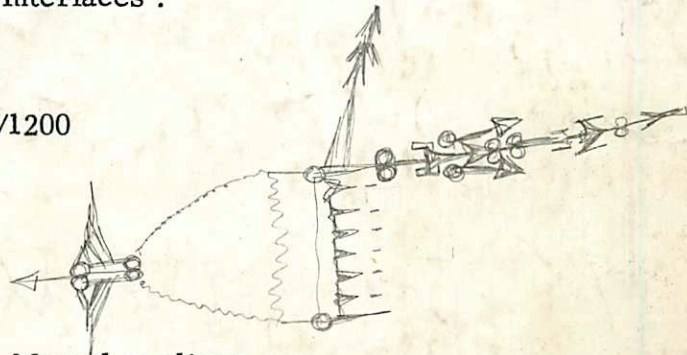
AMPEX ATR 100

AMPEX MM1100/1200

3M M79

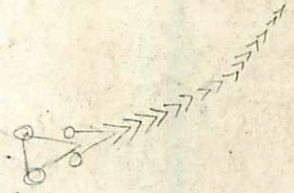
MCI JH-16

STUDER A80



Please do not release this Master Manual to clients.

*When can we*



*Steve -  
Warren - Tech  
Record 1*

*↔ Obscene Options ↔*

*Huh! Shit, cunt.*

Ampex

Hans Sproeder.  
500 Rodier Drive.  
Glendale,  
California -  
91201

240 5000.

03 (10) 1973

COMMUNICATIONS SECTION  
FEDERAL BUREAU OF INVESTIGATION  
U. S. DEPARTMENT OF JUSTICE  
WASHINGTON, D. C. 20535  
TELEPHONE: (202) 647-5000  
FACSIMILE: (202) 647-4000

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## THE AUDIO KINETICS XT-24 INTELOCATOR

This is the first INTELigent autoLOCATOR made possible by microprocessor technology. It has a programmed capacity to learn a particular tape plus transport behaviour pattern, and subsequently optimise the locate sequence.

### FEATURES

- \* Intelligence
- \* Interfaces with Ampex MM1200 and ATR 100/104
- \* Utilises two separate counters, master and intelocate, both operating in minutes and seconds
- \* Four pre or immediate load memories
- \* Inches per second speedometer for vari-speed reference
- \* Full standard tape transport remotes with LED indication
- \* Leverwheel numerics for faster location point entry with physical memory
- \* High accuracy of  $\pm 2$  seconds over 30 minutes of tape at 15 ips
- \* Automatic compensation for HI/LO speed change -  $7\frac{1}{2}/15$  or  $15/30$  ips operation available by one switch
- \* Automatic master count freeze display - for logging - on tape runout

*from cdd or reset assumes can learn forwards from current position. ∴ for tails out have to provide false forward run out condition. can learn backwards provided*

The XT 24 consists of two units, an attractive small calculator style control unit and a compact logic computer unit 'brain' housed within the multitrack tape machine. An 8 metre miniature multicore cable links the two units.

### FEATURES DESCRIPTION

The unique intelligence feature of the XT 24 results in the fastest search action possible with no overshoot, it is best described by the intelocation process :

When any search function is initiated for the first time, the following sequence occurs :

- A) The display converts from real time position to a reducing countdown to the selected location point
- B) The transport wind button LEDs will indicate direction of tape, regardless of wind mode
- C) Near the location point the machine will enter a momentary slow-down phase to check the available deceleration. At this time the display will convert to GO - L or GO - 0 or GO - 1 (or 2, 3, 4) depending upon the location point selected. The hyphen between GO and the designated point will flash proportionately with tape speed.
- D) The programme now continues to search using the newly derived deceleration figure, typically speeding up again until the correct point on the tape is reached to allow constant firm deceleration to a standstill at the location point.



- E) At the conclusion of the search, the newly derived figure is stored for re-use on subsequent searches to this location.

On any repeat of this search, the above sequence will be repeated. However the computer will now have optimised the point where initial deceleration should begin. In other words it has learnt the behaviour pattern of that section of the particular reel of tape with the given tape transport.

Such optimum data is stored in the computer until :

- A) The tape is wound off the machine at high speed
- B) The power is switched off from the locator
- C) The RESET button is depressed on the control unit

Note the data will not be lost if the tape is removed from the guides for editing.

The XT 24 can intelocate to any of six aim points comprising four memories, intelocate zero and the leverwheels setting. In addition cyclic sequences can be programmed between any two of the six aim points. The programming procedure is explained in the 'Operation' section.

The XT 24 has two completely separate counters; one is the master tape timer normally with zero reference at the beginning of the tape, the other is the intelocate counter with a resettable zero enabling cyclic programming to be referenced to a local zero without affecting the master counter. Note that the XT 24 will only permit the entry of an intelocate zero 'downstream' from the master zero e.g. where the master count is zero or positive. Any attempt to enter an intelocate zero point prior to the master zero point will be rejected by the computer which will indicate that it has sensed an illegal command by displaying the message 'HUH ?'

Four memory presets are provided which can be pre-loaded via the leverwheels or directly loaded with the current tape position. Theoretically, using a microprocessor, a large number of memories could be provided. We chose four as the maximum number a normal human being can remember under session conditions. In excess of four memories would result in the memory figure having to be logged thus negating the function.

The inches per second speedometer display i.e. 15.3" enables accurate logging in order that the precise speed can be achieved again on a subsequent recording session.

### OPERATION OF XT 24 INTELOCATOR

We suggest that the full facilities of the XT 24 are best explained by a description of its use.

#### Initial Recording Session

When the machine is switched on the XT 24 initiates the RESET condition as follows :

- a) All transport characteristic memories are set to worst case deceleration
- b) Master and Intelocate counters are set to zero
- c) The four locate memories are set to zero
- d) Cycle and Re-cycle programmes are set between intelocate zero and the leverwheel settings.

The lacing of a new reel of tape automatically enables the two counters. If reference tones are recorded at the beginning of the tape, it is useful to re-zero both counters after the tones using MASTER . SET . ZERO.

Assuming the first take is not satisfactory, tape can be conserved by simply depressing the ZERO button; the machine will then intelocate to the zero position and stop, learning that part of the tape in the process. Simple logging of the real time read-outs at the beginning of good takes will enable the engineer to review any take quickly, by setting the minutes and seconds figure into the leverwheels and depressing the LEVER button. The machine will then accurately intelocate to the beginning of the desired take.

At the end of the session the tape should be spooled off the machine tails out, the locator counter will freeze automatically and display the master count. This figure should be logged on the tape box.

### Overdubbing

The previously recorded tape is re-laced on to the machine tails out. We assume a previous final readout of 32' 35". By setting 32' 35" into the leverwheels and using the sequence MASTER . SET . LEVER these figures are loaded into the master counter. In other words the master counter is defined at the end of the reel, rather than zeroed at the beginning. This eliminates the need to re-spool the tape to zero in order to make use of the logged master count figures from the original recording session.

Assume that the first take to be worked on is at 7'30". By setting the leverwheels to 7'30" and depressing LEVER the machine will intelocate to the beginning of that take. At this point we suggest using SET . ZERO which will load the intelocate zero into the display. The take is then played through, stopping at the end. The display now reads 3' 00". By loading 3' 00" into the leverwheels, the take has its lower limit 0' 00" and its upper limit 3' 00" defined for the CYCLE process. By depressing CYCLE the machine will spool back to the beginning of the take, play it through automatically (to 3' 00") and then rewind to 0' 00" and stop. If the artist or engineer wish to hear the take many times, before attempting an overdub, use of the RECYCLE button will play the take over and over until some other function is selected.

When the artist is ready to record, simultaneous depression of RECORD + CYCLE will cause the machine to record on the selected track up to 3' 00" rewind to 0' 00" automatically play the take back to you, rewind to the beginning and stop. This is fine for straight through overdubbing. However

let us assume a problem vocal overdub at the chorus section. Using CYCLE play through the take again, at the beginning of the problem area press SET . 1 and at the end of the section press SET . 2. Memories 1 and 2 are now loaded with absolute points on tape (ie Master count figures) at the beginning and end of the first chorus. Now the CYCLE facility should be re-programmed using SET . CYCLE . 1 . 2. You have not lost the beginning and end of the main take which are still 0' 00" and 3' 00", you have merely re-assigned the CYCLE programme to where it is most needed. By using RECYCLE the machine will play through the chorus continuously until the artist is happy to record. The RECORD . CYCLE facility can then be used just for the chorus. This process can be repeated for the second chorus merely by updating SET . 1 and SET . 2.

