Operator's Manual

OPERATOR'S MANUAL FOR MODEL 101 MAGNETIC TAPE RECORDER/REPRODUCER PORTABLE SYSTEM

AUGUST 1984

(SERIAL NUMBERS 5001784XH83 AND FOLLOWING)

NOTICE

This technical manual is prepared in accordance with standards of good commercial practice. It is not intended in whole or in part to satisfy specific requirements of military or government specifications. Preparation of contents to such specifications will be quoted on request.

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ADDENDUM TO
TECHNICAL MANUAL 16783818-002AE
MODEL 101 OPERATOR'S

This addendum provides coverage for the 16784205-007 Data Housing Driver Circuit Card Assembly.

Page 5-5.

Jumper J5 has been added to the right of C21. This jumper is set as follows.

J5: SELECTS IRIG STANDARD
FOR REPRODUCING SERVO
REFERENCE SIGNAL
C TO X/2, X - IRIG STANDARD OR ONE-
HALF IRIG STANDARD
C TO 2X - TWICE IRIG STANDARD

HONEYWELL, INC.-Test Instruments Division-P.O. Box 5227 - Denver, CO
16783818-002AF-December, 1984

ADDENDUM TO

TECHNICAL MANUAL 16783818-002AD

MODEL 101 OPERATOR'S

The addendum clarifies the use of J5 on the Dual Reel Servo CCA.

Page 5-8 Figure 5-13, change J5 nomenclature as follows:

J5: C to 1 - NORMAL
C TO 2 - 10-1/2 IN. REELS

HONEYWELL, INC.-Test Instruments Division-P.O. Box 5227-Denver, CO 80217
16783818-002AE-November, 1984

ADDENDUM TO

TECHNICAL MANUAL 16783818-002AD

MODEL 101 OPERATOR'S

Page A-7, Paragraph F.

Change SE and SI commands as follows:

SI - Selects EXT CAL (Must be in CAL or PREAMBLE mode).

SE - Selects INT CAL (Must be in CAL or PREAMBLE mode).

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16783818-002AD.1-December, 1984

SECTION 1
Description

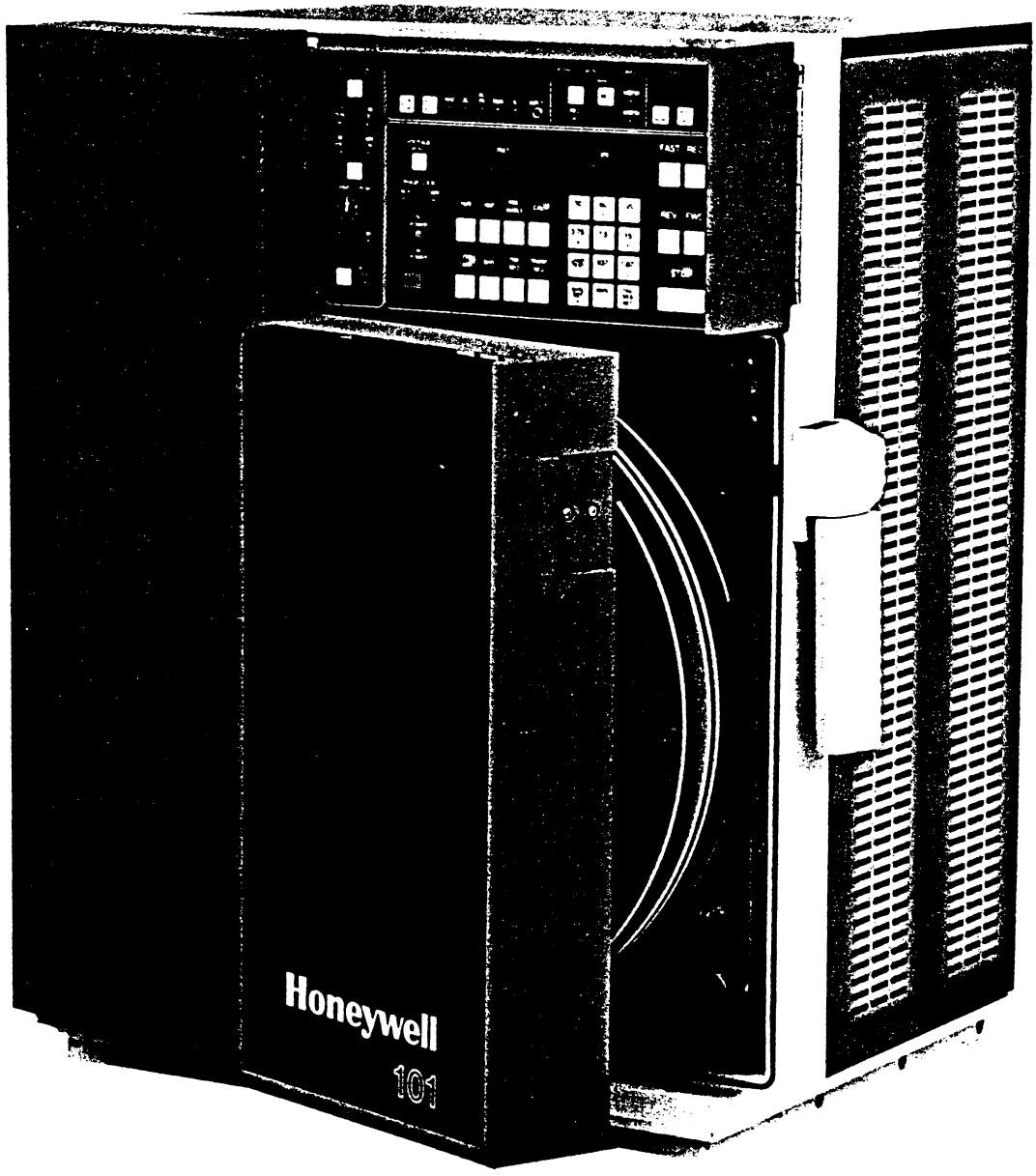


FIGURE 1-1. MODEL 101 PORTABLE TAPE RECORDER/REPRODUCER

SECTION 1
Description

What This Section Contains

This section describes the Honeywell Model 101 Portable Magnetic Tape Recorder/Reproducer System from the operator's point-of-view.

It contains both a functional and physical description of the overall system. The illustrations locate the various parts of the system.

The system specifications and a list of related manuals are included at the back of the manual.

System Description

The Model 101 (Figure 1-1) is a high-performance IRIG portable magnetic tape recorder/reproducer with microcomputer control. It can be setup, calibrated and operated under field conditions without any external test equipment.

The Model 101 has a coaxial reel system that transfers the tape between reel planes without distorting the tape path. There are no pinch rollers or mechanical adjustments in the tape path.

Two basic configurations are available. One has mediumband heads (Direct-600 kHz System; FM-IRIG Intermediate Band and FM-IRIG Wideband Group 1). The other has wideband heads (Direct-2 MHz System; FM-IRIG Wideband Group II). (See specifications at the back of this manual.)

Two data electronics housings are available. One has the capacity of 16 record amplifiers and 16 reproduce amplifiers. The other houses 32 record amplifiers and two reproduce amplifiers for monitoring. An auxiliary housing that adds up to 32 reproduce channels is available as an option.

Data electronics are designed for record/reproduce operations at eight speeds without changing plug-ins. A full selection of FM and direct amplifiers is available for mediumband and wideband applications. Electronic flutter compensation is standard as is the capability to servo the capstan either from its own tachometer or from a recorded reference signal.

Tape width can be converted from 1/2 to 1 inch by changing rollers and heads. Half-inch heads are available in the 7-track IRIG configurations. One-inch heads are available with either 14 or 28-track IRIG configuration.

The microcomputer control system automates and supervises a number of operating and checkout functions according to preprogrammed instructions and commands from the control panel.

Functional Description

Figure 1-2 shows the basic transport system and Figure 1-3 is a basic block diagram of the overall system. The discussion that follows gives an overall functional description of the system from the operator's viewpoint.

Tape is pulled past the heads at a constant speed by a servo-controlled, dc motor-driven capstan. The dc motor provides fast acceleration at any of the eight selected speeds. (See Figure 1-2.)

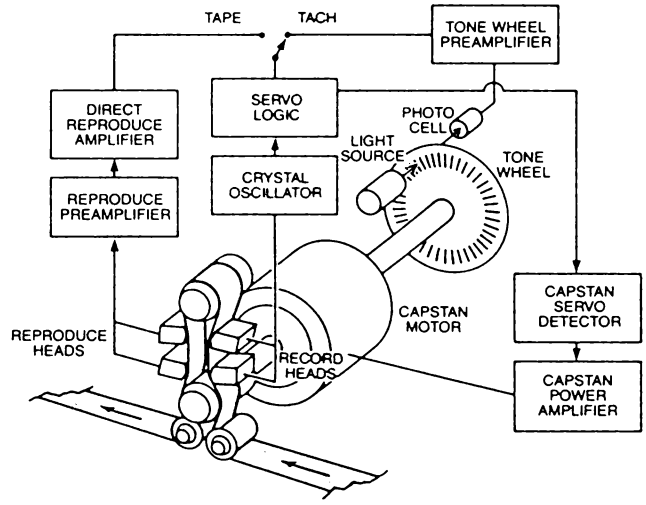


FIGURE 1-2. CAPSTAN SERVO

Precise operation is achieved by phase-locking a crystal oscillator with either a signal that is proportional to the rotational rate of the capstan or a reference signal recorded on tape. These two methods are identified on the control panel by TACH and TAPE indicators.

In the tach mode, a photocell/tone wheel tachometer, mounted on the capstan motor shaft, generates a frequency proportional to the speed of the capstan. The phase angle of this signal is compared with the crystal signal to obtain a speed correction signal.

In the tape mode, a signal locked to the crystal oscillator frequency is recorded on the tape for phase comparison during reproduce operations. Since this servo reference is recorded simultaneously with the data, both are affected identically by speed fluctuations. Thus enabling the system to track recorded flutter during reproduce operations, virtually eliminating errors in the data caused by uncorrected low-frequency flutter. If the servo reference signal is lost, the tachometer signal automatically resumes control of the capstan.

The reeling system maintains tape tension by controlling speed of the takeup and supply reels. A tension arm for each

reel detects tension variations and causes a speed correction signal to be sent to the respective reel motor.

A load signal is sent to each reel to establish proper tension before capstan motion can begin.

Control System

The microcomputer control system (see Figure 1-3) is involved in nearly every aspect of operating and calibrating the Model 101. It consists of a microprocessor (MPU), random access memory (RAM) and input/output devices, peripheral interface adapters (PIA's).

The operator-programmable instructions are stored in the RAM's.

The MPU continuously examines the contents of the memory and control panel status, and thereby controls the actions required.

The MPU monitors the configuration of data cards, transport control, and many operating parameters such as tape footage and speed. It provides for keyboard programmable shuttle points and programmable sequential track recording. These programs may be entered and displayed at any time without affecting transport operation.

In the calibration mode, the MPU combines the calibrator, channel selector, and meter monitor to automatically carry out many operations to simplify setup and calibration of the data channels.

In the auto test mode, the MPU completely automates a self-test of the system on a channel-by-channel basis. This provides a last-minute verification of calibration before starting actual data recording.

The primary controls for the system are pushbuttons located on the front panel. Back-lighted indicators and LED's show the control status. The measurement system and calibrator controls are also on the front panel. The control panel is hinged and swings out for viewing when adjusting the circuit cards in the data housing. All controls and indicators are explained in detail in Section 2 of this manual.

Data Electronics Housing

The data amplifier cards are accessible in the data housing on the right side of the Model 101. All operator adjustments are made at the edge without the need for card extenders. The card extractors are color-coded to identify each type of card so they can be matched with system, heads and channels as follows:

RED	— Mediumband FM (MBFM)
YELLOW	— Mediumband Direct
GREEN	— Wideband FM (WBFM)
BLUE	— Wideband Direct

A toggle switch on each record amplifier lets you turn it on or off for selective recording. Bias output to the record head is indicated by a LED at the edge of the card. During calibration, these LED's direct your attention to the active channel.

Jumpers on the record cards let you select either 75 ohms or 20 K ohms input impedance.

Direct System: The direct record amplifier presents a constant impedance to the data input and conditions the signal for the record heads.

Each direct reproduce amplifier contains eight speed-selected amplitude and phase equalizers. Mediumband and wideband versions are available. All equalizers are permanently installed so conversion from mediumband to wideband is *not* possible.

FM System: The FM record amplifier conditions the input data signal for IRIG ±40% or ±30% single-carrier FM recording.

Jumpers on the card set the FM center frequency. Jumpers are also used to offset the FM carrier frequency, permitting two times full-scale unipolar recording and doubling the dynamic range of the channel.

Mediumband cards (with red extractors) can be converted to either IRIG intermediate band or IRIG wideband I. Wideband cards (with green extractors) can be converted to Intermediate band, wideband I or wideband II.

FM carriers are generated by a single voltage control oscillator (VCO) and are binarily divided under the control of the tape speed switches so that a calibration at any one tape speed is valid for all tape speeds.

The FM reproduce amplifiers accept up to eight plugin filters to accommodate any IRIG mode at all eight tape speeds. Each filter may be individually selected to operate as either a linear-phase or flat-amplitude device by changing a jumper on the filter. The plugins are integrating low-pass filters only and may be installed in any position compatible with FM carrier/band-width relationships. The FM reproduce amplifiers have flutter elimination circuitry and the output is squelched except when the transport is in phase lock and a recorded signal is present.

Calibration/Measurement System

The calibration measurement system consists of a channel selector, meter monitor, calibrator, and overbias monitor.

