WILSON Laboratories, Inc.

TX-1200

OPERATION & MAINTENANCE MANUAL

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PROPRIETARY INFORMATION

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1.00 INTRODUCTION

The Model TX-1200 Exerciser is intended to exercise 7- and 9-track magnetic tape transports.

The TX-1200 will operate in an NRZI or phase-encoded (PE) mode.

The TX-1200 provides continuous or start-stop servo movements for servo ramp evaluations. It also supplies all the signals necessary to write and/or read several types of data and will tally and display all errors.

2.00 SPECIFICATIONS

2.01 TRANSPORT TYPE

The TX-1200 will exercise AMPEX, BRIGHT, PERTEC, and WANGCO transports configured in any of the following options:

Tracks:	7/9
Mode:	PE or NRZI
Density:	556, 800, 1600, or 6250 BPI
Head Type:	Dual or single gap
Data:	Strobed or unstrobed

Standard Speeds:	12.5, 25, 37.5, 45, 60, and 75 IPS
Special Speeds:	Up to 250 IPS

2.02 DETAILED SPECIFICATIONS

Size:	21" x 12" x 7"
Weight:	Less than 15 pounds
Power:	100-240 VAC, 50-60 Hz
Electronics:	142 LSI/MSI TTL circuits
Cooling:	Forced air
Operating Environment Temperature:	60 to 85 F
Timing:	Crystal controlled

3.00 CONTROLS

3.01 POWER

Applies AC power to the TX-1200.

3.02 START-STOP

A momentary pushbutton switch which alternately starts and stops all test actions.

3.03 REWIND

A momentary toggle switch which initiates a rewind sequence in a drive that is ON LINE and SELECTED. Depressing this switch also restores the TX-1200 to the "stopped" status.

3.04 BLOCK LENGTH

Selects the length of the write data when the MOTION switch is in the FWD/FWD position.

The indicated lengths are the number of characters written at 800 or 556 BPI. Twice as many are written in the PE mode.

This switch can also be used when reading in the RAMP read mode during cyclic motions (ALT, FWD/FWD, and REV/REV) to force a ramp down at precisely timed intervals.

BLOCK LENGTH	TAPE MOVEMENT	
	1600 & 800 BPI	556 BPI
8 Characters	.33"	.50"
64 Characters	.40"	.60"
128 Characters	.48"	.76"
256 Characters	.64"	.96"
512 Characters	.96"	1.44"
1024 Characters	1.60"	2.40"

3.05 MOTION

This switch selects one of six sequences of tape motion. The action on each selection is modified by the position of the WRITE-READ switch. The motion starts by depressing the START-STOP switch and may be stopped by again pressing this switch. The motion will stop when an error is sensed if the ERROR switch is in the up position.

3.06 FWD

Continuous forward motion at synchronous speed. Stops at EOT on read only. Writes continuously if WRITE-READ switch is up. Reads continuously if WRITE-READ switch is down or if SINGLE GAP/DUAL GAP switch is down.

3.07 REV

Continuous reverse synchronous motion. Read only. WRITE-READ switch must be in the down position. Stops at BOT or load points.

3.08 ALT

Alternate motion. Reads a single block in forward motion and a single block in reverse motion. WRITE-READ switch must be in the down position.

3.09 FWD/FWD

Advances the tape but starts and stops for each block. Writes or reads according to the WRITE-READ and SINGLE GAP/DUAL GAP switch positions. Rewinds at EOT on write mode.

3.10 REV/REV

Reads the tape in reverse, starting and stopping for each block. Stops at BOT.

3.11 PROGRAM

With the WRITE-READ switch in the up position, the TX-1200 writes forward 4 variable length records, reads in reverse 3 records, and then writes forward 5 records. This sequence is repeated until the EOT marker is detected. The tape then rewinds and repeats the sequence.

With the WRITE-READ switch in the down position, the TX-1200 reads in the forward direction 4 records, reads reverse 1 record, reads forward 5 records, and reads in reverse 3 records. This sequence is repeated until the EOT marker is detected. At EOT the sequence is altered to read in the reverse direction 7 records and then in the forward direction 1 record until the BOT marker is reached. The forward read sequence will continue until the stop button is pressed or stop if the error switch is on and there is an error.