Please note that multiple memories are not necessary. We provide four but doubt that 3 and 4 will be used frequently. The CYCLE/RECYCLE facility can be reprogrammed between any of the four memories, zero and or leverwheels.

Having completed the overdubs, by using SET . CYCLE . ZERO . LEVER, the take can be finally reviewed simply.

By using SET . ZERO at the beginning of the take, we replaced the master count with the intelocate count in the display. To find the next title or take, it is necessary to restore the master count to the display. This is done by using SET . MASTER. Consequently the logged minutes and seconds figure for the next take can be set into the leverwheels and found directly by using LEVER.

Should vari-speed be required whilst overdubbing, a reference readout is available in ips, displayed by depressing SET and PLAY together. This can be logged enabling exact duplication of the vari-speed setting easily.

### Mixing

The use of the XT 24 for mixing is the same as for overdubbing without the use of record. It is likely that RECYCLE will be more frequently used allowing the engineer to concentrate on the console/sounds rather than tape position. The advantages of always working to a local zero, are important, as the engineer knows at a glance his correct tape position, without mental arithmetic.

## SUMMARY OF BUTTON FUNCTIONS AND OPERATION

### One button sequence

MASTER	Master count displayed for 1.5 seconds - designed for check on master count whilst using the intelocate count, without having to load the master count into the display.
ZERO	Machine intelocates to intelocate zero
LEVER	Machine intelocates to leverwheel settings
1 (or 2, 3, 4)	Machine intelocates to memory 1 (or 2, 3, 4)

Hit any search function s. eg lever, zero, 1234 + then follow it by Set Play it will locate to memory (sequential) & then start to play immediately.

When running on interlocate zero diff to master zero  
to return to master zero enter set. master  
and then zero. ie updated interlocate zero.

During locate display shows distance to go to  
desired point + then Go - ... ~~for~~ whilst braking.

Edit whilst cycling between memories can cause  
problems.

When recycle selected may update cycle points  
during operation.



CYCLE

if cycle not set will intelocate between lever + zero  
if cycle set will continue to cycle between the chosen points until cancelled or changed.  
Assume XT 24 programmed to cycle between memories 3 and 4 where memory 3 is a higher real time figure than memory 4. The machine will intelocate to memory 4, play through to memory 3, rewind to memory 4 and stop. always cycles in direction of play from lower to higher real time fig.

RECYCLE

As cycle except programme is repeated until cancelled by any other transport command function.

Two Button Sequences

must be gap in between or may say

All multiple button sequences should be entered one button at a time otherwise the entry will confuse the computer and the display will show 'HUH ?'

HUH? or takes 1st command

- SET.MASTER Enters the master count figure into the intelocate counter
- SET.ZERO Zeroes the intelocate counter
- SET.LEVER Enters leverwheel settings into the intelocate counter
- SET.1 (2, 3, 4) Enters master count figure, at split second of entry, into memory 1 (or 2, 3, 4).

Three Button Sequences

- MASTER.SET.ZERO Re-zeroes both master and intelocate counters
- MASTER.SET.LEVER Enters leverwheel settings into both master and intelocate counters, altering master zero reference.
- MASTER.SET.1 (2, 3, 4) Enters leverwheel settings directly into memory 1 (or 2, 3, 4). Entries relate to master count only.

Four Button Sequences

- SET.CYCLE.ZERO (or LEVER or 1, 2, 3, 4). LEVER (or ZERO or 1, 2, 3, 4)
- SET.RECYCLE.ZERO (or LEVER or 1, 2, 3, 4). LEVER (or ZERO or 1, 2, 3, 4)

Note CYCLE and RECYCLE share the same programming. Also they can be programmed whilst the XT 24 is making an unrelated search operation, or even performing a different CYCLE or RECYCLE sequence.

Simultaneous Two Button Sequences

use + hold down both together.

Unlike any other operation of the XT 24 the following sequences are only valid when both buttons are depressed momentarily simultaneously. Either button may be depressed first.

- PLAY + RECORD Normal record mode entered
- CYCLE + RECORD Machine intelocates to lower parameter (1) enters record to upper parameter (2) rewinds to (1) plays to (2) rewinds to (1) and stops
- RECYCLE + RECORD Machine intelocates to (1) records to (2) rewinds to (1) plays to (2) rewinds to (1) plays to (2) until cancelled by another transport command
- SET + PLAY Varispeed reference display in inches per second. Note if SET is depressed first, existing transport or intelocation function remains undisturbed

M.B. during recycle can use varispeed setting & get display - to cancel just press recycle etc.

## Special Facility for Ampex MM1200.

Diagnostics whilst machine running -  
lever wheels to zero - press sets lever.

Tilt will get out of diagnostics  
without loosing memories

For Software Type press stop/cycle/recycle  
simultaneously.

	Speed display is cancelled by pressing any XT 24 button
STOP + 1 (or 2, 3, 4)	Temporary memory 1 (or 2, 3, 4) recall to display whilst buttons are held down
STOP + RECORD	Button LED and all display segment check for 1.5 seconds

Special Facilities Ampex MM1100/1200, ATR100/104

TILT	Re-stabilises computer if affected by external influence, e.g. unsuppressed mains pulse.
RESET	Causes all computer memories to be reset including intelligence and customer cyclic and memory programming. It need only be used if a machine/locator interface fault occurs, but it may be used on loading a new tape, as a quick alternative to MASTER . SET . ZERO

Unit comes supplied with 8 metre cable -  
 can be extended to 30 metres ie 100ft - in theory but delays + brightness may become problematic at longer distances.

On Studer / Ampex / MCI - tacho in deck + have decent o/p level ∴ can have Brain remote from deck.

On 3M. use own tacho + need Brain quite close to deck.

Type of:

Cannot have more than one key pad interfacing to Brain -

Brain connectors not too strong if wanting to reconnect Key pads often.

Brain can possibly run two machines together for Studer / Ampex / MCI provided interface O.K but 3M not recommended.

- Not recommended anyway  
 Sell 2 locators.  
 impractical.

	Speed display is cancelled by pressing any XT 24 button
STOP + 1 (or 2, 3, 4)	Temporary memory 1 (or 2, 3, 4) recall to display whilst buttons are held down
STOP + RECORD	Button LED and all display segment check for 1.5 seconds

Special Facilities Ampex MM100/1200, ATR100/104

TILT	Re-stabilises computer if affected by external influence, e.g. unsuppressed mains pulse.
RESET	Causes all computer memories to be reset including intelligence and customer cyclic and memory programming. It need only be used if a machine/locator interface fault occurs, but it may be used on loading a new tape, as a quick alternative to MASTER . SET . ZERO

Diagnostics Routine - on Ampex ATR, 3M M79,

- 1) may be entered whilst machine running by entering set lever with lever wheels set to zero.
- 2) diagnostics entered on detection of tape run out condition.
- 3) Tilt may be used to exit diagnostics without losing stored information.
- 4) diagnostics routine is exited by arranging that all keyswitch tally LEDs are extinguished except Stop.

Software Type - Press Stop + cycle + recycle together.

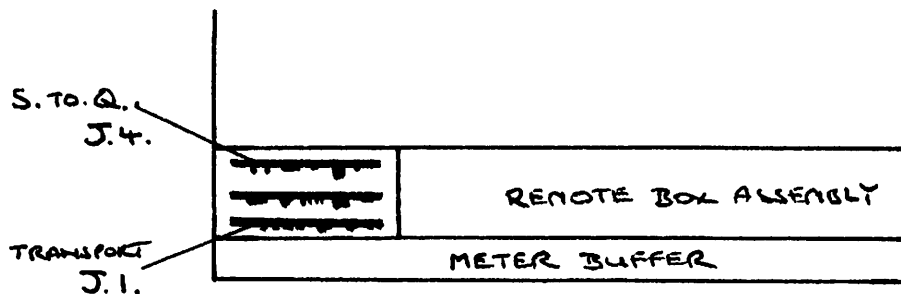
INSTALLATION INSTRUCTIONS FOR THE XT-24 INTELOCATOR WITH THE  
AMPEX MM1200

1. Remove the Left Hand Side Panel from the MM1200
2. Remove the Remote Track Control Box Assembly from the MM 1200
3. Remove the Transport Control, Capstan Servo and Search-To-Cue PC cards from the Transport Control Assembly (Front left of machine under lid).
4. Remove the 4 rear mounting screws securing the Transport Control Assembly (PC Card Cage) to the deck casting.

NOTE that access to the lower 2 securing screws is from within the deck assembly, and that these 2 lower screws double as cable harness clamps.

