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Operation of the VLBA Tape Recorder
at the VLA and VLBA Sites

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Introduction

The VLBA tape recorder is currently used to record data taking sessions in the MKIII format at the VLA and VLBA sites. In the near future, it will be used to record data in the "VLBA Format." In this report we will describe procedures for the site operator to follow when using the recorder. Figures 1 - 4 show the location and nomenclature of recorder parts.

The operator's functions are divided into the following categories:

1. Shipping and Receiving.

2. Cleaning the Tape Path.

3. Tape Mounting and Loading.

4. Prepassing Tapes.

5. Data Recording.

Appendix B outlines checks that can be done by the site technician to verify the correct operation of the tape recorder and to use the tape recorder to check out operation of the DAR (Data Acquisition Rack).

Some of the procedures require the use of SCREENS, a computer program used to monitor and command the antenna. SCREENS are accessed through a terminal connected to the Station Computer. In this document, menu selections and SCREEN commands are shown all in capital letters. Menu selections are named starting from the top menu selection; for example, TAPE/TDC means to move the cursor to TAPE on the top menu bar, ENTER, move the cursor to TDC on the TAPE menu bar, and ENTER.

With few exceptions, diagnostic procedures are not presented in this document. If the operator finds the equipment does not operate as described, he should stop and seek assistance.

Shipping and Receiving:

1. Keep unloaded tapes in the shipping canister. Stack canisters on end to avoid any chance of edge damage to the tape. Safeguarding the tape edge from damage is important because the edge is used to guide the tape through the recorder.

2. Use "zebra" tape to fasten down the tape end. Other tapes can leave a sticky deposit which can transfer to the tape path.

3. Allow a few hours in the control room after shipment before opening and using tapes. Moisture will condense on a cold tape and make it sticky, which increases friction with the head.

4. After recording, apply the label provided with the observing schedule. If the preprinted label is not available, attach a label specifying the station, wavelength, date/time range of the recorded date, and project code. Place a red dot over the green dot.

5. Label tape canister with the project code, and the tape number of the sequence (i.e. "Tape 1 of 5").

Cleaning the Tape Path:

1. Use only high quality (190 Proof or better) isopropyl or denatured alcohol to clean the tape path. 91% alcohol is available from the VLA warehouse.

2. Use cotton swabs to clean the head, capstan, and idler (see Fig. 2). **Never dip a dirty swab into the bottle of alcohol**. Pouring a little alcohol into a separate container for each cleaning operation will help prevent the alcohol supply from becoming contaminated. Swabs and alcohol are available from the VLA warehouse.

3. Do not drip alcohol onto the magnetic tape.

4. Use a separate swab for the headstack. Use a wiping motion perpendicular to the direction of tape motion for head cleaning. Clean only the tip plate and not the sides of the headstack, as the connections on the side can be broken with too much cleaning. Wipe from back to front only.

5. Hold a wetted swab firmly against the capstan and turn the capstan by hand to insure a deep cleaning of all surfaces including the corners of the grooves. Continue cleaning until the swab comes clean. Do the same to the idler, though it is not possible to scrub as hard because of the abrasivity of the surface. Pick loose cotton fibers from the idler.
   Whenever tape slips on the capstan or idler, the surface tends to become glazed; unprocessable off-speed recordings may result. Alcohol restores the grip of the polyurethane-impregnated surfaces.

6. Clean the optical vacuum loop sensor windows, all surfaces of the vacuum column, I/O rollers, guides and other surfaces in the tape path with alcohol; a TexWipe will do. Use a cotton swab to clean out the corners between the precision plate and the "E" casting. TexWipes are available from the VLA warehouse.

7. Remove any build-up of hard deposits in the tape edge contact regions of the precision plate and the front door using alcohol, a swab, and persistent scrubbing. The deposits can increase tape edge heating and damage the tape.
        Haystack Observatory even recommends the use of a safety razor to remove tape deposits, but one must use extreme care not to damage the soft aluminum walls of the "E" casting if this technique is attempted. At the VLA, this procedure should be referred to the Recorder Group.

Tape Mounting and Loading:

1. Turn on the Recorder power. Start the SCREEN Program. Select TAPE/TDC. This will bring up several tape screens and the cursor will be in a screen called "TAPE DRIVE CONTROL"; this screen is used to send commands to the tape recorder. To initialize the tape recorder after power up, enter the TDC Command INIT. If the vacuum motor is on, turn it off by entering the TDC Command VACUUM 0.