3.12 SPEED

Selects one of 6 speeds. Calibrated in inches-per-second.

The 75 SPL position is a special position. It may be used to implement one of 4 special user-selected speeds as selected by a miniature slide switch located inside the TX-1200. Normally, the user will leave this miniature switch with the 75 IPS speed selected.

If in doubt of where the switch is, the user may observe the speed the tester is currently running by momentarily holding down on the STATUS TEST switch. The speed, in IPS, will be displayed in the SKEW/SPEED DIGITAL READOUT.

Optional crystals may be required to derive non-standard speeds.

3.13 UNIT SELECT-STATUS TEST

When this switch is in the up position, the unit select line to the transport will be enabled and the status indicators will display the status returned from the drive.

When this switch is held in the down position, the 9 DRIVE STATUS indicators will be forced on as a self-test of the indicators. Also, the SKEW-SPEED display will indicate the speed in IPS that the tester write circuits are optioned.

In the center position, neither of the above 2 functions is performed.

3.14 OFF LINE-UNLOAD

In the up position the control switch on the transport is enabled and the tester control is disabled.

Momentary pressing down on this switch allows a tape unit with remote unload features to override the normal rewind from BOT and causes the transport to unload.

3.15 NORMAL-RAMP

With this switch in the up position, CYCLIC read only motion ignores recorded block gaps. RAMP action is forced at fixed intervals as selected by block length switch.

3.16 NORMAL-LOW READ

Selects a lower clipping margin for read electronics or a normal clipping level.

3.17 WRITE RESET-NORMAL

When this switch is in the up position and a normal write operation is attempted, the WARS line to the tape drive is held in the on state during write data strobes. The result is all write flip-flops in the tape drive should be inhibited in this mode. The error counter is active and will tally any RDS pulses received as an error.

This switch is ignored when in the PROGRAM mode.

NOTE

> A WARS pulse is automatically sent to the drive at the end of each record written when this switch is in the normal position.

3.18 WRITE-READ

When this switch is in the up position, the TX-1200 will instruct the transport to write. If the DUAL GAP/SINGLE GAP switch is in the DUAL GAP position, the TX-1200 will check for errors while writing. When the WRITE-READ switch is in the down position, the TX-1200 will condition the drive to read.

NOTE

> The WRITE RESET switch must be in the down position or "erasing only" will occur during a write operation.

3.19 NORMAL-6250-AMPEX

Differences in the function of the two synchronous motor control lines require that the switch be up when exercising an AMPEX transport (see "NOTE" below) and down when exercising a PERTEC or WANGCO transport. This switch also provides a necessary inversion of the FILE PROTECT and DENSITY indicators and alters the timing of the READ DATA STROBE (RDS) usage.

NOTE

> When in AMPEX mode, the skew display will not work until the data is changed to the unstrobed condition on the tape drive.
>
> Refer to the tape drive manual for correct jumper configuration.

In the center position (6250), the TX-1200 functions as in the down position, except that the clock rate is increased.

3.20 DUAL GAP/SINGLE GAP

This switch, when in the up position, inhibits error sensing when writing because single gap heads cannot read while writing. When in the up position, this switch shortens the program motion by eliminating duplicate read passes.

3.21 HIGH DENSITY/LOW DENSITY

In the up position, high density NRZI recording (800 BPI) is selected. Pertains to 7-track transports only. Disabled when the 9-track/7-track switch is in the 9-track position.

3.22 9-TRACK/7-TRACK

This switch should be up for 9-track transport and down for 7-track transport.

3.23 NRZI PE

Place this switch up for phase encoding and down for NRZI.

3.24 RANDOM-ANSI-TRACK DATA SWITCH

Selects the type of data to be written and/or compared for errors.

In the RANDOM position, random data with odd vertical parity is generated.

In the ANSI position, a 32-word pattern is generated (32 x 8 bits with odd parity).

In the TRACK position, the pattern selected by the 9 TRACK switches is generated. In this mode, the parity channel data is switch selectable as are the other 8 data channels.