5. With the Meter panel fully extended, the P.C. Card Cage may now be rotated down into the area normally occupied by the Control Box Assembly. Transport control and Search-To-Cue edge connectors J1 and J4 will now be accessible from the left of the machine.
6. The supplied machine interconnect cable may now be introduced into the chassis of the machine through any convenient aperture; unless it is proposed to remove the Ampex Timer Display and Search-To-Cue in addition to the XT-24, a convenient method is as follows :-

Remove from the accessory panel on the rear of the MM 1200 the Accessory Socket together with attached sub-panel. This termination is used to extend the Ampex Timer Readout and Search-To-Cue function and is otherwise unused. Tape of this socket. Introduce the XT-24 cable through this aperture leading through with the existing harness to terminate on the edge connectors of the P.C. Card Cage.





INSTALLATION INSTRUCTIONS FOR THE XT-24 INTELOCATOR WITH THE

AMPEX MM1200 continued

7. Connect the 17 required cores of the interconnect cable in parallel with the existing connections to J1 and J4 as shown below:-

J1	2	Red/Blue
	10	White/Blue
	11	Blue
	14	Yellow/Red
	20	Brown
	21	Yellow/Blue
	23	Red/Black
	25	Red/Brown
	26	Green/Red
	K	Orange
	W	Red
	Z	White/Red
	DD	Violet
	EE	Pink
	FF	Turquoise
J4	21	Orange/Blue
	22	Blue/Black

8. Re-assembly is a reversal of steps 1-5
9. Confirm that the mains voltage is indicated correctly on the exterior of the XT-24 Brain unit. If incorrect the mains tapings on the transformer inside the Brain may be adjusted as follows :-
- 115 vac working : remove any link 2/3 and then add links 1/3, 2/4.  
230 vac working : remove any links 1/3, 2/4 and then add link 2/3.
10. Connect the Brain to the mains a.c. outlet.
11. Switch off the MM1200 and connect the machine interconnect cable to the Brain.
12. Connect the XT-24 Controller to the Brain.
13. Switch on the MM 1200 - A relay in the XT-24 senses presence of +27v in the MM1200 and applies power to the XT-24.

NOTE this safeguard does not allow power to be applied to the XT-24 unless connected to the MM 1200 which is important when using sensitive computer circuitry. Consequently an ON/OFF switch is not required.

## ADJUSTMENTS TO THE XT-24 INTELOCATOR

No set-up is normally required, since a thorough checkout is made at the factory; however, after prolonged use the following one adjustment may be deemed necessary.

### Speed Readout/Adjustment

Engage PLAY mode, and simultaneously depress PLAY and SET on the XT-24 Controller. The display will now show current tape speed until any further button is depressed at the XT-24 Controller.

Normally a 1% accuracy is maintained by this readout, settling to final accuracy some 5-6 minutes after switch on.

AUDIO KINETICS do not recommend re-calibration of this readout, since it has been set against a crystal standard during manufacture; it may however, be adjusted as follows :

Remove the Brain cover and adjust trimmer RV1 on the computer board (The lower of the two boards) until the desired reading is achieved.

ON NO ACCOUNT DISTURB THE SETTINGS OF RV2 and RV3

INSTALLATION INSTRUCTIONS FOR THE XT-24 INTELOCATOR WITH THE

*plessy & say.*

AMPEX MM1200 continued

*ref out 1  
ref in 2*

7. Connect the 17 required cores of the interconnect cable in parallel with the existing connections to J1 and J4 as shown below:-

TRANSPORT CONTROL CONNECTOR	FUNCTION	104 MRCA	D CONNECTOR	PIN NO
J1 2	Red/Blue	28 Volts	C	13
10	White/Blue	PLAY. T, TO XT	V	20
11	Blue	SPEED. T, TO XT	P	2
14	Yellow/Red	GROUND.	A	15
20	Brown	LIFT. C, FROM XT	L	7
21	Yellow/Blue	RECORD. FROM XT.	K	19
23	Red/Black	STOP. FROM XT	E	17
25	Red/Brown	REWIND. FROM XT	H	18
26	Green/Red	PLAY. FROM XT	J	14
K	Orange	RECORD. TO XT	W	9
W	Red	RUNOUT. TO XT	<del>U</del>	1
Z	White/Red	FORWARD FROM XT	F	16
DD	Violet <i>(purple-mauve)</i>	STOP. T, TO XT.	S	8
EE	Pink	FORWARD T, TO XT	T	10
FF	Turquoise	REWIND T, TO XT.	U	11
SEARCH TO CUE.				
J4 21	Orange/Blue	DIRECTION T, TO XT	CP	22 Z MRCA
22	Blue/Black	TACH T, TO XT	CK	21-AA 26 or a way.

8. Re-assembly is a reversal of steps 1-5

*T = Tally to XT  
C = Command from XT.*

9. Confirm that the mains voltage is indicated correctly on the exterior of the XT-24 Brain unit. If incorrect the mains tapings on the transformer inside the Brain may be adjusted as follows :-

115 vac working : remove any link 2/3 and then add links 1/3, 2/4.

230 vac working : remove any links 1/3, 2/4 and then add link 2/3.

10. Connect the Brain to the mains a.c. outlet.

11. Switch off the MM1200 and connect the machine interconnect cable to the Brain.

12. Connect the XT-24 Controller to the Brain.

13. Switch on the MM 1200 - A relay in the XT-24 senses presence of +27v in the MM1200 and applies power to the XT-24.

NOTE this safeguard does not allow power to be applied to the XT-24 unless connected to the MM 1200 which is important when using sensitive computer circuitry. Consequently an ON/OFF switch is not required.

# Adjustments. to Ampex MM1200.

## 1) Normalising Reel Servos.

- Adjust Supply gain R7 pot until torque on supply reel is felt + then back off to give no motion.
- Adjust Take up gain R8 with Rewind Button Pressed while holding the Take up reel + ~~back off~~ turn R8 clockwise until torque is felt, then back off to zero.

## 2) Stop Tension.

- Load tape onto machine with full supply + almost empty take up. Hold take up reel + apply power, and momentarily press Left Defeat. to disengage reel brakes. Adjust stop tension pot R3 until align next surface of tension sensor arm is aligned with the 1" or 2" alignment mark.

Note If the transport exhibits a tendency to oscillate during these adjustments readjust overall gain pot R34 from mid point until oscillations just cease.

- This should be done with a minimum tape pack on supply reel.

- Momentarily press left defeat to release reel brakes. Adjust Stop take up potentiometer until take just stops + the tensions are then balanced.

## 3) Play Tension.

- push end of tape arm towards centre of transport releasing reel tension and applying reel motor brakes. Remove the tape from between the capstan shaft and the pinch roller + route tape around outside of capstan shaft. Then take up slack in tape.

- Depress Play pushbutton while holding take up reel to prevent motion.

- Adjust play supply potentiometer R2 for 2" or R10 for 1" until the tension arm aligns with appropriate tape size alignment mark.

- Release take up reel and adjust play take up potentiometer R5 for 2" or R11 for 1" until tape shows no tendency to move.

- Depress Stop Button.

## 4) Play Tension - Acceleration Adjustment.

- Make 90 second, 3.1kHz Test Signal on Tape.

- Monitor o/p of this channel + press play + stop buttons alternately.

- When play is pressed tone should not alter in frequency as the tape reaches normal speed. If it does, adjust R14 as follows.

- If tape underspeeds adjust R14 clockwise, if tape overspeeds adjust R14 counter clockwise until frequency shift no longer occurs when play mode is entered.

- Repeat a → c for low speed operation and adjust R15, as above.

## 5) Shuttle Tension. - Press rewind button. - When tape at max speed adjust

- rew take up pot R4 so that tension sensor arm aligns with alignment mark.

- Shuttle the tape so that 2/3 tape is on take up reel - Depress fast forward and adjust fast forward supply pot R1 so that the tape accelerates at desired rate.

For more rapid fast forward and rewind shuttling R4 and R1 may be adjusted for less hold back required.



## TROUBLE SHOOTING THE XT-24 INTELOCATOR

### General

The engineer should be aware of the three 5 volt monolithic regulators in the equipment; U18 and U19 on the computer board and U11 on the controller sub-board.

At commencement of any fault finding, confirm the presence of +5 volts from the two regulators in the computer with the controller and interface board first disconnected and then re-connected.

Repair or replace PSU components as necessary.