Channel Selector: The channel selector lets you select any channel for test and measurement. You can increment it manually or place it in an auto-scan mode. It can access any record or reproduce amplifier and indicates its type either direct, MBFM, or WBFM. When recording, indicators flash to indicate a mismatch if record or reproduce amplifiers in a particular channel are not of the same type. The channel number and amplifier type displayed on the channel selector determine calibration signal selection and routing by the microcomputer.

Meter Monitor: The meter monitor is a multipurpose digital voltmeter, frequency counter, and distortion analyzer. As selected by the operator or microcomputer, it displays various data electronic system signals. It measures DC VOLTS, AC peak, or RMS VOLTS and serves as frequency counter. As a distortion analyzer, the meter displays the percent of the third harmonic distortion of 30 or 100 kHz signals.

As a monitor meter, it displays normalized record inputs and reproduce outputs.

The meter can be used for external signals inserted at the telephone jack marked INPUT on the control panel. To use for external measurement, the switch inside the control panel (S7) must be set to EXT.

Calibrator: The calibrator consists of a variable-amplitude frequency synthesizer and a bipolar DC voltage source. These calibrator outputs are used as stimulus for calibrating the data channels. It also has a dial potentiometer for gain calibration. The controls and indicators are on the left side of the control panel. A pushbutton-switch lets you select the stimulus with microcomputer control for the data channel selected during calibration. In auto-test mode, the microcomputer automatically selects the channels and applies the stimulus.

Overbias Monitor: The overbias monitor is an analog meter that lets you set bias current by giving a relative indication of reproduce signal amplitude.

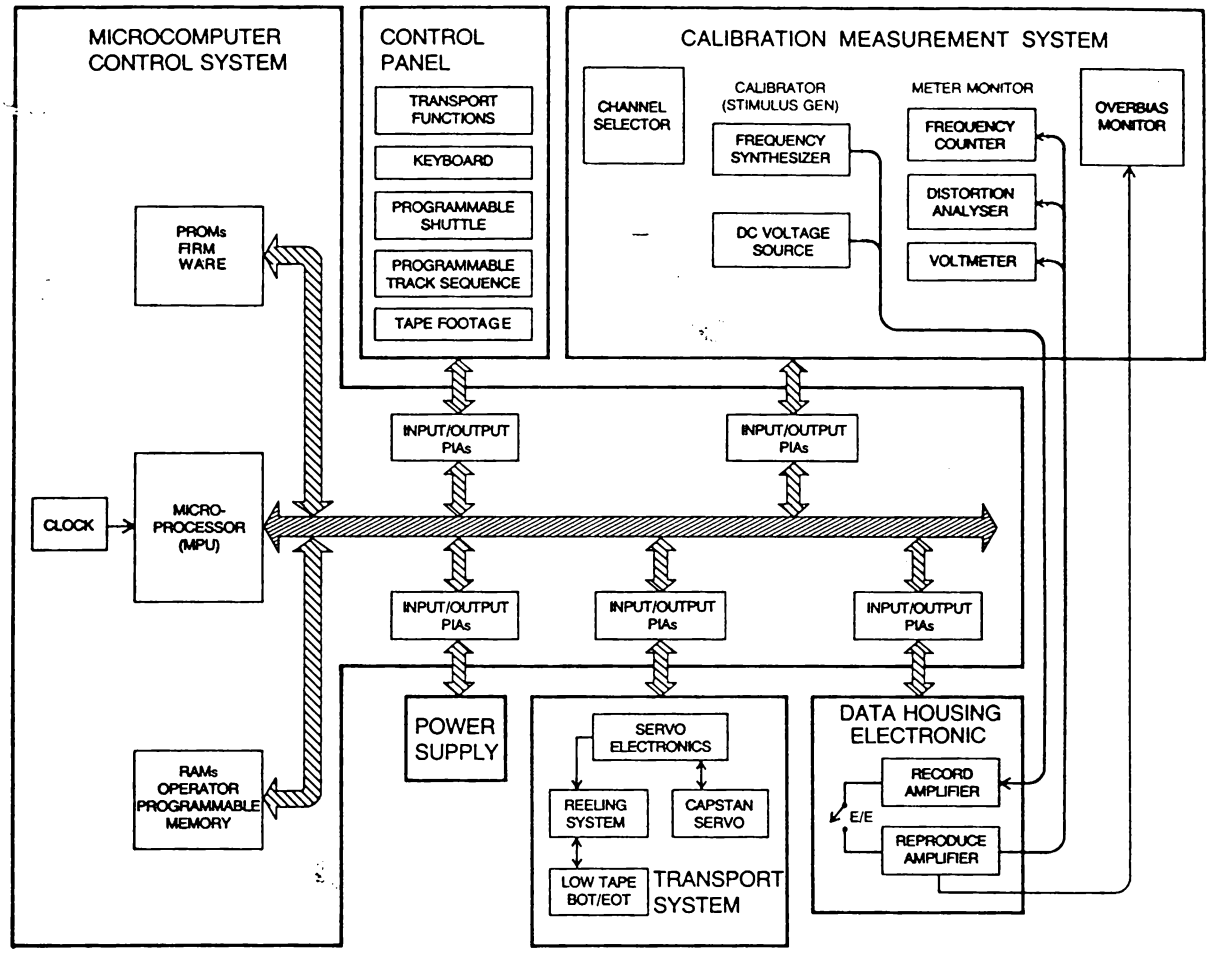


FIGURE 1-3. MODEL 101 SYSTEM BLOCK DIAGRAM

Figures 1-4 through 1-14 locate and identify the basic parts of the Model 101 that you will need to know to operate it.

Transport Front

Figure 1-4 shows the front of the Model 101 and identifies major parts that are referenced in the manual.

Control Panel

The primary controls of the system are pushbuttons mounted on the front panel. Back lighted indicators and LED's show the control status in effect.

The control panel front is hinged to the transport housing and swings out for easy viewing while adjusting data channels.

The control panel front is separated into four major areas as shown in figure 1-5: main panel, channel selector, meter monitor and calibrator. The main control panel is also separated into three functional control areas. The function of each control and indicator is explained in Section 2.

Inside the control panel are circuit cards as follows: display driver, channel selector/meter monitor display, channel selector/meter monitor, calibrator display and calibrator.

Heads

The record/reproduce head cover is hinged and swings out for easy access.

Figure 1-6 shows the head assemblies. The preamplifiers are mounted on the reproduce head assembly, and the record interface card is mounted on the record head.

Standard IRIG head configurations are shown in Figure 1-7. Mediumband and wideband heads are both of solid-ferrite construction.

The heads are prealigned and can be easily removed. Reproduce head azimuth is adjustable.

Mediumband heads use 4 MHz bias and can only be used with mediumband data cards.

Wideband heads use 8 MHz bias and can only be used with wideband data cards.

Data Housing

The Model 101 comes with either of two different data housings.

The 16-channel housing (Figure 1-8) holds up to 16 record amplifiers and 16 reproduce amplifiers. Through preamplifier switching, reproduce channels 15 and 16 may be used for monitoring.

The housing has four compartments for plugin data cards. The top two compartments house record cards. The two bottom compartments house reproduce cards.

The 32-channel housing (Figure 1-9) holds up to 32 record amplifier cards and two reproduce amplifier cards for monitoring. It also has space for a data card which may be used for specified options or storage.

The overbias monitor is located at the top left side of the housing. Control system circuit cards are on the left side of the housing. The remote card, an optional accessory, is mounted on top of the control logic card. The data housing driver card is also mounted on the control logic card.