3.25 TRACK SWITCHES

These 9 switches select the data pattern generated when the data select switch is in the TRACK position.

When activated, any of the 9 switches in the up position will generate a "1" and any switch in the down position will generate a "0" in its respective channel.

3.26 SPEED-SKEW

This switch selects the usage of the digital display. When in the up position, speed will be displayed.

3.27 DYNAMIC-STATIC

This switch is spring-loaded to hold itself in the DYNAMIC position. In this position, the skew displayed represents a sample of 8 consecutive cells. The sample is taken every half second. Dynamic skew is determined by subtracting the minimum readout from the maximum readout.

When the switch is depressed to the lower position and held, a sample of 1024 cells is taken and divided by 1024. The result calculated in this manner is displayed once and held in the display until the switch is released.

3.28 HALT-OVERRIDE

In the up position, the TX-1200 will halt if an error is detected. In the down position, errors are tallied in the error counter display but the TX-1200 will not halt as the result of an error.

3.29 RESET ERRORS

When momentarily depressed to the down position, this switch causes the error count display to be reset to zero.

This switch also resets the WRITE and FWD indicators.

4.00 INDICATORS

All indicators are LED type display. The SPEED-SKEW indicator is a 7-segment, 4-digit readout with an appropriate light filter for ease of viewing.

4.01 POWER

Indicates the +5V supply in the TX-1200 is functioning properly and no fuses are blown.

4.02 ILLEGAL COMMAND

This indicator will blink on and off alternately every half-second if an illegal operation (operator program) would result if the START-STOP switch were depressed. When this occurs, the START-STOP switch will be ignored.

Examples of illegal operations include:

a. Writing in reverse.

b. Writing on a FILE PROTECTED media.

c. Reverse operations at BOT.

d. Forward operations at EOT.

4.03 P - 7

These 9 indicators perform a dual function. In the NRZI mode, they indicate the data received on each respective channel. Illumination denotes a "1" received.

In the PE mode, they indicate which channel(s) experienced an edge error.

4.04 SKEW-SPEED

A dual function indicator used to display, in decimal fashion, skew (in microinches) or speed (in inches-per-second).

The operator selects which of these 2 parameters he wishes to observe with the SKEW-SPEED switch.

Up to 9999 microinches of skew or 250 IPS speed will be displayed.

The display is automatically "blanked" out if the TX-1200 controls are set up in such a manner as to preclude a reliable readout. An example of this would be an attempt to read SPEED without first mounting a skew alignment tape.

4.05 LEADING TRACK

These 9 indicators display the leading track, e.g., which read track was received first.

4.06 WRITE

If illuminated, indicates the TX-1200 was in the process of writing when the last error occurred. This indicator can be reset by depressing the RESET switch.

4.07 FWD

If illuminated, indicates the TX-1200 was performing a forward operation when the last error occurred. This indicator can be reset by momentarily depressing the RESET switch.

4.08 1, 2, 4, 8, 16

These 5 indicators provide a count of the number of errors that have occurred. All are reset when the RESET switch is depressed or when power is first applied to the TX-1200.

4.09 OVERFLOW

A functional extension of the above indicators that latches on if more than 31 errors have occurred.

4.10 LRCC

When illuminated, indicates an LRCC error occurred.

4.11 READY*

Displays the current status of the READY interface line.

4.12 ON LINE*

Displays the current status of the ON LINE interface line.

4.13 EOT*

Displays the internally latched status of the TX-1200 EOT interface line. The EOT latch (and indicator) will remain on until a reverse operation is performed or a BOT is encountered. The indicator will thus report any EOT "glitches" that may occur on the drive interface line.

*These signals are returned from the drive only if the UNIT SELECT switch is in the up position. These indicators may be tested by holding the STATUS TEST switches to the down position.

4.14 REWINDING*

Displays the current status of the REWIND interface line.

4.15 DENSITY*

Displays the current status of the DENSITY interface line as interpreted by the TX-1200. Basically, if the AMPEX-6250-NORMAL switch is not in the AMPEX position, the indicator will be illuminated when the DENSITY line is at a low (ground) level.