2. If the reels do not turn freely enter the TDC Command RELEASE to release the reel brakes.

3. Be sure to mount the reel firmly against the motor flange so that there is no wobble when the reel is rotating. A misaligned reel can cause excessive dragging of the tape against the reel flange and/or fold over at the I/O rollers. Check for tightness of the reel on the hub; if the reel is loose, stop and notify the Recorder Group.

4. Fasten the tape to the hub of the glass take-up reel using static-cling. The cling may be developed by laying the tape end on the take-up reel hub and spinning the reel. A bump on the take-up reel produced by a folded end propagates up through the whole pack and can damage the tape.

5. Be careful not to fold over the tape edge when threading.

6. Be careful to thread the correct path without catching the tape on the triangular piece near the idler or inadvertently bypassing either I/O roller.

5. Enter the TDC Command LOAD. If the recorder misoperates, check the PARM/RECPARM screen as explained in Appendix A.

6. If there is any strange noise when the tape runs, stop operation immediately. Check the tape path and PARM/RECPARM. If the problem persists, notify the Recorder Group.

7. The vacuum should be 10" as displayed on the gage inside the back door of the recorder cabinet; if more than 1" off, notify the Recorder Group.

Prepassing Tapes:

The first time a tape is played after shipment there is often a small tracking difference compared with subsequent passes. This is because at normal tape speeds there is insufficient time for the tape to relax after being relieved from the stresses of the reel pack. The tracking shift of the initial pass can be eliminated by prepassing the tape. The prepass can be done well in advance of use since no strains of consequence are built up on a tape reel pack unless the tape is subject to large environmental changes. Prepassing also removes debris from the tape that may have been loosened during shipment. Prepassing takes about 20 minutes with thick tape and 50 minutes with thin tape.

1. Clean the head and tape path as explained in the previous section.

2. Load the tape as explained in the previous section.

3. Select TAPE/PREPASS.

4. The tape will move from the supply reel to the takeup reel. When the tape stops, remove the tape from the tape path to avoid getting alcohol on it and reclean the head so that debris collected on the leading edge of the head step during the forward pass won't be redistributed on the tape during the reverse pass.

5. Continue the prepass in the reverse direction. Enter the Volume Serial Number (VSN) and Cyclical Redundancy Check (CRC) numbers at the prompt. Figure 5 shows where to find VSN and CRC on the reel.

6. The tape will unload unless you kill the Prepass Screen by moving the cursor to "K" and pressing ENTER.

7. Replace the tape in the shipping canister if it is not to be used immediately. Store the canisters on edge to avoid any possible edge damage. Keep prepassed tapes separate from un-prepassed tapes.

Data Recording:

1. Clean the head and tape path as instructed earlier.

2. Load a prepassed tape using the TAPE/MOUNT Screen. Unrecorded tapes are marked with a green tag. The operators in Socorro will know that the tape is ready if the tape is loaded. The footage counter is set automatically and VSN and CRC must be entered when the TAPE/MOUNT Screen is used; the TDC command LOAD should only be used for testing. If you are loading remotely, use KILL to exit MOUNT when the VSN inquiry appears.

3. At the VLA site only, until a VLBA formatter is installed, the output rate for the tape recorder is set by a Wavetek signal generator. At the VLA, check that the Wavetek output rate synthesizer is set at 94.5 MHz by inspecting the dial setting. There may be an experiment where it is to be set at 189 MHZ, but special instructions will have to be given if that is the case.

4. The operation of the tape recorder is controlled by the Socorro operators and by the observing system file during the data taking session.

5. At the end of the experiment or to change a tape during an experiment, enter UNLOAD as a TDC command to wind all of the tape on to the supply reel. After all of the tape is wound on to the supply reel, turn off the vacuum motor and release the brakes, if necessary, with the TDC commands VACUUM 0 and RELEASE.

6. Remove the tape from the reel, label it, and place it in a shipping canister. Place the used tape in a separate location from unused tapes until it is shipped. Put a red sticky dot on top of the green dot on both tape and canister to show that the tape has recorded data. Also, put the project code and tape number in sequence (i.e. BG7, tape 1 of 5) on the canister.