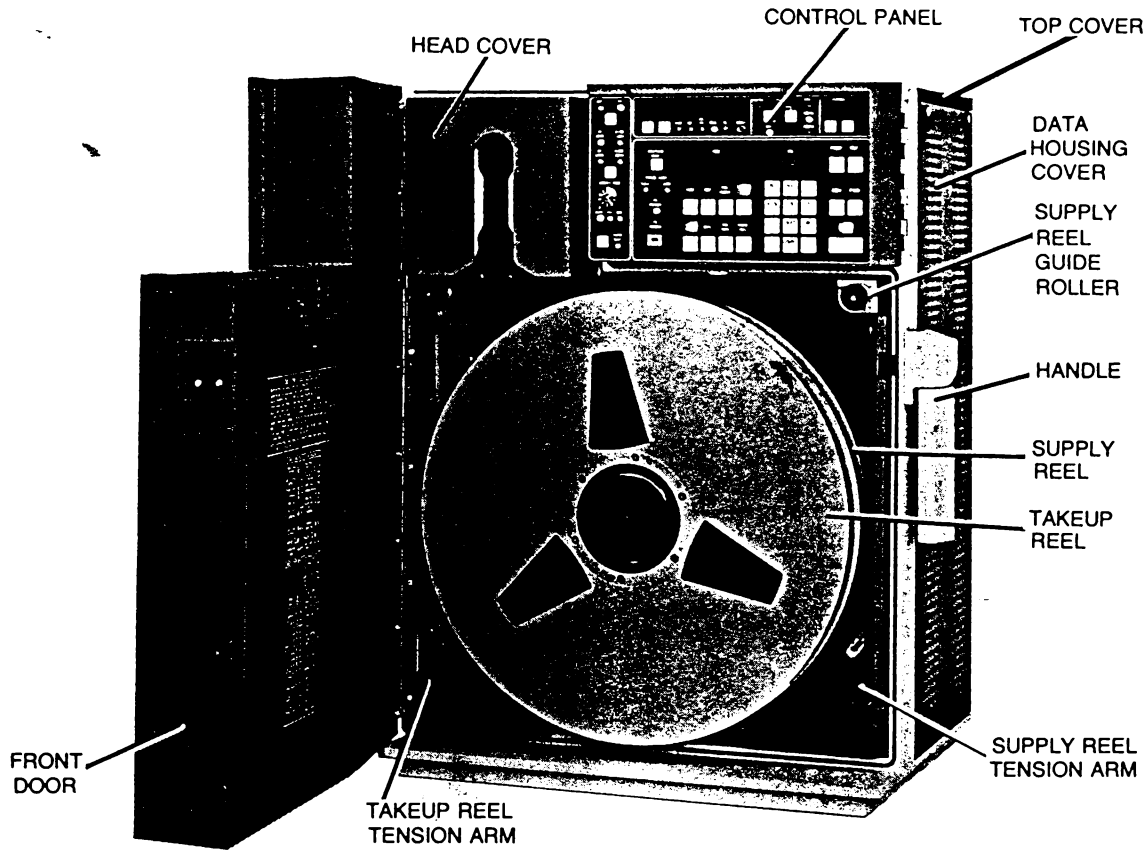


FIGURE 1-4. TRANSPORT

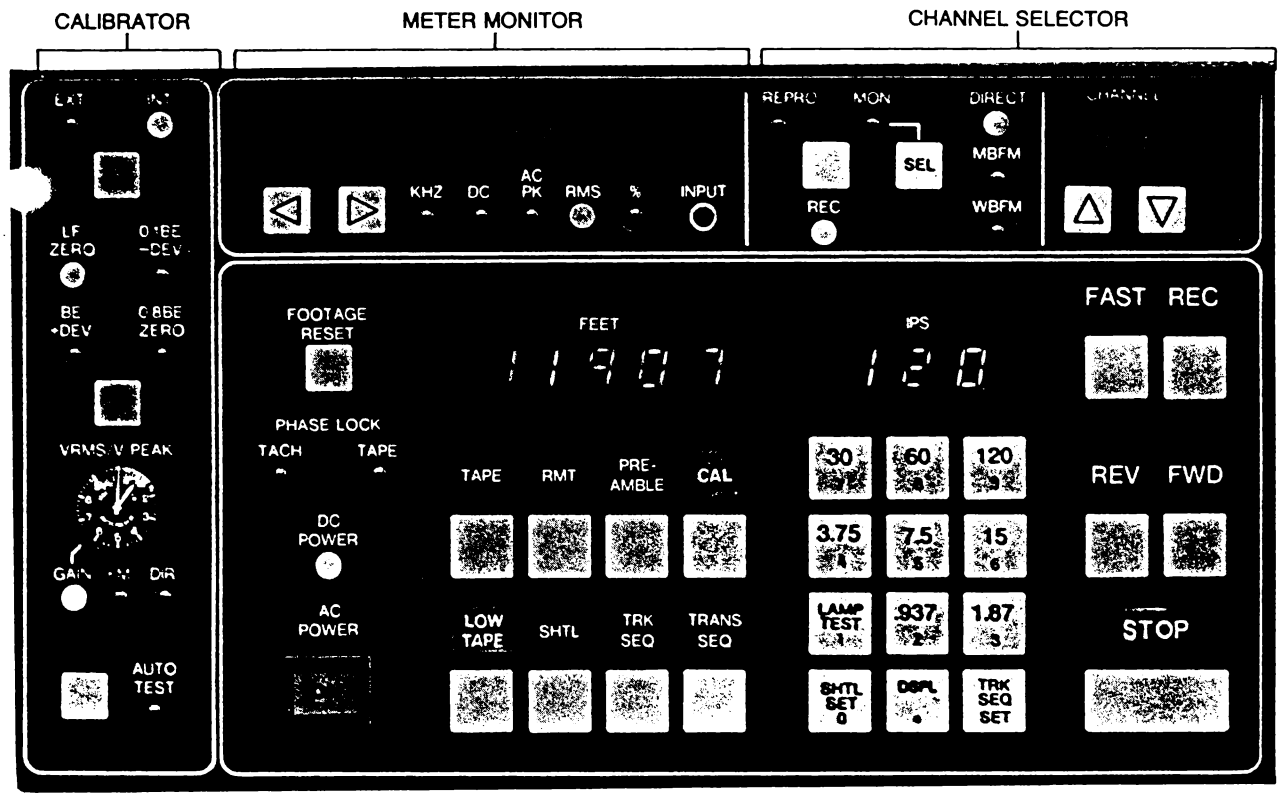


FIGURE 1-5. CONTROL PANEL

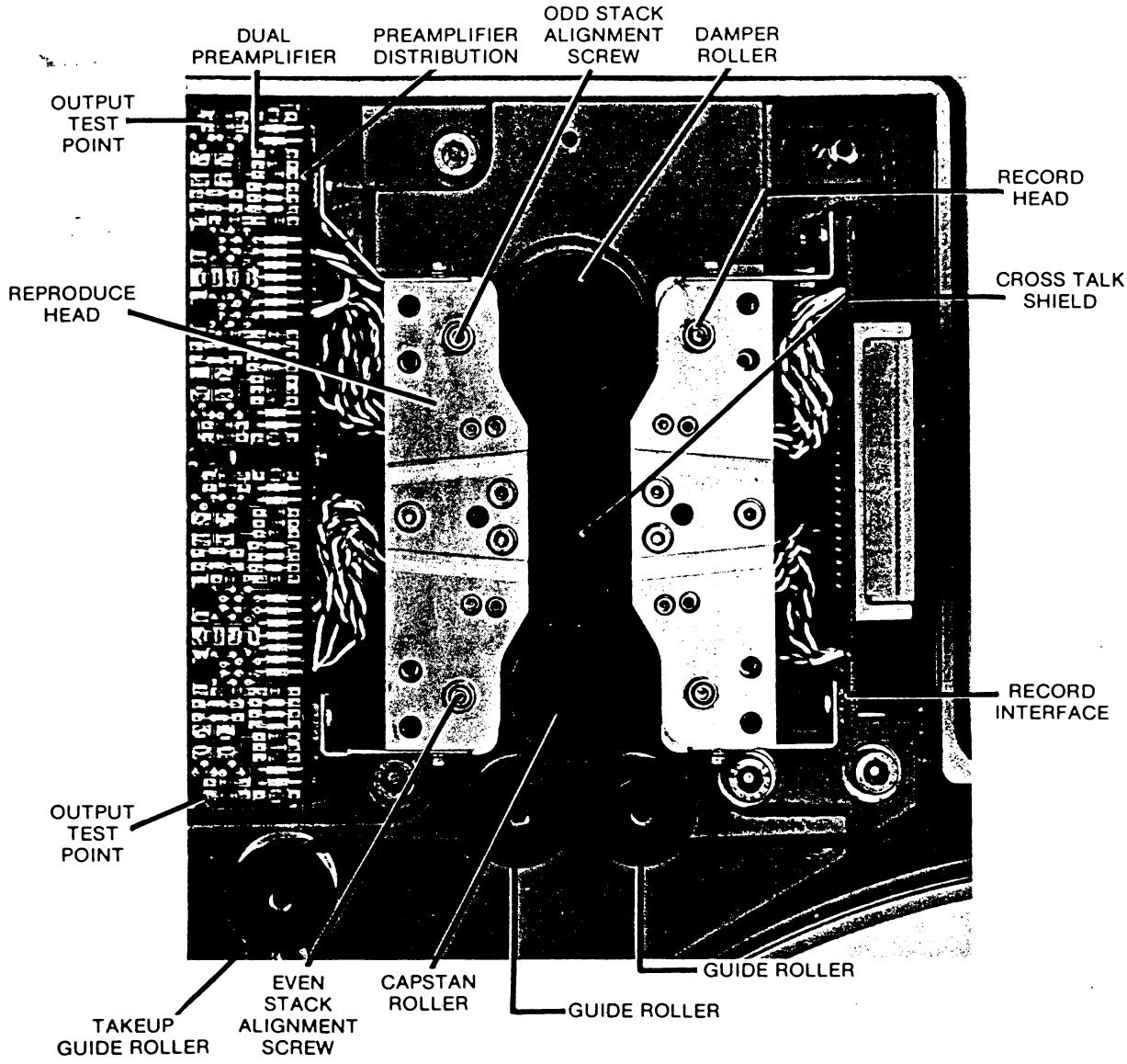
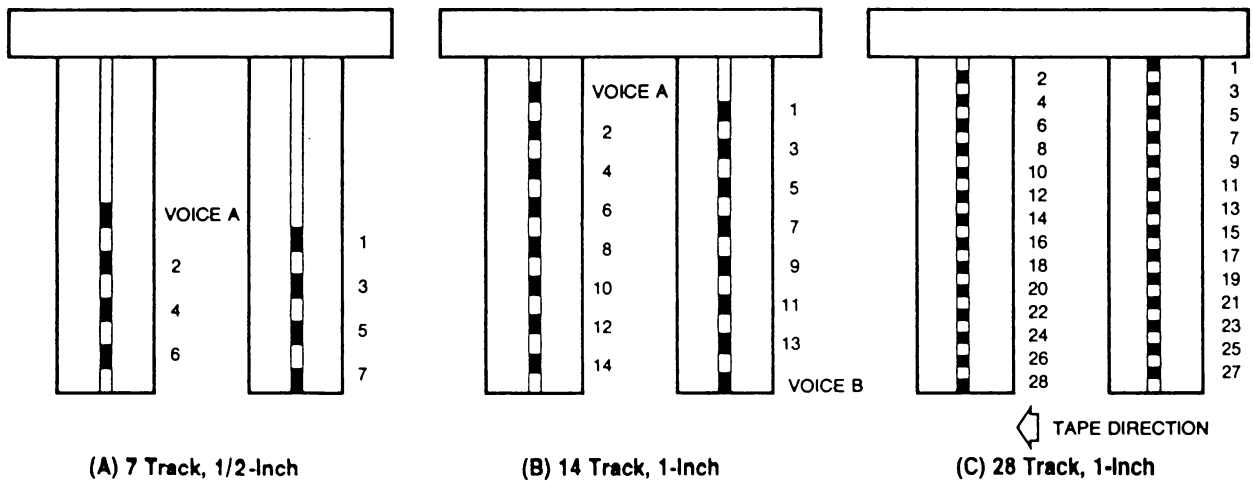


FIGURE 1-6. RECORD/REPRODUCE HEADS



(A) 7 Track, 1/2-Inch **(B) 14 Track, 1-Inch** **(C) 28 Track, 1-Inch**

FIGURE 1-7. TYPICAL IRIG RECORD/REPRODUCE HEAD CONFIGURATIONS

Transport Rear

Figure 1-10 shows the rear of the transport. Notice the name plate at the top. The nameplate lists Part Number, Serial Number, and Honeywell Sales Order Number. These numbers identify the particular unit. Use them when requesting service from Honeywell. You will need all three for proper identification.

Side Opposite Data Housing

Mounted on this side of the unit (Figure 1-11) are the capstan and reel servo circuit cards and the power supply unit. The power supply is a plug in unit that slides out of the housing.

Top of Housing

Figure 1-12 shows the preamplifier switching unit card and the voltage regulator distribution card. The battery for the operating mode memory is located on the voltage regulator distribution card.

Input/Output Panels

Figure 1-13 and 1-14 show the input/output panels for the two data housings. Inputs and outputs are connected to the appropriate data channel through BNC connectors. The input/output panel is part of the data housing circuit board assembly.