4.16 NRZI*

Displays the current status of the NRZI interface line. If not illuminated, the drive is functioning in the PE mode. Used on dual density drives only.

4.17 SPEED*

Displays the current status of the SPEED interface line. Used on dual density drives only.

*These signals are returned from the drive only if the UNIT SELECT switch is in the up position. These indicators may be tested by holding the STATUS TEST switches to the down position.

4.18 FILE PROTECT*

Displays the current status of the FILE PROTECT interface line.

4.19 RDS*

When illuminated, indicates NRZI READ DATA STROBES are occurring, or in the PE mode, READ DATA is occurring. The indicator drive is latched for sufficient duration to permit some illumination of the indicator on short as well as long block lengths.

5.00 TEST POINTS

18 test points are provided on the front panel and are suitable for an oscilloscope probe. Unless stated otherwise, a true level is to be interpreted to mean a voltage level of +3.5V to +5V.

5.01 MOTION

This signal, when true, denotes the time the SFC (FORWARD DIRECTION) or SRC (REVERSE DIRECTION) level to the drive is active.

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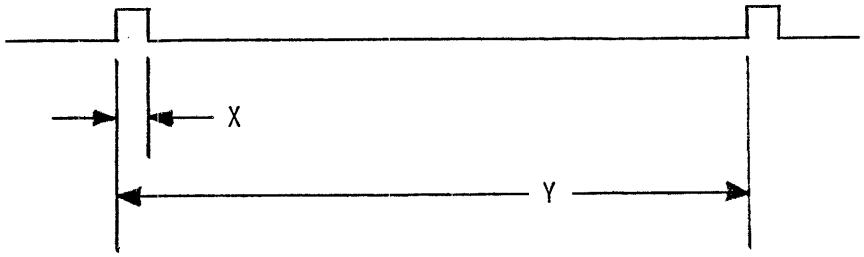
*These signals are returned from the drive only if the UNIT SELECT switch is in the up position. These indicators may be tested by holding the STATUS TEST switches to the down position.

5.02 CLOCK

The basic clock period used to clock data to the drive during a write operation.



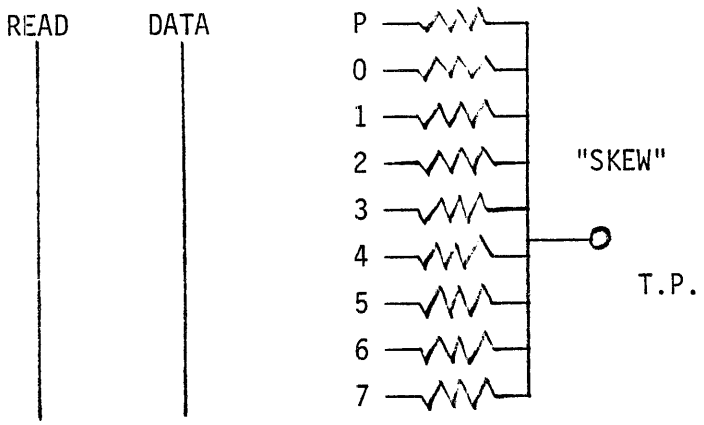
Where X is a user selectable value, usually set at the factory to 2 microseconds in duration.