### THEN

#### A - Computer Board Check

1. Disconnect controller and interface board
2. Jumper J1-12 to J1-11 (RESET N.C. to GROUND)
3. Check RST signal (U7-40) low for  $\frac{1}{2}$  second approximately at switch on, then high; if this condition is not satisfied, probable U15 or U17 fault.
4. Check for an approx 1 KHz waveform at U13-18; if not present, probable U15 fault.
5. Check for narrow (20-50 $\mu$  Sec) pulses at approx 1 KHz repetition rate present at U13-7/8/9; isolated failure at any pin indicates probable U13 fault; total absence indicates probable clock or program fault. If O.K. go to step 7.
6. Check for 1 MHz square wave at U8-10, U7-3/36/37; partial failure indicates U17 fault; total failure indicates U16 fault.
7. Check that U12-2 thro' U12-7 are high; any failure indicates U12 or program fault.
8. If no faults remain at this stage, the computer board is probably functional.

#### B - Controller Checkout

1. Remove jumper added in step A2, and reconnect controller to computer unit.
2. Check that pressing 'RESET' on the controller causes U7-40 on computer board to go low until button released; failure indicates cable or computer U14 fault.
3. Check that pressing "TILT" on controller causes computer U14-3 to go low until button released; failure indicates cable or computer U14 fault.
4. If no characters are displayed at all, check for function of +5 volt regulator within controller (U11) or cable fault not delivering 10 volts unregulated to the regulator. If O.K. suspect U9 or U10 (character drivers).
5. If display present with some missing or additional segments :-
  - a) Same segment missing from each character indicates cable fault carrying appropriate data, or LED driver fault U5/U6/U7/U8
  - b) Segment differences between characters indicate LED failure within the display chips.

NOTE :- RECORD and STOP simultaneously depressed is programmed to illuminate every button and display LED in the controller.

SOME UNITS - ALSO TESTS LEVERS DIRECTLY  
TO DISPLAY

System clock set up by RV2, RV3, each operating on 50% of waveform for symmetry. Pin 9, U16

system clock at observe 8602, on Pin 9 (socket). 1MHz.

RV2 + RV3.  
50, 50%

5.55V

out may overshoot or undershoot!

If system clock out, controller may overshoot!

search points etc.



TROUBLE SHOOTING THE XT-24 INTELOCATOR continued

B - Controller Checkout continued

6. Suspected button or leverwheel malfunction :-
  - a) Check for narrow (20-50 $\mu$  sec) pulses at controller J1-1/2/14; some waveform degradation is tolerable; isolated failure indicates cable fault.
  - b) Check that by operating tens of minutes of leverwheels from 0-9 causes an identifiable change to the waveforms on J1-8/9/10/16; any failure indicates leverwheel or U3/U4 fault.
  - c) Check that operating single minutes leverwheel from 0-9 causes an identifiable change to the waveform on J1-3/13/14/15; any failure indicates leverwheel or U1/U2 fault.
  - d) Check that operating each button as indicated in TABLE 1 causes an identifiable change in the waveform on the indicated J1 pin. Failure indicates button or defined chip fault.

TABLE 1

BUTTON	CHIP INVOLVED	SIGNAL NAME	J1 PIN
PLAY ZERO	U1	PB0	3
STOP LEVER		PB1	13
RECORD MEM.1	U2	PB2	14
FORWARD MEM.2		PB3	15
REWIND MEM.3	U3	PB4	16
EDIT (M.D) MEM.4		PB5	8
CYCLE MASTER	U4	PB6	9
RECYCLE SET		PB7	10

7. Any remaining fault is probably in the machine interface board (AK 2404 or 5) or in the cable to the machine.



## TROUBLE SHOOTING THE XT-24 INTELOCATOR - continued

### C - Machine Interface Board - Ampex MM1200

The board functions may be split into three categories; input; output and interrupt.

#### 1. INPUT

Signals from the PLAY, STOP, RECORD, FWD and RWD indicator busses in the MM1200 arrive on-board via Ribbon connectors 27, 29, 33, 37, 41 and are applied to resistive dividers R1/2, R3/4, R5/6, R7/8 and R9/10.

Approximately 4 volts of signal is developed across the lower half of each divider when the mode is inactive, falling to zero when the mode is active. These attenuated signals are applied via Ribbon connectors 30, 32, 34, 36 and 38 to high impedance input pins PB0 through PB4 on the computer board.

Other status information presented to the computer includes end-of-tape status and machine speed selection. These signals arrive via Ribbon 1 and 5 and pass through isolation diodes D1, D2 to pull-up resistors at pins 1, 13 of U4, a resistor network.

The resultant 0-5 volt signals are passed to inputs 11 and 3 of U6, a CMOS AOI chip configured to selectively pass either these runout and speed signals or another two status signals; Range and Override Detect (See 'output' section for description of Override Detect).

Range is at a zero level when set to handle a machine operating at  $7\frac{1}{2}/15$  ips, and a 5v level when set for a 15/30 ips machine. U6, the AOI chip, passes the selected pair of signals, as detailed above, via inverter/buffers U2-11/10 and U2-9/8 and Ribbon connectors 26, 28 to TTL inputs PA6, PA7 on the computer board. The command signal to U6 to select the appropriate signal pair comes from control output CA2 on the computer board, via Ribbon 14 to pins 2, 12 of U6. U8-2/1 inverts the command signal and applies this to pins 4, 10 of U6.

Two TTL level inputs remain to be covered; these are the DIRECTION and TACH signals. Resistive pull-ups at the input points of these signals (Ribbon 35, 31) optimise signal characteristics after passing down the machine connector cable. The DIRECTION signal is inverted by U2-1/2 and applied as count up/count down control to counter U5. After re-inversion in U2-3/4 and pull-up treatment to ensure a 0-5v signal swing, the signal passes via Ribbon 42 to high impedance input PB6 on the computer board.

The TACH signal after inversion in U2-5/6 is applied as the clock signal to U5. A signal at 1/8 TACH rate is fed from U5 with pull-up to ensure 0-5v level via Ribbon 44 to high impedance input PB7 on the computer board.

*check on TPI.*

## TROUBLE SHOOTING THE XT-24 INTELOCATOR continued

### C.Machine Interface Board - Ampex MM1200 continued

#### 2. OUTPUT

Via Ribbon 12, 16, 18, 20, 22, 24, computer board outputs PA0 through PA5 may individually or in combination go active low, causing inverter outputs of U9 CMOS, to drive open-collector TTL inverter U10 active low, thus requesting action of the MM1200 via Ribbon 3, 11, 15, 19, 23, 25. These commands are inhibited during an END OF TAPE situation or during OVERRIDE DETECT.

#### Override Detect

AOI chip U7, with inverters in U8 and D3, 4, 6, 7, 8 resolves command contention problems as follows :-

The XT-24 is designed to drop out of any search, cycle or transport requesting mode, upon detection of a command not originating within the computer. Assume that an MM1200 mode button of the Ampex SEARCH-TO-CUE accessory requests a RWD function by pulling down the RWD command lines at some time when the XT-24 is not requesting this mode. At this time PA4 inactive high will be priming one input (pin 3) of AOI chip U7. The low-going external request will be transferred via D3 to inverter U8-5/4 which will complete the AND pattern at U7-4 and generate a low at U7-15, which may be monitored by the computer via the U6 selector circuitry.

#### 3. INTERRUPTS

To conserve the limited processing time available in any real time microcomputer system, the program does not routinely examine the state of the mode every so often; rather it expects the interface circuit to tell it that a status change has occurred, and only then updates its internal status memory by looking at the tally inputs. Parity trees U1, U3 achieve this 'excuse me' or INTERRUPT function.

Examining the interface diagram it will be noted that U1 monitors DIRECTION, DIVIDED TACH, STOP and RECORD tallies. U1-4 will change state when any one of these inputs changes. This causes rapid status updates by the following reasoning :

- a) Neither WIND modes nor PLAY mode needs monitoring since DIVIDED TACH changes for every  $\frac{1}{2}$  inch of tape motion.
- b) Theoretically the argument in a) could be extended to RECORD; however the XT-24 is capable of interfacing to machines other than the MM1200 where such rapid motion indications are not available, and in order rapidly to signal a change from PLAY to RECORD the RECORD tally is monitored.

TROUBLE SHOOTING THE XT-24 INTELOCATOR continued

C. - Machine Interface Board - Ampex MM1200 continued

Interrupts continued

c) During a WIND to STOP transition, the STOP tally does not appear until the 1200 has sensed a change in direction, so monitoring DIRECTION alone should be sufficient to update STOP tally status. However, as in case b) the XT-24 can be interfaced to machines employing similar logic but whose direction sensing is not synchronous with timer information, and for this reason the STOP status is monitored.