Appendix A

RESTORING RECORDER PARAMETERS IN THE RECPARM SCREEN

Access the RECPARM screen from PARM on the top menu bar. If you are on one of the tape recorder screens,
1. Enter <CONTROL> L to return to the TAPE menu bar,
2. Enter <CONTROL> T to return to the top menu bar,
3. Move the cursor to PARM and <ENTER>,
4. Move the cursor to RECPARM and <ENTER>.
5. Move the cursor to K on the screen and ENTER to kill the screen, when the inspection is completed.

Each recorder has different parameters, but the numbers should look something like those shown below. If the numbers are all 0 or look dramatically different from the sheet attached, it is necessary to restore the parameters on the hard disk.
In the case of the VLA, a floppy disk is kept nearby. The procedure for restoring the parameters is on a sheet folded up and stuck inside the floppy dust jacket.

```
FEPARM STATION RECPARM
Enter Recorder Unit Number (1-24)
<K,,,,,,,RECORDER PARAMETERS, 1,,,,,,,,,4
5         S/N 19                        5
5    VACUUM   4150    CAP SIZE 54634     5
5   THICKNESS 153   WRITE VOLT 10000     5
5   FAST OUT 1481      FAST IN 1075      5
5   SLOW OUT  159      SLOW IN  125      5
5   LVDT POS 1512     LVDT NEG 1512      5
5   FOR OFF  -131     REV OFF  -131      5
5     SLOPE     0   INTERCEPT     0      5
5   SAVE    RESTORE      READ    SEND    5
-,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,8
```

Figure 6
RECPARM Screen Example

Appendix B

SITE TECH TEST PROCEDURES

Three procedures are listed; the first to use the Tape Recorder to check the Formatter, the second to use the Formatter to check the Tape Recorder, and the third to use the Tape Recorder to check the Base Band Converters (BBC) and Samplers. SCREENS menu selections are shown starting from the top menu bar; for example, FORMAT/TRAK means to move the cursor to FORMAT on the top menu bar, ENTER, select TRAK on the FORMAT menu bar, and enter.

Diagnostic procedures are not presented; if the equipment does not operate as described, stop and seek assistance.

I. This test checks all 36 Formatter tracks to the Tape Recorder and Monitor Channels A and B from the Tape Recorder back to the Quality Analysis Module in the Formatter.

1. Select TAPE/TDC to access Recorder monitor screens and to access TDC Command screen.

2. Enter the TAPE/TDC Command INIT.

3. Enter the TDC Command BYPASS to bypass the Recorder Heads. The Tape Monitor Screen will show "bypass" for channels A and B.

4. Enter the TDC Command EN 1111 to enable the Recorder Head Write circuits. The Tape Record Screen will show all 4 groups of heads "on."

5. Select FORMAT/FORMAT to check that the ratio of SRATE (Sample Rate) to ORATE (Output Rate) is 8:9 and that the time is incrementing.

6. Select FORMAT/TRAK to check that all tracks are enabled.

7. Enter the TAPE/TDC Command FENABLE FFFFFFFFF to enable all Formatter tracks shown on the TRAK screen. No track should be OFF at this point. (Hint: Use <Shift>6 to move the cursor from TRAK to TDC Command).

8. Enter the TDC Command RP 0 1 to assign track 0 to Monitor Channel A and track 1 to Monitor Channel B. The Tape Monitor Status Screen will show tracks 0 and 1 selected for channels A and B.

9. Enter the TDC Command ER to view the Parity, CRC, RESYNC, and NOSYNC errors detected by the Formatter Q/A module in track 0 and track 1. All errors must be 0 or there is a problem; the power indicated in the Tape Monitor Screen should be 9.99.

10. Enter the TDC Command AUX, and check that the 3rd and 4th hexadecimal digits of the printed screen are equal to the track number for Channel A.

11.   Enter the TDC Command TIME, and check that the time on the printed screen is close to Formatter time.

12.   Enter the TDC Command BS 1, and repeat steps 10 and 11 to check Channel B.   Enter BS 0 to return to Channel A.

13.   Check the remaining tracks by selecting them two at a time using the RP command, entering ER, AUX, and TIME, and checking for errors.

II. This test uses the Formatter to check the Tape Recorder.
The test requires writing to a tape.

     1. Select TAPE/TDC to access Recorder monitor screens and to
access the TDC Command Screen.

     2. Enter the TAPE/TDC Command INIT.

     3. Enter the TDC Command EN 1111 to enable the Recorder Head
Write circuits. The Tape Record Screen will show all 4 groups of
heads "on."

