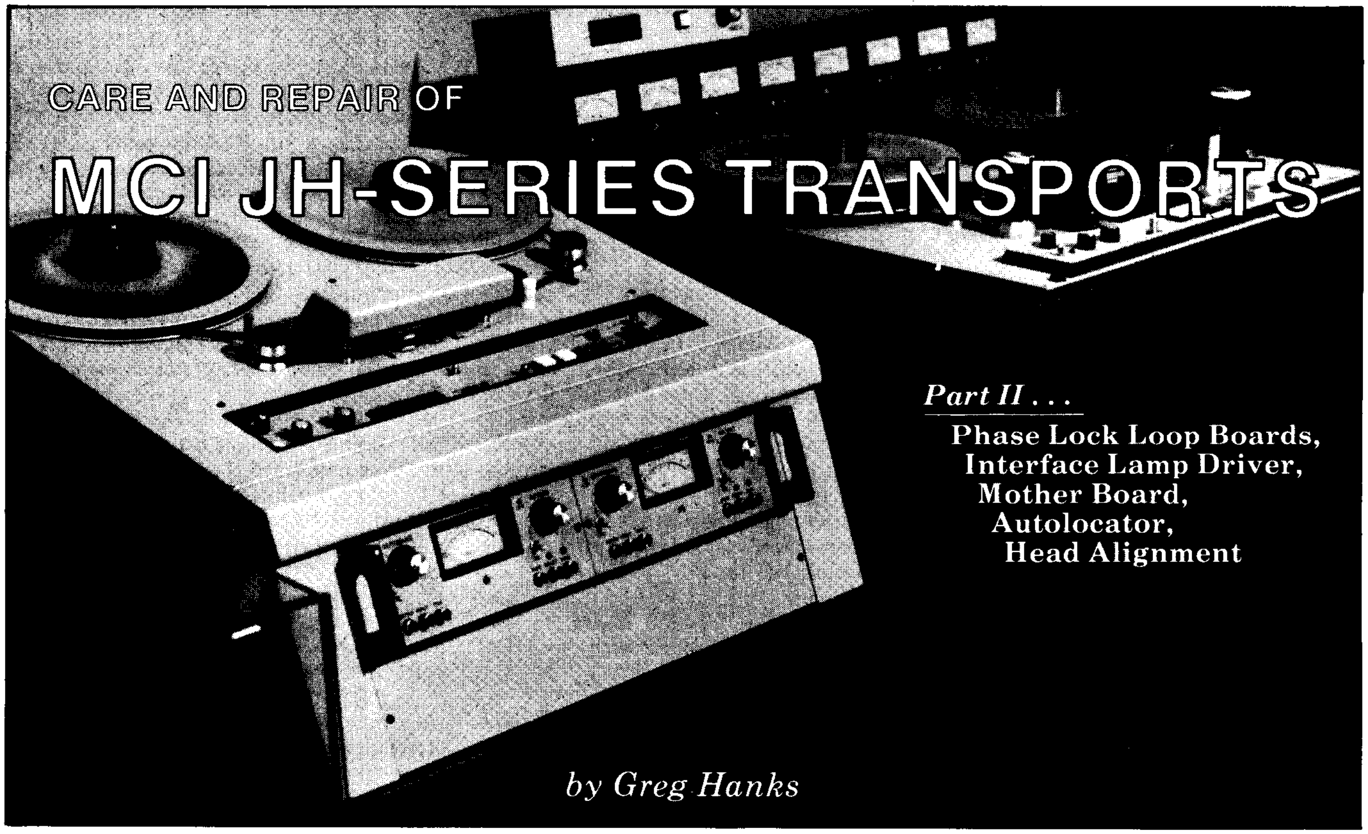
CARE AND REPAIR OF MCI JH-SERIES TRANSPORTS



Part II . . .

Phase Lock Loop Boards, Interface Lamp Driver, Mother Board, Autolocator, Head Alignment

by Greg Hanks

In Part One of this article, published in the October 1982 issue of R-e/p, we looked at the overall components of the Transport System, Power Supply, and Analog Torque Board. In this, the conclusion, it's the turn of the Phase Lock Loop Boards, Interface Lamp Driver, Mother Board, Autolocator, and routine Head Alignment.

Phase Lock Loop Boards

On some of the older JH-100s there can be a sizable start-up loop thrown, especially at 30 IPS and at the end of the reel. This can be diminished greatly by three changes to PC.2500C0089:

1) Change C2 from 4.7 mFd/25V to 20 mfd/25V, which lengthens the accelerate pulse discharge time.

2) Change R39 from 27K to 39K, which slows down the capstan slew-up time.

3) Change R90 on the Analog Torque Board from 12K to 7K5, which increases the gain of the accelerate amplifier.