} \*

Pulse Forming

U1-4 is connected directly to U1-1 and via delay network R12/C3 to U1-2. U1-3 normally low then pulses high for a few microseconds at each transition of U1-4 and is applied via Ribbon 46 to interrupt input CBI on the computer board. Similar arguments hold for U3.

} Interrupts  
=

Stop tally only appears when 1200 has sensed change of direction .!



AUDIO KINETICS (UK) LTD.

XT-24 CONTROLLER CABLE - ISSUE TWO - 17-7-78

25 Way D Series Plug Connector - 8 Metres of 20 Way Multicore Cable -  
20 Way Jermyn Red Plug (Strain Relief Grommet and 1 Sleeve)

<u>D Connector Plug</u>	<u>Jermyn Plug</u>	<u>Core Function</u>
1 RED	5	PA 7
2 BLUE	1	PA 5
3 -	-	(PA 3)
4 GREEN	7	PA 1
5 -	-	-
6 YELLOW	10	PB 7
7 WHITE	8	PB 5
8 BLACK	15	PB 3
9 BROWN	13	PB 1
10 -	-	-
11 <u>SCREEN</u>	12	GROUND
12 <u>VIOLET</u>	17	RESET N.C
13 ORANGE	11	+10 V. UNREG.
14 PINK	2	PA 6
15 -	-	(PA 4)
16 TURQUOISE	6	PA 2
17 GREY	4	PA 0
18 -	-	-
19 RED/BLUE	9	PB 6
20 GREEN/RED	16	PB 4
21 YELLOW/RED	14	PB 2
22 WHITE/RED	3	PB 0
23 RED/BLACK	18	RESET N.O.
24 RED/BROWN	19	TILT N.O.
25 YELLOW/BLUE	20	TILT N.C.

Assembly Notes

1. A strain relief grommet should be threaded onto the cable before attaching the Jermyn 20 Way connector. The relief sleeve towards the centre of the cable.
2. The screen connection to the D Plug should be made with a length of 7/.2 cable and NOT directly to the pin.
3. Leave 3" of the cores showing before the connection to the Jermyn Plug. i.e. strip back cable 3 $\frac{1}{2}$ " Use Sleeve where cores leave overall sheathing.

TAKE CARE on 2 & 3 when connecting the screens to the link wire. If the screen is twisted tight around the multicores burning can result when the twisted screen is tinned. This can be avoided by untwisting the screen as it leaves the sheathing AFTER the original twisting.

4. Whilst looking at the face of the connector with the cable towards the floor, assemble the D connector into the shroud so that pins 1 - 13 (the longer row of pins) are on the left.



AUDIO KINETICS (UK) LTD

XT-24 AMPEX MACHINE CABLE 1100/1200 Version

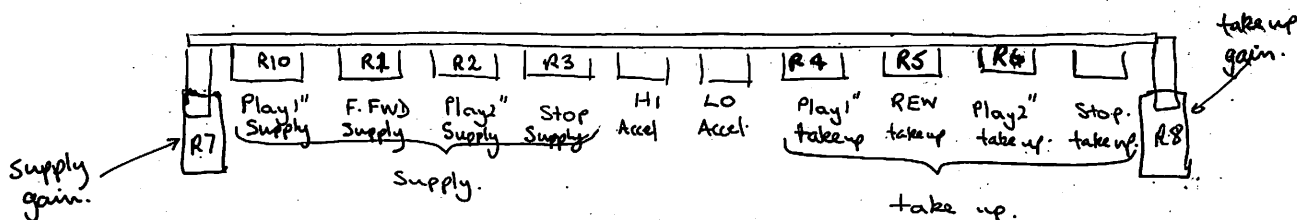
25 Way D Series Socket Connector - 4 Metres of 25 Way Miniature Cable - Pre-Tinned ends.

<u>D Connector Socket</u>	<u>Function</u>	<u>Edge Conn.</u>
1	Red	Runout ?
2	Blue	Speed ?
3	-	J1-W
4	-	J1-11
5	-	
6	-	
7	Brown	Lift :
8	Mauve	Stop ?
9	Orange	Record ?
10	Pink	Forward ?
11	Turquoise	Rewind ?
12	-	J1-20
13	Red/Blue	M/C 28v
14	Green/Red	Play :
15	Yellow/Red	Ground
16	White /Red	Forward :
17	Red/Black	Stop :
18	Red/Brown	Rewind :
19	Yellow/Blue	Record :
20	White/Blue	Play ?
21	Blue/Black	Tach ?
22	Orange/Blue	Direction ?
23	-	J1-DD
24	-	J1-K
25	-	J1-EE
		J1-FF
		J1-2
		J1-26
		J1-14
		J1-Z
		J1-23
		J1-25
		J1-21
		J1-10
		J4-22 *
		J4-21 *

Put isolation diodes in white/blue and green/red.

? = Tally to XT  
: = Command from XT

Transport Control Card Adjustments.



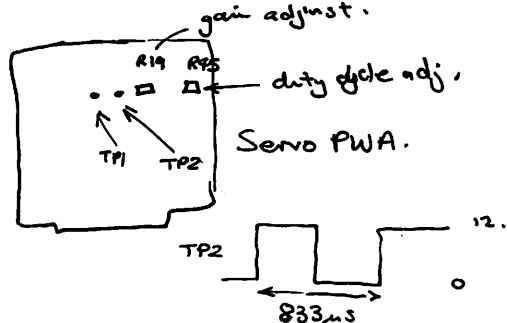
## Adjustments - Capstan Servo System.

A). attach. oscilloscope to TP2 @ 12V p/p. a.c.

Place transport in play mode.

Adjust R45 for 50% duty cycle

Adjust R19 for minimum jitter.



## Search to Cue / Tape Timer.

Load tape - Depress Search & Cue pushbuttons.

- 1) Measure voltage at pin 7 of A28 and adjust R68 as necessary, for an indication of +7.8V dc.
- 2) If tape overshoots cue point readjust R68 slightly counterclockwise and see if tape returns to cue point correctly.
- 3) If tape stops short & moves in series of stops & starts again readjust R68 for correct operation.

## Tachometer Check.

- 1) Connect Dual Trace oscilloscope to pins 4 and 6 of flip flop A1 on search to cue card and check the leading edges of the two waveforms are 90° out of phase!
- 2) Connect oscilloscope to pin 4 of the tachometer preamp assembly + while manually spinning tape timer idler check o/p is 1V p to p and adjust R3 as necessary.  
Similarly connect oscilloscope to pin 1 and adjust R2 for a 1V p/p display.

Notes: Use of XT24 with MINIMAG - Minimag uses 2 solid state relays to provide closures to ground on Play & Stop lines to the M11200. - If XT24 drops out of recycle modes probably due to loading on play line - cure with diode in play line to isolate from minimag. Toaching.

AUDIO KINETICS (UK) LTD

XT-24 AMPEX ATR 100/104 MACHINE CABLE

25 Way D Series Socket - 3 Metres of 25 Way Miniature Cable.  
- 28 Way P.C. Connector.

<u>D Socket</u>		<u>28 Way P.C.</u>	<u>Function</u>
1	RED	4	Runout ?
2	BLUE	M	Speed ?
3	-	-	-
4	-	-	-
5	-	-	-
6	-	-	-
7	BROWN	D	Lift :
8	VIOLET	6	Stop ?
9	ORANGE	B	Rec ?
10	PINK	V	Forward ?
11	TURQUOISE	18	Rewind ?
12	-	-	-
13	RED/BLUE	20	+ 20 v
14	GREEN/RED	16	Play:
15	YELLOW/RED	U	Ground (0 v)
16	WHITE/RED	22	Forward :
17	RED/BLACK	12	Stop :
18	RED/BROWN	21	Rewind :
19	YELLOW/BLUE	3	Record :
20	WHITE/BLUE	2	Play ?
21	BLUE/BLACK	N	Tach ?
22	ORANGE/BLUE	L	Direction ?
23	-	-	-
24	-	-	-
25	-	-	-

? = Tally to XT

: = Command from XT

Assembly Notes

1. Sleeve stripped back multicore before attaching to P.C. Connector.
2. Sleeve all terminations to 28 Way P.C. Connector leading cable in from A end. Allow a little slack on multicores.
3. Tie wrap cable to P.C. Connectors through hole at A end of connector.
4. Whilst looking at the face of the D Socket Connector with the cable towards the floor, assemble the connector into the shroud so that pins 1 - 13 (the longer row of pins) are on the left.