     4. Use the FORMAT/FORMAT Screen to set the SRATE (Sample Rate)
to 4 MHz and the ORATE (Output Rate) to 4.5 MHz. Check that the
Formatter time is incrementing.

     5. Select FORMAT/TRAK to check that all tracks are enabled.

     6. Enter the TAPE/TDC Command FENABLE FFFFFFFFF to enable all
Formatter tracks shown on the TRAK screen. No track should be
OFF at this point. (Hint: Use <Shift>6 to move the cursor from
TRAK to TDC Command).

     7. Enter the TDC Command SP 135 to set the Recorder speed to 135
ips.

     8. Load a prepassed tape with a green dot.

     9. Enter the TDC Command MOVEA 0 to move the Head Assembly to
the 0 micron position.

     10. Enter the TDC Command FOR to begin recording.

     11. Enter the TDC Command STOP to stop recording after a few
thousand feet of tape have been recorded. The Tape Record
screen shows the footage.

     12. Enter the TDC Command REV to rewind the tape to the starting
point.

     13. Enter the TDC Command READ to route read signals to monitor
channels A and B.

     14. Enter the TDC Command FOR to begin tape motion.

     15 Enter the TDC Command RP 0 1 to assign track 0 to Monitor
Channel A and track 1 to Monitor Channel B. The Tape Monitor
Status Screen will show tracks 0 and 1 selected for channels A
and B.

16. Enter the TDC Command ER to view the Parity, CRC, RESYNC, and NOSYNC errors detected by the Formatter Q/A module in track 0 and track 1. In the resulting display, parity errors should be 0.0003 or less; NOSYNC, RESYNC, and CRC errors should be close to 0; the power indicated in the Tape Monitor Screen should be nonzero.

17. Check the remaining tracks by selecting them two at a time using the RP command, entering ER, and checking for errors.

18. Unload the tape with the TDC Command UNLOAD.

19. Return the tape to the AOC for bulk erasure. The hand-held eraser can be used in an emergency, but bulk erasure is preferred before tape is used for collecting data.

III. This test uses the Tape Recorder to check that the BBCs and
Samplers are working.

        1. Select Base Band Converter (BBC) #1 as the reference
oscillator by connecting its LO output to IF Distributor A Input.
Using SCREEN, set MODULE/BBC #1 LO output to 700.00 MHz.

        2. Distribute the 700.00 MHz to all BBCs by selecting the IF
Distributor with MODULE/IFDIST. Set IFA input to EXTERNAL and
IFA attenuation to 20 db. This use of BBC #1 and IFA substitutes
for the use of PCAL insertion at the front end.

        3. Select MODULE/BBC and establish a 10 KHz signal on each LSB
BBC output by setting the LO Frequency on BBC #2 through BBC #8
to 700.01 MHz, IF to A, Bandwidth to 62.5 KHz, and gain control
to Auto Level. (700.00 MHz - 700.01 MHz - 10 KHz LSB.) For this
setup, Auto Level will seek a value around - 6 db that will AGC
the BBC total power output to about 16,000 counts. An auto level
of +5 db would more closely simulate observing conditions, but
the wider bandwidth required to achieve that level with this test
setup would result in poorer, more ambiguous correlator results.

        4. Assign BBC LSB Sign outputs to formatter tracks with the
FORMAT/TRAK Screen. BBC #2 LSB Sign output is 2LS, BBC #3 LSB
Sign output is 3LS, etc. Select a hexadecimal mask word on the
TRAK Screen to enable tracks in use. Figure 7 shows an example
setup.

        5. Use the FORMAT/FORMAT Screen to check that the ratio of SRATE
(Sample Rate) to ORATE (Output Rate) is 8:9 and that the
Formatter time is incrementing.

        6. Use the TAPE/TDC Commands INIT, BYPASS, and ENABLE 1111 to
route formatter tracks to monitor channels A and B at the Tape
Recorder.

        7. Enter the Screen Command PCAL to perform a correlation
between the tracks enabled on TRAK and a 10 KHz reference signal
developed on the Formatter Quality Analysis Module. The PCAL
output shows the track number (TRK), the correlation amplitude in
percent (AMP), and the phase (PHASE). Use the TRAK screen to
determine which BBC is assigned to which track; then for the
signals 2LS through 8LS, the correlation amplitude should be 70%
or better. Do PCAL two more times. The phase for a given track
should remain constant within 1 count.