$$Y = \frac{1}{\text{DENSITY} \cdot \text{SPEED} \cdot K}$$

K = recording mode

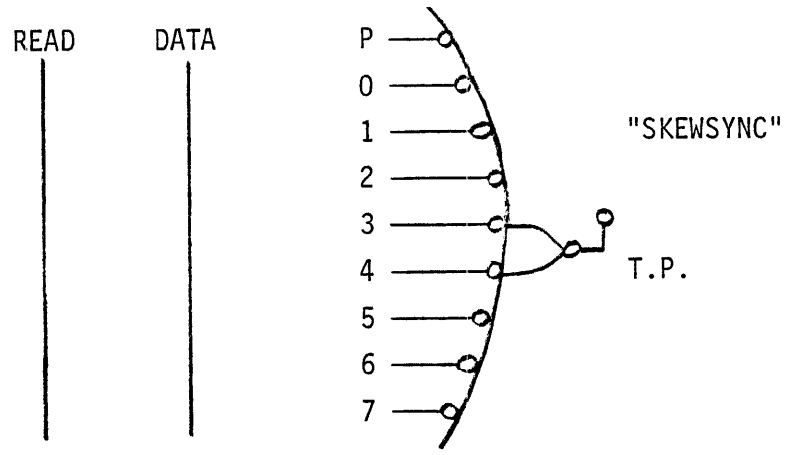
5.03 STAIRCASE

A composite analog signal useful in checking the skew of a drive. It is generated by summing the 9 READ DATA CHANNELS as depicted below.



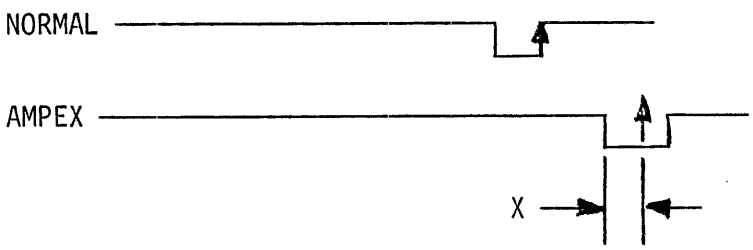
5.04 SKEW SYNC

The result produced when all 9 READ DATA CHANNELS are "OR'd" together as depicted below.



5.05 RDS

The interface READ DATA STROBE. True when at OV level.



Where ↑ is the time the READ DATA LINES are sampled. X = 500 nanoseconds.

Not used in the PE mode.

5.06 READ BLOCK

A sync signal useful in scoping read data problems. This signal is set true upon the occurrence of the first data encountered after the transport ramp-up period has expired. It is reset upon the detection of a data gap.

5.07 ERROR PULSE

A signal that occurs concurrent with the occurrence of an NRZI data miscompare or PE missing edge detection condition.

(Missing edge or greater than 1.25 cells of dispersion.)

The signal is updated each cell time.

5.08 INHIBIT LRCC

A test point provided to enable the user to inhibit the detection of LRCC errors. This might be desirable if the user wanted to count all errors except LRCC errors.

To implement this feature, the operator must tie this point to ground (the adjacent test point).

5.09 GND

DC ground.

5.10 READ DATA P-7

The 9 $\overline{\text{READ DATA}}$ channels interface lines received from the drive.

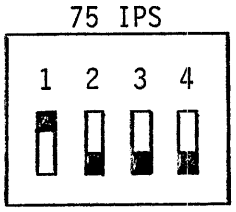
6.00 OPTIONS

6.01 SPEEDS

The user can select any one of 3 additional speeds. These speeds are implemented by:

a. Positioning the SPEED select to 75 SPL.

b. Removing the cover from the tester and positioning the TOGGLE DIP switches located near the center of the board, to the desired position:



User Selects

Dip Switch

1. Only 1 switch in the UP position at one time.

2. When #4 is up, 75 IPS is selected.

3. When 2, 3, or 4 is up, any of 3 preprogrammed (in a PROGRAMMABLE READ-ONLY MEMORY, PROM) speeds is implemented.

The preprogrammed speeds are normally chosen at the time of order. However, the PROM may easily be changed in the field.

To determine what speeds are in the PROM, the user can monitor the IPS displayed in the SKEW-SPEED INDICATOR when SPEED is selected and the STATUS TEST SWITCH is held.

In addition to these special speeds, the user may, if he chooses not to use the 6250 feature to check 6250 type drives, use the 6250 switch to implement an additional 9 custom speeds. This is possible because when 6250 is selected, this becomes merely another address line into the speed select PROM. Hence, when this line is altered, the SPEED SELECT switch is in effect selecting from a new "PROM MAP". The user can select 6 special speeds in this manner without opening the TX-1200 and an additional 3 speeds by opening the TX-1200 and changing the 4-position DIP switch.

6.02 POWER

The TX-1200 will accept a wide range of AC input power. See the maintenance manual for voltage selection.