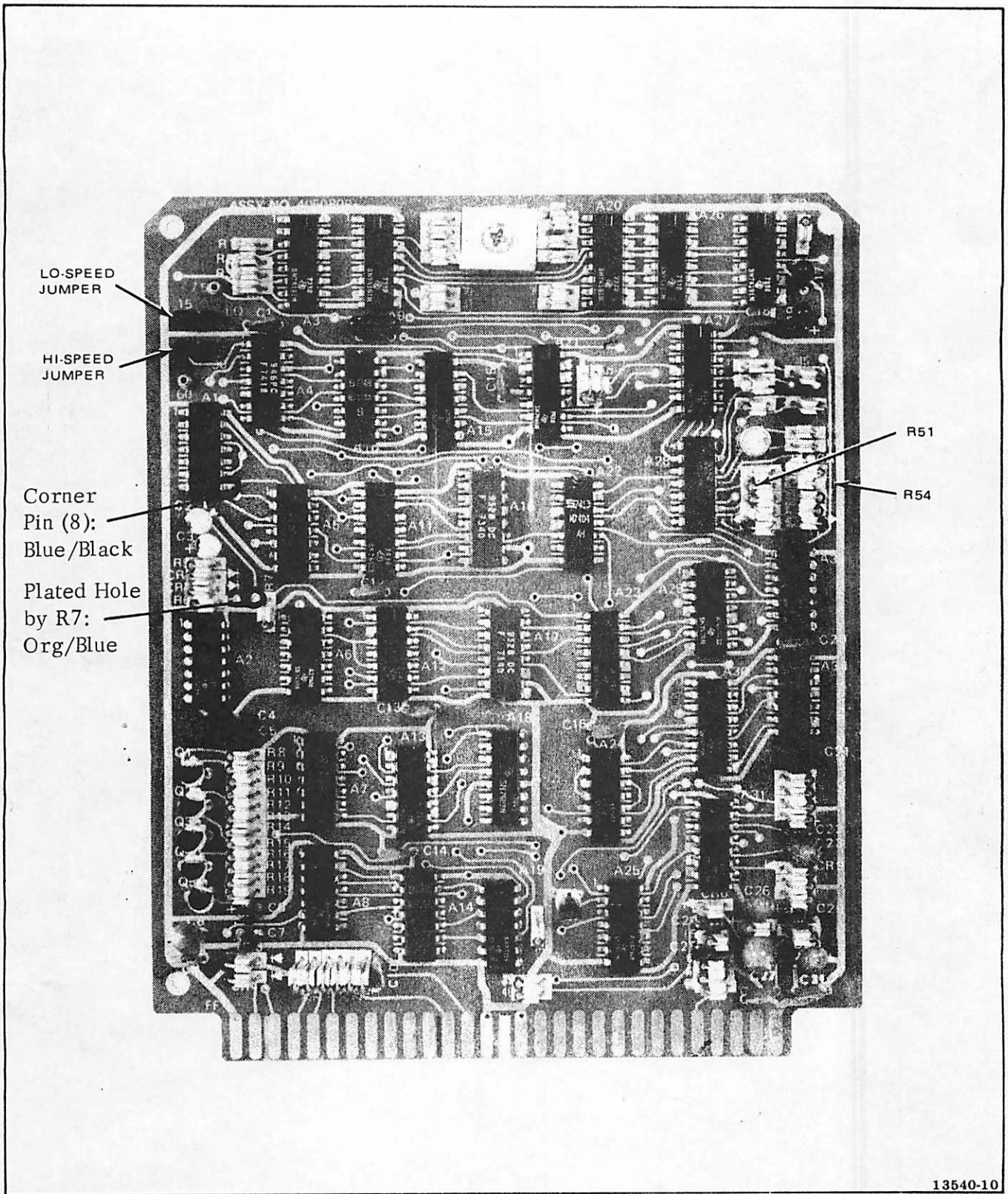


Figure 2-4. Search-to-Cue and Tape Timer PWA

Ampex MM1200 Tachometer information.

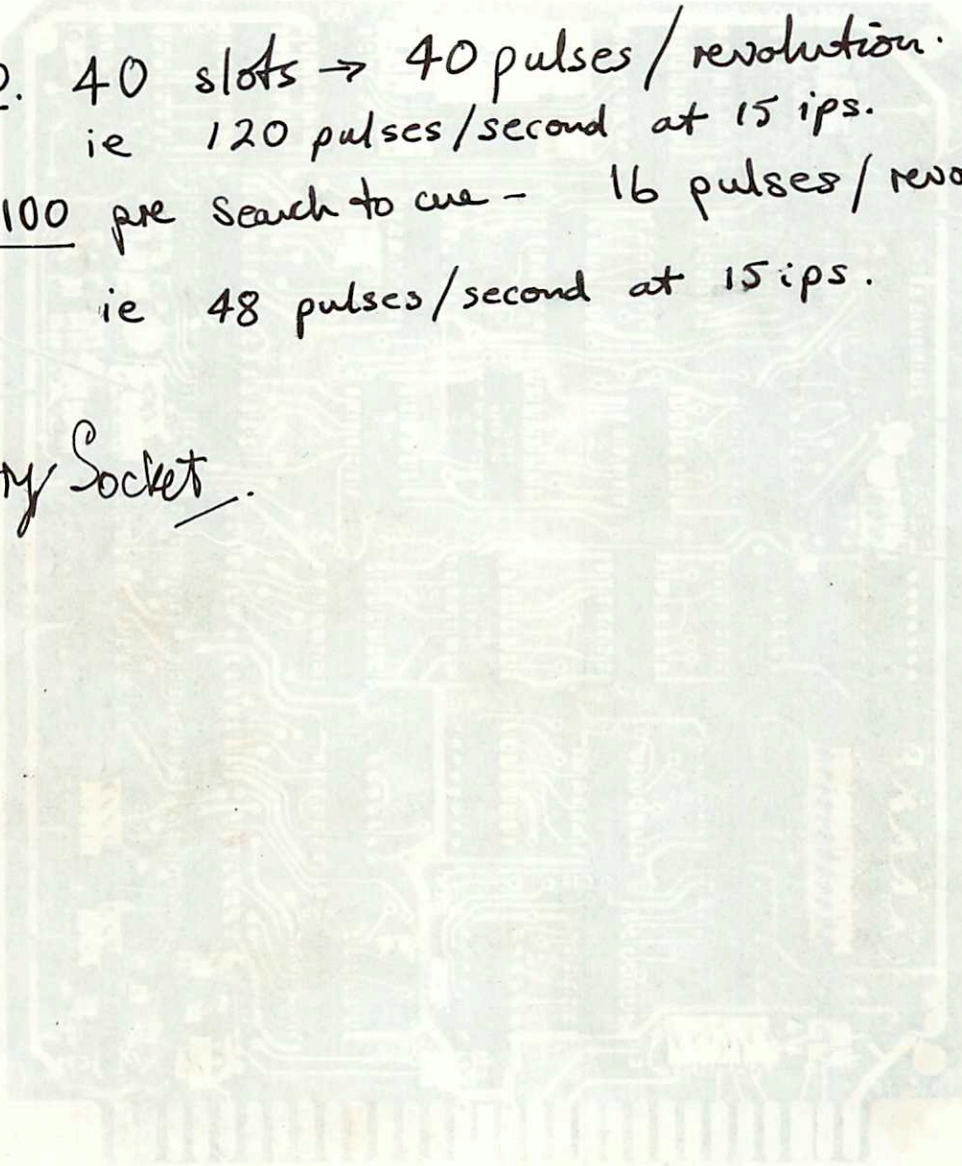
1.59" diameter sensor  $\equiv$  5" circumference.

3 revs at 15"/second.

MM1200. 40 slots  $\rightarrow$  40 pulses/revolution.  
ie 120 pulses/second at 15 ips.

old MM1100 pre search to cue - 16 pulses/revolution  
ie 48 pulses/second at 15 ips.

Accessory Socket.