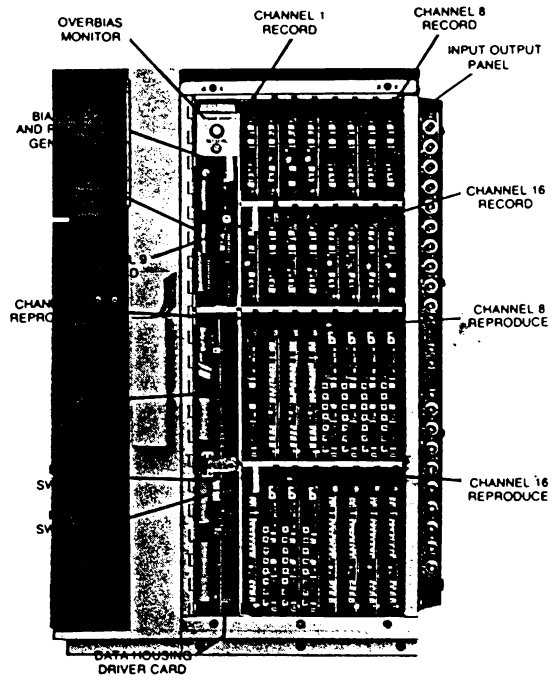


FIGURE 1-8. 16 CHANNEL DATA HOUSING

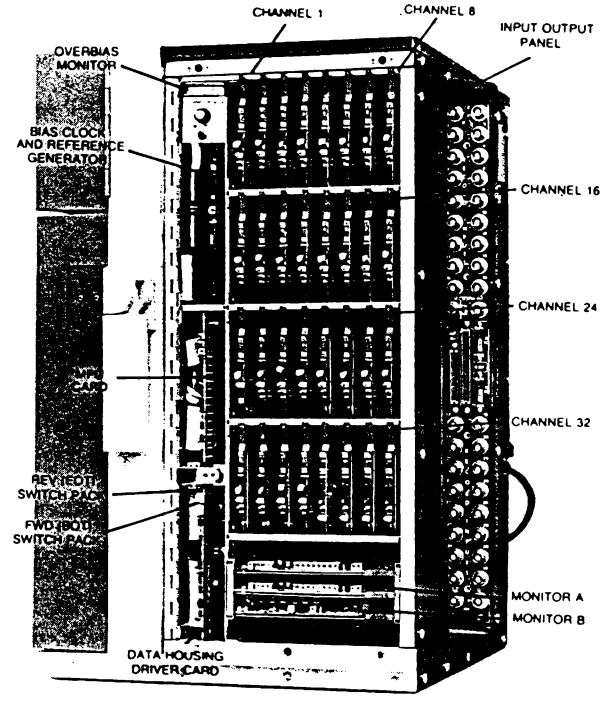


FIGURE 1-9. 32 CHANNEL DATA HOUSING

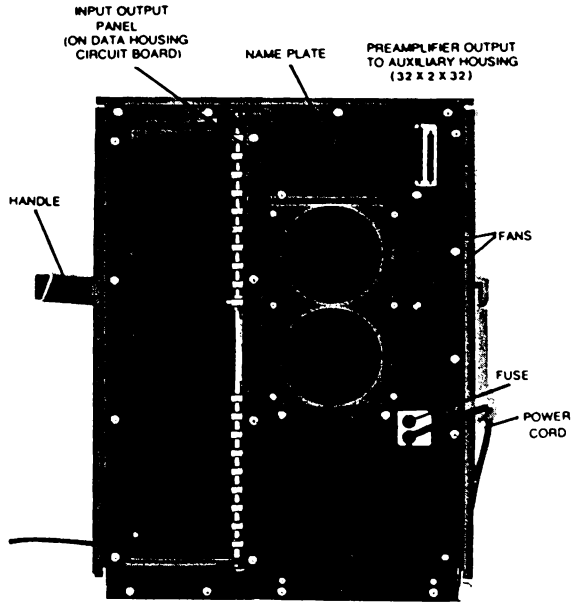


FIGURE 1-10. REAR OF TRANSPORT

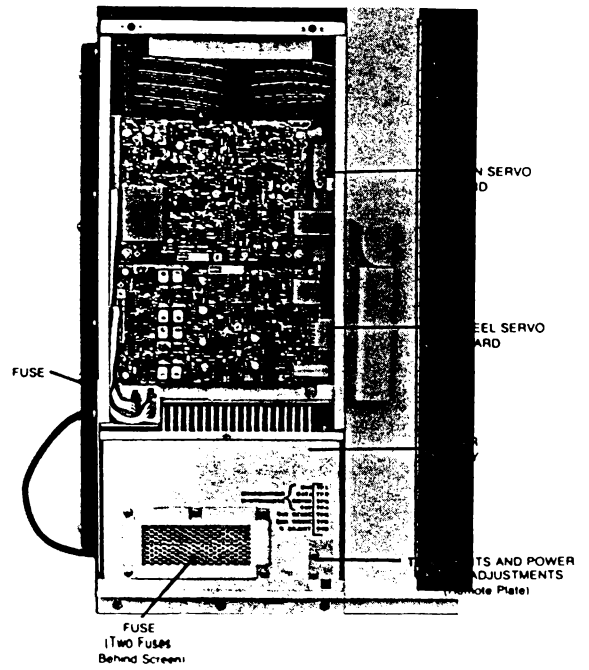


FIGURE 1-11. SIDE OPPOSITE DATA HOUSING

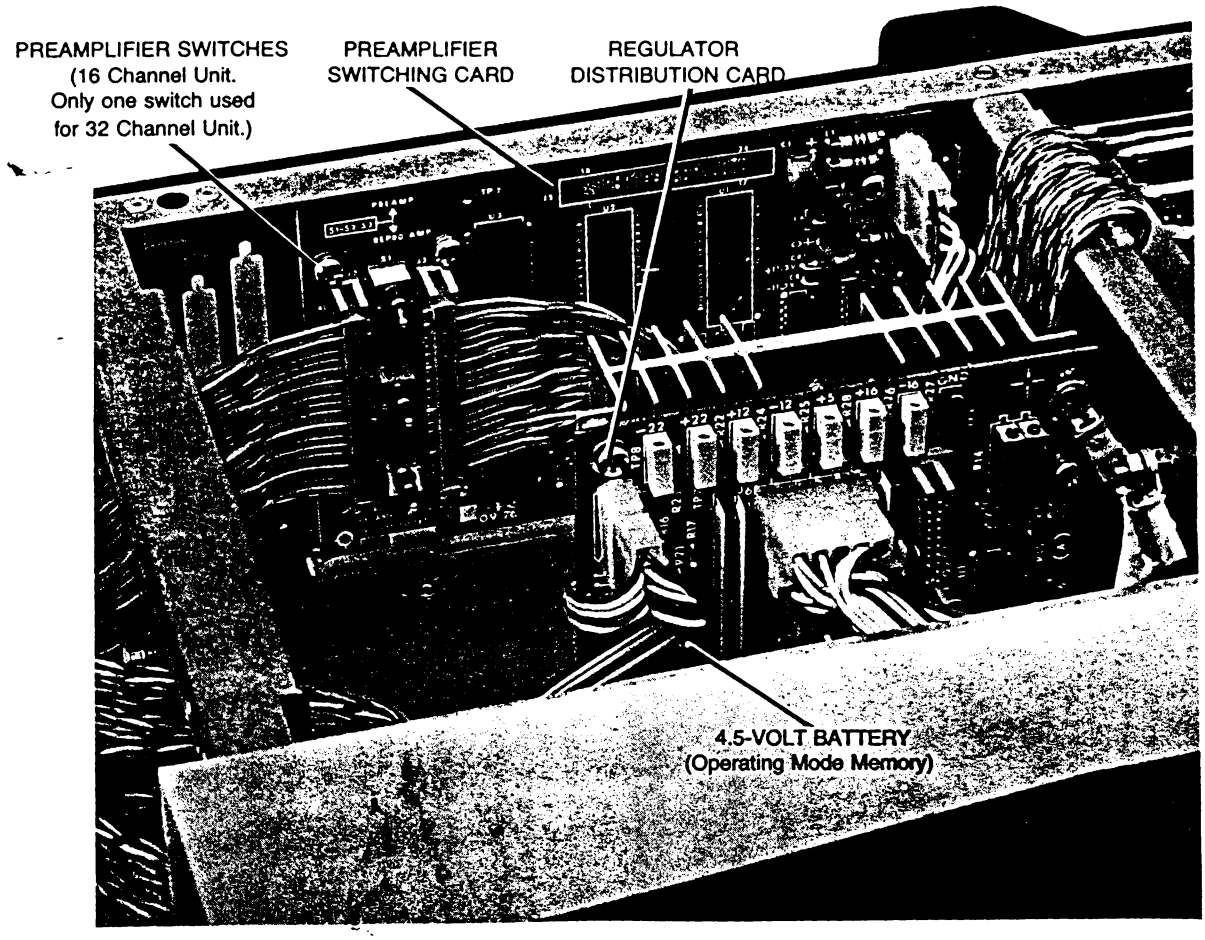


FIGURE 1-12. TOP OF HOUSING

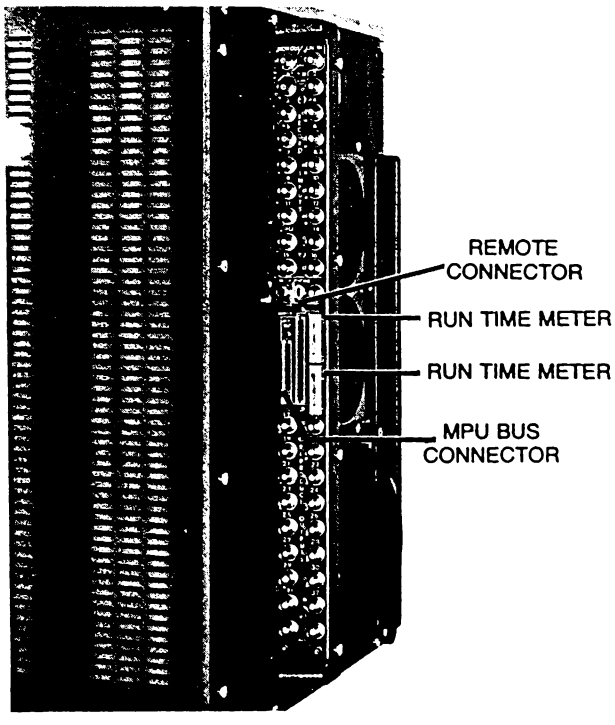


FIGURE 1-13. 16 CHANNEL INPUT/OUTPUT PANEL

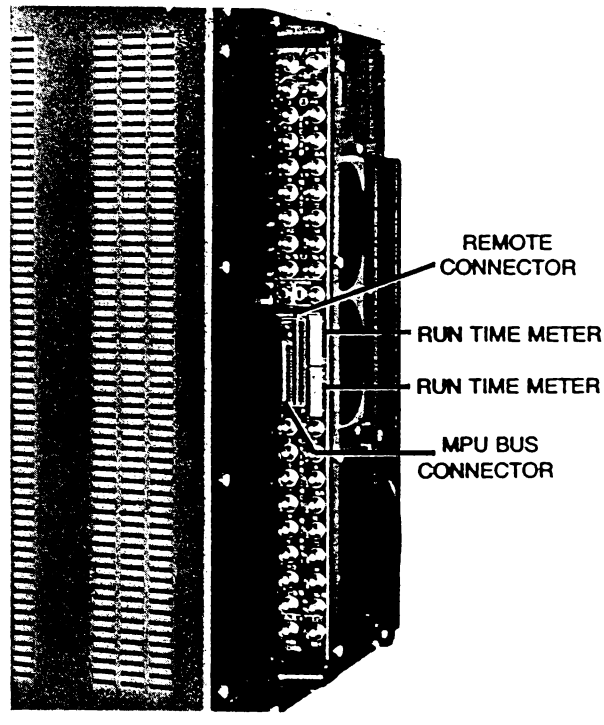


FIGURE 1-14. 32 CHANNEL INPUT/OUTPUT PANEL

Remote Unit

The remote unit (Figure 1-15) controls basic transport operation from as far away as 25 feet. Command is transferred to the remote unit when it is connected to the Model 101 and the RMT mode is selected from the Model 101 control panel. Indicators on the remote unit are active anytime it is connected.

In addition to basic transport functions, phase lock, footage, and tape speed are displayed by the remote unit. Tape speed can be selected from the remote unit.

The remote unit is approximately the size of a pocket calculator. It comes with a 25-foot ribbon cable permanently attached with a 40-pin connector that connects to the Model 101 RMT receptacle on the Input/Output panel.

FIGURE 1-15. REMOTE UNIT

Remote Interface Kit

The remote interface kit is an optional accessory. It consists of the remote interface circuit card, attaching hardware and installation instructions.

The card is necessary to operate in the remote or transport sequence modes.

To operate in the transport sequence mode, you will also need the transport sequence cable.

The interface circuit card mounts on the clad side of the MPU card above the data housing driver card.

Servo Reproduce Kit

The servo reproduce kit consists of the servo reproduce circuit card, BNC cable and BNC/TEE connector. This option permits the Model 101 to servo from a prerecorded tape signal for IRIG configured signals X/2, 1X or 2X. The tape signal can be multiplexed with data or not multiplex.

Rack Mount Kit

This kit (Figure 1-16) contains the bolt-on hardware for mounting the Model 101 in a standard 19-inch EIA rack. The recorder is attached to a slide-out tray to permit access to the sides and rear of the Model 101. A storage drawer is built into the tray. The tray also contains a speaker with volume control, receptacles and cabling to accommodate the voice kit. Figure 1-16 shows a typical rack mounting installation.

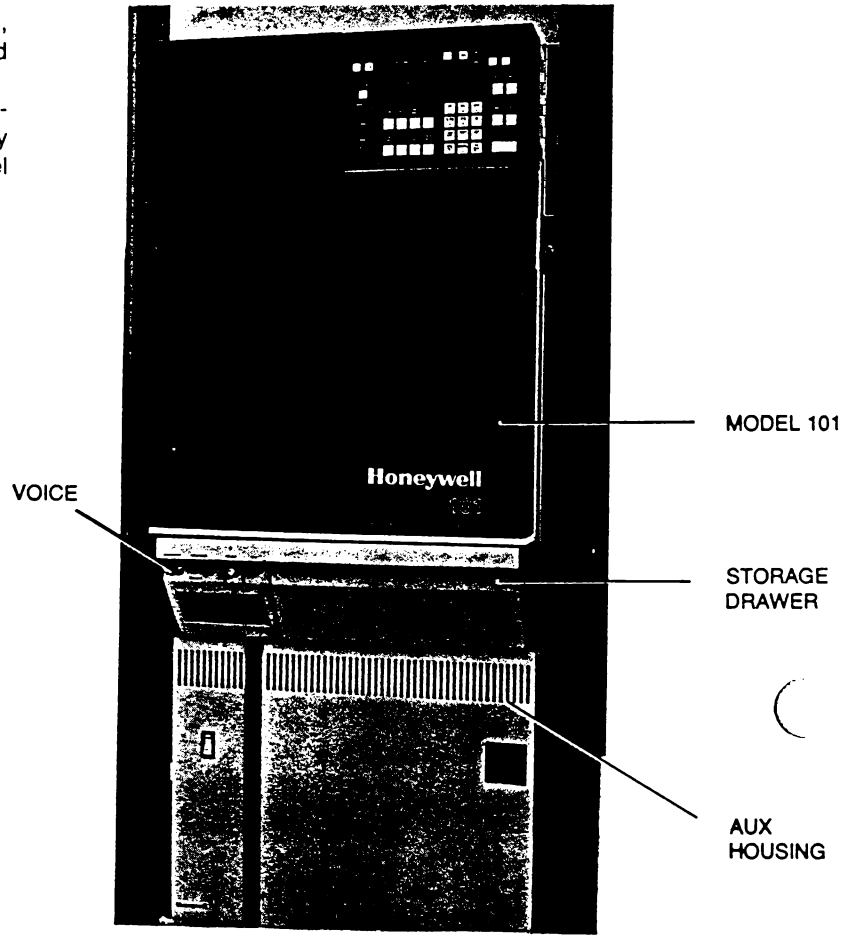


FIGURE 1-16. RACK MOUNT

Voice Kit

The voice kit (Figure 1-17) is an optional accessory. It can be used to record voice annotation on a data or edge track.

The kit contains voice record amplifier card, voice reproduce amplifier card, head set assembly which includes microphone and push-to-talk (PTT) switch, coaxial cable, and BNC connector.

The voice record card includes a bias oscillator, permitting simultaneous voice annotation recording and data playback.

The head set assembly may be connected to the Model 101 Input/Output panel or to the slide-out tray if rack mounted. The volume control on the slide-out tray is active for both the built-in speaker or head set.

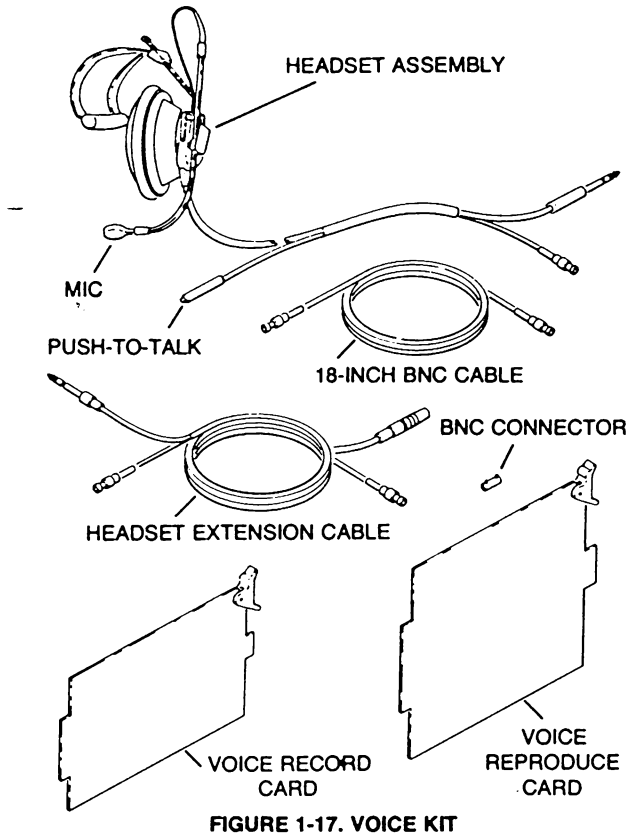


FIGURE 1-17. VOICE KIT

Auxiliary Housing

The auxiliary housing is used with the 32-channel versions of the Model 101. The aux housing can be installed in a standard rack (Figure 1-16) or installed in a portable enclosure (Figure 1-18). When rack mounted, the housing occupies only 14 inches of rack space.

The housing has a self-contained power supply and holds up to 32 reproduce data cards.

The housing connects to the Model 101 with four ribbon cables which connect to receptacles on the rear panel and a ground strap. Two of the cables couple the outputs of the preamplifiers to the data cards via the aux housing circuit card. One of the cables tie the MPU bus to the aux housing for microcomputer control. The other ribbon cable connects to a receptacle labeled AUX on the Model 101. This cable interconnects the busing network. A 30-inch ground strap insures proper grounding of the two units.

A functional system block diagram of the aux housing is contained in Section 4 of the System Manual.

All calibration, monitoring, and auto test functions of the Model 101 are usable with the aux housing.

For calibration and set up procedure refer to Section 4 of this Operator's Manual.

Adjustment locations are shown on the inside of the front panel. Channel output BNC connectors are on the rear panel.

The data cards slide into the aux housing as shown in Figure 1-19. The channels are numbered consecutively from left to right starting with the upper left channel slot.