7.00 INTERFACE

The TX-1200 connects to the transport with 3 cables.

8.00 GENERAL

a. With power off to both tester and tape transport, connect the interface cables to the transport to be serviced.

b. Turn power on. The power-on lamp should light.

c. Set the following controls and switches for the type of transport to be tested:

1. Speed
2. Ampex/6250/Normal
3. 9-Track/7-Track
4. Single Gap/Dual Gap
5. PE/NRZI

8.01 READY TEST

a. Load a tape on the tape unit and bring to load point and on line.

b. Turn unit select switch on. The ready, on line, and BOT lights should now be on.

8.02 WRITE CONTINUOUS

a. Perform steps 8.00 and 8.01.

b. File protect indicator must be off. If not, check transport to see if the file protect ring is on.

c. Turn on write enable switch.

d. Set motion control to FWD.

e. Select data pattern. On track switches, switch up writes a one.

f. Set error control switch up if stop on error is required.

g. Start/stop switch is pressed to start writing, pressed again to stop writing.

NOTE

When in PE MODE, the speed switch must be selected to write or read valid data.

8.03 WRITE RESET (NRZI ONLY)

a. Perform steps 8.00, 8.01, and 8.02.

b. Turn on write reset switch.

c. Set random/data switch to track switches.

d. Set all track switches up.

e. Press start/stop switch; if any of the write reset circuits is not working, the error counter will count up (if error override is on). If errors are present, start turning off each track switch one at a time, until the

error counter stops counting. The faulty circuit has now been isolated.

NOTE

> The read strobe and data indicators will turn on only if a track is failing the write reset test.

8.04 READ

a. Perform steps 8.00 and 8.01.

b. Write enable switch off.

c. If the track switches were used to generate the data, they must remain in the same order for correct comparison. In random mode or ANSI, the track switches have no effect.

8.05 RAMP READ

a. Perform steps 8.00 and 8.01.

b. Write enable switch off.

c. Set ramp read switch up.

d. Press start. You can now read tapes that have no gaps in a start/stop mode.

8.06 READ RANDOM/OR ANSI

a. Perform steps 8.00 and 8.01.

b. Write enable switch off.

c. Random data or ANSI switch up.

d. Press start. Data will be read and checked for vertical parity and LRCC.

NOTE

> Pressing the START-STOP button wile reading block data may cause an LRCC error. This is legal because you may have stopped in the middle of a block of data. Press ERROR RESET to clear this condition.

8.07 SERVO TEST

a. Perform steps 8.00 and 8.01.

b. Select the motion desired except REV or REV/REV at BOT.

c. Select your block length.

d. Check the manufacturer's tape manual for servo adjustments.

8.08 OVERALL EXERCISE

An overall exercise test of a tape drive can be performed by running the program mode for 30 minutes, while observing the error counter. There should be no errors, provided a quality tape is used.

9.00 SKEW/SPEED READOUT TEST

9.01 GENERAL

The 4-digit 7-segment readout is used to display SKEW or SPEED as selected by the SKEW-SPEED switch. If certain commands are attempted which would invalidate the READOUT, the READOUT is automatically "blanked" out by the tester.

Legal conditions for displaying SKEW are:

a. Continuous forward motion (FWD) or continuous reverse motion (REV).

b. TRACK SWITCH DATA is selected. This enables the operator to select the channel(s) he wishes to monitor the skew on.

Legal conditions for displaying SPEED are:

a. The operator must have an IBM skew tape installed on the drive (with the WRITE-PROTECT ring removed).

b. The operator must not attempt a WRITE operation.

c. The operator must select the continuous FWD or REV motion mode.

PE skew is displayed only while writing in the continuous FWD motion mode. The TX-1200 will automatically insert a special missing

cell once each second when this mode is selected. This special cell is used by the skew circuits to calculate:

a. How many cells are the selected data channels skewed?

b. What fraction of a cell is the selected data channels skewed?

c. a and b (above) are summed digitally and displayed.

On 1600 PE, up to 2500 microinches of skew can usually be tolerated by most FORMATTERS before an error will be detected.