Together these changes minimize the loop. Sometimes, however, they also cause a bit of trouble, for instance:

A) Capstan takes a long time to come up to speed. To correct this simply decrease slightly the value of R39.

B) Capstan overshoots operating speed; to remedy increase slightly the value of R90.

If it proves difficult to adjust the PLL so that there are not intermittent flutterings in the transport, it may be necessary to adjust the tach pickups under the capstan motor. To perform this adjustment, which requires an oscilloscope, look at TPl on the tach board, and adjust the cam on the top of the PCB so that the envelope of the tach signal is the most stable. Slow sweep rates on the scope are necessary to do this (50 milliseconds per division or so). If the signal cannot be made stable then it may be necessary to adjust the individual photocells. For proper cell operation they should be matched to within about 10% of each other; they are sold by MCI in matched pairs. To adjust them, ground the white lead from one photocell and note the envelope level at TPl (Figure 1). Ground the other white lead (removing the ground from the first one), and note the level; the two signals should be the same. If they are not, the photocell with the lowest gain should be reset to match the other. To accomplish this, loosen th 4X40 Allen that holds the photocell, and repositions it so that its gain matches that of the other. When this procedure is complete remove the ground wire and readjust the cam on the top of the PC board.

— The Author —
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It should be noted that the 74CO0 CMOS IC on the tach board is biased as an amplifier, and is also used to double the tach frequency; every other pulse from this board will have small amounts of jitter.

Maintenance: One of the common failure modes of the capstan assembly is bearing deterioration, caused by excessive amounts of alcohol or other cleaners running down the shaft and into the motor bearings. Once these bearings get real noisy, the only real cure is to send the motor back to MCI and have it rebuilt. To clean the shaft apply 409 or Fantastick to a Q-tip and rub this on the shaft; these alkali-base cleaners work very well on the ceramic — they also do wonders cleaning up the Woelke head.

Alignment: Older PLL boards should be aligned with the gain control so that TP3 has minimum jitter. The duty cycle is usually somewhere between 30 and 60%. When the "sweet spot" is found it is usually fairly sharp, but not very obvious, and sometimes difficult to snot.

Preferences: With old style PLLs, the "S" revision is the most desireable to have in your machine. It includes an

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extra drive transistor in the output circuit, along with a little different pattern layout that eliminates some radiation problems.

Pitfall: When utilizing an external drive signal for speed control on JH-100 type PLLs, ensure that the FET control is biased off; without this the VCO and External signal are shorted together. The result is in excessive flutter in the variable and external mode, and catastrophic PLL failure can result. To bias off the FET, tie the gate to +15V through a 100K resistor. (Actually, this may be done by tying pins 2 and 3 together in the external Capstan Programming plug used with the synchronizer or external frequency source.)

Troubleshooting: The time for capstan re-building is at hand when the pinch roller pressure causes the shaft to shift its rotational axis off from being perpendicular to the top plate. To check for this, you must unplug the capstan, put the machine in play and check the parallelism of the shaft to the outgoing head guide. If it changes between pinch roller engaged and stop, then it is time for a new motor. (The motor may be repair/exchanged with any MCI dealer, or MCI proper.)

Interface Lamp Driver

This cute little guy is almost trouble-free, but provides a good place to find the various signals that are very handy for troubleshooting the rest of the deck electronics. The record momentary and the record hold pulses that go to the power supply are to be seen at P38, pin(s) 1 and 3 respectively; the tach generator pulses can be seen at P26 pin 4; and the MVC firing line appears at P22 pin 2. The MVC circuit, in fact, is one of the two most common failures in this sub-system. The MVC control was originally called U300; however, the company that made this hybrid touch decoder went out of business. The replacement device was a long thin hybrid circuit called IC 3000 (but the documentation designations never changed); alas, this supplier also bit the dust. Now, however, there is a new circuit that uses industry standard JEDEC-type parts that can be repaired, and with parts available through many sources. The only problems that we have encountered with this circuit, whether it be the U300, IC 3000, or the new circuit, is the connection to the motherboard of the twisted pair that goes to the joystick contactor — sometimes the Molex is put on mis-pinned.

Another problem involves the use of 748 op-amps instead of 7419, a device change that sometimes results in oscillation because of the lack of compensation required for the 748. A change to the 741-type device cures this difficulty.

If when you turn your machine on it goes into the MVC mode, or locks into this mode intermittently, we have a fix. On JH-114s introduced in early 1980, there was a ground trace left off the circuit board. To repair this tie a jumper from the upper left-hand corner pin to the top of the upper left-hand resistor.