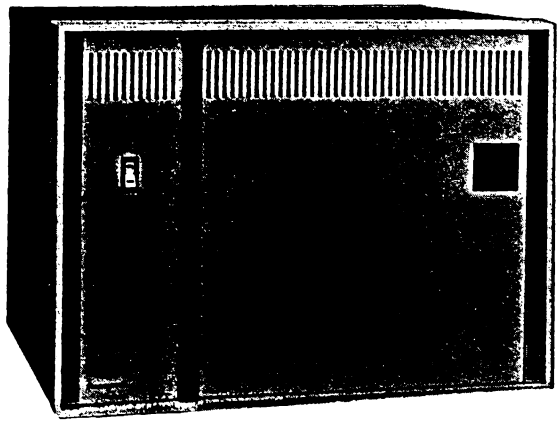


FIGURE 1-18. AUXILIARY DATA HOUSING

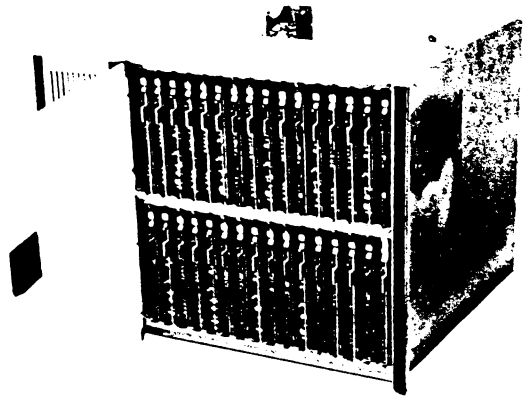


FIGURE 1-19. AUXILIARY DATA HOUSING

SECTION 2
Controls and Indicators

SECTION 2
Controls and Indicators

What This Section Contains

This section describes the function and locates the controls and indicators you will use to operate the Model 101. It does not cover jumper switches on the circuit cards. They're covered in Section 5.

Most of the controls you will need to operate the system are on the control panel. (See Figure 2-1.) It's important that you know the function of each control and indicator.

Many controls on the control panel have multiple functions. This discussion gives the complete function of each control and indicator. So it's the one place in the manual that contains the complete coverage. After reading and understanding the information in this section, use it as a handy reference until you master the simplicity of operating the Model 101.

Control Panel

The control panel (Figure 2-1) is separated into sections as shown in Figure 1-5. (See Page 1-4.) This discussion covers the function of each control and indicator by control panel section.

Transport Controls

STOP/LOAD Pushbutton: (Below **STOP** Indicator) Functions as a load stop and keyboard entry correction switch.

Press and hold to initiate ready condition and tension tape. Release when **STOP** indicator lights. Press to stop tape from any operating mode; record **(REC),** forward **(FWD),** reverse **(REV),** or **FAST.**

When entering or displaying shuttle or track sequence programs from the keyboard (**SHTL** or **TRK SEQ** mode indicator flashing), pressing the **STOP/LOAD** pushbutton will cancel the program being entered without stopping tape or affecting the program in memory; thus allowing you to correct instructions prior to entering them in memory. Pressing the **STOP/LOAD** pushbutton cancels the preamble mode.

STOP Indicator: Lights when transport is ready and tape is tensioned.

FWD Pushbutton: (Below **FWD** Indicator) Functions as a forward drive switch and as a memory entry key or memory display key for programmable shuttle and track sequence data.

Initiates forward tape movement at a preselected speed if shuttle or track sequence program (**SHTL** or **TRK SEQ** indicator flashing) is **not** being programmed from the keyboard.

If shuttle or track sequence instructions are being programmed, pressing **FWD** pushbutton will then enter the instructions in memory for forward drive mode without affecting transport operation.

If the display **(DSPL)** shuttle set point mode is energized at the keyboard, then pressing and holding pressed the **FWD** pushbutton will cause the program in memory to be displayed by the footage counter. Similarly, if the display track sequence program is initiated, then pressing and holding pressed will cause the sequential track selection program to be displayed by the **IPS** counter and the cycle number will be displayed by the footage **(FEET)** counter. These operations can be performed with tape stopped or moving without changing the transport mode of operation.

FWD Indicator: Lights when transport is moving tape in the forward direction.

REC Pushbutton: (Below **REC** indicator) Initiates record mode, must be pressed simultaneously with **FWD** or **REV** pushbutton. Initiates FM Electronics-to-Electronics (E-E) when pressed after **CAL** pushbutton is pressed. (The E-E calibration bypasses the record and reproduce heads.) Initiates tape moving calibration when pressed simultaneously with **FWD** pushbutton after **CAL** pushbutton is pressed.

REC Indicator: Lights when system is in the record mode.

FAST Indicator: Lights in either fast forward or fast reverse mode.

FAST Pushbutton: (Below **FAST** indicator) Pressing, when in the forward **(FWD)** or reverse **(REV)** mode, overrides the preselected speed on the keyboard and moves tape at a preset speed, adjustable from 75 to 180 IPS. Pressing the **FAST** pushbutton also disables the preamble mode.

REV Indicator: Lights when the transport is moving tape in the reverse direction.

REV Pushbutton: (Below **REV** indicator) Performs the same function as the **FWD** pushbutton except for reverse operations.

Tape Speed/Numbers Keyboard

IPS Display: Three-place, digital readout, displays tape speed selected. Displays track selected when programming or displaying track sequence data. Displays error entry *E* if during track sequence programming you attempt to enter a track number that is already in memory. Displays *F* if fast is preset on **FWD** or **REV** pack switches on control logic circuit card when **DSPL** track sequence is initiated.

Speed Selected/Numbers Pushbuttons: Eight pushbuttons double for tape speed selection or number keys.

Speeds of **0.937, 1.87, 3.75, 7.5, 15, 30, 60** and **120 IPS** may be selected by pressing the indicated speed pushbutton. All speeds are bidirectional and may be changed with tape in motion without stopping tape. Once a speed is selected it will remain selected until a new speed is selected.

The red numbers **0** through **9** and decimal point operate as number entry keys when the shuttle *set* or track sequence *set* modes are energized, **SHTL** or **TRK SEQ** mode indicator flashing. They also serve as footage entry keys when the **FOOTAGE RESET** pushbutton is held pressed.

LAMP TEST Pushbutton: Pressing and holding pressed lights all the displays on control panel.

SHTL SET Pushbutton: Initiates the shuttle set programming operation and causes the **SHTL** mode indicator to flash. When pressed after the **DSPL** pushbutton is pressed, it enables display of the shuttle point if **FWD** or **REV** pushbutton is also pressed and held pressed.

DSPL Pushbutton: Initiates the display function and causes both the **SHTL** and **TRK SEQ** mode indicators to flash.

TRK SEQ SET Pushbutton: Initiates track sequence programming operation and causes the **TRK SEQ** mode indicator to flash. When pressed after the **DSPL** pushbutton is pressed, it enables display of the track sequence program if **FWD** or **REV** pushbutton is also pressed and held pressed.

Function Controls

AC POWER ON-OFF Pushbutton: Turns on and off ac power.

DC POWER (Green LED): Lights when dc voltages from all system power supplies are present.

PHASE LOCK/TACH (Orange LED): Lights when the capstan servo is controlled by the tachometer and phase lock achieved.

PHASE LOCK/TAPE (Orange LED): Lights when the capstan servo is controlled by the servo reference signal on the tape control track when tape mode is energized and phase lock is achieved.

FOOTAGE RESET Pushbutton: Press to reset footage counter to zero. Press and hold pressed while entering footage values from the keyboard.

FEET (Footage Counter): Five-place LED readout, displays tape footage to ±19,999 feet. As an alternate action, it displays shuttle points in memory storage, tape cycle number in the track sequence mode, or entry error *E* when incorrect track sequence data is entered or displayed. If low tape (BOT/EOT) is selected as a shuttle point, the counter displays an *L* when display shuttle points is initiated. When low tape (BOT and/or EOT) is preset as shuttle point, the counter will display a flashing *L* for about 4 seconds if you try to enter shuttle points from the keyboard.

TRANS SEQ Pushbutton: Press once to energize and once again to deenergize the mode. The transport sequence mode overrides the low tape and shuttle modes. The **TRANS SEQ** indicator (above switch) lights to indicate the **FWD** or **REC/FWD** will transfer to a second Model 101 when the low tape point is reached. To transfer, the second Model 101 must also be in the transport sequence mode.

TRK SEQ Pushbutton: Initiates the track sequence and shuttle modes and overrides the low tape mode. The **TRK SEQ** indicator lights but the **SHTL** indicator does not light when the mode is energized. It flashes when track sequence set or display mode is energized. The **TRK SEQ** pushbutton is disabled if system is in preamble mode.

SHTL Pushbutton: Initiates the shuttle mode and overrides the transport sequence, track sequence, and low tape modes. The **SHTL** indicator lights when the mode is energized.

LOW TAPE Pushbutton: Enables and disables the low tape mode. Pressing the pushbutton when the **LOW TAPE** indicator is **not** lighted enables the low tape mode, preventing tape from unspooling from both reels. Pressing the pushbutton with the **LOW TAPE** indicator lighted disables the low tape mode, causing tape to unspool from the supply reel only. The **LOW TAPE** indicator lights when the mode is energized. Selecting the low tape mode overrides the shuttle, track sequence and transport sequence modes.

TAPE Pushbutton: Press once to energize the tape mode and once again to deenergize the mode. The **TAPE** indicator (above switch) lights to indicate that the capstan servo will attempt to servo from a prerecord servo reference signal in the reproduce mode. The **PHASE LOCK/TAPE** LED will light when phase lock is achieved. If **REC** is selected, the **TAPE** indicator will extinguish and the system will phase lock from tach.

RMT Pushbutton: Transfers control of the **STOP/LOAD, FAST, FWD, REV, REC** (speed select) and footage reset operations to the remote panel. Push once to transfer, once again to transfer back. The **RMT** indicator lights to indicate that the above operating controls on the panel have been transferred to the remote control panel. **STOP** from the transport is always active. The **RMT** pushbutton is disabled when the remote unit is not connected and the **RMT** indicator will not light.

PREAMBLE Pushbutton: Initiates preamble mode if track sequence or tape modes are not energized, allowing calibration signals to be recorded on all channels simultaneously. Push once to initiate mode and once again to deenergize. The **PREAMBLE** indicator lights when the mode is initiated. (The **STOP** or **REC** indicator must be lighted to enter the preamble mode.)

CAL Pushbutton: Enables the calibration subsystem and initiates the calibration mode. Used in combination with **REC, FWD,** speed selection and **AUTO TEST** pushbuttons. The **CAL** indicator lights when the system is in calibration or auto test modes. It flashes when a data channel fails auto test.

Channel Selector

CHANNEL Display: Two-place digital readout, displays the channel number selected.

△ **Channel Increment Pushbutton:** Selects the next highest active channel available. When either 16 or 32 is

passed, the process starts over at channel 1. Press and hold pressed to increment sequentially.

▽ **Channel Decrement Pushbutton:** Selects the next lowest active channel available. When Channel 1 is selected, the process starts over at 16 or 32. Press and hold pressed to decrement sequentially.

DIRECT (Orange LED): Indicates that the record or reproduce data card connected to the meter monitor is a direct type. The LED will flash on and off if recording on tape and there is a mismatch between record card and reproduce (or monitor) card.

MBFM (Orange LED): Indicates that the record or reproduce data card connected to the measurement subsystem is medium band (Intermediate Band or Wideband I) FM TYPE. The LED will flash on and off if recording on tape and there is a mismatch between record card and reproduce (or monitor) card.

WBFM (Orange LED): Indicates that the record or reproduce card connected to the measurement subsystem is Wideband II FM type. The LED will flash on and off if recording on tape and there is a mismatch between record card and reproduce (or monitor) card in the channel selected.

MON (Orange LED): Indicates that the measurement subsystem is connected to the reproduce monitor bus and monitor data cards are in use.

SEL Pushbutton: If the **MON** LED is lighted and the Model 101 is in the reproduce mode, it alternately selects one of the two monitor cards. If the Model 101 is in the **REC** mode the **SEL** switch is inoperative, and the monitor cards are selected automatically by the microcomputer.

REPRO (Orange LED): Indicates the reproduction monitor bus is selected for measurement.

REC (Orange LED): Indicates the record monitor bus is selected for measurement. If the **CAL REC,** and **KHZ** indicators are lighted, the **REC** LED indicates the E-E (Electronics-to-Electronics) bus is selected for measurement (FM cards only).

Meter Monitor

Measurement Display: Six-place, digital readout, displays measurements of various data electronic system signals. As selected, it operates as DC, AC peak, and rms voltmeter, frequency counter, and distortion analyzer.

▷ **Increment Right Pushbutton:** Selects the next function to the right for measurement in a rotary manner if allowed by the microcomputer at the time the pushbutton is pressed.

◁ **Increment Left Pushbutton:** Selects the next function to the left for measurement in a rotary manner if allowed by the microcomputer at the time the pushbutton is pressed.

KHZ (Orange LED): Indicates that the meter monitor will measure the frequency of the applied signal and display results in kHz.

DC (Orange LED): Indicates that the meter is set to measure dc average value of the applied signal and will display results in volts.

AC PK (Orange LED): Indicates that the meter will measure the ac-coupled, peak value of the applied signal and display results in volts.

RMS (Orange LED): Indicates that the meter will measure ac-coupled, detected fullwave average responding value of the applied signal and display results in volts.

% (Orange LED): Indicates that meter will measure the percentage of third harmonic distortion of a 1 V rms signal at 60 IPS, 0.1BE (bandedge).

NOTE

All meter monitor LED's flash when selected if the meter monitor is set for external measurement.

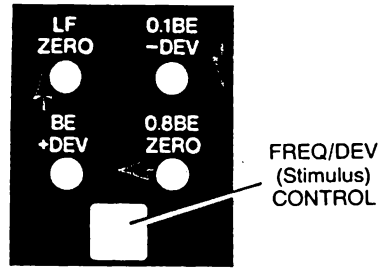
Calibrator

INT/EXT Pushbutton: Selects either internal calibration source or external calibration source if allowed by the microcomputer at the time the switch is pressed.

EXT (Orange LED): Indicates the calibrate signals are being obtained from the ext **CAL** BNC connector on the rear of the Model 101.

INT (Orange LED): Indicates the calibrate signals are being obtained from the calibrator.

