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PLAYBACK STATION #2 FOR CAL NET AND 5-DAY-RECORDER TAPES

by

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PLAYBACK STATION #2 FOR CAL NET AND 5-DAY-RECORDER TAPES

This report documents the layout and construction of Playback Station #2, primarily by means of the appropriate sketches, block diagrams, and circuit diagrams. It is intended as an introduction to the purpose and capabilities of the playback station and as a guide to its use and maintenance. The report is organized as follows:

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Acknowledgments

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I. INTRODUCTION

Purpose and Capabilities

A second system (Playback Station #2) has been set up to play back Cal Net 1" tapes and 5-day-recorder 1/2" tapes. As with the first playback system (Playback Station #1) the tapes are played back on a Bell and Howell VR3700B tape deck and the records are written out on a 16-channel direct-writing Siemens "Oscillomink". Separate reproduce heads, tape guides, and tape tension sensor rollers are required for playing back 1" tapes and 1/2" tapes, but changing these tape deck components is a simple task that requires only a few minutes.

The discriminators, patch panels, selector switches, filters, time code translators, and signal conditioning circuits for the time code translators and for the tape-speed-compensation signal are all mounted in an equipment rack that stands beside the playback tape deck. Changing playback speeds (15/16 ips or 3 3/4 ips) or changing from Cal Net tapes to 5-day-recorder tapes requires only flipping a few switches and/or changing a few patch cables on the patch panel (in addition to changing the reproduce heads, etc., to change from 1" tape to 1/2" tape).

For the Cal Net tapes, the system provides for playback of 9 data channels (680 hz thru 3060 hz plus 400 hz*) and 3 time signals (IRIG-E, IRIG-C, and WWVB) at both 15/16 ips (x1 speed) and 3 3/4 ips (x4 speed).

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*Available on x1 playback speed only.

Available modes of compensation (using either a 4688 hz reference or a 3125 hz reference) are subtractive, capstan, capstan plus subtractive, or no compensation. Data filtering possibilities include:

1) no filters,
2) passive 6 db/octave very low frequency low cut filters (i.e., D.C. Filters in rack #2),
3) moderate slope bandpass (active adjustable 12 db/octave hi cut and 6 db/octave lo cut filters--to be added to Stn #2 rack),
4) steep slope bandpass (active adjustable 24 db/octave hi and/or low pass filters--in Stn #1 rack but available to Stn #2 through a pair of patch cables linking the two playback stations). These filters are cascaded hi-pass and lo-pass stages individually switchable in or out so that hi-pass, lo-pass, or band-pass functions can be obtained.

Time signals can be recovered from tapes recorded in either the normal Cal Net format or the Centipede (old Cal Net) format. IRIG-E and WWVB signals are provided, respectively, for the Time Code Translator (TCT) and WWVB Code Translator (VBT) at x1, x4, and x64 playback speeds (i.e., at 15/16, 3 3/4, and 60 ips). At the x64 speed, IRIG-E can be recovered from the 1020 hz carrier on track 13 as well as from the 3500 hz carrier on all tracks.

For the 5-day-recorder tapes, the system provides for playback of 6 data channels and 2 time channels (multiplexed onto a single track along with the compensation reference signal) at playback speeds of x1 (15/16 ips, which is 5 times recording speed) or x4 (3 3/4 ips, which is 20 times recording speed). Both capstan compensation and subtractive compensation have been implemented and can be applied in any combination.

Adjustable high cut filtering at 12 db/octave is included in the special compensation/filter unit used with the 5-day tapes. This unit also provides optional time ticks, synchronized with either WWVB or IRIG-C, that can be superposed on the data traces. The active adjustable 24 db/octave bandpass filters in Pb Stn #1 can also be used with the 5-day tapes by use of the two patch cables that link the two playback stations.

The playback station #1 B & H tape deck has also been adapted to operate with capstan compensation. By using the patch cables between stations #1 and #2, tapes played back on the station #1 tape deck can be processed through the electronics of station #2 and the recovered signals can be returned to station #1 for further processing or recording. Because station #1 is interfaced with the CDC 1700, the arrangement described above permits the CDC 1700 to digitize records played out with capstan and/or subtractive compensation. Records from several 5-day recorders, which have poor recording speed regulation, can be restored to an accurate common time base by the use of capstan compensation.

II. COMPONENT LAYOUT

An overview of the equipment in the electronics rack is shown in Figure 1. From top to bottom, the rack contains:

1) the WWVB time code translator,
2) the time code translator for IRIG-E and IRIG-C,
3) the panel containing conditioning circuits for the IRIG time code (TCT), the WWVB time code (VBT), the tape speed control signal for capstan compensation (TSC), and racks for several Develco and Airpax discriminators for recovering selected time signals,
4) a dual trace oscilloscope for monitoring critical signals--e.g., time codes, tape speed control signals, and data carrier or multiplex signals,
5) patch panel A,
6) patch panel B,
7) the Develco discriminator rack,
8) the Tricom discriminator rack,
9) the 5-day-system compensation/filter unit,
10) the Cal Net moderate slope filters (not yet installed),
11) the active steep slope filters (now in Playback station #1), and
12) power supplies.

Details of the two patch panels are shown in Figure 2. The function of each connector (Winchester 16-pair pin sockets) is indicated in the figure. By means of suitable patch cables, signals from the FM and Direct reproduce amplifiers in the Bell and Howell tape deck can be routed through the appropriate channel selection units, discriminators, compensation circuits,

filters, etc., and then sent on to the Siemens Oscillomink for recording. Patch panel B also contains the Cal Net channel select unit, which will be described more fully in a later section.

The discriminators in each of the 3 racks are identified by frequency and function in Figure 3. Develco discriminators in the center rack serve for 15/16 ips playback of both Cal Net and 5-day tapes. Tricom discriminators in the lower rack serve for 3 3/4 ips playback of both Cal Net and 5-day tapes. Several Tricom discriminators in the lower rack and the Airpax discriminators in the upper rack are used to recover time signals at the 60 ips search speed. The 680 hz and 1020 hz Develco discriminators in the upper rack are used to recover WWVB and IRIG-E from track 13 on "old format" Cal Net tapes at a playback speed of 15/16 ips. Parentheses around a discriminator designation (e.g., the 400 hz discriminator in slot 9 of the lower rack) indicates that that discriminator is not currently available.

The input and output connections to the 3 banks of discriminators are shown in Figure 4. For the upper and lower racks there is a one-to-one correspondence between rack "slots" and labeled connectors on the rear panel. For the center rack, however, input signals to several groups of rack slots are introduced through appropriately labeled terminal pairs: e.g., the multiplex input to the 9 Cal Net data discriminators (labelled "1 to 9 IN Data").

III. 5-DAY-TAPE PLAYBACK SYSTEM

The 5-day-recorder seismic system presents special playback problems because it records in a hybrid mode: the 6 data channels (tracks 1, 2, 3, 4, 6, and 7) are recorded in a straight FM mode but the timing signals and reference frequency are multiplexed together and recorded in direct record mode on track 5. To implement subtractive compensation it was necessary to build a special unit to combine the output of the FM data channels with the appropriately scaled output of the multiplexed compensation channel. The unit for this purpose was also built to include a set of adjustable 12 db/octave highcut filters to reduce system and ground noise at frequencies substantially higher than those in the recorded data signals. It also contains a circuit for generating time pulses from IRIG-C or WWVB that can be superposed on the data traces.

A block diagram of the 5-day-tape playback electronics (compensation/filter unit, discriminators, and associated switches) is shown in Figure 5. The data signals (already discriminated) from the 6 seismic channels are input directly to the compensation/filter unit, and the multiplexed timing and reference signals are introduced to the appropriate set of discriminators through the speed selector switch. Compensation and timing signals from these discriminators are routed through the speed and compensation selector switches to their appropriate destinations. The output of the compensation discriminator is introduced both to the timing channel discriminators and to the compensation/filter unit for subtractive compensation.

The output of the Develco compensation discriminator (xl playback speed, or 15/16 ips) is reversed internally but that of the Tricom compensation discriminator (x4 playback speed, or 3 3/4 ips) is not; and the output levels of the two discriminators are not the same. Thus, it was necessary to

introduce level adjustment potentiometers for both discriminators as well as a reversing amplifier for the Tricom discriminator. These features permit effective subtractive compensation to be attained at both playback speeds without changing adjustments in the compensation/filter unit.

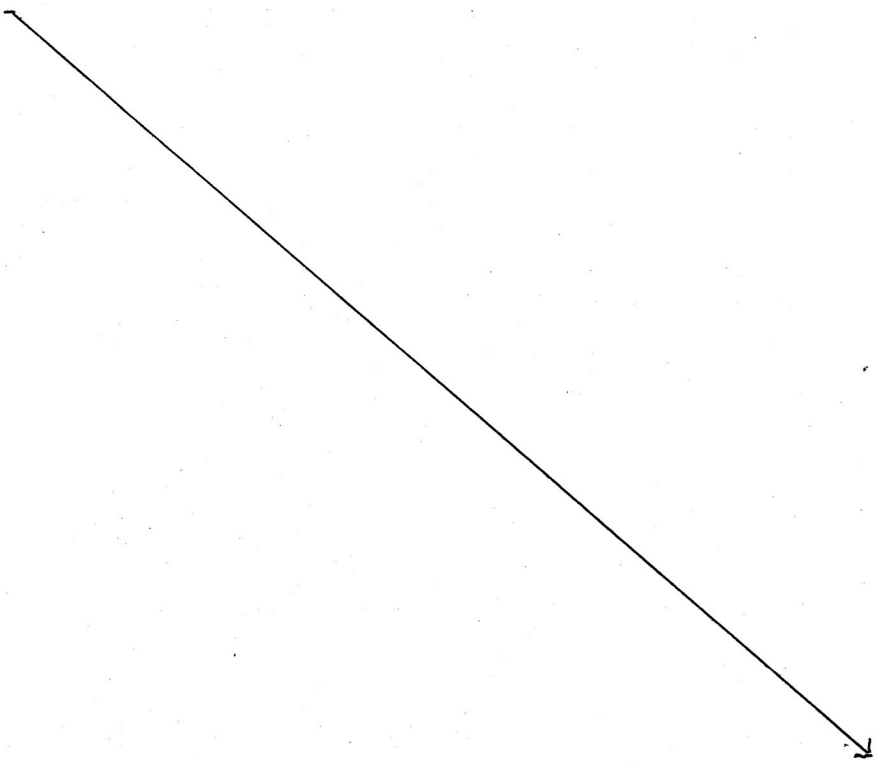
The front panel of the compensation/filter unit is illustrated in Figure 6. Filter setting switches for the 6 data channels are on the left half of the panel, and the speed select switches (ganged pair), compensation mode switch, and compensation signal level adjustment potentiometers are near the center. The potentiometers and toggle switches for the time mark circuit are on the right. The lower half of Figure 6 shows the connectors on the rear of the unit. On the left are the data input and output and the compensation input BNC connectors for the compensation/filter circuits. On the right is the connector strip for cables to and from discriminators, time code translators, etc. The BNC input connectors for the IRIG-C and WWVB time code signals to the time mark circuit are also on the left.

The circuit of the time pulse generator is shown at the top of Figure 7. The portion of the circuit between IC1 and IC2 converts the time code signal into a series of equally spaced positive going "spikes" of short duration. IC2 converts this series of spikes into a series of flat-topped pulses of adjustable width; and the height of the pulses is adjusted by the potentiometer following T1. The input "code select" switch permits a choice of WWVB (1 second pulses) or IRIG-C (0.5 second pulses) as the source of the time marks. The output "on-off" switch permits the time pulses to be passed on to the compensation/filter circuits for superposition on the data traces or to be switched off.

The circuit of a single compensation/filter channel is shown at the bottom of Figure 7. The compensation signal is adjusted for level in IC4/1 and then combined with the data input signal in IC4/2. The first stage of the hi-cut filter is between IC4/2 and IC4/3 and the second stage of the hi-cut filter is between IC4/3 and IC4/4.

The time pulse signal is isolated from the pulse generator by IC5. It is then combined with the filtered data signal in IC6. The final amplifier, IC7, restores the signal to the correct polarity and provides a low impedance output to the Oscillomink recorder.

The experimentally determined frequency response of the compensation/filter unit is shown in Figure 8. In this figure, F.5 is the frequency at which the ratio of output to input voltages is 0.5. F.5 was determined experimentally for each of the filter settings A, B, C, etc., by means of a



signal generator, a frequency counter, and a calibrated dual channel oscilloscope. In addition, the output-to-input voltage ratio was measured for a wide range of frequencies for filter setting F, for which F.5 = 110 hz. In Figure 8 the relative response (i.e., output-to-input voltage ratio) is plotted versus relative frequency (signal frequency divided by F.5). At high frequencies the response curve approaches a line with a slope of -12 db/octave that passes very nearly through the point 1.0, 1.0 on the graph.

The data frequencies at playback speeds of 15/16 ips and 3 3/4 ips for which the relative response is 0.5 can be obtained by dividing F.5 by 5 and by 20, respectively, for each of the filter settings A, B, C, etc. The table in Figure 8 was constructed according to the foregoing principles. For each filter setting the data frequency at which the relative response is down to 0.5 is indicated for playback speeds of x1 (15/16 ips = 5 times recording speed) and x4 (3 3/4 ips = 20 times recording speed).

The low frequency relative responses of all 6 data channels are very near 1.0, and the channel-to-channel variation in F.5 for a given filter setting is near or within the limits of measurement of the calibration experiment on which the foregoing results are based.

The two patch cables required for the 5-day-tape setup are diagrammed in Figure 9. Track 5 from the direct reproduce OUT socket on patch panel A is jumpered to position 16 on the FM reproduce OUT socket. This arrangement permits the 6 FM data signals plus the multiplexed timing and reference signal to be picked up by a single patch cable for input to the compensation/filter unit. The connector on the "Oscillomink" end of the second cable is wired to provide the desired arrangement of data and timing tracks on the Oscillomink playouts.

IV CAL NET PLAYBACK SYSTEM

The Cal Net channel select unit, shown in Figure 10, provides a simple flexible means of selecting the tape tracks from which the following signals are recovered:

1) the multiplexed data signal (up to 9 seismic channels),
2) the compensation reference signal,
3) the IRIG-E time code,
4) the IRIG-C time code, and
5) the WWVB time code.

It also provides signal switching for changing playback speeds from x1 (15/16 ips) to x4 (3 3/4 ips), for selecting the mode of compensation to be applied, for selecting the reference frequency to be used, and for selecting the source of the IRIG-E signal used at search (60 ips) speed. In addition it permits playback of tapes with two different timing signal formats: normal Cal Net with timing multiplexed onto the data channels versus old Cal Net format with timing signals recorded exclusively on track 13.

The configuration and function of switches on the Cal Net channel select unit front panel are shown at the top of Figure 11. The wiring of its IN and OUT pin sockets is also indicated there. The connector strip on the rear of the unit is shown at the bottom of Figure 11. The source or destination of wires attached to the connector panel terminals is also shown. Discriminators are designated by their "x1" center frequencies and playback speeds; e.g., x64 3500, and x1 4688. The reference frequency outputs of the compensation discriminators are labeled "ref"; e.g., x4 4688 ref.

The Cal Net discriminator wiring diagram, including some switches on the Cal Net channel select unit, is shown in Figure 12. The x1 discriminators are in the Develco rack and the x4 discriminators are in the Tricom rack. The x64 3500 and x64 3950 timing discriminators for search speed (60 ips) are in the Tricom rack and the x64 1020 timing discriminator for search speed as well as the x1 680T and x1 1020T "old format" timing discriminators are in the Develco/Airpax rack.

Patch cables required for the Cal Net playback setup are described in Figure 13. The first three cables have 16 pairs connecting channel i to channel i, with i = 1, 16. The cable making the final connection to the Oscillomink IN socket, which is illustrated at the bottom of Figure 13, is wired for the desired format of data and timing channel signals on the Oscillomink playout.