Mother Board

Strange as it seems, there are a significant number of troubles that can be associated with this PCB. Intermittent tensions, odd servo lock, and intermittent wind and locate functions can usually be traced to cold solder joints on the Molex pins, sometimes because the solder just won't take to them. If you look very closely at the connection between the mother board and the pins, sometimes you will see what looks like a cone of solder building up around the pin, but a thin dark ring around the pin identifies that the solder didn't form a weld with the pin. Bad connections can also be identified by wiggling the pin and seeing if it moves at the board, within the solder connection. When defective joints are found, the best cure has been to file the pin at the solder line, removing the old solder with wick or solder sucker and re-soldering the connection. When all of the suspect connections have been re-done, a thorough cleaning with a flux remover followed by another re-inspection is in order.

Modification: When using the machine with an A/L-III or the JH-45 Autolock, Rl must be jumpered out. When using the JH-45 Autolock, the minus 15V feed to the transport switches — both on the transport and the remote — must be isolated by a 4K7 resistor, or greater.

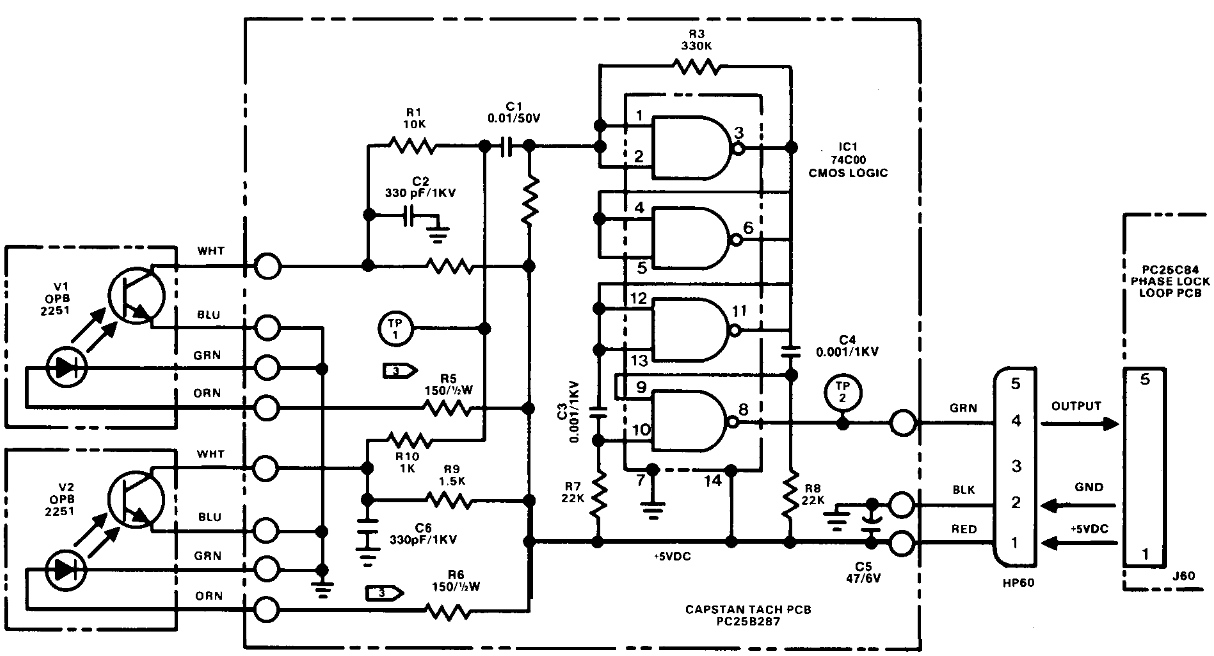
Troubleshooting: When the play mode will not initiate, but both the stop light and the play light are illuminated, and the tape is at a complete stop, look for:

- Lifters not fully retracted (micro-switch senses this)
- Motion sense line hung up

*Tape not fully stopped, but creeping sufficiently to hang up a motion sense line

Adjustment: Head shield adjustment on the JH-100 and JH-114 is by means of a brass screw on the rotary solenoid. Sometimes this screw (the bottom one of three) is replaced with a screw like the other two. To properly adjust the head gate, set the screw so that when the shield button is depressed, the shield doesn't bounce when it hits the bottom. Once adjusted, hold the screw's position while tightening up the locking bolt. Double check the operation because locking the bolt often changes the adjustment. *continued on page 41*

FIGURE 1: WIRING OF CAPSTAN TACH PCB, WITH CONNECTIONS TO TACH PHOTOCELLS



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— continued from page 38 . . .

After considerable use, the Teflon block that guides the shield becomes mired with crud. To determine if this is happening, back off the air dash pot a bit. With no dash pot tension, the gate should move very briskly. If it doesn't try cleaning the bar, and the top and bottom of the block with alcohol. After a thorough cleaning lubricate the bar and the block with something like Tri-Flow, which is a Teflon-based lubricant. Then adjust the shield with the dash pot for brisk, but not violent, return.