        8. Establish a 10 KHz signal on each USB BBC output by setting
the LO frequency on BBC #2 through BBC #8 to 699.99 MHz, IF to A,
Bandwidth to 62.5 KHz, and gain control to Auto Level. (700.00 -
699.99 MHz MHz = 10 KHz USB.)

        9. Assign BBC USB Sign outputs to formatter tracks with the TRAK
Screen. BBC #2 USB Sign output is 2US, BBC #3 USB Sign output is
3US, etc. Select a hexadecimal mask word on the TRAK Screen to

enable tracks in use (see example).

10. Enter the Screen Command PCAL. For the signals 2US through 8US, the correlation amplitude measured by PCAL should be 70% or better. Do PCAL two more times and check that the phase is constant within 1 count.

11. Check BBC #1 by connecting BBC #2 as the reference oscillator, and check BBC #1 LSB and USB following the steps above.

VLBA TAPE HANDLING AND TAPE RECORDER CHECKSHEET
Revision date: FEB. 26, 1992

A. Shipping, receiving and care of VLBA/MarkIII tapes & recorder:

__ Store the canisters on their edge.

__ Use "ZEBRA" tape to hold down the ends.

__ Apply pre-printed label and a "recorded" red-dot sticker AFTER data collection and cleaning.

__ Use only 91% ISOPROPYL alcohol to clean the tape recorder.

__ Using a perpendicular movement to the tape motion, (wiping back to front), clean the recorder head with a cotton swab.

__ Scrub capstan and idler.

__ Clean the tape path, rollers and sensors, vacuum column with TexWipe. Clean out the corners with a cotton swab.

__ Remove the buildup of hard tape deposits on the tape edge guides in the vacuum column.

B. Tape Mounting and Loading:

__ On the terminal use the TAPE/TDCCMD command INIT to initialize the recorder, and if necessary, the commands VACUUM 0 and RELEASE when powering up the recorder.

__ Load the tape reel: make sure it is tight and the reel does not wobble.

__ Use static cling to start tape on take-up reel; DO NOT FOLD THE TAPE OVER OR UNDER ITSELF! Do not use moisture or adhesive.

__ Load the tape using the TAPE/MOUNT or TAPE/PREPASS screen.

__ Check the Vacuum for value of 10, and if necessary, the RECPARM screen.

C. Pre-passing the tapes:

__ Clean the tape path.

__ Load the tape using TAPE/PREPASS.

__ Clean the recording heads when the tape has all moved to take-up reel.

__ Enter VSN and CRC on command and store separately from un-prepassed tapes.

__ At the VLA, check the WAVETEK "Output Rate Synthesizer".

D. Data Recording

__ Clean the tape path and load a pre-passed tape using the TAPE/MOUNT screen.

__ At the VLA, check the WAVETEK "Output Rate Synthesizer."

__ At the end of the experiment, unload the tape, label it, and place in a canister separate from the unused tapes. Tag the tape and canister with a red dot to identify the tape as written. Place the project code and tape number in sequence on the canister.

REFERENCES

1.   VLBA Acquisition Memo #247, Mark III Tape-Labelling and
Handling Procedures, Alan R. Whitney, Haystack Observatory, March
20, 1991.

2.   VLBA Acquisition Memo #267, Tape (thin) and Transport
Handling Procedures, Alan E. E. Rogers and Hans F. Hinteregger,
Haystack Observatory, September 27, 1991.

3.   A High Data Rate Recorder for Astronomy, Hinteregger et. al.,
IEEE Transactions on Magnetics, Vol. 27, No. 3, May 1991.

FRONT VIEW

- (reels shown)
- HONEYWELL NINETY SIX
- BLANK PANEL
- DIGITAL POWER SUPPLY MODULE
- ANALOG POWER SUPPLY MODULE
- HONEYWELL UNREGULATED POWER SUPPLY MODULE

(FRONT VIEW)

SIDE VIEW

- MOTOR
- RESERVED NIM BIN
- I.W. CONTROLLER & ANALOG COND. NIM BIN
- READ & WRITE NIM BIN
- MOTOR
- REEL SERVO
- VME CONTROLLER NIM BIN
- POWER DISTRIBUTION UNIT NIM BIN
- DIGITAL POWER SUPPLY
- ANALOG POWER SUPPLY
- FAN
- HONEYWELL UNREGULATED POWER SUPPLY

(SIDE VIEW)