TO SPEED  
JUMPER  
HIPPED  
JUMPER  
Corner  
Pin (8)  
Blue/Black  
Plated Hole  
by RT  
Org/Blue

↑↑↑↑  
return to two  
lines & direction

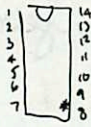
connect to  
board  
direction

over  
7

Figure 2-4. Search-to-Cue and Tape Timer PWA

2-18

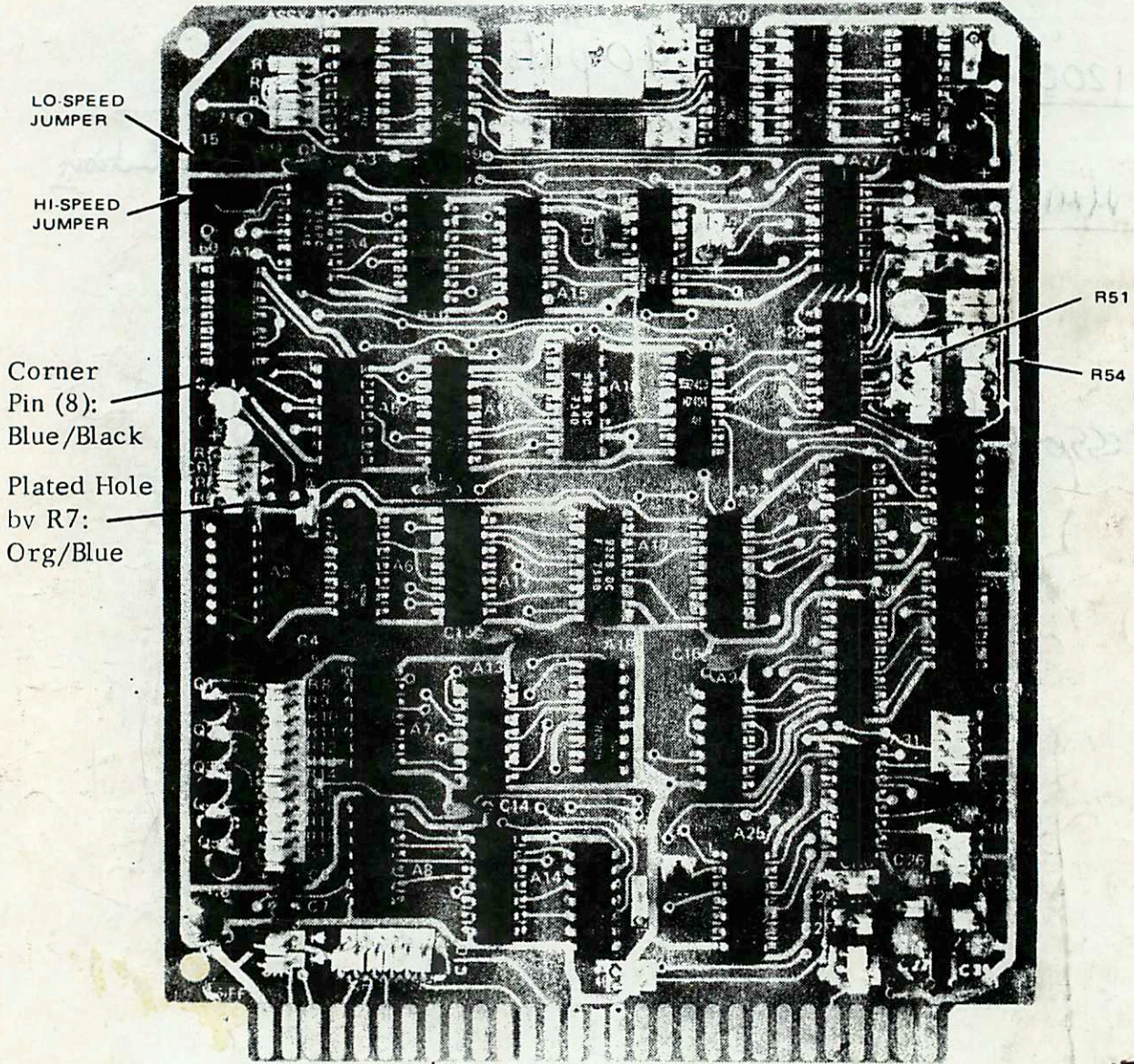




A1, 7417.

90° out of phase.

1V peak to peak from preamp. into board.



LO-SPEED JUMPER

HI-SPEED JUMPER

Corner Pin (8):  
Blue/Black

Plated Hole by R7:  
Org/Blue

R51

R54

blue black 22  
Tack  
21 orange blue  
connect to rear of board.  
Direction.

A5 7474:  
Q out + inverted gives Direction  
13540-10

Figure 2-4. Search-to-Cue and Tape Timer PWA

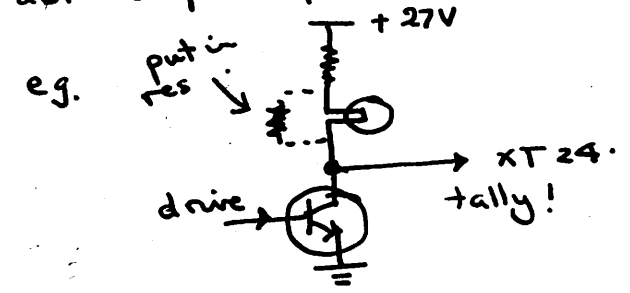
1 for forward.  
0 for rewind.

2-5/6

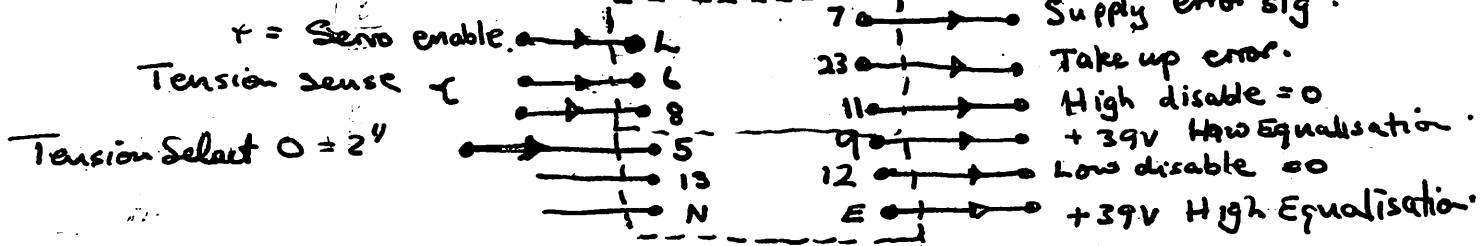
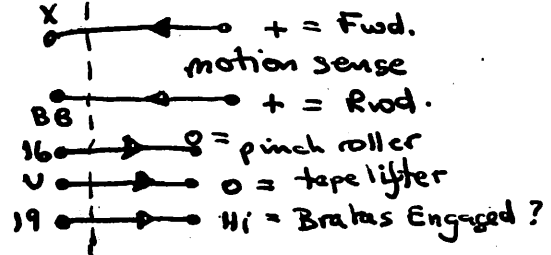
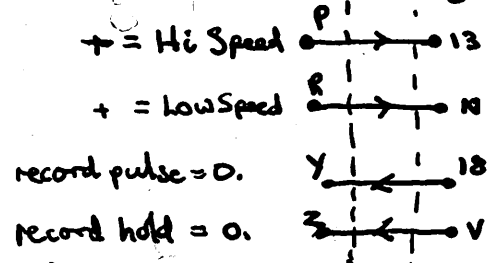
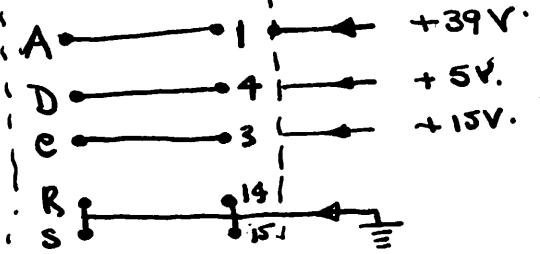
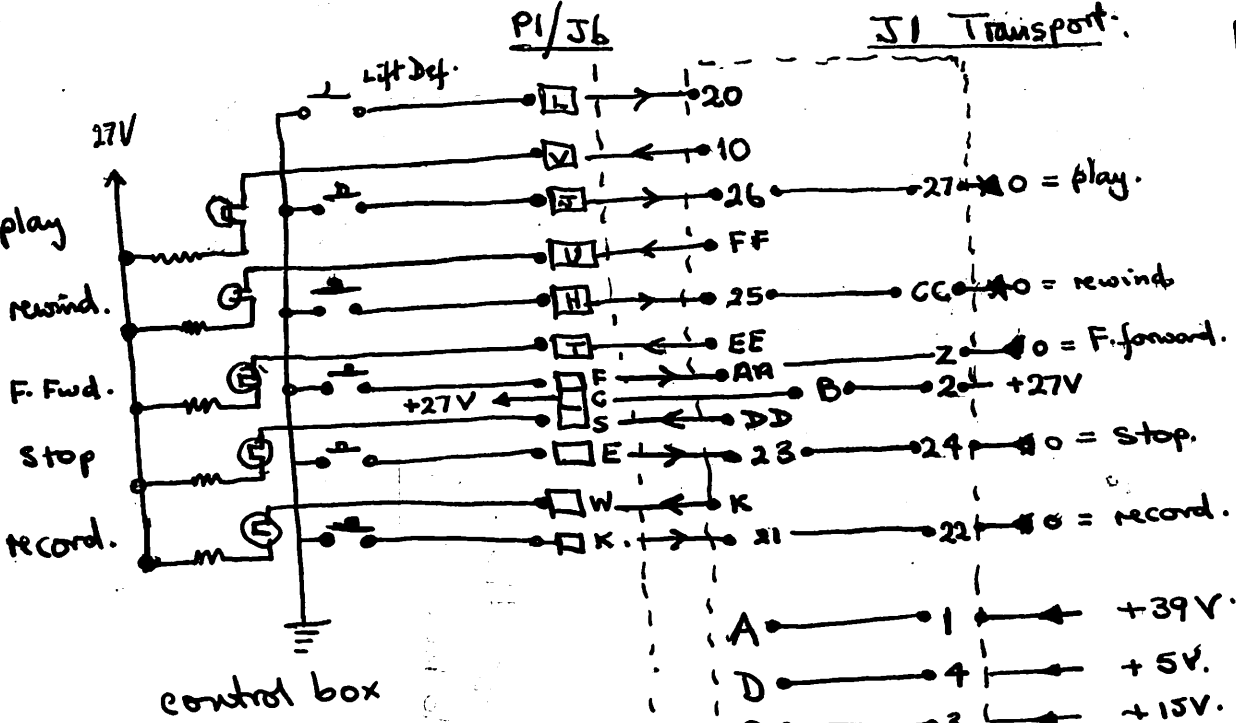