FREQ/DEV (Stimulus) Control Pushbutton: Each time the pushbutton is pressed the microcomputer causes a new stimulus (sinewave frequency or dc voltage) to be applied to the data channel being calibrated if allowed by the program in effect at the time the pushbutton is pressed. And, the microcomputer causes a clockwise rotary change in the four stimulus LED's above the pushbutton. The pattern is shown below:



LF/ZERO (Orange LED): Indicates that a low frequence (LF) sinewave is applied to the variable cal bus if the **GAIN** indicator is lighted or the DIRECT normalize cal bus if the **DIR** indicator is lighted. If the **FM** indicator is lighted, the voltage on the FM normalized cal bus is the correct value to cause zero deviation of the FM carrier frequency.

0.1 BE/-DEV (Orange LED): If the channel being calibrated is direct—indicates that the sinewave on the direct normalized calibrate bus is 0.1 bandedge (BE) at the selected tape speed.

If the channel being calibrated is FM—indicates that the

voltage on the FM normalized calibrate bus is the correct value to cause a full scale negative deflection of the FM carrier frequency.

0.8 BE/ZERO (Orange LED): If the channel being calibrated is direct—indicates that the frequency applied to the direct normalized calibrate bus is 0.8 bandedge at the selected tape speed.

If the channel being calibrated is FM—indicates that the voltage on the FM normalized bus is the correct value to cause zero deviation of the FM carrier frequency.

BE/+DEV (Orange LED): Indicates that the frequency applied to the DIRECT normalized bus is bandedge at the selected tape speed if the channel being calibrated is direct. However, if the channel being calibrated is FM, it indicates that the voltage on the FM normalize bus is sufficient to cause full scale positive deviation of the FM carrier frequency.

VMS/V PEAK DIAL: Use for gain calibration. The dial setting indicates voltage applied to variable cal bus (VRMS for direct data card—V PEAK for FM data cards).

GAIN (Orange LED): Indicates that the low frequency signal is applied to the variable calibrate bus and the variable calibrate bus is active.

FM (Orange LED): Indicates that the **FREQ/DEV** (stimulus control) indicators are deviation only and the FM normalized cal bus is active.

DIR (Orange LED): Indicates the DIR normalize cal bus is active. The **DIR** indicator flashes when applying internal preamble signals at 120 IPS to indicate that the **BE** and 0.8 BE sinewaves are not generated.

NOTE

When the **FM** and **DIR LED's** are lighted at the same time, the **FREQ/DEV** Stimulus LED's indicates that sinewave frequencies are applied when a direct channel is selected for calibration and DC voltages are applied when an **FM** channel is selected for calibration.

AUTO TEST Pushbutton: Pressing places the system in auto-test mode if the **CAL** indicator is lighted.

AUTO TEST (Amber LED): Lights when system is in auto-test mode.

External Controls

Meter Monitor

Internal/External Toggle Switch S7 (located inside the control panel, top/center): When in EXT position it allows the meter monitor to be used for external measurement by connecting the input jack on the front of the control panel to the meter. When in the internal position, the switch allows the meter monitor to be used for internal measurements.

NOTE

The **KHZ, DC, AC PK, RMS** and **%** LED's flash when selected for measurement when the meter monitor is being used as an external meter.

Input/Output Panel

VAR/OFF/NORM (Toggle Switch): Not used if the system is equipped with built-in calibrator. Selects Var or Norm if system is not equipped with built-in calibrator. (Not mounted on some units.)

Preamplifier Switching

S1, S2, S3 MON AMP/Repro Amp (used on 16 channel units with preamplifier switching cards): When all switches (Figure 2-2) are in the **MON AMP** position, allows channels 15 and 16 to be used as reproduce monitor cards. As selected by the channel selector, the output of any preamplifier can be directed to both channel 15 and 16 for monitoring on the meter monitor.

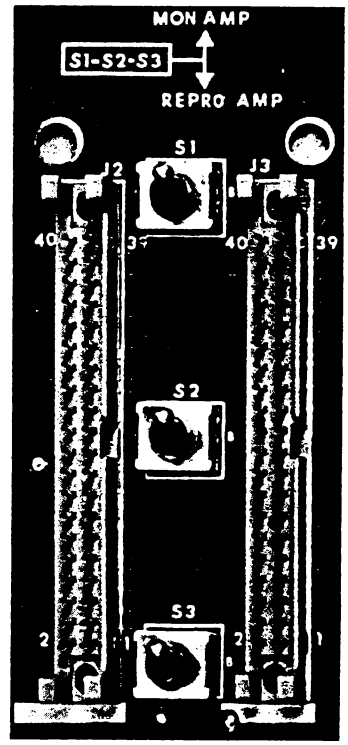


FIGURE 2-2. PREAMPLIFIER SWITCHING (16 CHANNEL UNIT)

When all switches are in the **REPRO AMP** position, the outputs of the preamplifier are applied to respective channel reproduce amplifier.

S1 MON AMP/REPRO AMP (only one switch used on 32 channel units): When in the **MON AMP** position (Figure 2-3) allows the two monitor cards to be used for monitoring as selected by the channel selector.

When in the **REPRO AMP** position and the auxiliary housing is being used, the outputs of each preamplifier are applied to the respective channel reproduce amplifier in the auxiliary housing.

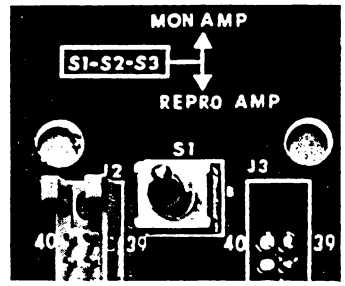


FIGURE 2-3. PREAMPLIFIER SWITCHING (32 CHANNEL UNIT)

Options

Remote Unit

The functions of the pushbuttons and indicators with the same nomenclature on the remote unit are identical to those on the Model 101 control panel. The **RESET** and **DISPLAY** pushbuttons have multiple functions.

RESET Pushbutton: Doubles as a footage reset or speed increment key. Press to reset footage counter.

DISPLAY Pushbutton: Doubles as a speed in IPS display selector or speed change enable key. Press and hold press to display speed selected. Release to display footage.

REMOTE LED: Lights only when the RMT mode is activated.

Auxiliary Housing

OFF-ON Pushbutton: Applies ac power to aux housing

Voice.

HEADPHONE/SPEAKER Toggle Switch: Selects either rack mount speaker or headset for VOICE output.

RS-232C

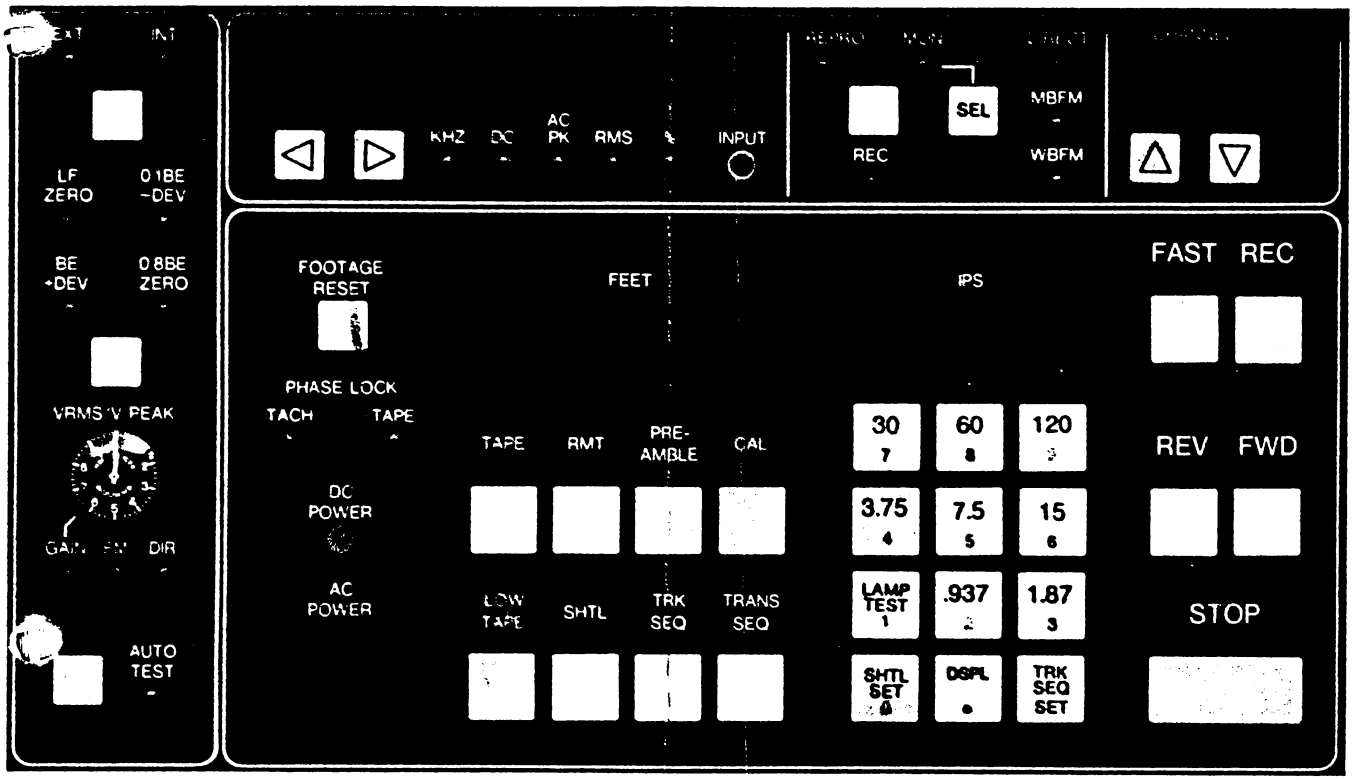
See Appendix A for description of this option.

IEEE 488 BUS

See Appendix B for description of this option.

Open this flap

Keep this flap open when using this manual



3URE 2-1. CONTROL PANEL

SECTION 3 Operation

What This Section Contains

This section tells you how to operate the Model 101. It includes all of the procedures you will need for normal operation. A brief description precedes the actual step-by-step procedure.

Take a few minutes to become familiar with the controls and indicators. The complete function of all controls and indicators is covered in Section 2. The function and location of jumper switches are covered in Section 5.

Before proceeding, look at the Custom Data section of the Maintenance Manual to determine if any modifications have been made to the equipment which could affect operation.

How To Load Tape

The tape loading procedure and threading diagram is shown on the inside of the transport door. The procedure is also covered in this manual as a study and training aid. The threading diagram (Figure 3-1) is at the back of this section.

NOTE

Verify jumper J5 on the Dual Reel Servo circuit card is in the proper position. See Section 5.
If using 1/2-inch tape, install adapter ring in front of each reel.
When loading a new spool of tape for the first time, it is good practice to spool forward and reverse at the fast rate.

1. Open transport door.
2. If hubs are locked together with tangs, roundpins and tang on locking ring aligned, go to step 6. (This would be the position the hubs would normally be in if you had just removed both reels).
3. Grasp front hub and make sure the locking ring is fully counterclockwise (CCW).
4. Grasp rear hub and position so any two tangs are aligned. Depress center button and rotate front hub clockwise (CW) until it stops. Then release center button.
5. Grasp rear hub and rotate front hub fully CCW.
6. Slide supply reel on hub until it seats against rear stop. Grasp supply reel securely and rotate front hub clockwise (CW) to lock supply reel.
7. Remove crosstalk shield and thread tape as shown in the tape path diagram (Figure 3-1). Insert crosstalk shield with clip up.
8. Grasp supply reel. Depress center button and rotate front hub CCW until it stops. Release center button.
9. Slide takeup reel on hub. Grasp takeup reel securely and rotate front locking ring CW to lock takeup reel.
10. Finish threading by feeding 8 or 10 turns of tape around the takeup reel, making sure tape pack around takeup reel hub is tight.
11. Press **AC POWER** pushbutton and observe that the **DC POWER** LED lights.
12. Press and hold the **STOP/READY** pushbutton until tape is tensioned and the **STOP** indicator lights.

The Model 101 is now ready for operation. The **STOP** indicators will remain lighted after the **STOP/READY** pushbutton is released to indicate the Model 101 is ready.

How To Unload Tape

NOTE

To completely unspool tape from takeup reel, the **LOW TAPE, SHTL,** or **TRK SEQ** indicators must not be lighted. If the transport stops as a result of any of these indicators lighted, just press **REV** pushbutton.

1. Turn power off.
2. Grasp takeup reel (Figure 3-1) and turn locking ring fully CCW.
3. Remove takeup reel.
4. Grasp supply reel and align any two tangs. Depress center button and turn front hub CW until it stops. Release center button.
5. Grasp supply reel, turn front hub fully CCW.
6. Slide supply reel off hub.

How To Record

Simultaneous recording and reproducing occurs at all times during the record forward mode **(REC/FWD)** only. Recording only occurs during the **REC/REV** mode.

1. Position all external switches and jumpers on circuit cards as desired.
2. Set the preamplifier switches to **REPRO AMP** or **MON AMP** as desired. See page 2-4.
3. Connect input/output data signals.

CAUTION

When ac line power to the Model 101 is turned off, the **RECORD INPUT** drops to several K ohms. A resistive path between **RECORD INPUT BNC's** of several K ohms is also created. If you intend to record from high impedance sources, employ high impedance isolation devices such as amplifiers, transformers, series resistors, etc between your source and the **RECORD INPUTS.**

4. Perform auto-test or calibration if desired, see Section 4.
5. If you're going to operate in track sequence or shuttle mode, program or check programs as desired. See page 3-2 for shuttle and page 3-6 for track sequence.
6. Load a clean, well-degaussed roll of tape, and place the transport in a ready condition.
7. Select speed.
8. Select mode of operation.
9. Press **FWD** and **REC** or **REV** and **REC** pushbuttons simultaneously.

How To Reproduce

1. Position all internal controls and jumper switches as desired. See Section 5.
2. Make external connection to reproduce data outputs.