The tape lifter is also oftentimes a little out of spec. The adjustments for this are:

- Non-engaged rest position
- Engaged extension position
- Rate of outward travel

These adjustments are located under the deck in the form of screws that retain eccentric disks with rubber peri-

ADDING A FLASHING VARISPEED INDICATOR TO MCI JH-110A SERIES TAPE MACHINES . . . . . . *by Roman Olearczuk*

Imagine you have just finished a tricky mix, and now are ready for some fancy tape editing. Horror of horrors, you've just realized that the VSO switch was still on, and everything you've just patiently recorded is at the wrong tape speed! Apparently, this frustrating experience is quite a common occurence, since MCI didn't include any kind of indicator within the JH-110A Series tape machine remote control unit to show the tape operator when varispeed mode has been selected.

The circuit addition described here solves such an ommission in the following ways. With the varispeed mode engaged, the Play indicator (on the machine and the remote box) flashes at a rate of 1 Hz whenever the transport is in the Play mode. In the Stop mode, the Stop indicator flashes instead. With this design an engineer will always know if the tape recorder is in a varispeed mode.

The original partial schematic of the JH-110A's control logic board is shown in Figure 1. Only the ICs and board I/O pins directly involved in this modification are referenced here. An effort was made to utilize the spare IC gates already present on this board, but the number required for a correct logic interface exceeded those that were available. Figure 2, then, shows the external circuit that was designed to provide the features mentioned above.

The flashing circuit basically is added in a logical AND fashion to the existing Play and Stop light commands. The circuit operation is as follows. A Signetics NE555 (or similar device) is connected to run as a multivibrator, by triggering itself for an astable operation. The frequency is set at 1 Hz (33% duty cycle) through the combination of 470 kohm resistors and a 1 mFd capacitor across pins 6 and 7 of the IC. The timer is inhibited whenever pin 4 (Reset) has a voltage of 0.4 VDC, or lower. The Variable Not-Enable flag that originates from the Speed Reference Switch (refer to the JH-110A Manual Interconnect Harness Schematic) is used to activate the oscillator through a logic interface at the Reset pin.

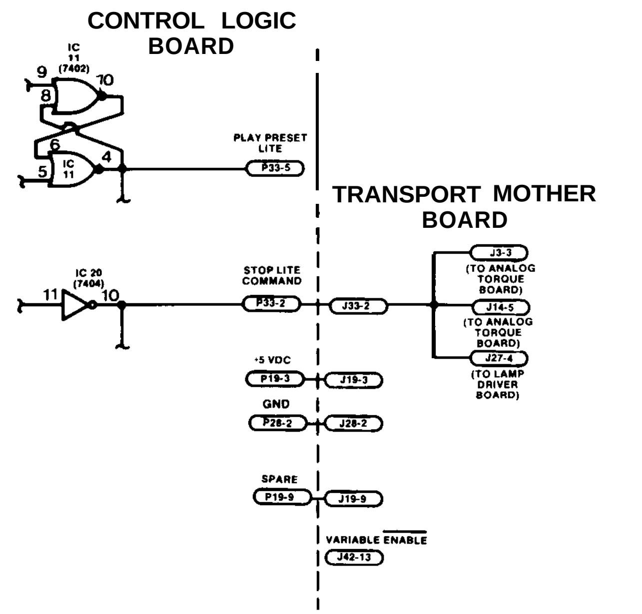
When varispeed mode is engaged, Variable Not-Enable goes Lo (Gnd). This action turns on the 2N3906 PNP transistor, which pulls pin 4 high, enabling the timer. The output pulses on pin 3 drive a 2N3904 NPN transistor that interconnects with the 7408 AND gates. The pin 3 output remains in a low state whenever the timer is in Reset. This logic permits the normal Play and Stop light commands to occur unimpeded through the AND gates.

When the VSO is switched in, then the output pulses appear at the inputs of both AND gates. The appropriate gate will then be activated dependent upon the transport mode selected. As expected, the Rewind and Fast Forward modes deselect the flashing indicator from either Play or Stop lamps.

The circuit can be constructed compactly on a small pre-drilled circuit board. A convenient mounting location is to the right of the transport control logic card. As Figure 2 illustrates, two PCB traces need to be cut and a wire brought out to a spare socket pin, in addition to the expected circuit interface wiring.

The first cut trace occurs at the trace leaving the output pin 4 of IC 11. An incision should be made somewhere on the trace after this point, but before the trace reaches P33-5. Here a wire is added from IC 11 pin 4 to P19-9 (a spare pin).