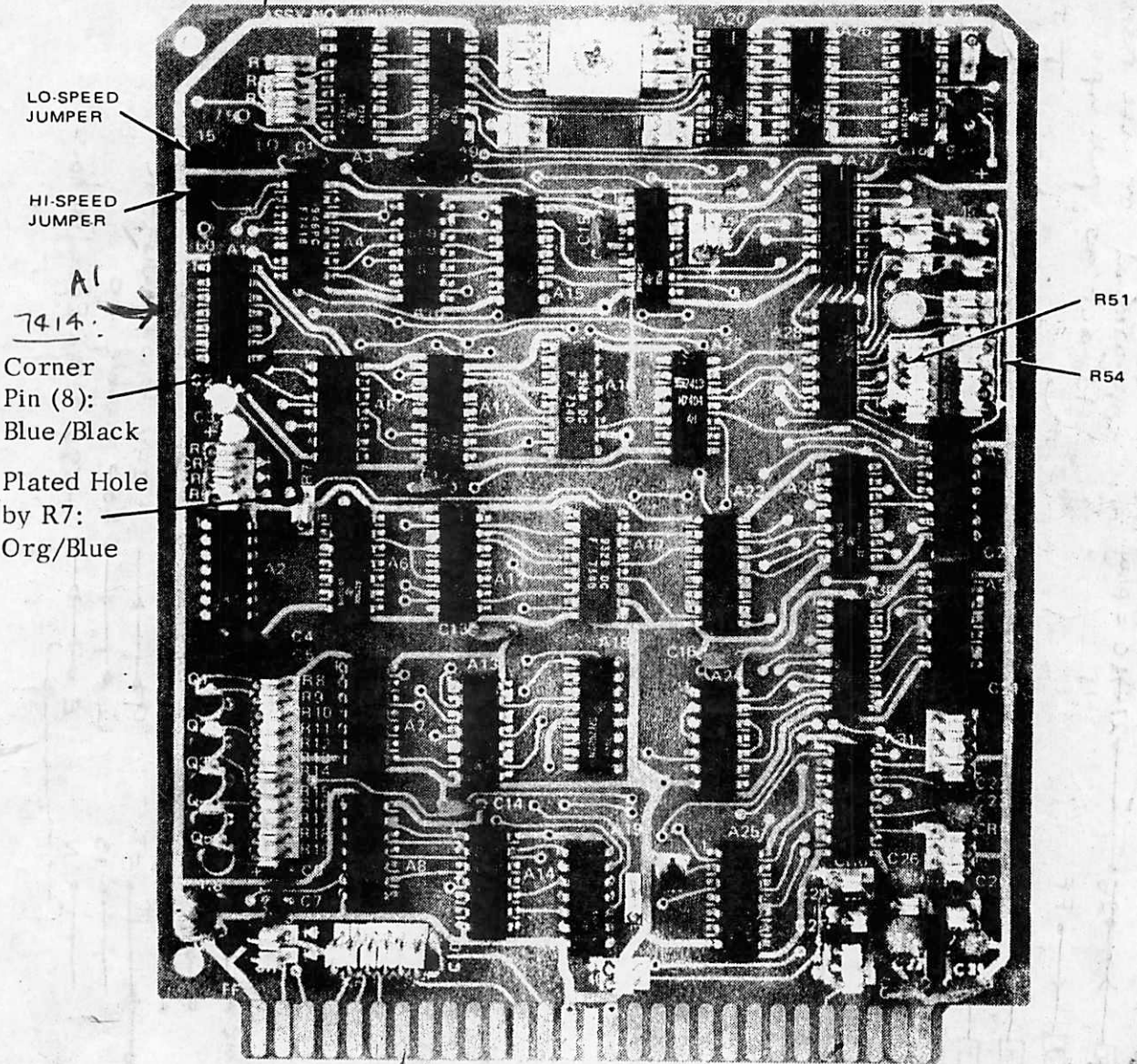
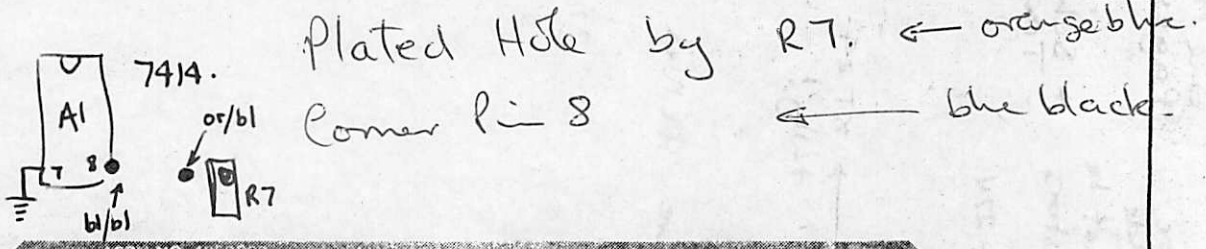
See Ampex  
Pages. 6/5-6.  
6/9-10.  
+ Schematic  
Transport Control.

N.B lamps are in  
collector cct of indicator  
drivers which also provide  
tally for XT 24 ∴ must be  
operational or use resistors  
to act as pull ups



logic ccts are HiNid TTL, 15V.





blue/black 22.

21 - orange/blue -  
Connect to Rear of Cart.

13540-10

Figure 2-4. Search-to-Cue and Tape Timer PWA

## \* Problems:

- 1) Bulb problems. - Faulty tally bulbs in remote unit may cause incorrect logic operation + failure.
- 2) Coarse setting up procedure can cause problems
- 3) Slip can be a problem due to metal rollers but correct tape tensions improve condition.
- 4) Record / Play drop in / out doesn't always work - may be improved by reducing C19 on transport control board from  $2.2\mu\text{F } 20\text{V}$  to  $\approx 0.1\mu\text{F } 20\text{V}$  (tants). (Stop  $\rightarrow \frac{1}{3}$  line)
- 5) Counting Problems - spurious counting pulses giving counting at double rate - On board AK2405 put  $10\mu\text{F}$  or less  $\approx 20\text{V}$  across  $V_r$  to schmitt (pin 5, Ic 2) to ground, Pin 7.  
due to bad batches of 74LS14.



Installation Instructions for the XT-24 Intelocator in use with the Ampex  
ATR 100/104

*See page 39 for assembly notes  
& connection diagrams.*

On the left underside of the ATR transport there is the cage containing the logic electronics. Protruding from the right of this cage is a P.C. The top connector links to the transport controls. The lower connector is for the autolocator. Simply plug in the interface cable supplied so that the cable leads off in the same direction as the top connector, eg. to the rear of the machine.

P



Installation Instructions for the XT-24 Intelocator in use with the Ampex  
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Note

If transport stops after using XT-24 play command to exit record, change C19 on transport control P.C. (Front card) from 2.2mf. to 0.1 mf.