V. TCT and VBT SIGNAL CONDITIONERS

The IRIG and WWVB time code translators require clean signals with adequate amplitudes and DC centering. The same code translators must also be used with both the Cal Net tapes and the 5-day-system tapes; and they must function for x1 (15/16 ips) and x4 (3 3/4 ips) playback speeds as well as for the x64 (60 ips) search speed.

The signal conditioning circuits required to drive the code translators from the outputs of the various discriminators that are needed to cope with the system and speed combinations indicated above are outlined by the block diagram in Figure 14. Switch 1 addresses the system to either Cal Net or 5-Day tapes. Switch 2 (contained in a relay in the B & H tape deck) automatically switches between the playback speeds (15/16 ips or 3 3/4 ips) and the search speed (60 ips). The wiring of the cable connecting the TCT/VBT signal conditioning unit to the B & H relay is also shown in Figure 14.

The layout of switches on the front panel and connectors on the rear panel of the TCT/VBT signal conditioning unit is shown in Figure 15. The connector terminal labels, CN-S = Cal Net Search, 5D-R = 5-Day Run, etc., identify the nature and source of the timing signals connected to the individual terminals.

The circuit diagram of the amplifier/DC level shift module included in each time code conditioning circuit is shown in Figure 16.

VI. TAPE SPEED COMPENSATION SIGNAL SELECTION AND CONDITIONING CIRCUIT

For effective tape speed compensation (or capstan compensation) the B & H tape deck requires a strong, steady signal at a nominal frequency of 1562.5 hz at a 15/16 ips playback speed or 6250 hz at a 3 3/4 ips playback speed. The reference frequencies recorded on both the 5-day system and the Cal Net system must first be isolated from a multiplexed signal carrying timing (5-day) or timing and data (Cal Net) subcarriers as well as the reference frequency. Moreover, the recovered reference frequencies at 15/16 ips playback speed are not 1562.5 hz, as required, but 3125 hz for the 5-day system and 4687.5 hz or 3125 hz for the Cal Net system. Thus, the reference frequencies derived from the tapes must be divided by 2 (3125 hz) or by 3 (4687.5 hz) before they can be used for capstan compensation.

Isolation of the reference frequencies is accomplished by the input bandpass filters in their respective compensation discriminators. The output of the Tricom bandpass filter is available at one of the discriminator card connectors; and the circuit of the Develco compensation discriminator was modified (see details below) so that the output of its bandpass filter is also available at a card connector. These card connectors were wired to rear panel terminals on the discriminator card cages to make the isolated reference frequencies conveniently available for further conditioning.

The block diagram of the tape speed compensation signal conditioning circuit is shown in Figure 17. Selection of the tape system (Cal Net or 5-day) is made by switch 1, selection of the playback speed (x1 = 15/16 ips or x4 = 3 3/4 ips) is made by switch 2, and selection of the reference frequency (3125 $\div$ 2 or 4087.5 $\div$ 3) is made by switch 3.

The front panel of the unit showing switches and monitor connectors and the rear panel of the unit showing terminals for connections to other units are illustrated in Figure 18. Reference frequencies from the appropriate compensation discriminators are introduced at the screw-connectors as indicated, and the TSC signal to the B & H "Tape Reference" input is from the BNC connector.

The circuit (and construction) diagram of the limiter and divide-by-2-or-3 module employed in this unit is shown in Figure 19. This circuit was designed and built for this purpose by Jim Ellis, who also modified the B & H tape speed control circuitry to permit the use of a reference frequency recovered from a tape track containing several multiplexed signals (see below).

The xl compensation discriminators are Develco data discriminators that have been modified in several respects. The input bandpass filter has been altered to shift its center frequency to 3125 hz or 4688 hz and to broaden its passband from $\pm$125 hz to $\pm$300 hz, approximately. The 30 db/octave output filter corner frequency has also been raised from 30 hz to about 200 hz. Broadening the input filter bandwidth results in a substantial reduction in the filter's output/input voltage ratio. In the case of the 3125 hz compensation discriminator used with the 5-day tape system, this reduction in signal strength led to a serious increase in its output noise level. This problem was overcome by adding an IC preamplifier between the output of the bandpass filter and the input of the following stage. The preamplifier circuit and its connections to the Develco discriminator circuit (i.e., to the appropriate card connectors on the discriminator) are shown in the upper part of Figure 20.

The modification of the Develco compensation discriminator to permit the band-pass-filtered reference frequency to be picked off at the output of the relatively high impedance limiter stage is shown at the bottom of Figure 20. The voltage divider consisting of the 510 K resistor in series with the 41 K resistor was connected between the "frequency monitor point", F, and ground; and a coaxial cable was connected from the junction of these two resistors to the unused card connector D. Its shield was connected to ground at connector C. The output of the limiter is a square wave. Its level at F is about 10 V peak-to-peak and its level at D is somewhat less than 1 V peak-to-peak.

To permit the multiplexed reference frequency to be used for tape speed control, it was necessary to modify the logic of the B & H servo control system. In the original design, when the servo control switch was set on TAPE the tape transport speed was governed by the reference frequency derived from tape whenever the Reproduce Servo Card detected an adequately strong tape reference signal. If such a signal were lacking, control passed by default to the tachometer signal. This system is frustrated if the reference signal is multiplexed with other subcarrier frequencies on a single tape track because such additional subcarriers can be "mistaken" for the reference signal.

To remedy this problem the servo control system was modified. When the servo control switch is set on TAPE, the transport speed is controlled by the tachometer signal until the tachometer frequency and the internal "clock" reference frequency match; then speed control is transferred "blindly" to the reference frequency derived from tape. If an adequate tape signal, which has passed through the compensation discriminator input bandpass filter, is present, the transport speed adjusts to match the frequencies of the reference

signal and the internal clock. If an adequate tape reference signal is not present, the transport speed begins to "hunt" and control is returned to the tachometer. In this situation the transport speed is irregular because control oscillates between the tachometer and the inadequate (or nonexistant) tape reference signal.

Modifications to the capstan servo amplifier card, to the repoduce servo control card, and to the wiring of the tape deck electronics cage are shown in Figures 21, 22, and 23, respectively. The "jumper" between pin 3 of the reproduce servo control card and pin 3 of the capstan servo amplifier card is routed through a set of contacts on relay K420 which are closed for all playback speeds but 60 ips. They open when the transport is operated in the 60 ips "search" mode and inhibit the transfer of speed control from the tachometer signal to the tape reference signal.

VII. FIVE-DAY TAPE SETUP

1. Install 1/2" reproduce heads, guides, and tape tension rollers and adjust tape tension to 6 oz. Carefully verify that tape tracks properly.

2. With the appropriately labeled cable, connect the "FM" tape OUT to the 5-Day Comp/Filt IN. With the appropriately labeled cable, connect the 5-Day Comp/Filt OUT to the Oscillomink IN.

3. Set switches on the 5-Day Comp/Filt unit: Select the desired playback speed--

   x1 (= 15/16 ips) 5 times recording speed, or

   x4 (= 3 3/4 ips) 20 times recording speed--

   and set the two "ganged" toggle switches to the speed chosen (i.e., x1 or x4).

   Set the data channel hi-cut filters to the desired values--normally setting B (40.5 hz) for x4 playback and setting E (41 hz) for x1 playback.

   Set switches to control the presence (on or off), width, and amplitude of the time marks on the data traces.

4. Set switches on the TCT/VBT signal conditioning units and on the code translators.

   a) Set the TCT/VBT system switch to 5-Day.

   b) Set the TCT code switch to 4 (for IRIG-C).

   c) Set the TCT "Search" filter selector switches to 32/1.0.

   d) Set the TCT "Run" filter selector switches to 1/2 / 1.0 (for x1 playback) or to 2/1.0 (for x4 playback).

5. Set switches on the TSC signal conditioning unit:

   a) Set the system selector switch to 5-Day.

   b) Set the speed selector switch to the chosen playback speed (x1 or x4).

   c) Set the reference frequency switch to 3125.

6. Compensation

   a) Subtractive:

   The compensation selector toggle switch on the 5-Day Comp/Filter unit has three positions:

   OFF = no subtractive compensation

   Time = subtractive compensation applied to timing channels only

   Time and Data = subtractive compensation applied to timing channels and to data channels.

   b) Capstan compensation

   The Tach/Tape selector switch on the B and H control Panel determines whether capstan compensation is applied.

   Tach = no capstan compensation applied.

   Tape = capstan compensation applied.

   It is necessary to apply full subtractive compensation whenever capstan compensation is applied to suppress a high frequency "hunting" noise that accompanies capstan compensation.

   When the B and H is operated at the 60 ips Search speed, capstan compensation is inhibited if the selector switch is on Tape.

7. Verify that the Oscillomink channels that are fed signals from the electronics panel (Oscillomink IN) are functioning, i.e. that they have amplifiers and galvanometers: VB on channels 1 and 16; I-C on channels 2 and 15; compensation on channel 14; Hi Z on channel 3; Lo Z on channel 5; Hi N on channel 7; Lo N on channel 9; Hi E on channel 11; Lo E on channel 13.

8. At the beginning of each tape (and elsewhere if signal quality deteriorates), monitor the carrier signals recovered from each tape track. For the data tracks (1, 2, 3, 4, 6, 7), monitor the output of the preamp on the FM reproduce cards (see guide on B and H electronics bin door). The carrier level should be between 1 and 2 volts peak-to-peak and steady. If it fluctuates markedly and drops below 0.5 V peak-to-peak, you should expect data signal "dropouts." For the reference and timing multiplex track (5), monitor the output of the channel 5 direct reproduce amplifier. The multiplex signal level should be between 1.5 V and 4 V peak-to-peak. If it fluctuates and drops below 1 V peak-to-peak, you should anticipate timing signal dropouts and poor capstan compensation performance.

VIII. CAL NET TAPE SETUP

1. Install the 1" reproduce heads, guides, and tape tension rollers and adjust tape tension to 12 oz. Verify that the tape tension rollers are positioned correctly (and clamped firmly) so that the tape tracks properly.

2. With "16/16" patch cables,
   a. Connect the Direct tape OUT to the Cal Net Channel Select IN.
   b. Connect the Cal Net Channel Select OUT to Cal Net Discriminator IN.
   c. In accordance with the playback speed used x1 (= 15/16 ips) or x4 (= 3 3/4 ips) connect the appropriate Discriminator OUT to the DC Filter IN.

3. With the appropriately marked patch cable, connect the DC Filter OUT to the Oscillomink IN. If the DC Filters are not used, this cable should be used to connect the Discriminator OUT to the Oscillomink IN.

4. Set switches on the Cal Net Channel Select unit:
   a. Set the speed switch to the desired playback speed, x1 (15/16 ips) or x4 (3 3/4 ips).
   b. Set the toggle switches to select the tape tracks from which the compensation, IRIG-E, IRIG-C, VB, and IRIG-E (Search) signals are to be obtained.
   c. Set the timing select switch to "normal" for current Cal Net tapes or to "tr.12" for Centipede tapes or old format Cal Net tapes.

d. Set the compensation switch to select the compensation reference frequency that is available (3125 or 4688) and the mode of compensation to be applied: no compensation, capstan compensation, capstan and subtractive compensation. The Tach/Tape switch also controls the application of capstan compensation. If it is set on Tach, capstan compensation is not applied. Capstan compensation is also inhibited in the 60 ips Search mode.

e. The data channel select switch determines which tape track provides the multiplex signal fed to the data discriminator bank.

5. Set switches on the TCT/VBT signal conditioning units and on time code translators:

   a. Set the system selector switch on Cal Net.

   b. Set the TCT code switch to 6 (IRIG-E).

   c. Set the TCT "Search" filter selector switches to 64/0.1.

   d. Set the TCT "Run" filter selector switches to 1/0.1 for x1 (15/16 ips playback) or to 4/0.1 for x4 (3 3/4 ips playback).

6. Set switches on TSC signal conditioning unit:

   a. Set the system select switch on Cal Net.

   b. Set the speed select switch to the chosen playback speed (x1 or x4).

   c. Set the reference frequency selector switch to 3125 or 4688 to match that available from the tape.

7. Verify that the Oscillomink channels that are fed signals from the electronics panel (Oscillomink IN) are functioning: I-C on 1, I-E on 2 and 15, Ch 1 on 3, Ch 2 on 5, Ch 3 on 6, Comp on 7, Ch 4 on 8, Ch 5 on 9, Ch 6 on 11, Ch 7 on 12, Ch 9 (400 hz) on 13, Ch 8 on 14, and VB on 16.

8. At the beginning of each tape (and elsewhere if the signal deteriorates) monitor the multiplex signal levels on each track. These measurements are facilitated by the BNC "Data Channel Monitor" outlet on the Channel Select Panel. The multiplex signals should be 3 to 4 V peak-to-peak. If the level is less than 1 volt, you should expect a deterioration in the quality of the reproduced data signals.