REAR VIEW

- BLANK PANEL
- RESERVE FOR EXPANSION
- MONITOR CONTROL MODULE
- RESERVE FOR EXPANSION
- ANALOG CONDITIONER MODULE
- RESERVE FOR EXP.
- RESERVE FOR EXP.
- READ MODULE
- RESERVE FOR EXP.
- WRITE MODULE
- RESERVE FOR EXP.
- CPU BOARD
- D/A BOARD
- I/O PANEL
- TRANSPORT MODULE
- WRITE MODULE
- MONITOR MODULE
- VME POWER DISTRIBUTION UNIT
- VME MODULES
- NIM POWER DISTRIBUTION UNIT
- BLANK PANEL
- HONEYWELL REGULATED POWER MODULE
- INTERNAL PANEL
- I/O PANEL
- FAN

(REAR VIEW)

Fig. 1. Recorder rack layout. The overall dimensions are 22″ × 29″ × 77″.

TO SUPPLY REEL

FLANGED I/O ROLLER

HEADSTACK MOUNTING LOCATIONS

CAPSTAN

VACUUM BUFFER

EDGE GUIDING REGION IN FORWARD
EDGE GUIDING REGION IN REVERSE

LOWER MOUNTING LOCATIONS

IDLER ROLLER

TO TAKEUP REEL
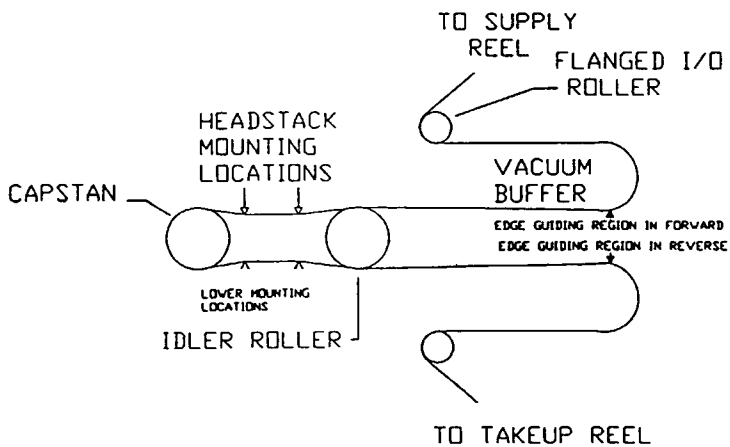
Fig. 2. Tape path in Honeywell Model 96 Transport.