The next incision occurs on the Transport Mother Board. The PCB trace leaving J33-2 splits off to three pins, J3-3, J14-5, and J27-4, on the same mother board. Only the trace that goes to J27-4 (the Lamp Driver Board) should be cut free from this interconnect —we only want to flash the Stop lamp, and not the torque motors! The rest of the wiring is straightforward. For neatness ribbon cable is recommended. ■■■



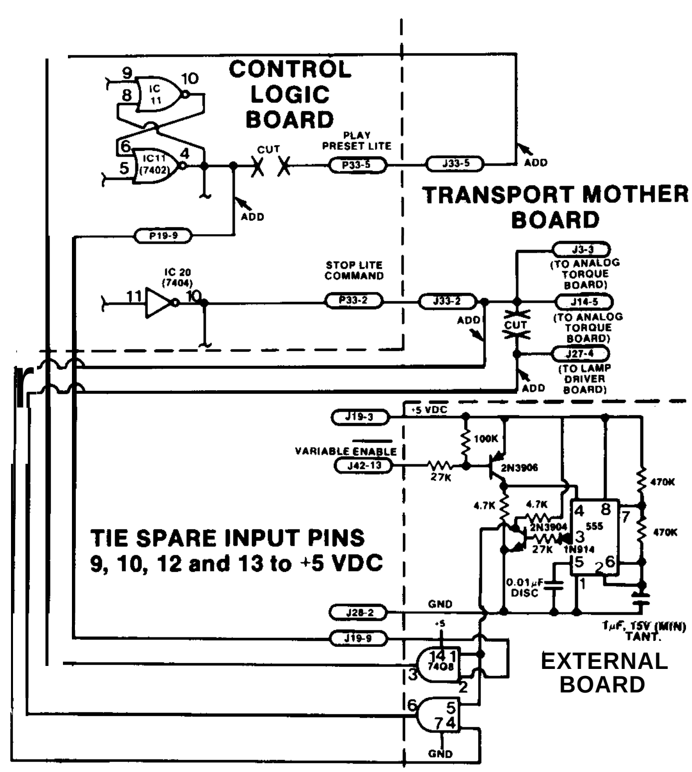


Figure 1 (above): Partial schematic of JH-110A Control Logic Board and Transport Mother Board, prior to modification.

Figure 2(right) External flashing circuit interface, circuit modifications, and necessary connections.

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pheries, and a dash pot located behind the assembly. The inner limit set should be about 0.125 inches behind the tape, while the outer limit should be set so that when in fast wind the tape is not extended beyond the guides — most specifically the guide next to the capstan. The dash pot should be set so that the lifter does not slap the tape, but engages it quickly.

Another adjustment that is rarely "on the nuts" is the azimuth and zenith of the tape lifter; this is an adjustment and mounting method combined. There are three threaded shafts that extend down from the bottom of the transport, and hold the rotary solenoid actuating the lifter. The solenoid is mounted on a plate that is secured in position by a nut and lock washer on the bottom, plus a jam nut on the top of the plate and threaded to the shafts.

To adjust the lifter, you need a third and sometimes fouth hand -plus a machinist's square and a two-inch gauge block. The first adjustment to perform is lifter azimuth. To do this, block the tape-break sensor, tilt the deck up to the first stop, and put the machine in fast wind with no tape threaded. Position the machinist's square to the left of the lifter, and use the two front nuts to set the lifter to perpendicular. Once this is done, use the gauge block to measure the parallelism of the lifter to the erase head and the outgoing head guide, and the rear nut to set lifter zenith. When these adjustments are done properly, the fast wind tape pack can improve considerably.

The smoothness of starting is affected by the rest position of the pinch roller. This can be adjusted on the solenoid itself, by changing the position of the solenoid plunger retainer arm. We suggest that the pinch roller should be as close to the capstan as possible, while still being able to easily thread the tape; this dimension is somewhere between 0.25 and 0.125 inches.

To adjust the newer Analog Torque Boards, the order and procedure are as follows:

1) Set off-set ***nulls.*** With tape loaded and no tape motion, attach a scope probe to TPl or 2, picking up ground at the large trace that ties the two electrolytic caps together. Set the off-set null pot so that the DC at these test points turns into a 50% duty cycle semi-square wave. (While making these measurements, if the tape is creeping have someone hold it still.)

2) ***Idle.*** Remove tape from the transport, block the tape sensor, and set the idle adjustment so that there is 1 volt at the test point(s). For the JH-100 and -114, set this to 1.5 volts.

3) ***Supply tension.*** Assuming that the dancer arm settings have not been changed, set the hold back tension for a dancer arm position in the center of its travel. If the dancer arm position has been changed it can be checked in one of two ways: with a "fish-scale" pulling the dancer arm to the center of its travel, and noting the tension; or by using a Tentelometer. Check the tension of the tape at the incoming side when it is centered; the tension should be around 8 ounces. My preference is to set the dancer arm 1 ounce above the minimum tension required for consistent head contact and phase stability. Our settings usually end up at around 6.5 to 7 ounces.

4) Take ***up tension.*** This setting is done after the supply reel because it depends on correct supply tension for its performance. Initiate play and allow a few seconds for the play boost to subside, then push the pinch roller away from the capstan. When set properly tape speed will remain constant.