Playback Station #2 Panel Layout

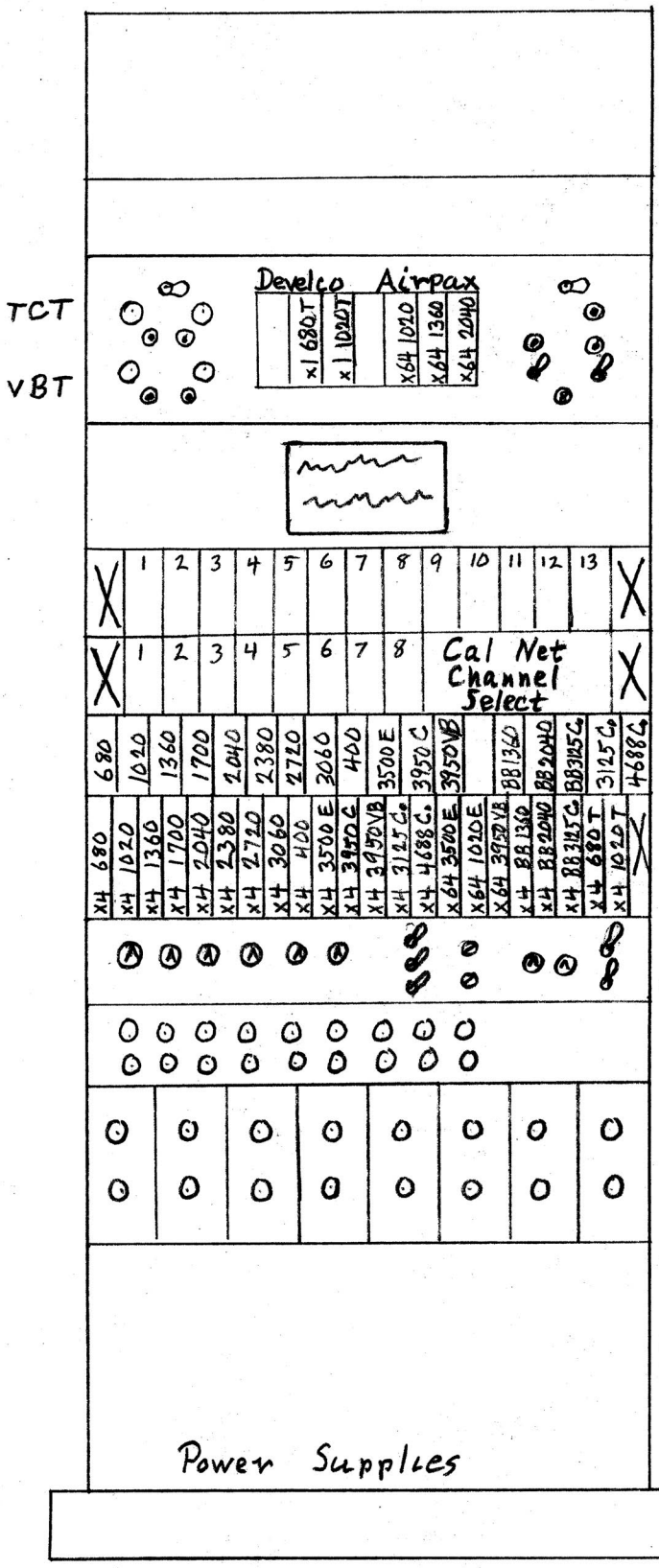
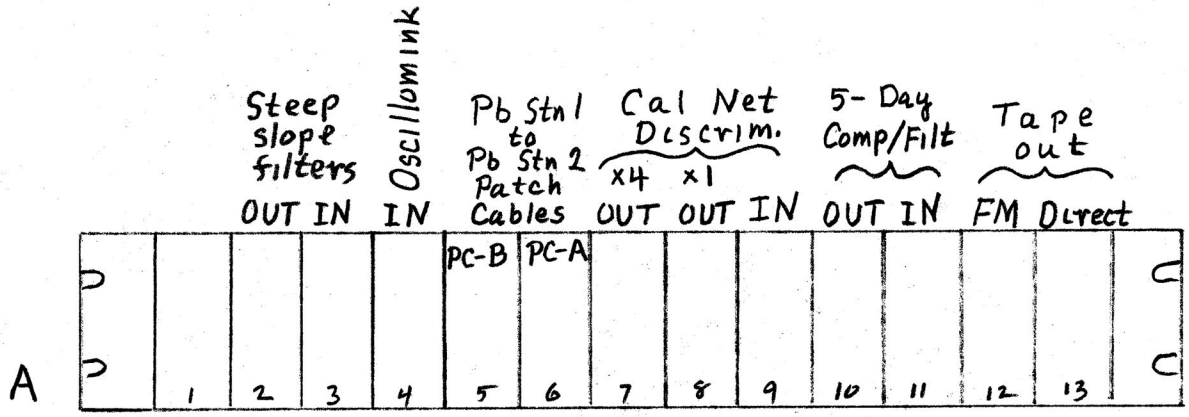
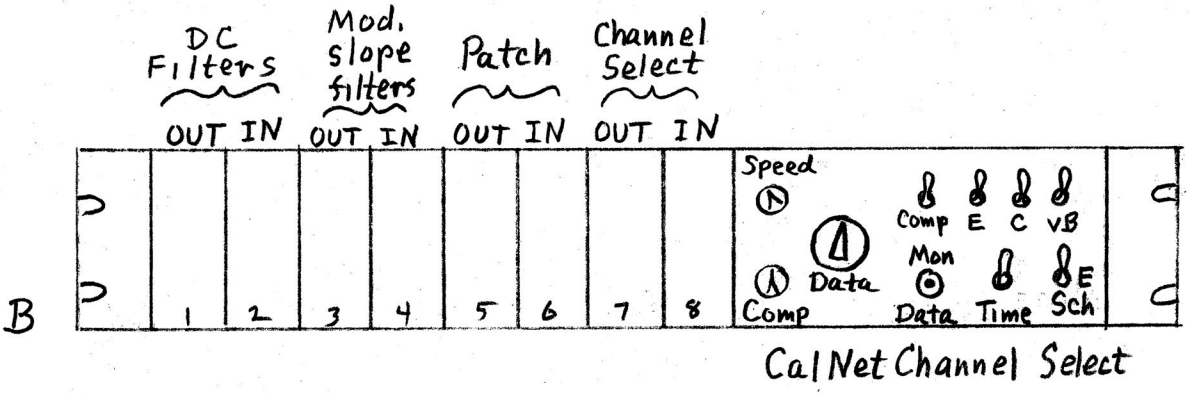


Fig 1

3/8/78 JPC

Playback Station #2 Patch Panels



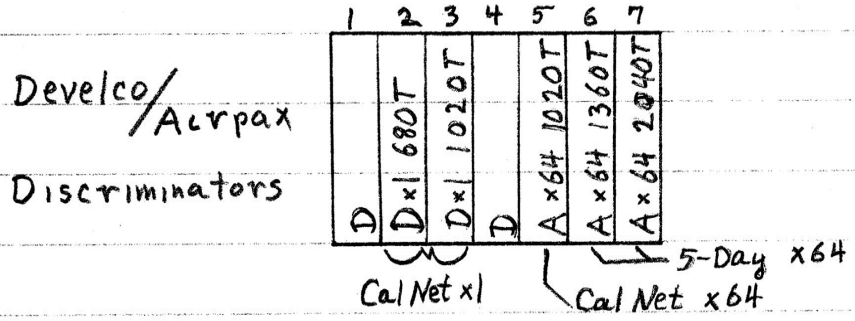


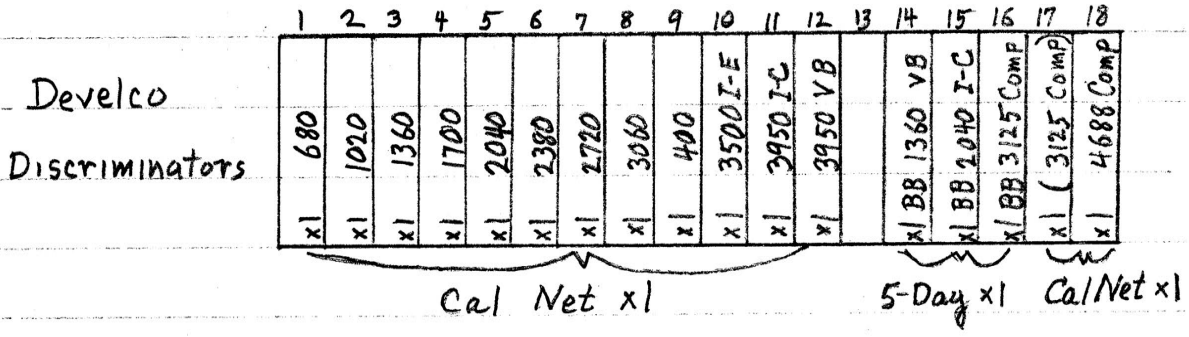
Cal Net Channel Select

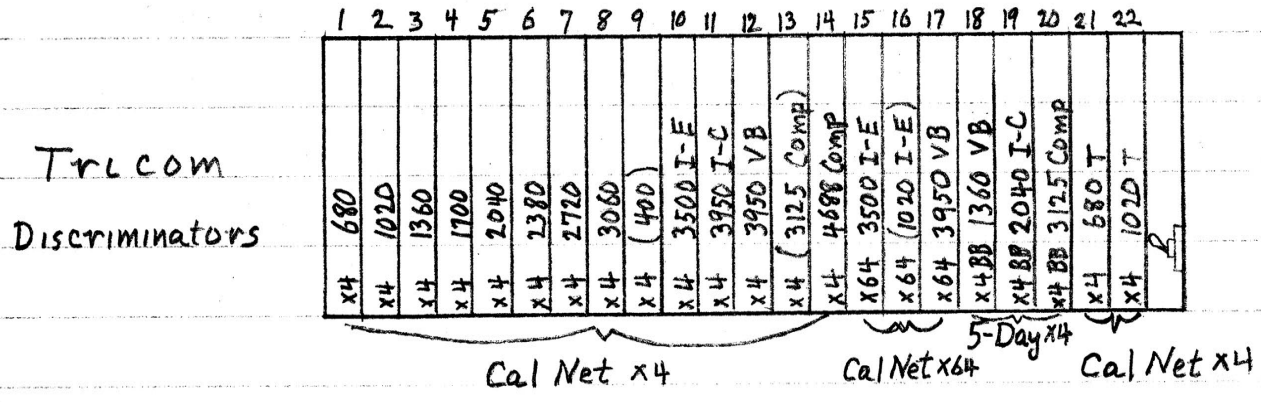
Fig 2

3/8/78 JPE

3/9/78 JPE





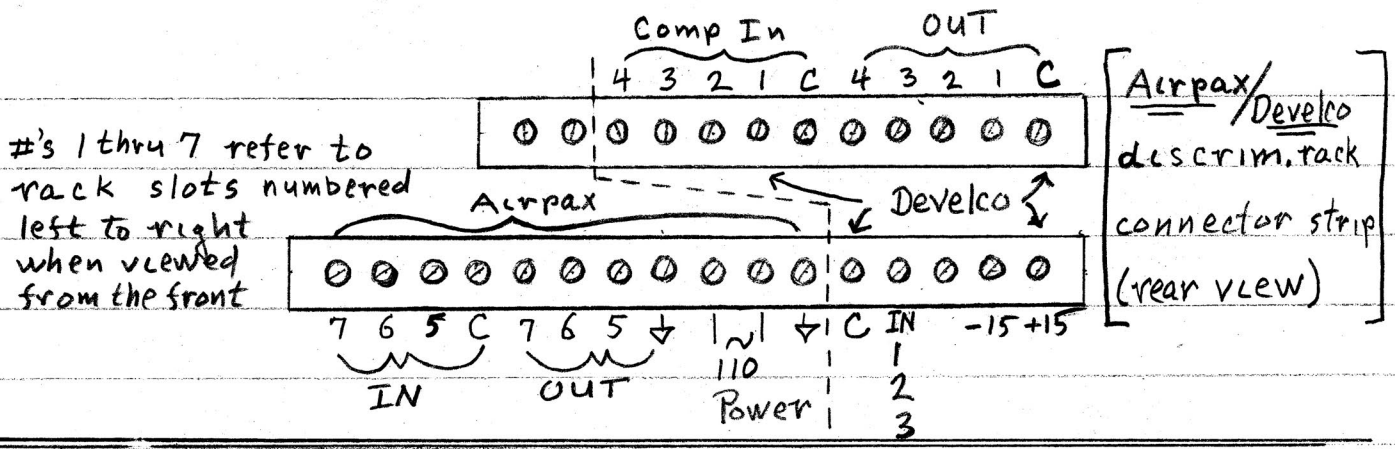


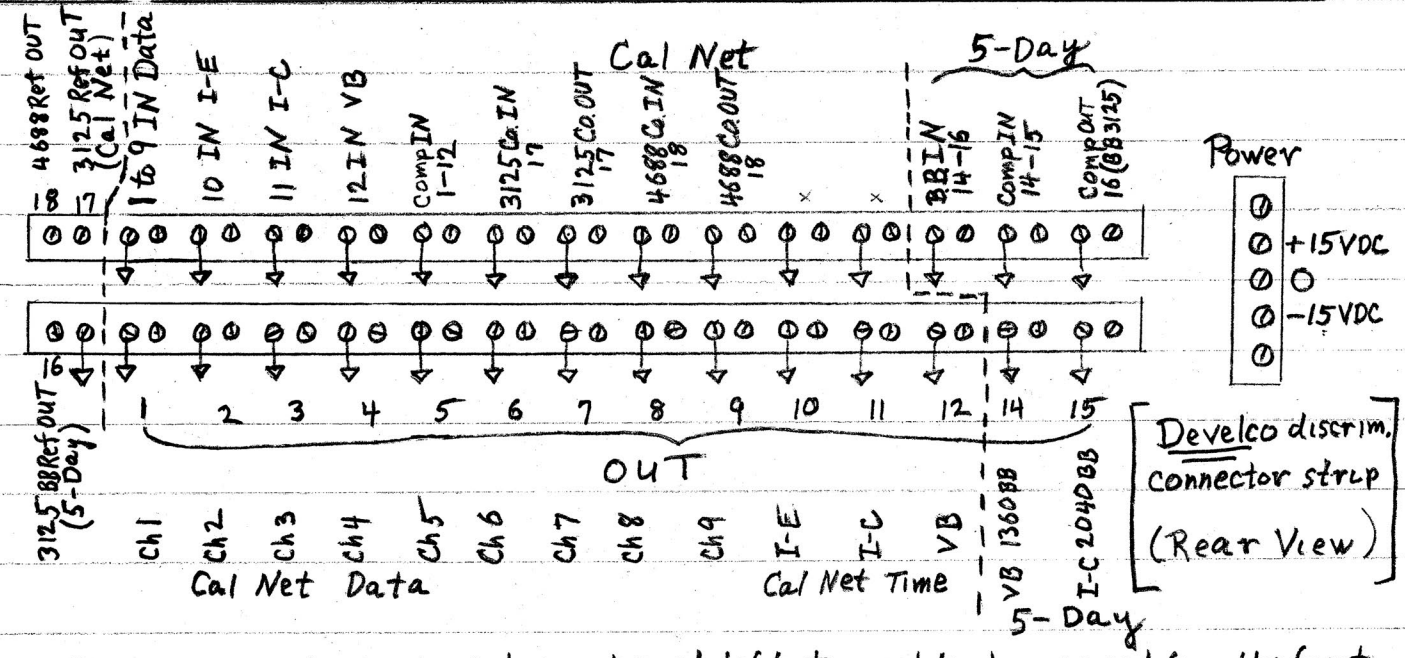
Discriminator Racks
(Front View)

Fig 3

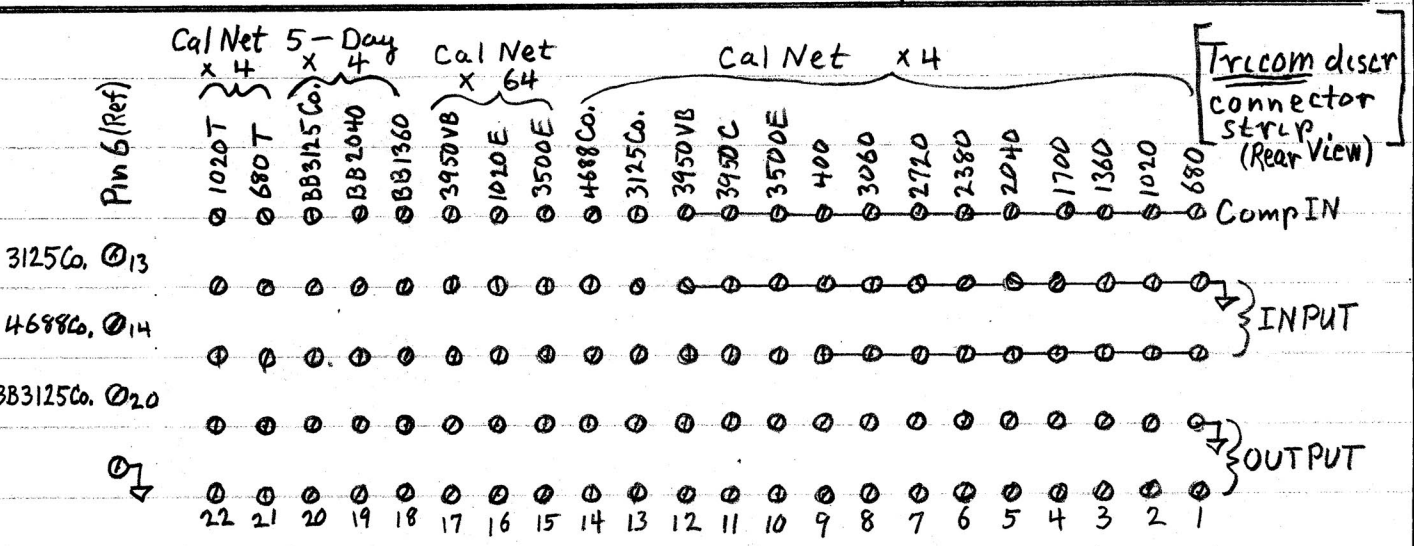
Discriminator Rack Connector Strips (Rear View)