DEPTH OF GAP = 38 microns
GAP AREA = 38 x 38 microns
GAP LENGTH = 0.33 microns

HEADSTEP WIDTH = 300 microns

SCALE | 100 microns

TIP
PLATE

HEAD TIP

REGION OUTSIDE
38 um CUT
AWAY ABOVE THIS
LEVEL

SINGLE CRYSTAL FERRITE
MU APPROX 700 AT 1 MHZ

CONTACT LINE

GLASS

CONTACT LINE

BASE

FLUXOR

48 TURN
FLUXOR COIL
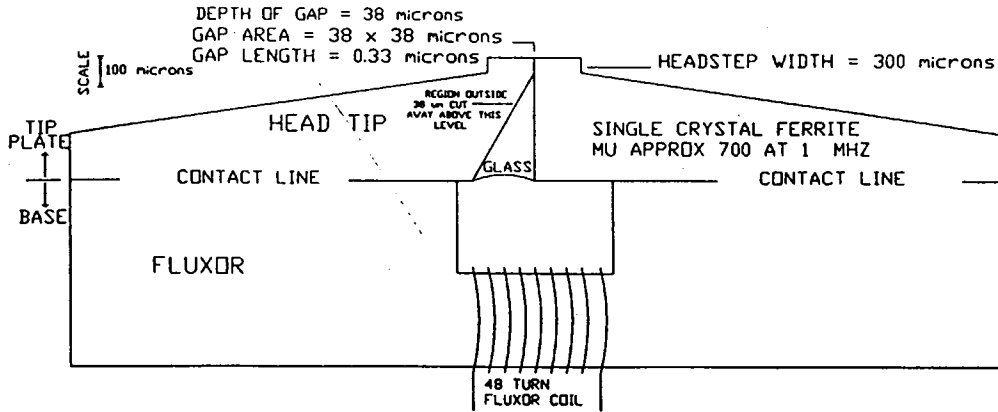
Fig. 3 Cross section of one head in the stack of 36.

┌ DOOR PLATE

◆ — APPROX 5 MIL CLEARANCE

SIDE VIEW OF TAPE
I.E. VIEW NORMAL TO TAPE
PLANE – OUTLINE SHAPE
IS EXAGGERATED

PULL OF VACUUM →

└ PRECISION BACK PLATE

PROFILE OF OUTER EDGE OF TAPE

PROFILE OF INNER EDGE OF TAPE

REGIONS
OF CONTACT
WITH
PRECISION
BACK PLATE

REGION
OF CONTACT
WITH FRONT
DOOR

LOOKING DOWN ON TAPE
I.E. LINE OF VIEW
IN PLANE
OF TAPE
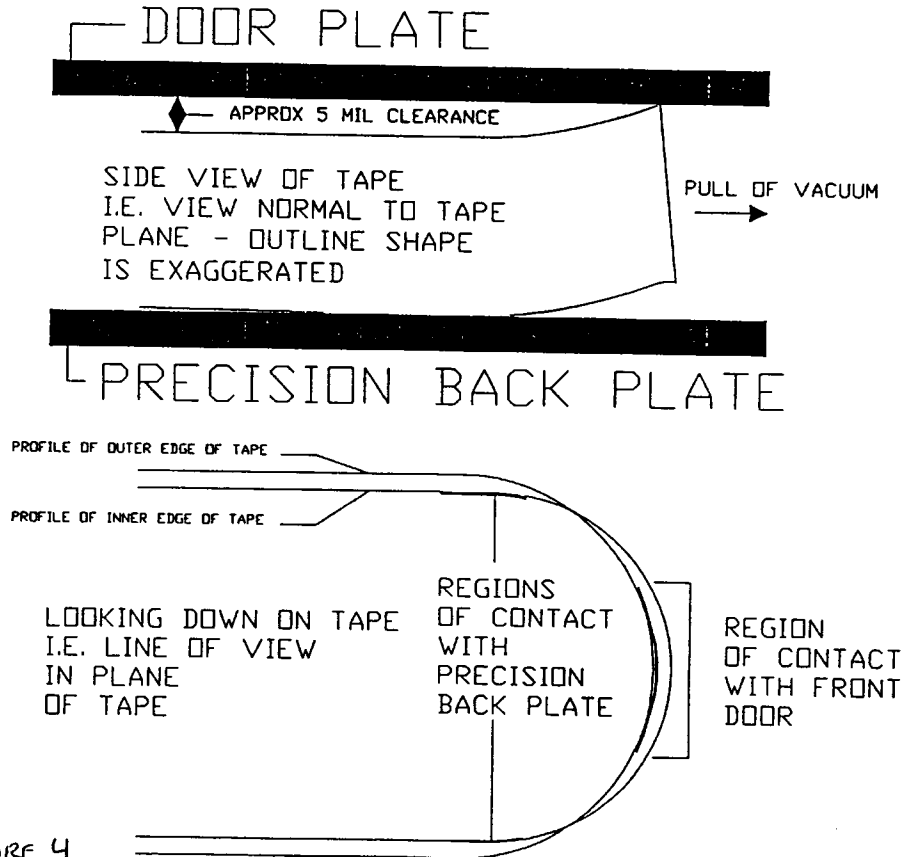
FIGURE 4

TAPE EDGE CONTACT REGIONS

VSN→ **HS002931   0F78** ← CRC

3M5198   /48928-19-010-1/MM/HS   /G

Figure 5 VSN Label Example

```
TRAK FORMAT FMTERR PCAL MARK2 SPAN
Enter Track Write Enable/Disable Mask
├┴┴┴┴┴┴┴┴┴┴TRACK ASSIGNMENTS┴┴┴┴┴┴┴┴┴┴┤
              ON/OFF 044444444
    2   1LS    3   OFF    4   OFF    5   OFF
    6   2LS    7   OFF    8   OFF    9   OFF
   10   3LS   11   OFF   12   OFF   13   OFF
   14   4LS   15   OFF   16   OFF   17   OFF
   18   5LS   19   OFF   20   OFF   21   OFF
   22   6LS   23   OFF   24   OFF   25   OFF
   26   7LS   27   OFF   28   OFF   29   OFF
   30   8LS   31   OFF   32   OFF   33   OFF
   S0 OFF    S1 OFF    S34 OFF   S35 OFF
├┴┴┴┴┴┴┴┴┴┴┴┴ 44444444┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴N
```
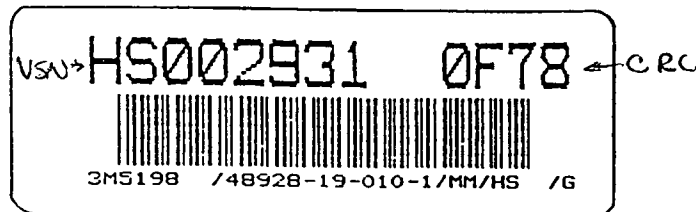
```
TRAK FORMAT FMTERR PCAL MARK2 SPAN
Enter Track 16 Assignment
├┴┴┴┴┴┴┴┴┴┴TRACK ASSIGNMENTS┴┴┴┴┴┴┴┴┴┴┤
              ON/OFF 111111110
    2   OFF    3   OFF    4   1US    5   OFF
    6   OFF    7   OFF    8   3US    9   OFF
   10   OFF   11   OFF   12   5US   13   OFF
   14   OFF   15   OFF   16   7US   17   OFF
   18   OFF   19   OFF   20   5US   21   OFF
   22   OFF   23   OFF   24   6US   25   OFF
   26   OFF   27   OFF   28   7US   29   OFF
   30   OFF   31   OFF   32   8US   33   OFF
   S0 OFF    S1 OFF    S34 OFF   S35 OFF
├┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴N