NOTE

For proper equalization, it is best to reproduce in the same direction the tape was recorded.

3. Load recorded tape.
4. Press desired speed pushbutton.
5. Press **FWD** or **REV** pushbutton.

Operating Mode Memory

The following operating modes and conditions are retained in memory at all times, even when the Model 101 is turned off.

- Selected Speed.
- Low tape or **not** Low Tape if selected.
- Shuttle Mode and Shuttle Program.
- Track Sequence Mode and Program.
- Transport Sequence Mode.
- Tape or Tach.
- Remote
- **INT** or **EXT** Calibration Selection.
- Footage indication on footage counter.

Once a mode is entered in memory it will be retained until changed or overridden by selecting another mode.

When the Model 101 is first turned on, the microcomputer will check the contents of the memory to determine which mode was activated when it was turned off. Then it automatically activates that mode and lights the mode indicator.

The operating mode portion of the microcomputer memory is backed up by a 4.5-volt battery. If you turn the Model 101 off or if ac power input is removed due to a primary power outage, the battery will supply the power necessary to operate the memory. However, if any of the internal power supplies should fail, the memory conditions must be reinserted.

If the battery is low when power is applied, the footage counter and IPS counter will indicate zero.

Low Tape Mode

Description of Mode

The low tape mode causes the transport to stop before the tape unspools. The electronic low tape sensing circuit commands stop when the tape pack on either supply or takeup reel reaches approximately ¼" of tape.

The **LOW TAPE** indicator lights when the mode is activated. If the **LOW TAPE** indicator is lighted, both low tape points **(BOT/EOT)** are activated.

The terms **BOT** and **EOT** are defined as:

BOT = Beginning-of-tape on supply reel.

EOT = End-of-tape on supply reel.

...the forward direction, the mode is active even if the mode is not selected. This is to prevent the tape from unspooling from the supply reel. An internal jumper (J12) on the control logic circuit card provides for overriding this condition. Table 3-1 lists the conditions with the jumper in or out.

Pressing the **LOW TAPE** pushbutton with the **LOW TAPE** indicator lighted enables the **not** low tape mode, allowing the tape to unspool from both reels if J12 (C-2) is **not** connected. If J12 (C-1) is connected the tape will unspool from the takeup reel only.

Selecting the shuttle or track sequence mode automatically overrides the low tape mode.

If the transport sequence mode is selected, the low tape signal will start a second Model 101.

Entering the calibrate mode automatically selects the low tape mode. However, you can select **not** low tape by pressing the **LOW TAPE** pushbutton with the **LOW TAPE** indicator lighted.

How To Select Low Tape Mode

Press the **LOW TAPE** pushbutton when the **LOW TAPE** indicator is **not** lighted.

How To Exit Low Tape Mode

Press the **LOW TAPE** pushbutton with the **LOW TAPE** indicator lighted. OR select shuttle, track sequence or transport sequence mode.

TABLE 3-1. LOW TAPE JUMPER SET POINT

LOW TAPE INDICATOR	JUMPER J12 ON CONTROL LOGIC CARD	TRANSPORT ACTION
Lighted	IN	Stops at both BOT and EOT
Not Lighted		Stops at EOT.
Lighted	OUT	Stops at both BOT and EOT.
Not Lighted		Ignores low tape at both ends (BOT/EOT)—spools off at either end.

Shuttle Mode

Description of Mode

The shuttle mode causes the transport to drive tape back and forth between two points. The shuttle points may be footage values or low tape points (BOT/EOT).

You can program the footage points from the keyboard or enter the actual tape position from the footage counter display. Low tape shuttle points (BOT/EOT) are set by switches on the control logic circuit card. The shuttle points can be set with tape moving or stopped and can be displayed for review at any time.

How To Enter Shuttle Mode

Press the **SHTL** pushbutton (See Figure 2-1). The **SHTL** indicator will light to indicate that the mode is activated. The shuttle mode overrides the low tape, track sequence, and transport sequence modes.

How To Exit Shuttle Mode

Press either **LOW TAPE, TRK SEQ** or **TRANS SEQ** pushbutton.

How To Program Shuttle Points From Keyboard

1. Press **SHTL SET** pushbutton. The **SHTL** mode indicator will flash, indicating that the desired shuttle points can be entered from the keyboard and the speed keys have been converted to number keys.
2. Enter the forward (low footage value) shuttle point by pressing the red number keys. The footage counter displays the numbers as they are entered.
3. Press **FWD** pushbutton to insert the low shuttle point in memory. The **SHTL** indicator stops flashing to indicate the sequence has been completed. The footage counter now displays footage and the number keys become speed keys.
4. Enter the reverse (high footage value) shuttle point in the same manner, except press the **REV** pushbutton to insert the high shuttle point in memory.

NOTE

Do not set shuttle points that are outside the low tape limits. If you do the low tape command will override the shuttle point, causing the Model 101 to stop.

Programming Example: As an example, to program the transport to shuttle between 1000 and 2000 feet just push the buttons according to the keystroke chart on the next page.

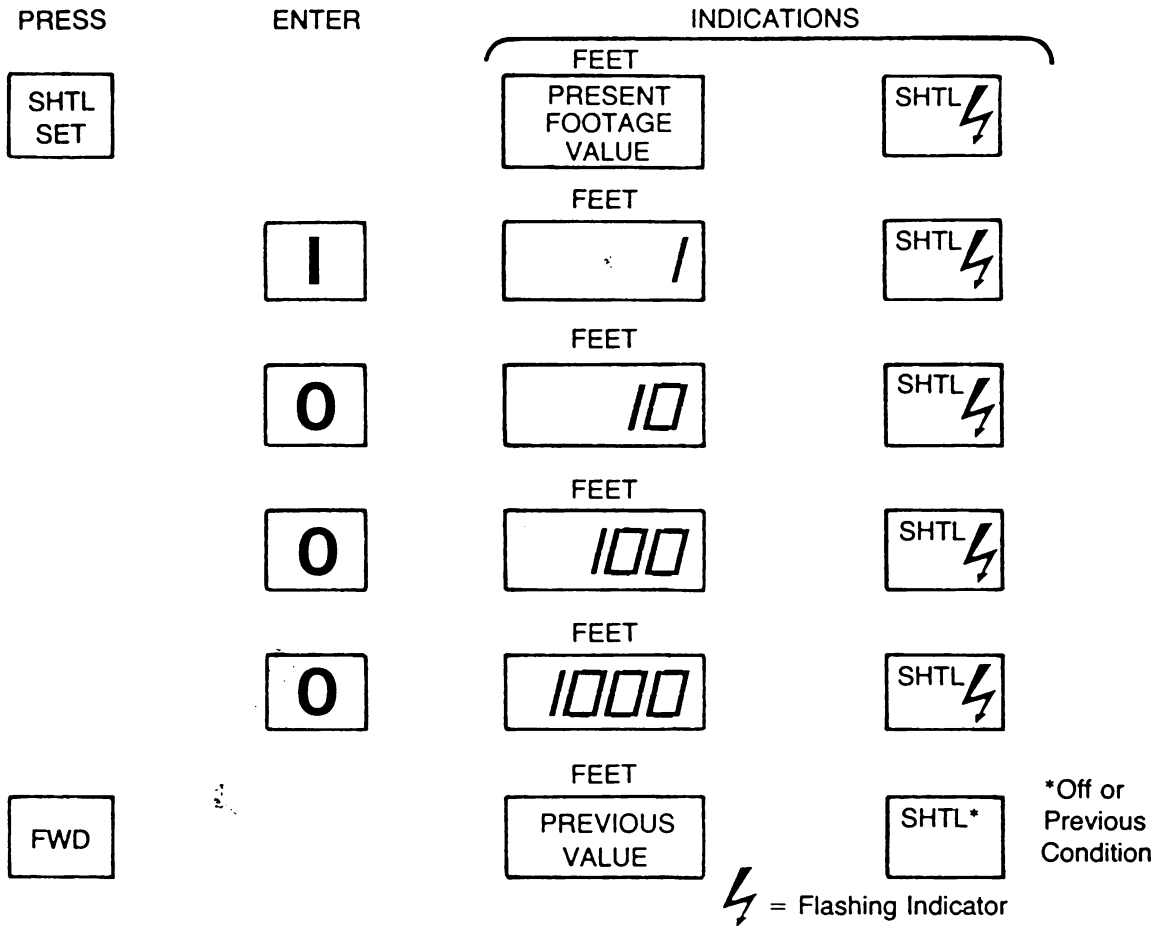
NOTE

If preset low tape is used as a shuttle point (see page 3-4) and you try to enter a new shuttle program from the keyboard, the footage counter will display a flashing (L) for about 5 seconds.

How To Clear Keyboard

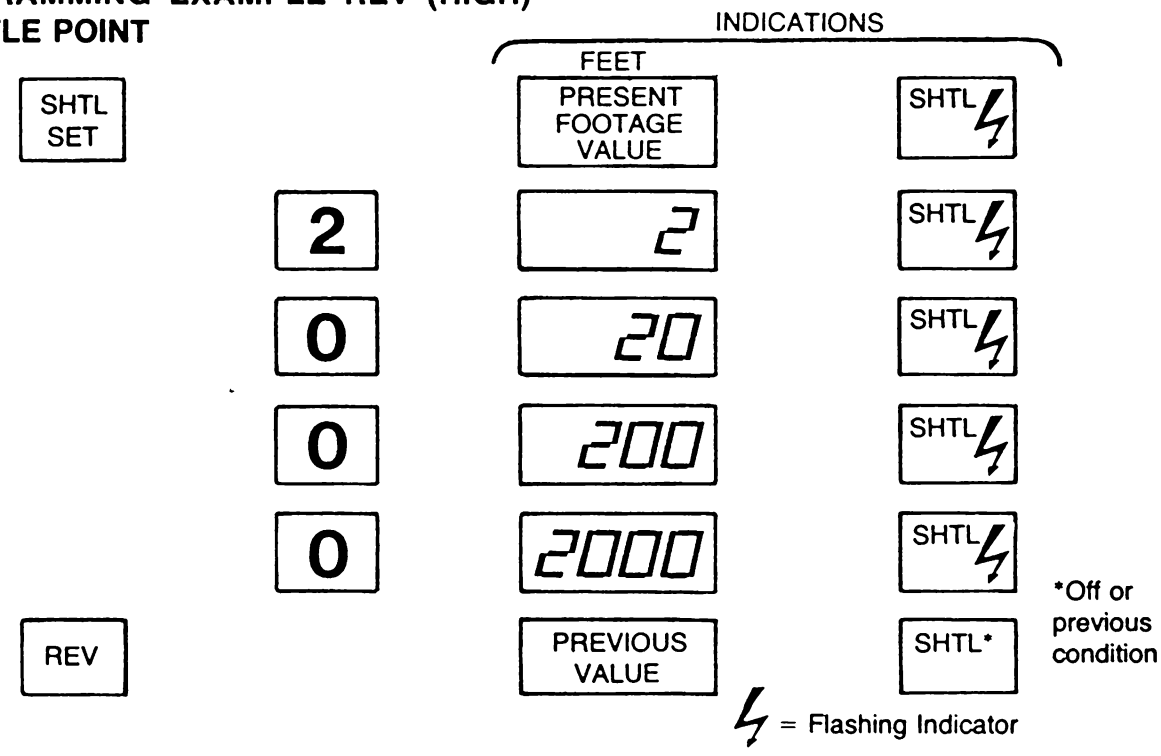
If you press the wrong key when entering the shuttle point from the keyboard, pressing the **STOP** pushbutton will clear the keyboard and terminate the sequence.

PROGRAMMING EXAMPLE—FWD (LOW) SHUTTLE POINT



The FWD shuttle points is now in memory

PROGRAMMING EXAMPLE REV (HIGH) SHUTTLE POINT



The REV (HIGH) shuttle point is now in memory

How To Set Shuttle Points From Footage Counter Values

You may also set shuttle points from footage values:

(1) FORWARD (low) shuttle point.

PRESS	FEET	
SHTL SET	FOOTAGE VALUE	SHTL ϟ
FWD	Footage counter value becomes the low shuttle point in memory. ϟ = Flashing indicator	

(2) REVERSE (high) shuttle point.

PRESS	FEET	
SHTL SET	FOOTAGE VALUE	SHTL ϟ
REV	Footage counter value becomes the high shuttle point. ϟ = Flashing indicator	

How To Display Shuttle Points

To display shuttle points, just press **DSPL** pushbutton and then press **SHTL SET** pushbutton. Then press and hold pressed the **FWD** or **REV** pushbutton. The **FWD** instructions will be displayed by the footage counter when the **FWD** pushbutton is held pressed. Here's the sequence for 1000 **FWD** and 2000 **REV:**

How To Clear Shuttle Points From Memory

Shuttle points are cleared from memory by selecting new ones. The new shuttle points may be programmed using the keyboard (page 3-2) or set directly from the footage counter (page 3-4). Preset low tape shuttle points override the memory, and they must be changed by selecting new switch positions (Tables 3-2 and 3-3).