3/9/78 PPC



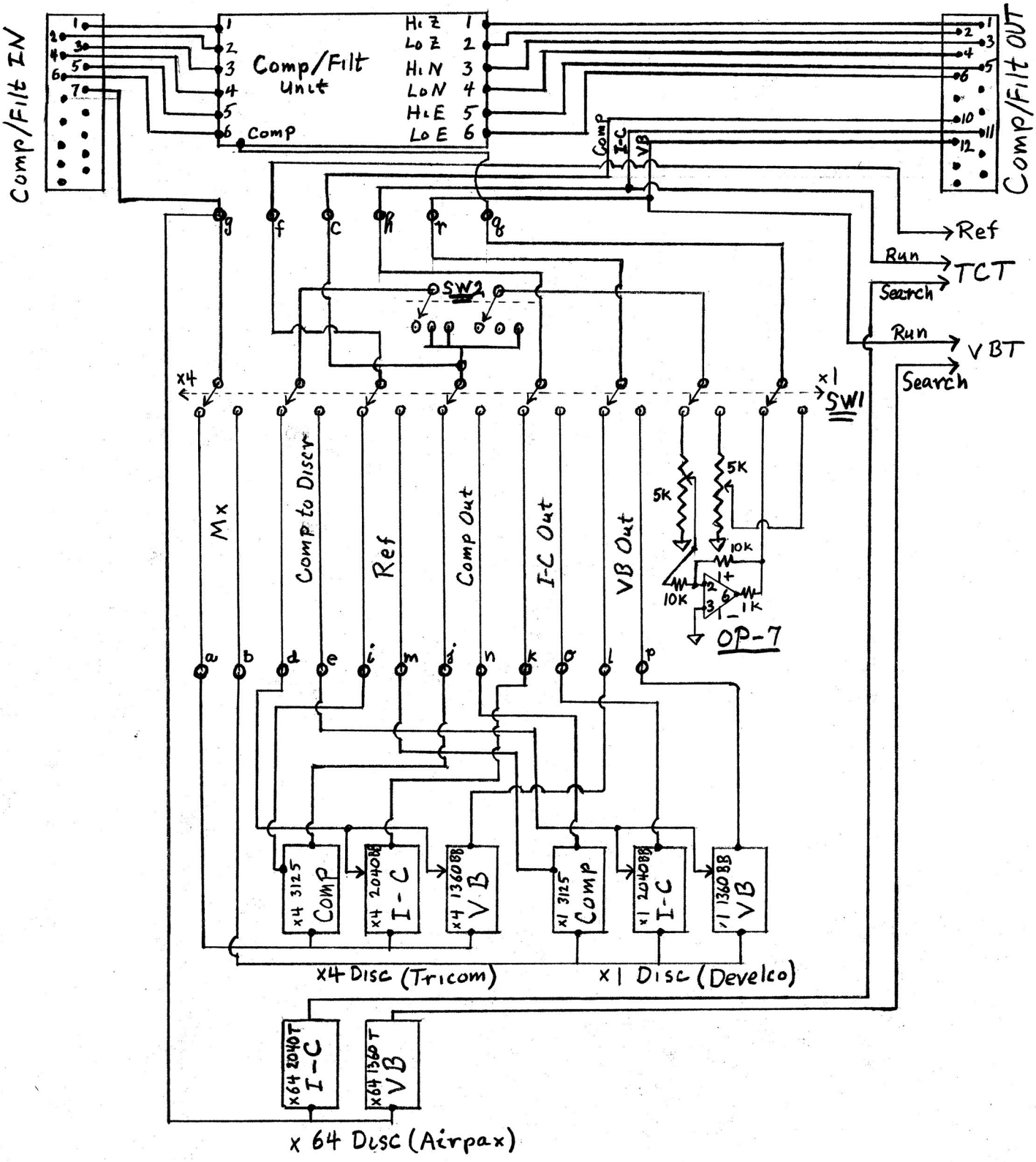


#'s 1 thru 18 refer to rack slots numbered left to right when viewed from the front



#S 1 thru 22 refer to rack slots numbered left to right when viewed from the front.

Fig 4



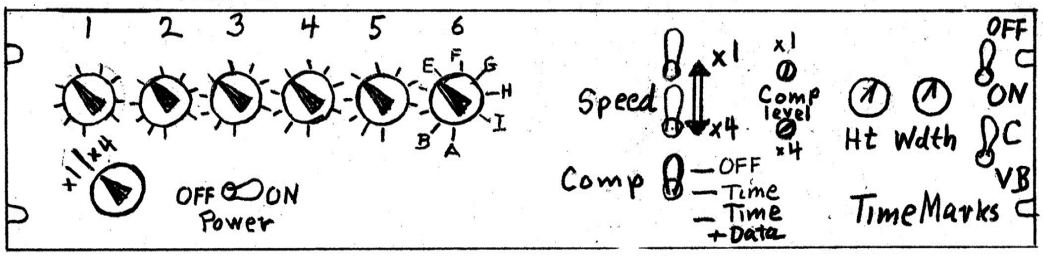
5-Day Comp/Filt unit and Discrim Block Diagram

3/8/78 JPE

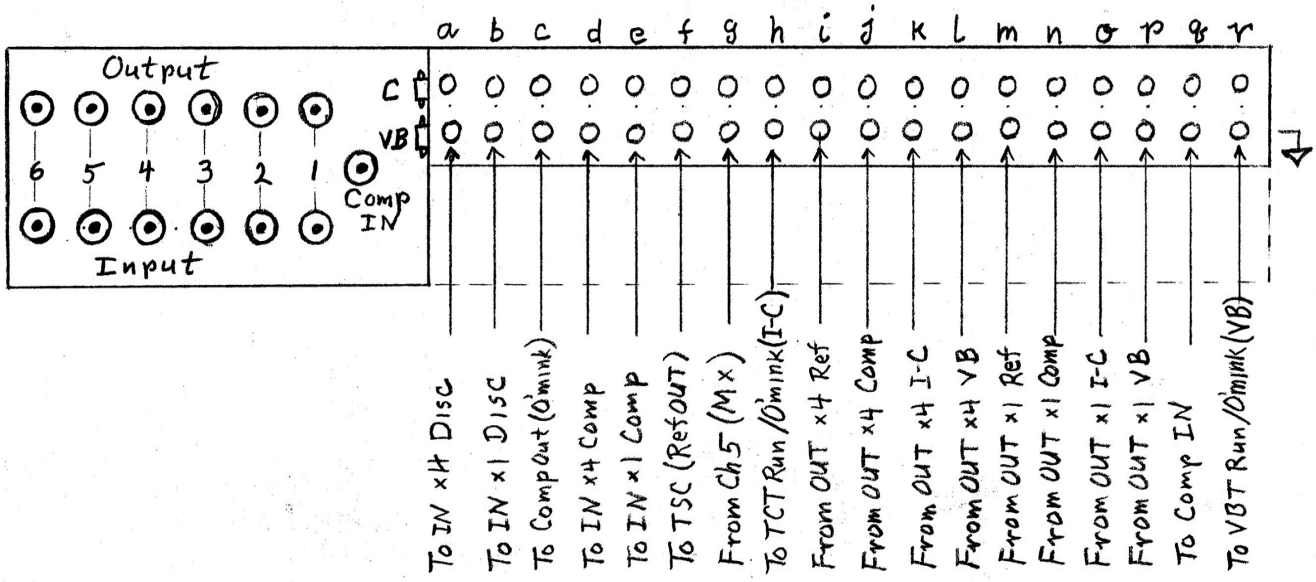
Fig 5

5-Day Comp/Filt UNIT

(Front Panel)



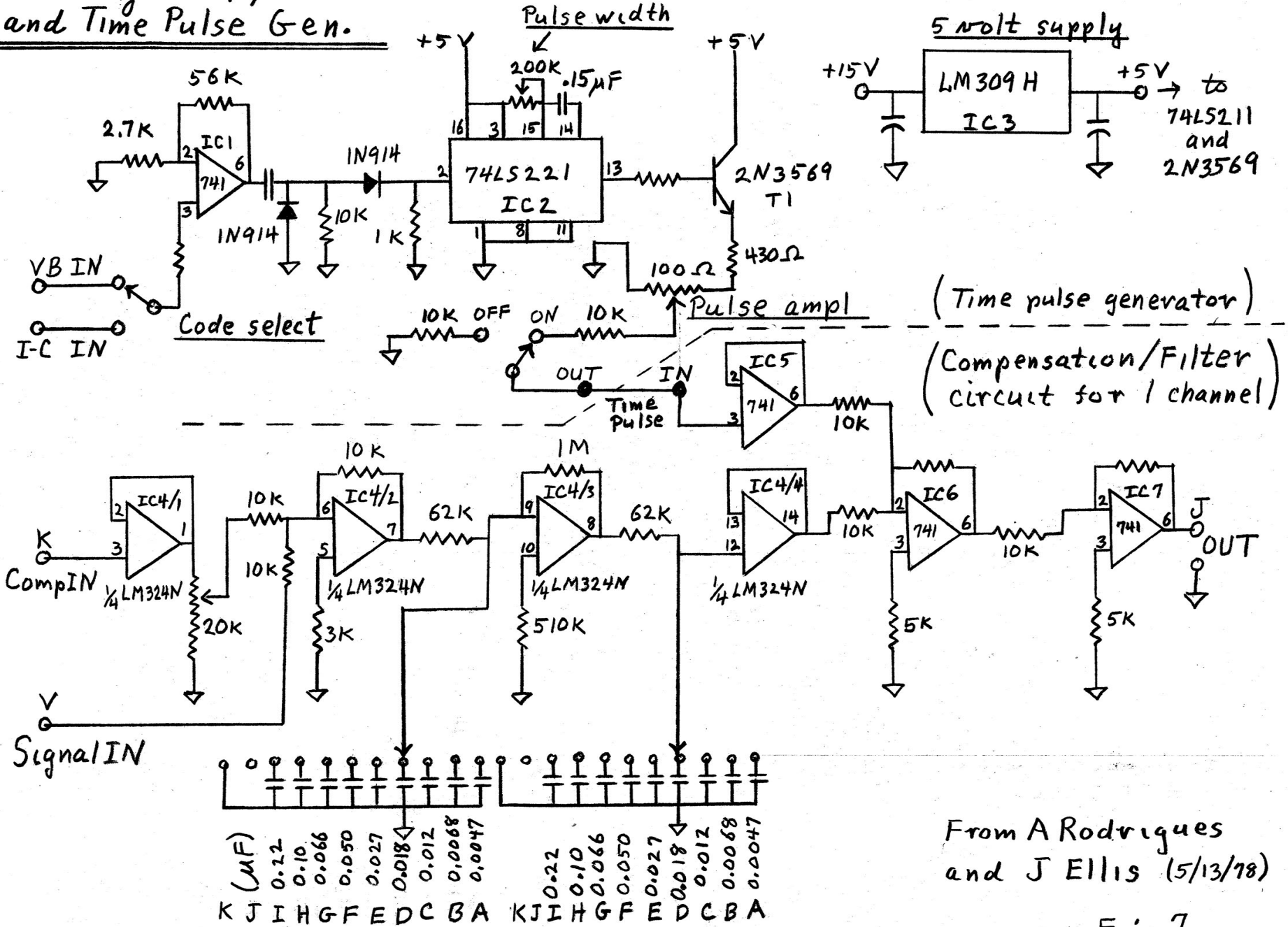
(Rear panel / connector strip)



3/8/78

Fig 6

5-Day Comp/Filter and Time Pulse Gen.

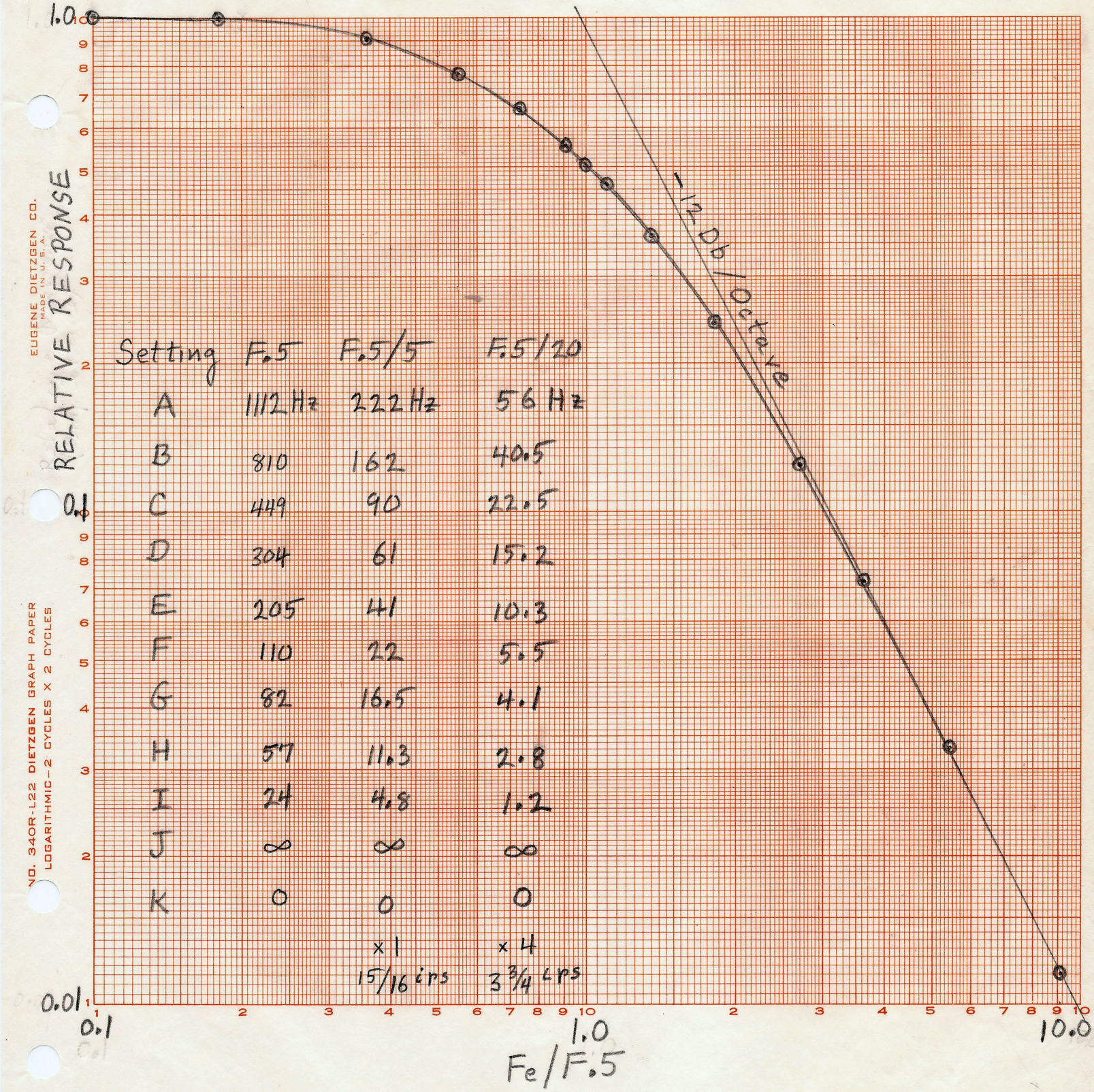


From A Rodrigues and J Ellis (5/13/78)