```

```
TRAK FORMAT FMTERR PCAL MARK2 SPAN
Enter Track Write Enable/Disable Mask
├┴┴┴┴┴┴┴┴┴┴┴┴TRACK ASSIGNMENTS┴┴┴┴┴┴┴┴┴┴┤
              ON/OFF 155555554
    2   1LS    3   OFF    4   1US    5   OFF
    6   2LS    7   OFF    8   2US    9   OFF
   10   3LS   11   OFF   12   3US   13   OFF
   14   4LS   15   OFF   16   4US   17   OFF
   18   5LS   19   OFF   20   5US   21   OFF
   22   6LS   23   OFF   24   6US   25   OFF
   26   7LS   27   OFF   28   7US   29   OFF
   30   8LS   31   OFF   32   8US   33   OFF
   S0 OFF    S1 OFF    S34 OFF   S35 OFF
├┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴N
```

```
BBC IFDIST SYN MASER PWRSP SN LOMON
Strike <CR> to Kill This Screen
┘K┴┴┴┴┴┴┴┴┴BASEBAND CONVERTER / 1┴┴┴┴┴┴┴┴┴
   IF B    LO FREQ  700.00      PERIOD  4
                    LSB          USB
          BANDWIDTH 62.5K         4M
      RAW BANDWIDTH #002B        #2410
         AUTO LEVEL   7.81        5.27
        TOTAL POWER  16182       16087
      SWITCHED POWER   381         404
├┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴N
```

```
┘K┴┴┴┴┴┴┴┴┴┴IF DISTRIBUTOR/1┴┴┴┴┴┴┴┴┴┴┴┤
     PERIOD  0    CHANNEL 1      CHANNEL 2
     ATTENUATION   20             0
         IF INPUT  EXTERN         NORMAL
        TOTAL POWER  208          416
      SWITCHED POWER   0            0
├┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴N
```

FOR LSB
```
┘K┴┴┴┴┴┴┴┴┴BASEBAND CONVERTER  5┴┴┴┴┴┴┴┴┤
   IF A    LO FREQ  700.01      PERIOD  0
                    LSB          USB
          BANDWIDTH 62.5K       62.5K
      RAW BANDWIDTH #002B       #002B
         AUTO LEVEL  -5.79       11.97
        TOTAL POWER  16224        4212
      SWITCHED POWER    -1           0
├┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴N
```

FOR USB
```
┘K┴┴┴┴┴┴┴┴┴BASEBAND CONVERTER  4┴┴┴┴┴┴┴┴┤
   IF A    LO FREQ  699.99      PERIOD  1
                    LSB          USB
          BANDWIDTH 62.5K       62.5K
      RAW BANDWIDTH #002B       #002B
         AUTO LEVEL  11.97       -8.93
        TOTAL POWER   4019       15158
      SWITCHED POWER    16         -19
├┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴N
```

FIGURE 7. SETUP FOR
SITE TECH PROCEDURE III.