Older Analog Torque Boards pose one or two problems:

1) ***Off-set nulls.*** Same as above.

2) 50/60 Hz. To set this, hook up a scope to the banana jacks next to the side being adjusted. Put the machine in rewind (for the supply reel) and adjust the pot for minimum crossover distortion in the waveform. CAUTION!! The case of the scope is at line potential! For the take up reel, put the machine in fast forward and do the same as before.

3) ***Idle.*** Same as above for newer boards.

4) ***Empty reel/full reel.*** The method I use is as follows: Using a calibrated Tentelometer with full reel of tape on the supply side, set the full reel tension pot for 7.5 ounces at the incoming side of the head stack. Roll to the end of the reel and set the empty reel tension to 7.5 ounces. At the same time, set the full reel pot on the take up side for a tension that allows for correct speed. Again, on the supply side reset the full reel tension to 7.5 ounces. Push the puck away, and set the empty reel of the take up side so the speed remains constant. Roll the tape so that the supply side is almost empty, and set the empty reel tension at 7.5 ounces. Push the puck away and set the full reel tension pot on the take up side so that the speed remains constant. ***Note:*** when starting the above procedure set the initial tensions using the empty reel/ full reel test switch to get the pots in a good starting position.

An alternate procedure that seems promising is to set the tensions using predominatly electronic measurement means:

1) Thread a full roll of tape, put the empty/full operate switch in the full position, and set the full reel pot on the supply for 7.5 ounces of tension at the incoming guide to the heads. Note the voltage at pin 6 of IC24. Switch back to operate.

2) Roll the tape so that there is a full pack on the supply reel. Initiate play and measure the voltage at the test points, noting the full reel tach output for the tape up side. Roll the tape so that the full pack is on the take up reel. Again

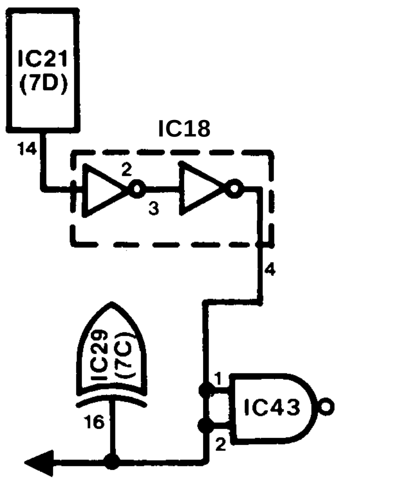

FIGURE 2: BUFFER ADDED TO AUTO-LOCATOR LOGIC BOARD OUTPUT

note the voltages at the test points. These will be empty reel supply, and full reel take up tach outputs.

3) Set the test switch to empty reel, and note the voltage at these test points. Devise a method of making these voltages the same as for the actual reel-tach output; this can be accomplished by inserting a multiturn pot in place of the resistor networks currently there.

4) Put the test switch to the empty reel position, and set the empty reel pot on the supply side to give the same voltage as measured in step #l. Now place the machine in operate mode, and set the tension at the take up reel to give constant speed with the puck pushed away. At this time measure the voltage at pin 6 of IC14, and note it.

5) After achieving the same voltages with the test switch at the test points that the corresponding tach in the operate position yields, it is possible to set the tensions without having to go back and forth with a reel of tape and the Tentelometer, but simply to use the empty reel/full reel test switch to bounce back and forth. Care must be taken to ensure that the voltages that appear on the test points are within 5% of the actual tach output values, otherwise this procedure is useless. ***Good Luck!***

Autolocator

There are a number of changes that should be made to an Autolocator II that has intermittent problems:

Field Service Bulletin 712 — Install grounding bus from the ground pin on the Autolocator logic board to pins 12 and 13 of IC31,32,33, and 34. Also add a pair of 1 mFd Tantelum capacitors from each +5V Molex pin to ground.

FSB 711- Add a 100 pf cap from pin 14 to pin 12 of IC21.

FSB 703-ReplaceIC21,22,23,24,31, 32,33, and 34 to ***ceramic 74835.***

FSB 702 — Install buffer on output of IC21 (Figure 2).

This one has no Field Service Bulletin attached, but is from my experiences: closely inspect all IC connections on the soldered side of the PC board for leads bent over traces that run alongside the pins. Trim bent leads carefully so that overlaps do not take place.

For problems with multiple entry of numbers with a single key stroke on the Autolocator, a de-bounce board modification kit is available. A slight problem exists with the de-bounce board, however, that requires modification as well: install a 300-ohm "R" and a 0.47 mFd capacitor as described in FSB 711.

Sometimes the tape counter will seem to gain counts, or lose location, a problem that almost always is caused by the tach pulse generator becoming smooth with use. To verify that this is the problem, attach an oscilloscope to the interface lamp driver board at P26 pin 3, and put the machine in fast wind. Pulses at this location should become closer and closer as the velocity increases. At terminal velocity, if the pulses widen out, then the roller needs replacing; factory repair/exchanges are offered by MCI. The tach pulse generator is the outgoing roller guide.