Fig 7

SPC 3/14/78

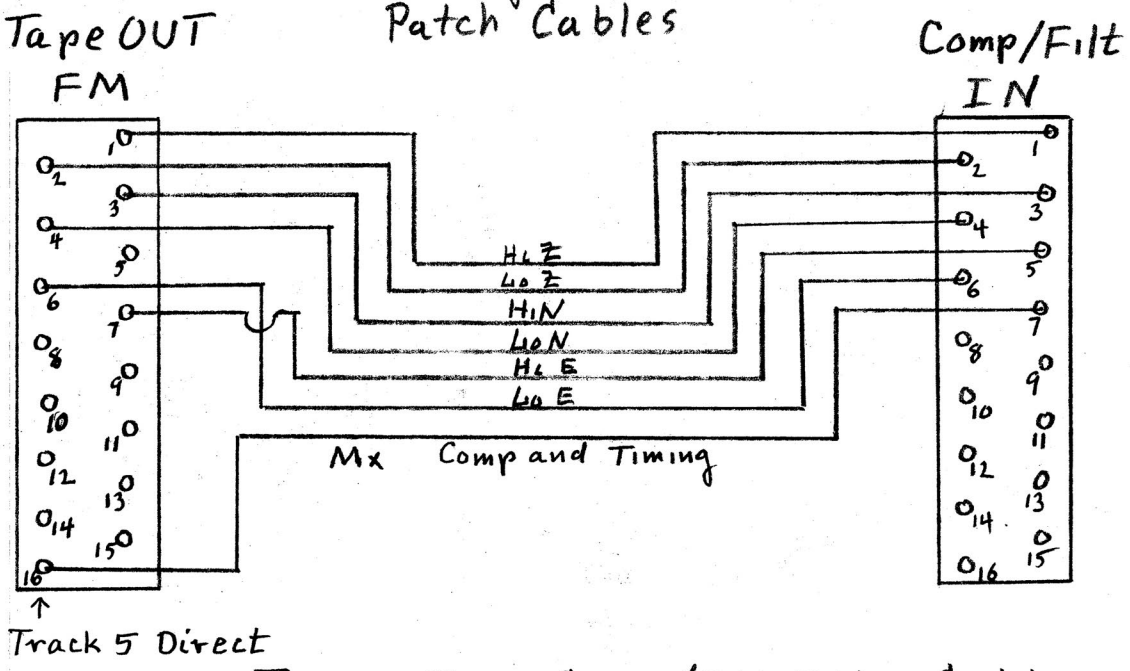
5-Day Comp/Filt Filter Response



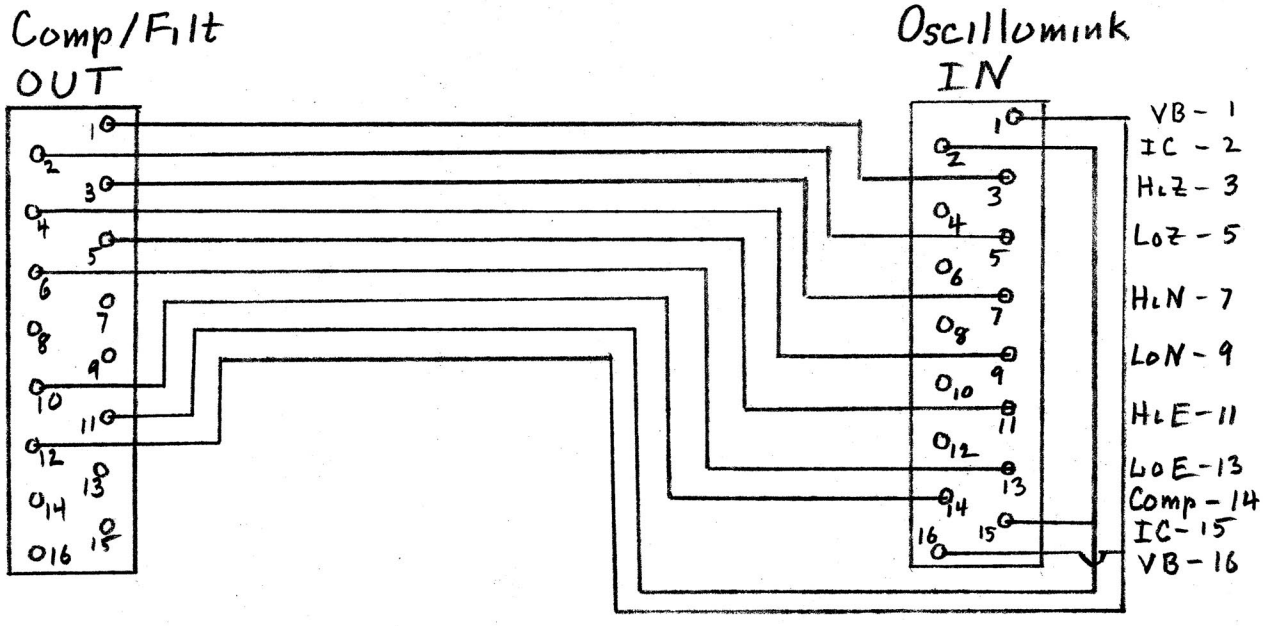
Setting	F.5	F.5/5	F.5/20
A	1112 Hz	222 Hz	56 Hz
B	810	162	40.5
C	449	90	22.5
D	304	61	15.2
E	205	41	10.3
F	110	22	5.5
G	82	16.5	4.1
H	57	11.3	2.8
I	24	4.8	1.2
J	∞	∞	∞
K	0	0	0
	x 1		x 4
	15/16 ips		3 3/4 ips

Fig 8

5-Day-System Patch Cables



Tape OUT → Comp/Filt IN Cable

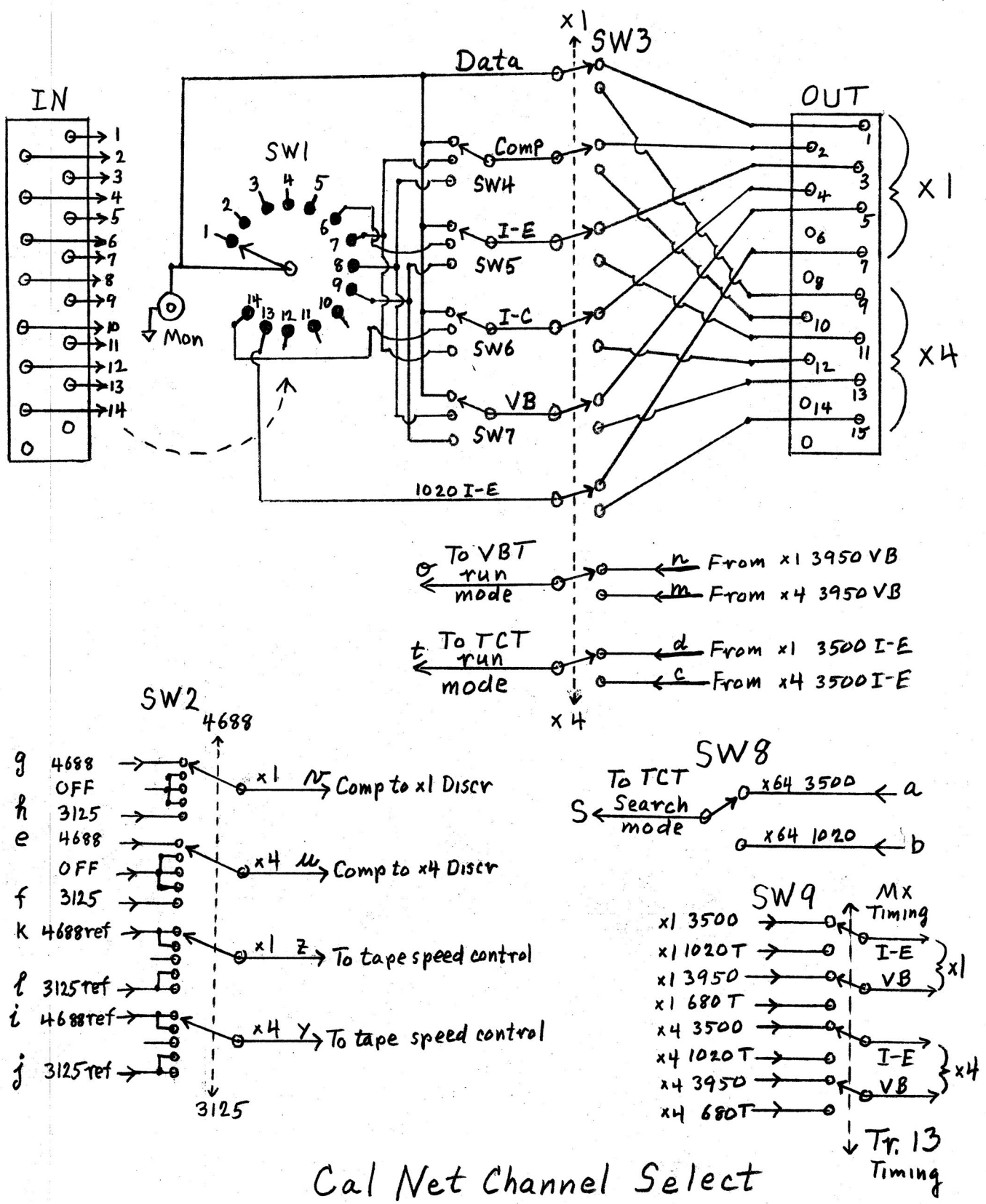


Comp/Filt OUT → O'mink IN Cable

Fig 9

3/8/78 PPE

3/9/78 JPE



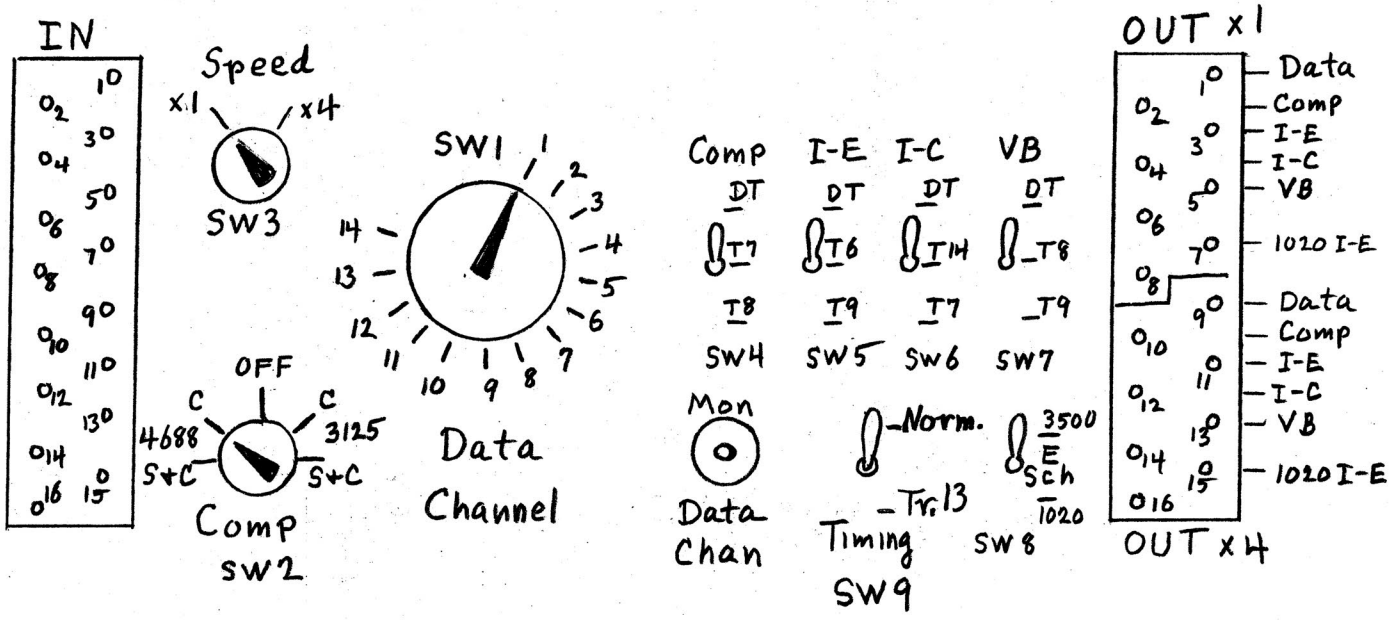
Cal Net Channel Select

Circuit Diagram

Fig 10

3/9/78 JPC

Cal Net Channel Select
Front Panel



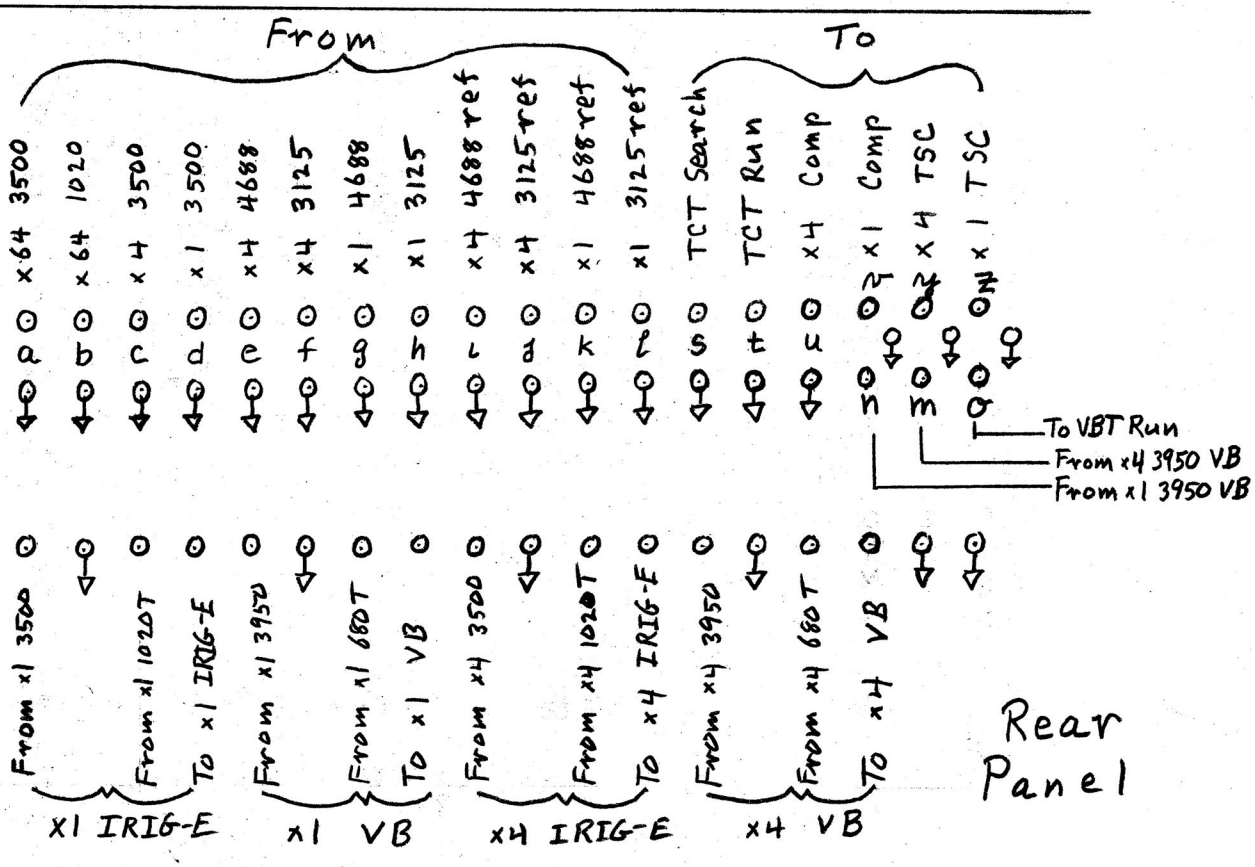
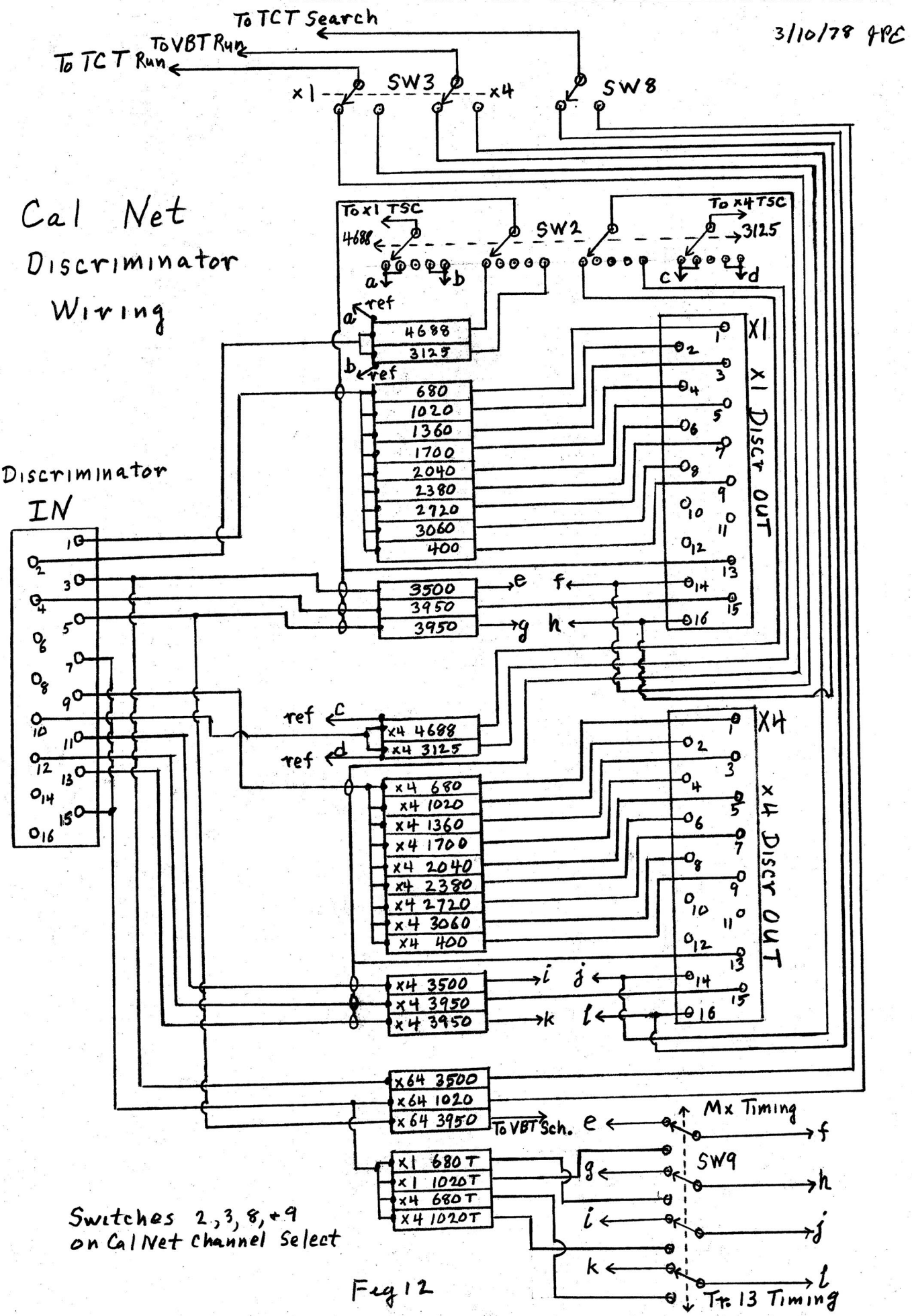