NOTE

> To display data track errors in PE with the track switches, the speed switch must be selected.

9.02 STATIC SWITCH

The STATIC SWITCH is spring-loaded to return itself out of the STATIC position (into the DYNAMIC position) when released.

In the DYNAMIC mode, the skew display may vary substantially because, in the short run, tape skew is not constant. In this mode, the skew meter displays the actual microinches of skew taken at a random single cell sample. To calculate dynamic skew range, the user records the high and low reading obtained over a 30-second period.

To obtain a longer range average, i.e., STATIC READING, the user must hold the STATIC switch in the depressed position. This will cause the TX-1200 to take 1000 samplings and divide the result by 1000. This produces an average reading with minimal readout dispersion. The result will be held in the display until the switch is released.

9.03 TYPICAL USE

a. NRZI-CHECK READ SKEW

1. Mount an IBM skew tape on the drive and place the drive ON-LINE.

2. Set up TX-1200:

   (a) Drive configuration: As required

   (b) Motion: FWD

   (c) Write/Read: Read

   (d) Unit Sel: Up

3. With all the TRACK SWITCHES in the up position, depress the START-STOP switch. Tape motion should commence.

4. Note the leading track by observing the 9 LEADING TRACK TEDs located to the right of the STATIC switch.

5. Return all the track switches, except the one representing the leading track, to the down position.

6. Place the above 8 data channel switches to the up position, one at a time, and record the SKEW reading for each channel (hold down the STATIC switch each time if a STATIC reading is required). The user now has a profile of the microinches of displacement between the leading track and all other tracks.

7. To check reverse skew, the same procedure is repeated except in the REV motion mode.

b. NRZI-WRITE SKEW ADJUST

1. Plot the read profile as detailed in the above steps.

2. Install a scratch-tape and write in the FWD mode.

3. Adjust the write deskew on each channel as required by the READ SKEW profile. Refer to the manufacturer's tape manual.

9.04 OUTSIDE TRACK SKEW

Write or read in the continuous mode with TRACK SWITCHES 4 and 5 in the UP position for 9-track and P+7 for 7-track.

9.05 SPEED CHECK

a. Mount an IBM SKEW TAPE.

b. READ forward or reverse continuous.

c. Speed is displayed in INCHES PER SECOND ±1%.

9.06 LRCC ERROR

The LRCC error check is only performed on NRZI drives.

The 5 ERROR count indicators (and the overflow indicator) tally the data miscompares as follows:

a. In the TRACK SWITCH data mode, each data character received is compared to the track switches. Each miscompare counts as 1 error.

b. In the ASCII or RANDOM data modes, vertical parity is checked. Each miscompare is counted as 1 error.

c. On NRZI drives, the LRCC is also checked. If an LRCC error occurs in a block, the LRC LED will illuminate. If an error is reported in a block of data before the LRCC character is received and checked, the LRCC error will also be tallied, thus producing an extra error count. Note that LRCC errors may be inhibited. Refer to INHIBIT LRCC.

9.07 PE SKEW CHECK

In order to check PE Write Skew, set the controls as follows:

a. Normal
b. Dual Gap
c. High Density
d. 9 Track
e. PE Mode
f. Skew Microinches
g. Unite select
h. Write
i. Speed
j. Motion (fwd)
k. Track switches

With all track switches in the up position, depress the start/stop switch, tape motion should commence.

Note the leading edges by observing the 9 leading track leds located to the right of the static switch.

Return all the track switches, except the one representing the leading track to the down position.

Place the above 8 data channel switches to the up position, one at a time and note the skew reading for each channel (hold down the static switch each time if a static reading is required). The user now has a profile of the microinches of displacement between the leading track and all other tracks.

The main reason for looking at PE Skew is to check two things: one is the total skew which should have a steady reading indication that there is no marginal channels; the second is to check the outside tracks in forward and reverse to insure minimum tape wear.

NOTE

> The error counter is inhibited while checking PE Skew. The reason is that to reset all channels during a Write skew check, we force all tracks to Zero, which produces an invalid character which is written on the tape.