If, after all of the above fixes have been tried, intermittent operation still plagues the A/L II, remove all of the ICs and wash the sockets with a stream of "Flux Remover." Re-insert the ICs after any residue has been removed with Freon.

Heads

Over a fairly long period of time, MCI has been using AMC record and play back heads. While these units perform well, a large number evidence incorrect crown centering. (What this means in a nutshell is that the gap is not centered on the center of the headface peak, which leads to an asymmetrical wear pattern about the gap.) As a result, higher tape tensions than would otherwise be required are necessary to maintain sufficient tape-to-head contact. The only solution to this problem is to have the heads recontoured. (JRF, Inc. of Hopatcong, New Jersey, is the only facility I know of that can handle such work.) This phenomena has not been noted with the JH-24 type head assembly.

EQ Set-Up: Newer machines have a potentiometer located on the repro board just behind the head transformer, which is used to "critically damp" the secondary of the head/primary/secondary input network. Properly set with a flux loop and a square wave generator, this pot would be set for minimum overshoot or droop. Lacking a flux loop or equalizing network necessary for its use, a practical way to set the pot is to make the playback flat at 16 kHz.

It is necessary to set up the machine first using 500 Hz as level reference, 10 kHz as the HF EQ reference, and use the damping pot for 16 kHz. This control has a lot of interaction with the HF EQ at 10 kHz, so a lot of bouncing back and forth is necessary.

On older JH-100s and -114s a fixed resistor serves this purpose. The easiest way to determine what value it should be is to replace the "R" with a 2 megohm multiturn pot. Adjust the pot as described in the above paragraph, measure the value obtained, and insert the appropriate fixed value. (This resistor should be of the metal-film type.)

Wrap Set-Up: To perform wrap adjustment on a new machine, or on heads that have just been relapped, run a full reel of tape over the heads and adjust the wrap for a symmetrical scrub pattern on the gap. Run this same reel of tape over the heads two or three times. The pole tips of the heads are often slightly "work hardened" during either manufacture or lapping. Running at least half to a full hour of tape across the heads is necessary to remove the very thin crust of work-hardened material from the gap. Otherwise this material changes the permeability of the gap area, and often results in an incorrect initial wrap adjustment.

Once there is a slight wear pattern on the heads, the wrap is then turned on the playback head while reproducing a 16 kHz tone, to obtain maximum output. The record head is adjusted in the same way, but reproducing in the sync mode. There is about 0.5 dB interaction between the record and the erase heads, so some re-adjustment is necessary — the erase head should be done first.

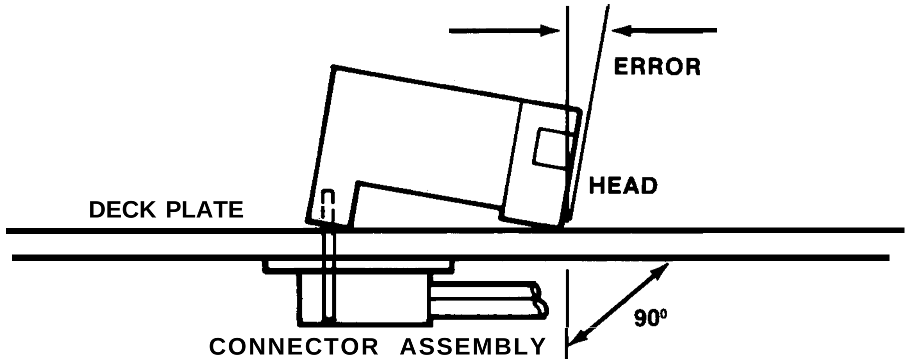

Figure 3: Correct seating of head connector is essential before making further adjustments.

To adjust the erase wrap and azimuth, plug the head connectors into the record head position on the back of the headstack. Reproducing a 500 Hz tone (or something convenient in the mid-range), set the head so that the outputs are symmetrical. Because the erase head uses a staggered track pattern, the setting should be one where the even tracks are the same distance away from their peak as the odd tracks. The azimuth should be measured (on machines with adjustable azimuth!) using the summing method, and even or odd tracks only.

Once the erase head is set return the head connectors to their proper place and do the record and playback. The record head only interacts with the erase setting about 0.75 dB on erase head output, so the latter, once set, need not be touched again.

Head **Set-Up:** Before attempting any head adjustments on the JH-110 recorder ensure that the head connector is not fully bottomed in the connector, and thereby spacing the head stack off the deck. The easiest way to determine if this presents a problem is to simply back off the screws that retain the head plug assembly on the bottom of the deck, and check if it pushes away from the deck plate. If it does, space it off of the deck with washers. Position the plug bracket just a skosh farther away from the deck then it sits naturally (Figure 3).