Fig 11


3/10/78 JPC
To TCT Search
To VBT Run
To TCT Run
x1
SW3
x4
SW8
Cal Net
Discriminator
Wiring
To x1 TSC
4688
SW2
To x4 TSC
3125
a
b
c
d
ref
4688
3125
680
1020
1360
1700
2040
2380
2720
3060
400
X1
X1 Discr OUT
Discriminator
IN
3500
3950
3950
e
f
g
h
ref
ref
x4 4688
x4 3125
x4 680
x4 1020
x4 1360
x4 1700
x4 2040
x4 2380
x4 2720
x4 3060
x4 400
X4
X4 Discr OUT
x4 3500
x4 3950
x4 3950
i
j
k
l
x64 3500
x64 1020
x64 3950
To VBT Sch.
Mx Timing
SW9
x1 680T
x1 1020T
x4 680T
x4 1020T
Tr. 13 Timing
Switches 2, 3, 8, & 9
on Cal Net Channel Select
Fig 12

3/10/78 APC

Cal Net Cables

1. Tape Direct OUT
   to Channel Select IN: 16 pair direct wired cable

2. Channel Select OUT
   to Discriminator IN: ditto

3. Discriminator OUT (×1 or ×4)
   to DC Filter IN: ditto

4. DC Filter OUT
   to Oscillomink IN:

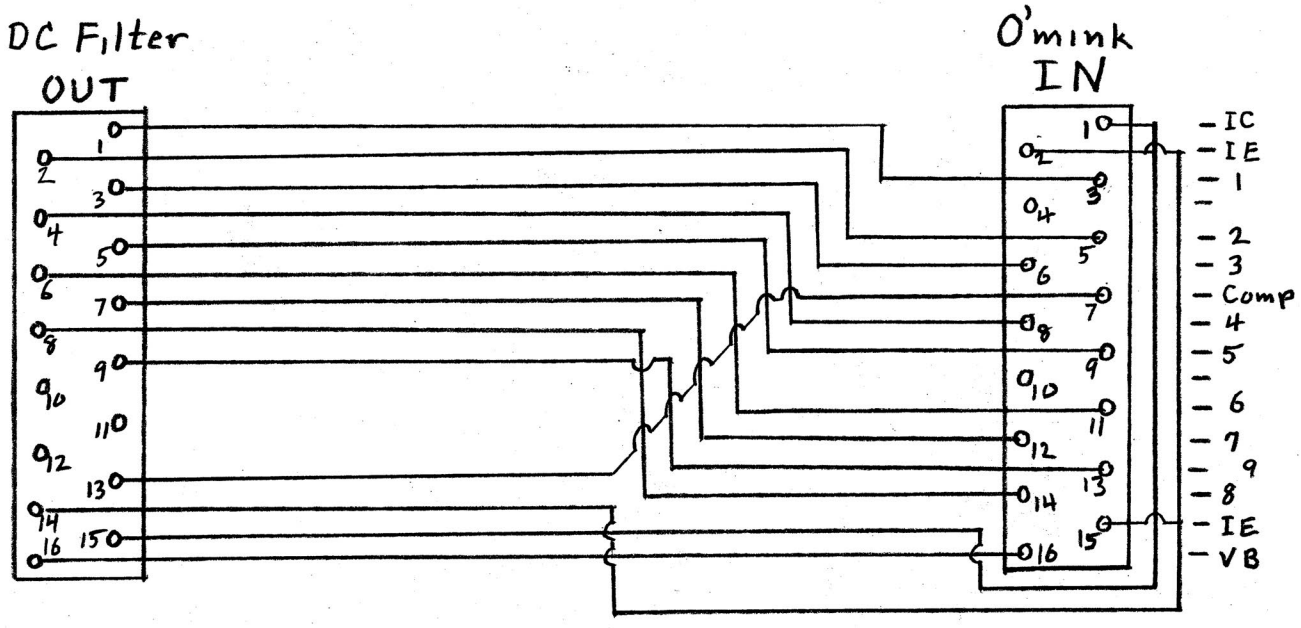
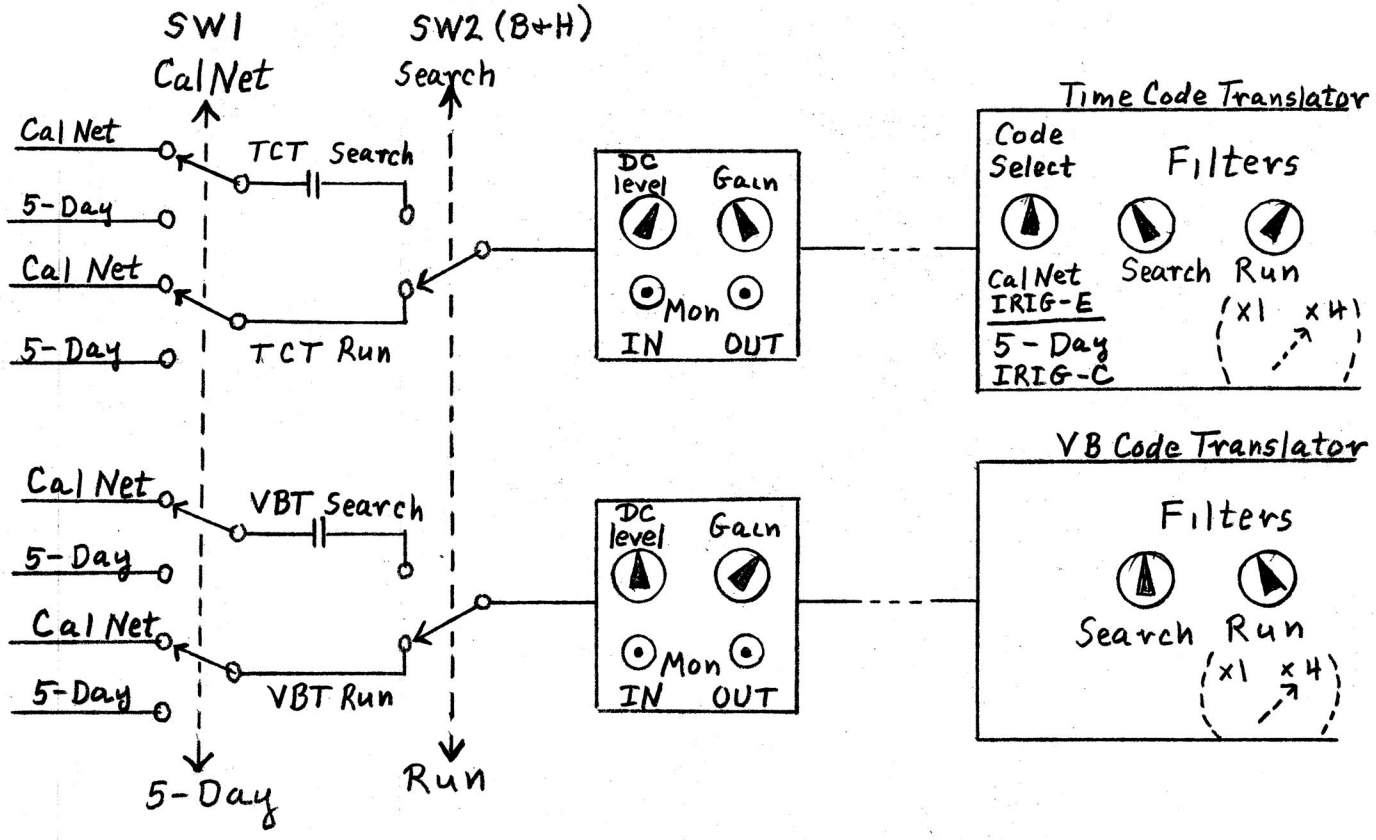
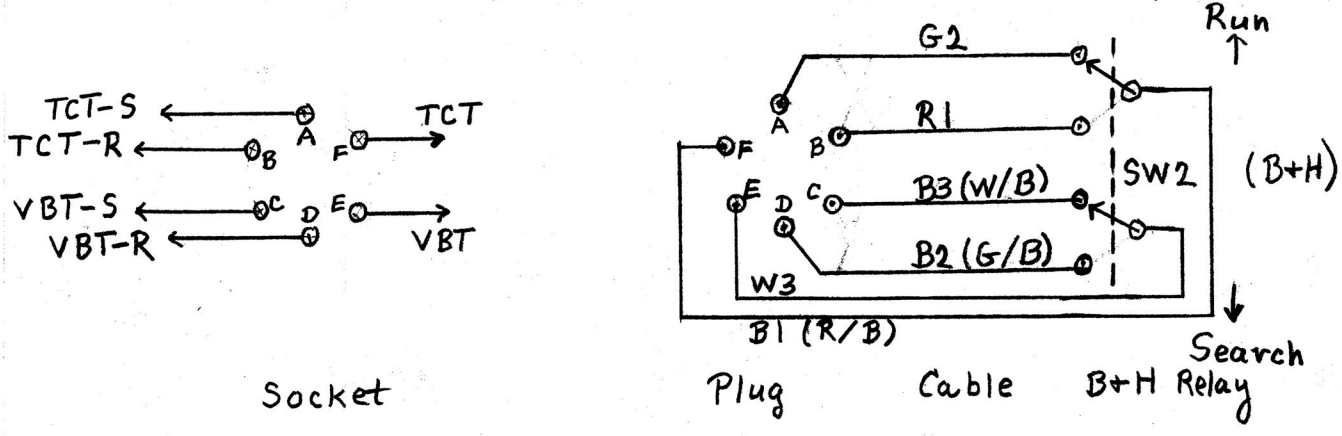


Fig 13

TCT/VBT Signal Conditioning Circuit



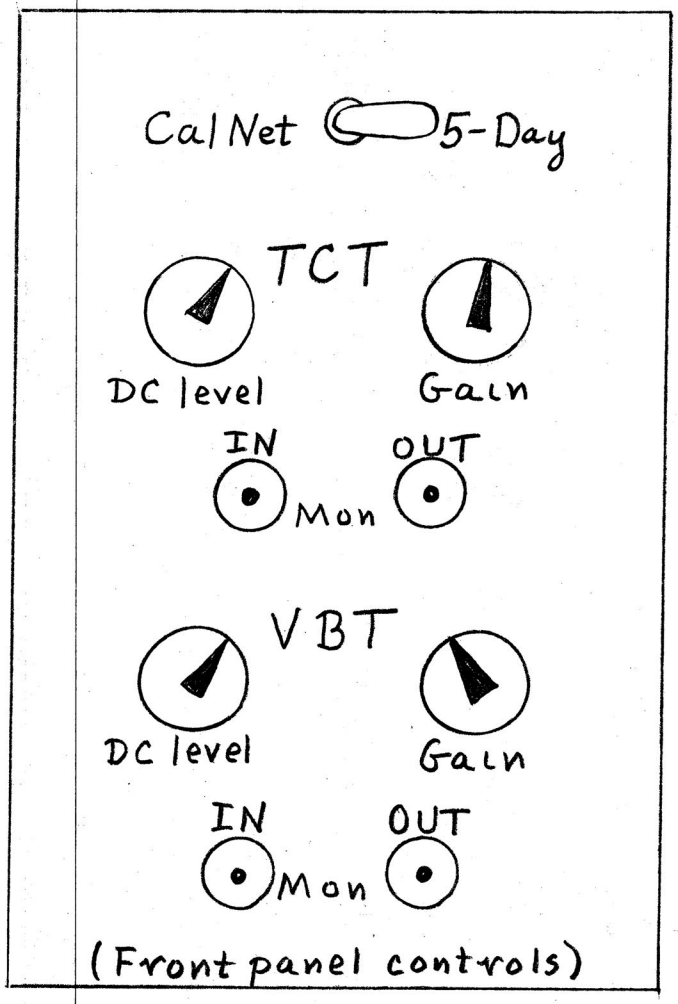
Search/Run control cable to B+H relay

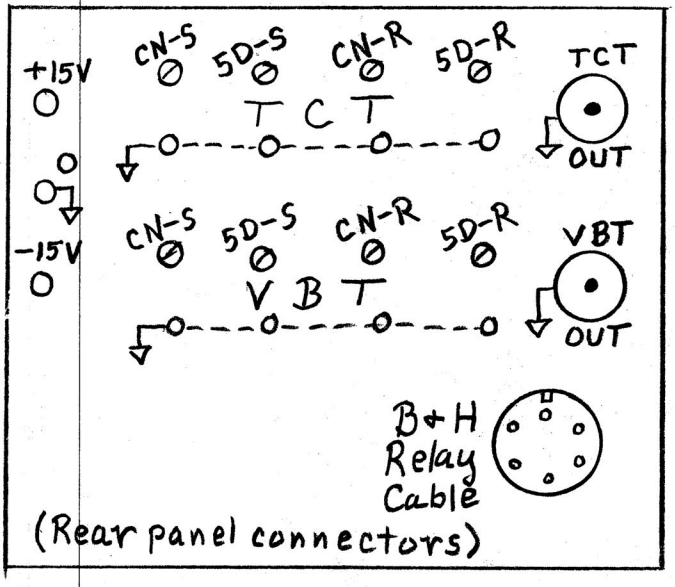


3/10/78 JPE

Fig 14

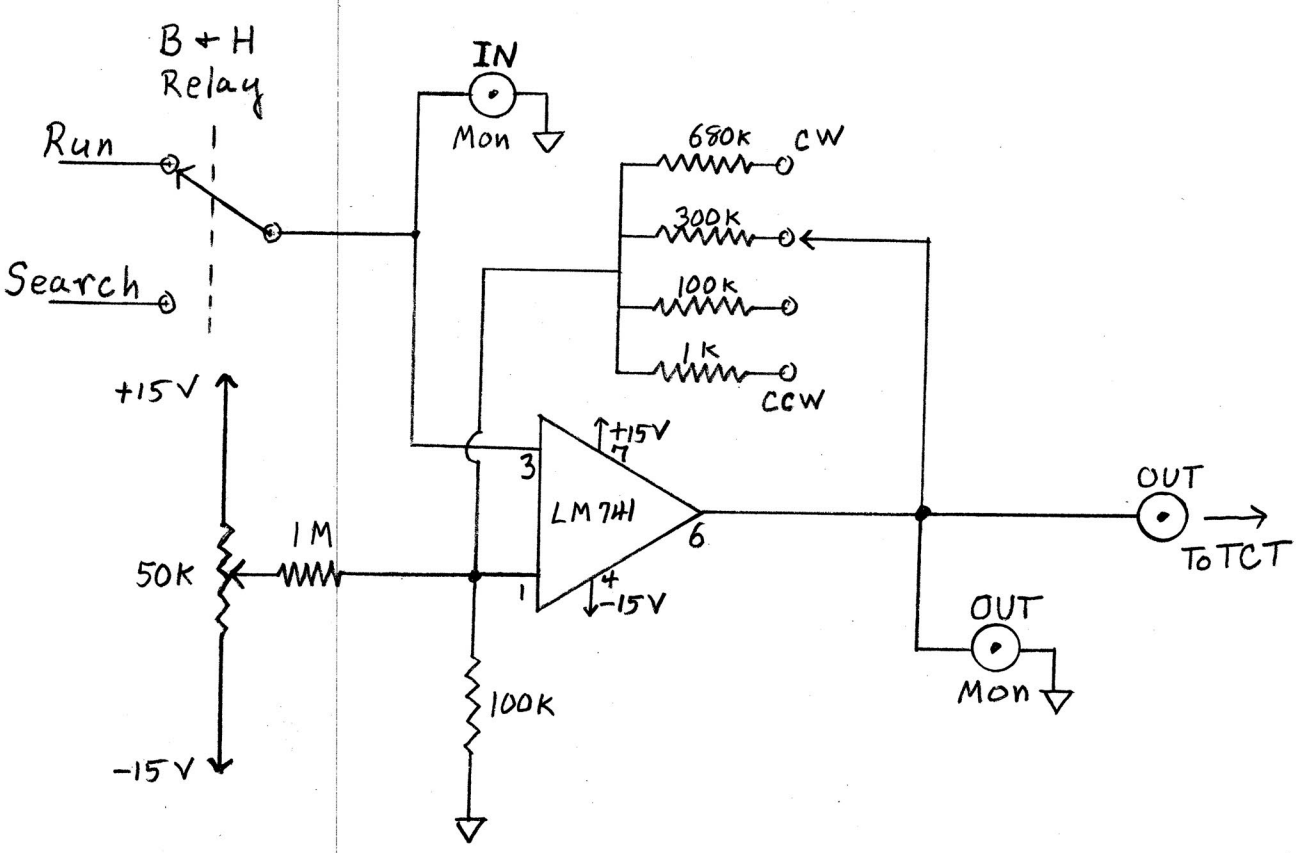
Signal conditioning circuits for time codes





3/10/78 JPE

Fig 15

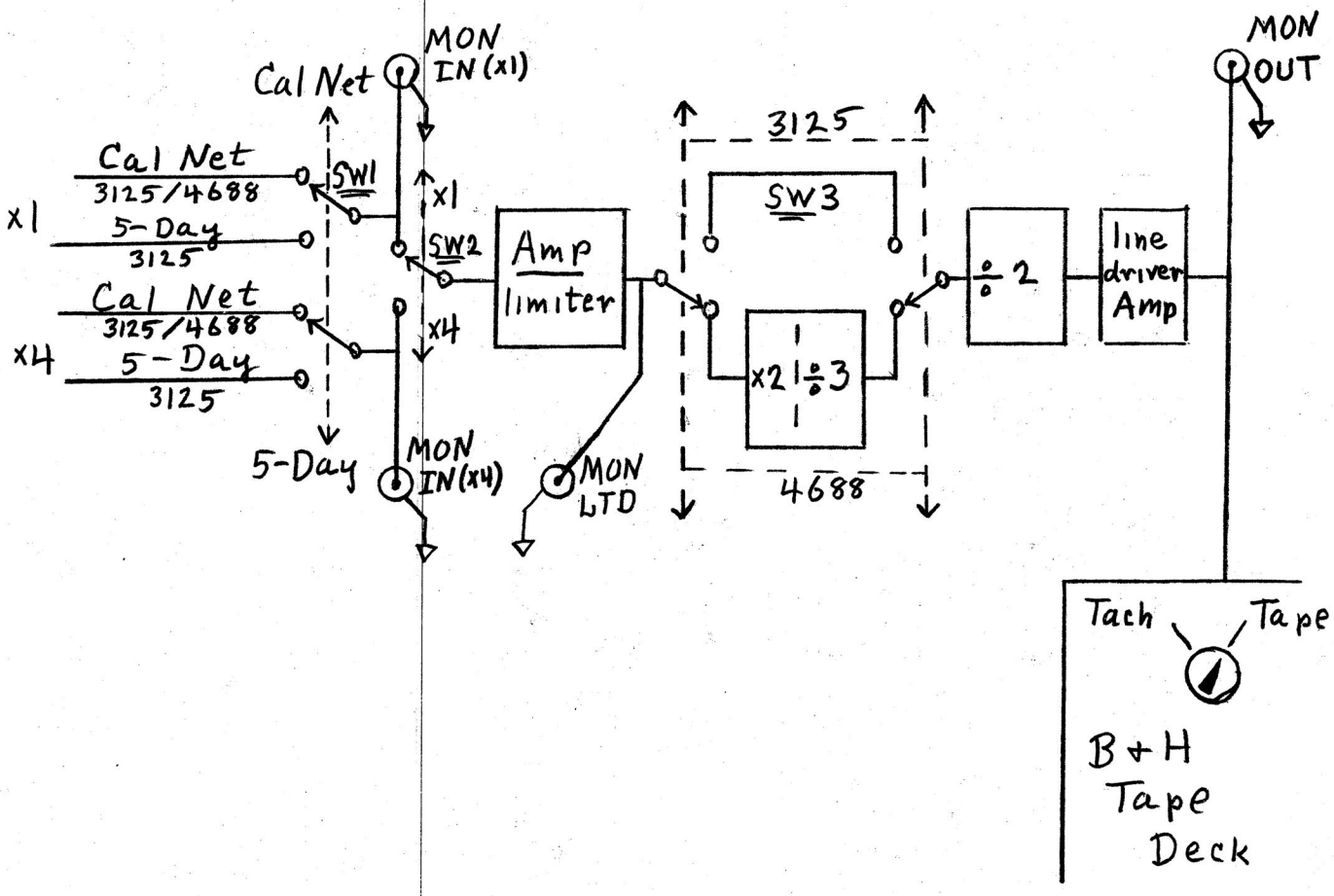


Amplifier/DC level control unit
for time code signals

Fig 16

From Fred Butler
(3/13/78 gPE)

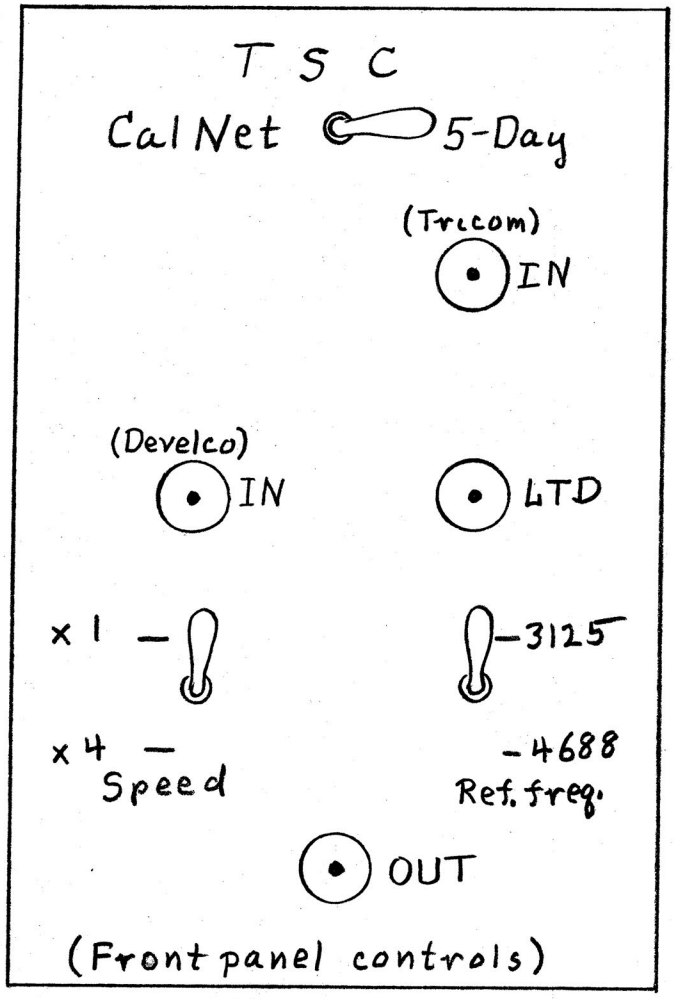
Tape speed compensation
signal conditioning circuit
(Block diagram)

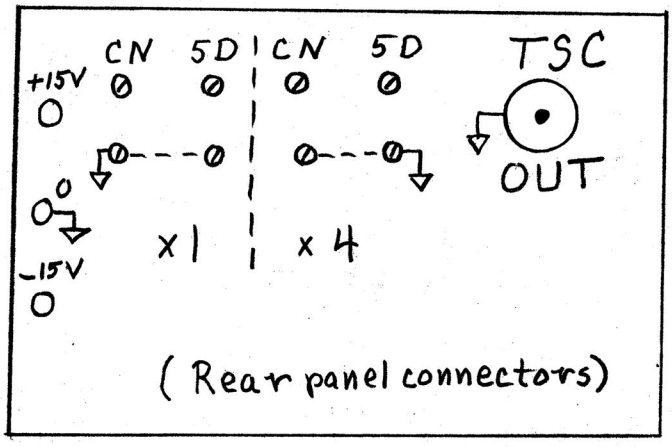


3/10/78 JPE

Fig 17

Signal conditioning circuit for tape speed control

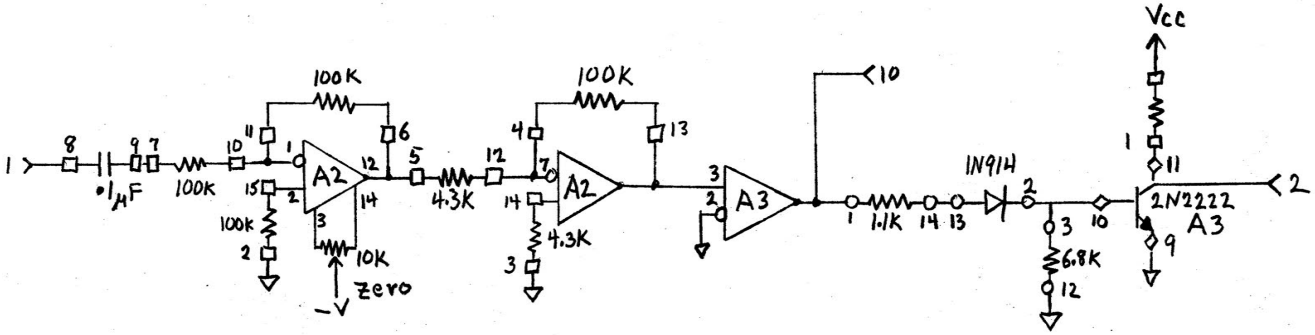




3/10/78 PPE

Limiter and Divide by 2 or 3

2-13-78 J. ELLIS



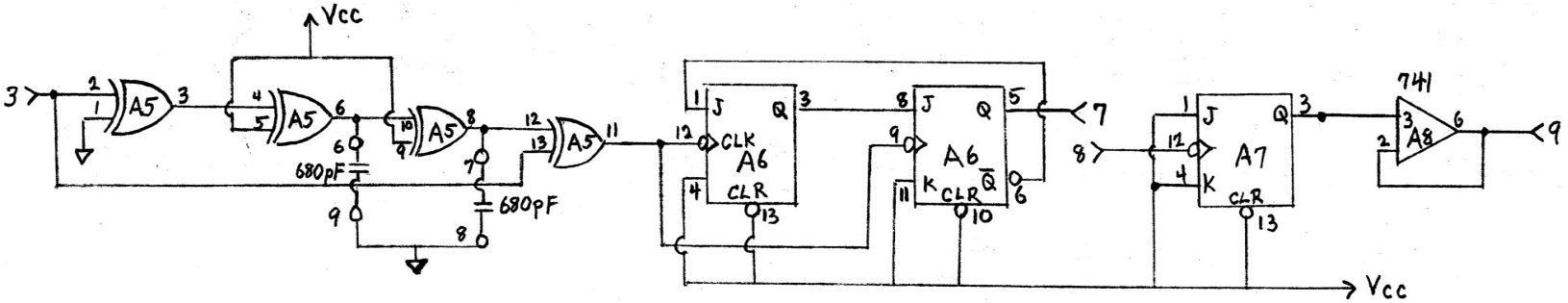
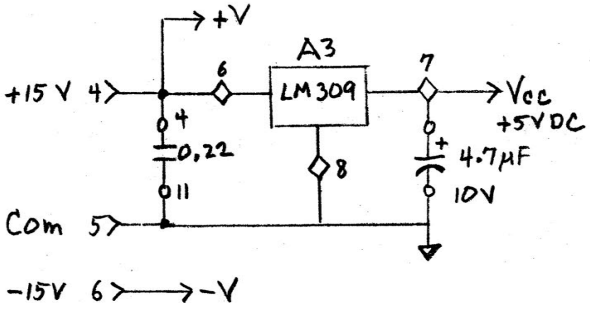
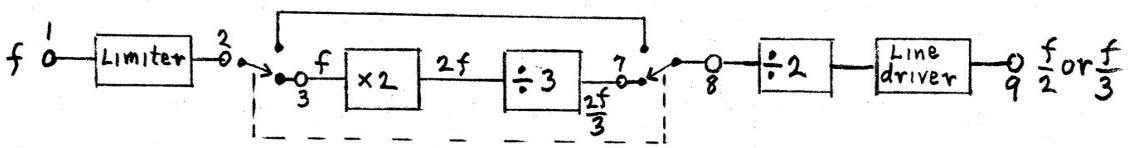
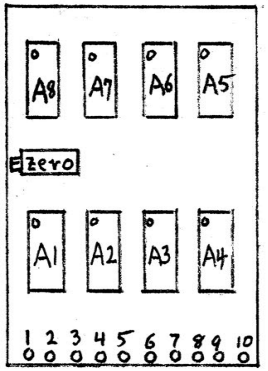
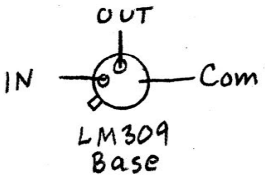