Update: The 30 IPS playback low-end response on most JH-100s and older 114s often leaves a lot to be desired. This can be remedied to a large extent by the replacement of R103 (1.3 megohm) with a 0.0018 mFd capacitor. To protect yourself, it is also advisable to put a 200 to 400 kohm resistor in series with this new cap, to limit the range of the pot.

Pitfall: Every so often a tape comes in from the outside world that has far too much signal at 100 Hz. Lining up the machine with the outside tones you find that the low-end EQ has to be turned all the way off. When this is done, however, what often goes unnoticed is the phenomenon of broadband level coming down about 2 dB, which results in a net low-frequency gain. After a "line-up" in this manner, the level is often brought up in subsequent re-alignment, and a complaint of not being able to get 100 Hz down far enough arises. A cure is to inset the series resistor mentioned in the preceding modification, which prevents the 0.0018 mFd cap from being simply parallelled with the 0.0033 mFd capacitor.

Bias: When carrying out bias alignments you've got to be careful of a number of things. First of all, when making any erase peak or bias trap settings, it is imperative that either a low capacitance (10X) probe or an instrument be used that has input characteristics of 1 megohm or more, shunted by 10 pf or less. The reason is that by attaching a set of test leads to the trimmer cap, we in essence have placed a capacitor equal to the instrument/probe between the measured point and ground. It is amazing what a difference 100 pf to ground makes between measured and actual performance!

When setting the erase peak on non-QUIOR erase boards using an old

Woelke head — this is the one with the checkerboard pattern, but without the guard bands between tracks — there are some insidious problems that can be encountered. Most of the time, the original erase board can "ring up" with Woelke heads to 170 to 210 volts, peak-to-peak. This amount of erase current provides an excellent level or erasure, so long as nothing in the circuit is in saturation. However, the erasure is so good that the adjacent erase head track can couple to the energized channel, and start partially wiping the track!

The easiest way to test for this is to record a 10 to 16 kHz tone at zero VU. Rewind the tape to the head of the tone, and erase only one track. Observe the playback on the adjacent track, and note whether and by how much it is attenuated. Repeat this test on the same track and see if the playback on the adjacent track is further reduced in level. If further attenuation is noted it will be necessary to back down the erase level until such "cross-erasure" ceases.

Something to note is that the phenomenon of the first pass, with any usable erase level, will cause an attenuation of somewhere between 0.25 and 0.5 dB of loss. I think that this is due, in part, to a differential in short-and long-term tape retentivity. It is the second and subsequent passes that are of concern. The process takes some time to accomplish the first time around, so it is advisable to log the resulting peak-to-peak erase voltage for future alignment.

Erase Set-Up: With newer Woelke heads (the ones with the guard band) the ideal place to be with the erase peak adjustment is centered on the peak, and below saturation. However, in the real world saturation usually occurs right near the peak, so a good place to set the trimmer is about 5 volts below saturation.

Modification: On a number of late vintage JH-114 recorders, the erase peak cannot be adjusted to provide sufficient erasure without going into saturation. The reason for this is the cans enclosing the coils. The vendor of these cans changed the winding diameter without proper OEM notification, so a number of these units hit the field; replacement cans can be had from MCI.

Repair: After performing the erase alignment procedures on a 24-track machine, it was found that a number of tracks would not bias properly -the tracks would not back down to a readable peak. After much fussing around it was discovered that the pots, after 3 or 4 years of alignment, had decreased to almost half of their original value.

Master Bias Set-Up: One procedure that needs reviewing is the JH-110 and -11OA master bias bus level adjustment. This pot is, in effect, a master erase level adjustment. To set the pot, first peak the erase capacitor, then adjust the bus level to a point just below clipping. The places to look for clipping are:

1) TPl on the bias card(s).
2) The other side of the erase peak cap (look for waveform distortion).
3) The output of the first buffer amp on the bias PCB.

Clipping at any of these locations, on any track, will be the cause of "rocks" and other bias noises. The idea is to maximize the erase currents but ensure that none of the circuits clip. The manual gives values for the master bus level that vary with the date of the manual's printing. Given the importance of this step, it is this author's humble opinion that the figures given in the manuals must be disposed of.

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So there you have it. The above hints and tips are the result of many, many years working with all "breeds" of MCI machines, and more hours of trial and error fixing than I really care to think about. MCI stereo and multitrack decks are, without doubt, the most popular brand of tape machine in the United States (probably the world for that matter), and there's no denying that with routine love and attention they can provide years of excellent service to a studio. The information provided in this article is intended to help those who are just beginning to get to know the JH Series of tape transports, or who have been working with them for a while, but want to know more about keeping them in fine fettle. I trust that the information proves useful to you all.

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