Fig 19









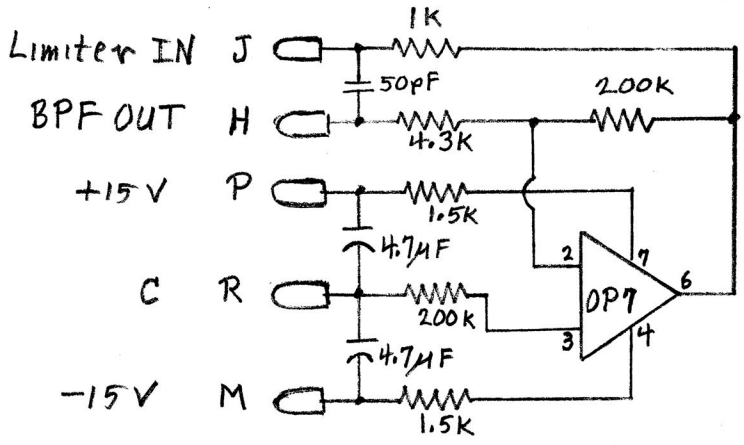
IN/OUT Pins — A1 Pins — A4 Pins — A6 Pins

	Pins	
A1, A4 Components	OpAmp	Socket
A2 747	1	1
A5 74LS86	2	2
A6,A7 74LS107	3	3
A3 NE531 Op Amp	4	4
A8 741 " "	5	13
LM 309 voltage regulator	6	14
2N2222 Transistor	7	15
	8	16

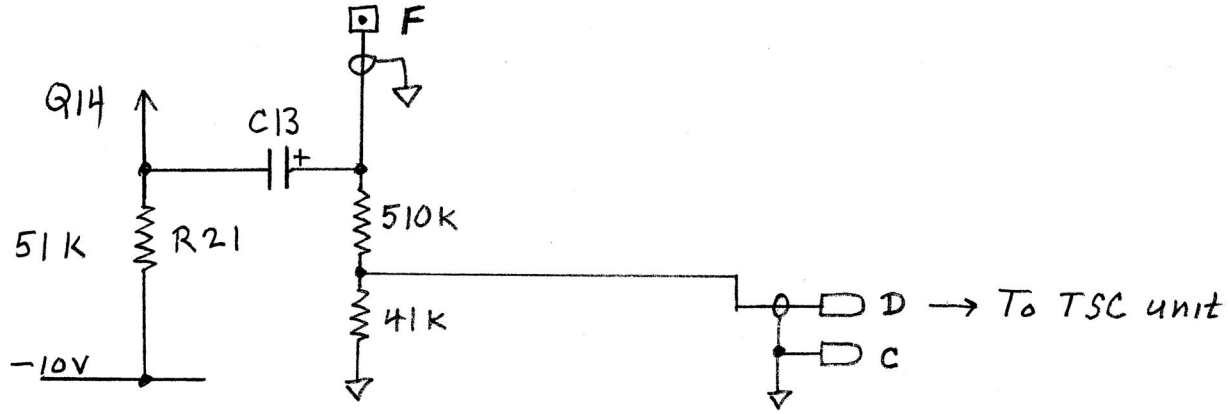
3/13/78 JPE

Special modifications to Develco 3125 Hz compensation discriminator

(See Fig 7, P 18, Develco Model 6203 Discriminator Instruction Manual)



Post band-pass-filter amplifier



Carrier frequency (limited ampl.) output to TSC signal conditioning unit

Fig 20

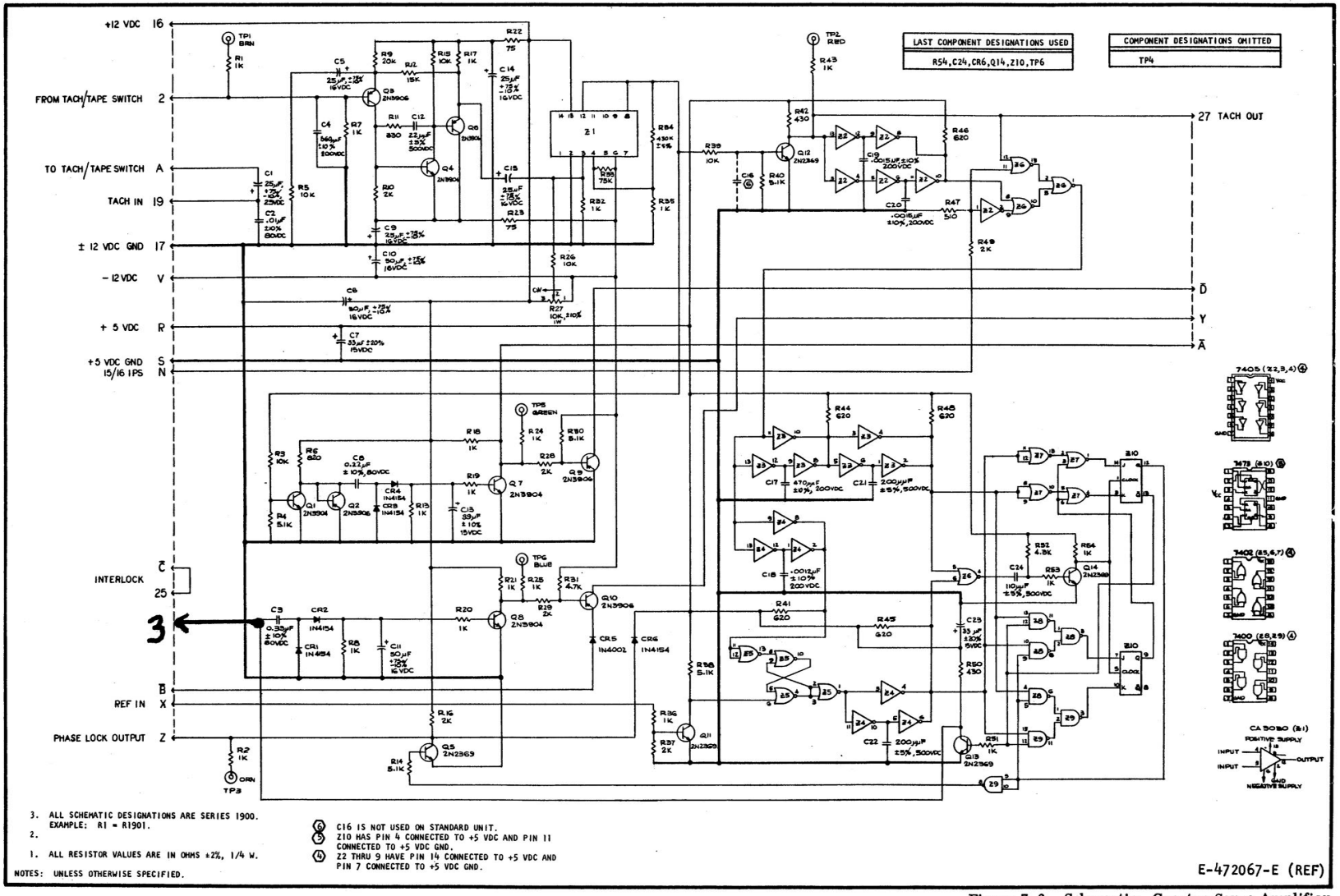


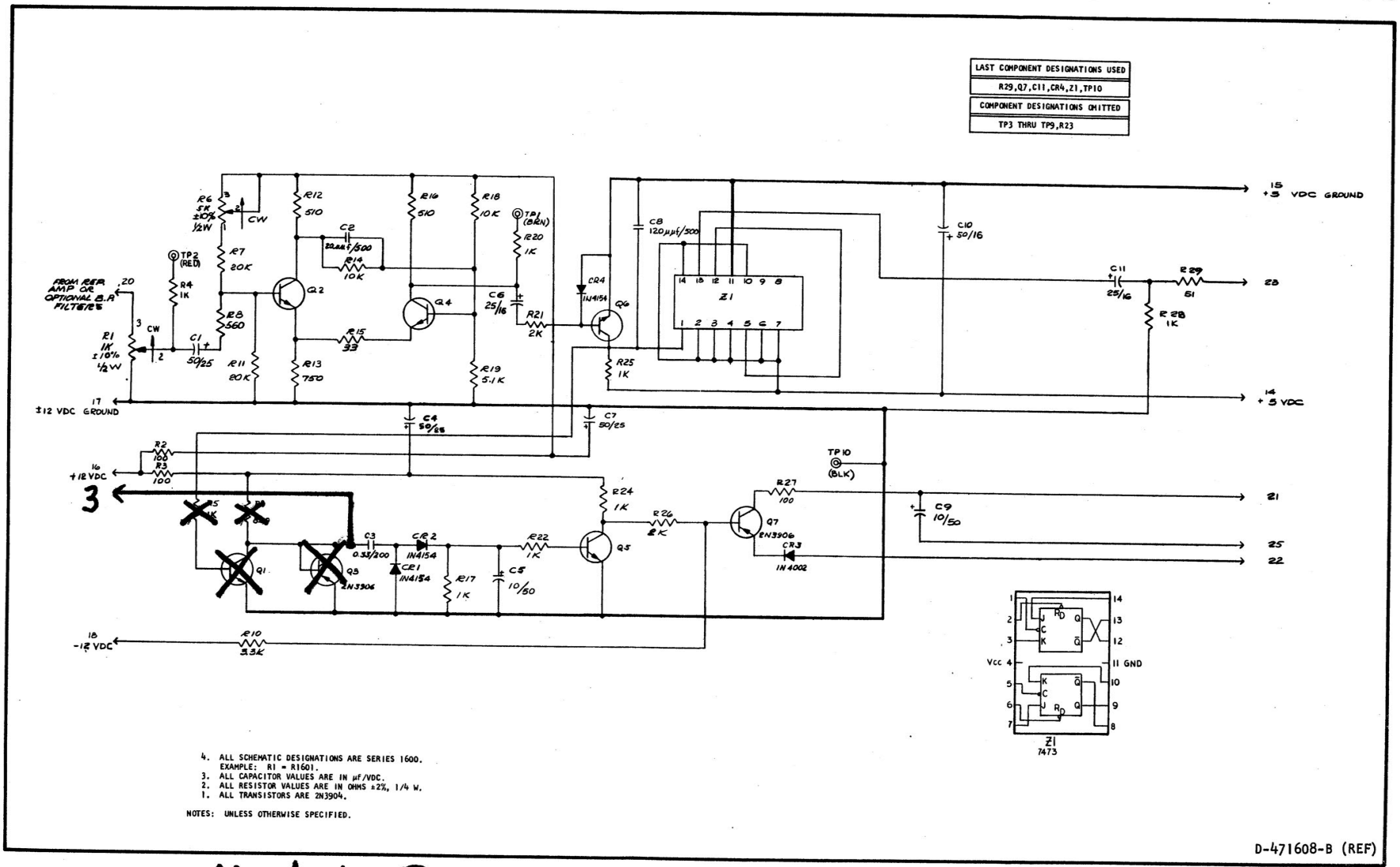
Figure 7-6. Schematic, Capstan Servo Amplifier and Tape Control Logic

7-15/7-16

Fig 21

Mod. to Capstan Servo Amplifier ...

J Ellis



4. ALL SCHEMATIC DESIGNATIONS ARE SERIES 1600.
   EXAMPLE: R1 = R1601.
3. ALL CAPACITOR VALUES ARE IN μF/VDC.
2. ALL RESISTOR VALUES ARE IN OHMS ±2%, 1/4 W.
1. ALL TRANSISTORS ARE 2N3904.

NOTES: UNLESS OTHERWISE SPECIFIED.

D-471608-B (REF)

Figure 7-11. Schematic, Reproduce Servo Control

7-25/7-26

Fig 22

Mod. to Reproduce Servo Control

J Ellis

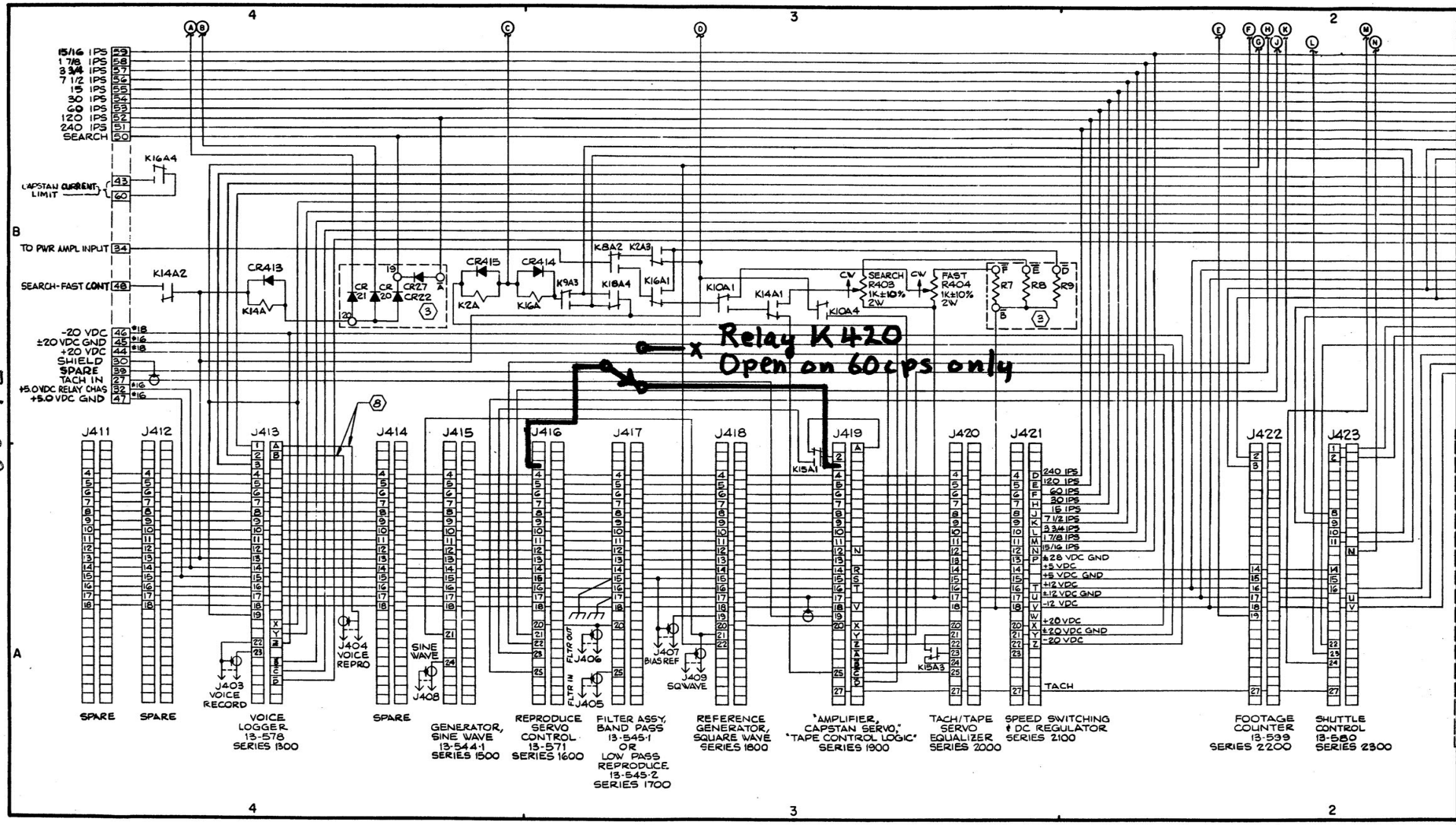


Fig 23

Mod. to tape deck electronics cage wiring

7-5/7-6

J Ellis