How To Preset Low Tape Shuttle Points (BOT/EOT)

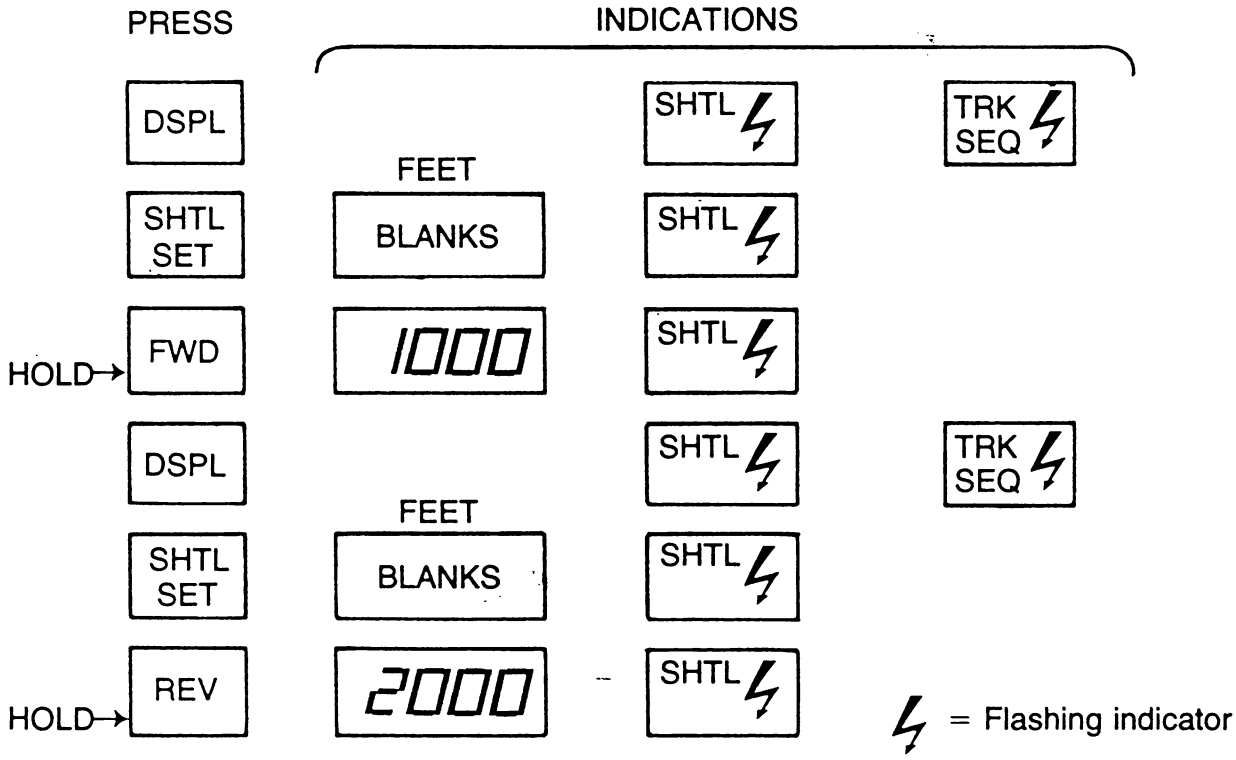
Two four-position switch packs on the outside edge of the MPU card allow you to preset various low tape shuttle and transport conditions. These conditions override the programmed shuttle points in memory.

Switch S2 presets the FWD (low) shuttle points. Switch S1 presets the REV (high) shuttle points. The switches are labeled FWD and REV and they are accessible by removing the data housing side panel (see figure 1-8).

Tables 3-2 and 3-3 show set points for the switches and the resulting transport response.

EXAMPLES:

1. To shuttle between low tape points BOT/EOT, set both switches to position 1.
2. To shuttle between a FWD shuttle point in memory and low tape on the supply reel (EOT), set REV switch S1 to position 1 and S2 to OFF.
3. To shuttle between a FWD shuttle point in memory and low tape (EOT) and have the transport return to the FWD shuttle point in the fast mode and stop, then set the REV switch S1 to position 2 and the FWD switch S2 to position 4.



NOTE: If preset low tape BOT/EOT are set as shuttle points, the footage counter will display an *L*.

TABLE 3-2. PRESET REVERSE SHUTTLE CONDITIONS

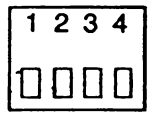
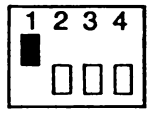
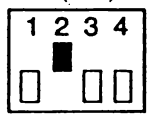
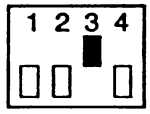
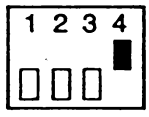
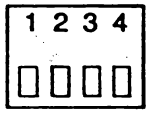
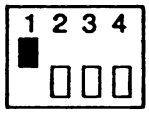
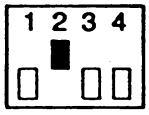
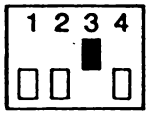
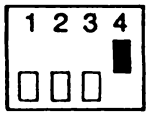
REV SW POS. S1	NAME ON MPU CARD	TRANSPORT ACTION
0 (NONE ON) 	SHTL DR	Drives in REV when keyboard set REV (high) shuttle point in memory is reached.
1 (ON) 	LT DRIVE	Drives in REV when low tape point is reached on supply reel, EOT
2 (ON) 	LT FAST	Drives FAST REV when low tape point is reached on supply reel, EOT
3 (ON) 	SHTL FAST	Drives FAST REV when keyboard set REV (high) shuttle point in memory is reached.
4 (ON) 	SHTL STOP	Stops when keyboard set REV (high) shuttle point in memory is reached.

TABLE 3-3. PRESET FORWARD SHUTTLE CONDITIONS

FWD SW POSITION S2	NAME ON MPU CARD	TRANSPORT ACTION
0 (NONE ON) 	SHTL DR	Drives FWD when keyboard set FWD (low) shuttle point in memory is reached.
1 (ON) 	LT DRIVE	Drives FWD when low tape point is reached on takeup reel, BOT.
2 (ON) 	LT FAST	Drives FAST FWD when low tape point is reached on takeup reel, BOT.
3 (ON) 	SHTL FAST	Drive FAST FWD when keyboard set point FWD (low) shuttle point in memory is reached.
4 (ON) 	SHTL STOP	Stops when keyboard set FWD (low) shuttle point in memory is reached.

Track Sequence Mode

Description of Mode

Using the microcomputer, you can program any combination of tracks for recording in forward and reverse directions. The program is stored in memory. You can initiate, change or display the program at any time from the control panel.

During operation only the specific tracks programmed for the specific pass are active. Bias and record currents are disabled on the other tracks. The sequence continues until completed and the transport stops automatically.

Actuating the track sequence mode will automatically select the shuttle mode but the *shuttle* indicator will *not* light. The lighted **TRK SEQ** indicator indicates that both modes are active.

If the fast preset shuttle is selected, the Model 101 is instructed to ignore the track sequence program for the fast passes.

To enter the track sequence mode, you must have a track sequence program in memory and **NOT** be in the preamble or record mode.

If the tape stops for any reason while recording in the track sequence mode, reactivating the mode will start the program over from the beginning.

How To Enter Track Sequence Mode

1. Select **STOP.**
2. Make sure the desired shuttle and track sequence programs are in memory. (See page 3-2 for shuttle program and page 3-6 for track sequence program.)
3. Press **TRK SEQ** pushbutton.
4. Press either **FWD/REC** or **REV/REC** pushbuttons simultaneously as desired.

How To Exit Track Sequence Mode

When the program has been completed, the microcomputer automatically commands STOP. However, you can terminate the sequence at any time by pressing **STOP, LOW TAPE,** or **SHTL** pushbuttons.

How To Program Track Sequence

A maximum of 16 forward and 16 reverse channels can be programmed. All entries are made from the keyboard.

The footage counter displays the cycle number. A cycle is defined as a pass forward that is followed by a pass in reverse.

The IPS counter displays the track number. The **FWD** or **REV** pushbutton enters the instruction in memory.

The program is initiated by pressing the **TRK SEQ SET** pushbutton. This converts the speed keys to number keys and causes the **TRK SEQ** mode indicator to flash, indicating the desired track sequence instructions can be entered from the keyboard. Next, enter the track numbers desired by pressing the red number keys. **Separate each track number entry by entering a decimal point. Separate a cycle number by entering a second decimal point.**

Don't intermingle forward or reverse instructions. Enter track numbers for all forward passes; then press **FWD** button. Enter track numbers for all reverse passes; then press **REV** button.

Note that the **TRK SEQ** mode indicator stops flashing when either the **FWD** or **REV** button is pressed. This indicates that either the forward or reverse portion of the program has been inserted in memory (depending upon which button is pressed) and that portion of the sequence is terminated.

Here's an example: Lets assume that you have the following requirements to program:

Using 14-track heads, record on 3 tracks at a time until 12 tracks of data are recorded. Edge tracks A & B are referred to as tracks 15 and 16 but will not normally be used for data.

To program, make the following entries at the keyboard.

FORWARD ENTRY: [TRK SEQ SET] 1.3.5..7.9.11. [FWD]

REVERSE ENTRY: [TRK SEQ SET] 2.4.6..8.10.12. [REV]

The keystroking chart on the next page shows the steps required to program the above example and the resulting indications.

The 101 is now programmed to record as follows:

1. Tracks 1, 3, and 5 on the first forward pass.
2. Tracks 2, 4, and 6 on the first reverse pass.
3. Tracks 7, 9, and 11 on the second forward pass.
4. Tracks 8, 10, and 12 on the second reverse pass.

Remember. Any combinations of tracks may be recorded in forward and reverse; or record forward only with fast reverse, etc.

For example to program the above example for record forward only with fast reverse:

1. Preset shuttle points so S1 on MPU card is in position 2 (LT FAST) and S2 is in position 1 (LT DRIVE). (See page 3-4.)
2. Program Track Sequence Entry:

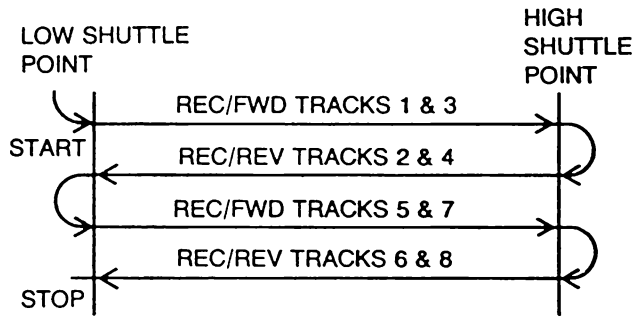
[TRK SEQ SET] 1.3.5..2.4.6..7.9.11..8.10.12. [FWD]

The 101 is now programmed to shuttle between low tape points (BOT/EOT) with fast return, recording FWD on tracks 1, 3, and 5 the first pass, recording FWD on tracks 2, 4, and 6 the second FWD pass, etc. until 12 tracks are recorded. After the fourth FWD pass, the transport will return to the BOT point and stop.

Suggested Method of Programming

Here's a suggested way to enter the program desired:

Make a rough sketch and map out exactly what you want the Model 101 to do. Then enter your program.



To program, enter:

[TRK SEQ SET] 1.3..5.7. [FWD] [TRK SEQ SET] 2.4..6.8. [REV]

PROGRAMMING EXAMPLE FOR FORWARD TRACK SEQUENCE PROGRAM

PRESS	ENTER	INDICATIONS		
		FEET	IPS	
TRK SEQ SET		1	0	TRK SEQ ϟ
	1	1	1	TRK SEQ ϟ
	•	1	0	TRK SEQ ϟ
	3	1	3	TRK SEQ ϟ
	•	1	0	TRK SEQ ϟ
	5	1	5	TRK SEQ ϟ
	•	1	0	TRK SEQ ϟ
NOTE CYCLE CHANGE {	•	2	0	TRK SEQ ϟ
	7	2	7	TRK SEQ ϟ
	•	2	0	TRK SEQ ϟ
	9	2	9	TRK SEQ ϟ
	•	2	0	TRK SEQ ϟ
	11	2	11	TRK SEQ ϟ
	•	2	0	TRK SEQ ϟ
FWD		PREVIOUS FOOTAGE	PREVIOUS SPEED	TRK SEQ*

ϟ = FLASHING

*PREVIOUS STATE

PROGRAMMING EXAMPLE FOR REVERSE TRACK SEQUENCE PROGRAM

PRESS	ENTER	INDICATIONS		
		FEET	IPS	
TRK SEQ SET		1	0	TRK SEQ ϟ
	2	1	2	TRK SEQ ϟ
	•	1	0	TRK SEQ ϟ
	4	1	4	TRK SEQ ϟ
	•	1	0	TRK SEQ ϟ
	6	1	6	TRK SEQ ϟ
	•	1	0	TRK SEQ ϟ
NOTE CYCLE CHANGE {	•	2	0	TRK SEQ ϟ
	8	2	8	TRK SEQ ϟ
	•	2	0	TRK SEQ ϟ
	10	2	10	TRK SEQ ϟ
	•	2	0	TRK SEQ ϟ
	12	2	12	TRK SEQ ϟ
	•	2	0	TRK SEQ ϟ
REV		PREVIOUS FOOTAGE	PREVIOUS SPEED	TRK SEQ*

ϟ = FLASHING

*PREVIOUS STATE

How To Clear Program In Memory

To clear the program in memory, press the **TRK SEQ SET** pushbutton, then press the **FWD** pushbutton. This will clear the forward program. Press the **TRK SEQ SET** and then press the **REV** pushbutton to clear the reverse program.

Entry Error

If the same track is entered more than once for either forward or reverse, the **FEET** counter will display a flashing *E* continuously until the sequence is terminated. To correct, press STOP pushbutton to terminate the sequence. Clear memory. Then re-enter the program in the normal way.

How To Clear Keyboard

Pressing the STOP pushbutton will clear numbers entered from the keyboard and terminate the sequence if pressed prior to inserting in memory by pressing the FWD or REV button.

How To Display Track Sequence Program

The contents of the program in memory can be displayed at any time without stopping tape or changing any operating mode of the 101.

To display, just press the **DSPL** pushbutton to initiate the display functions. Then press the **TRK SEQ SET** pushbutton to tell the Model 101 which program you want to display. Now press and hold pressed the **FWD** pushbutton. The **FWD** track sequence program will now be displayed sequentially on the footage and **IPS** counters. Releasing the **FWD** pushbutton terminates the display function.

To display the reverse program, repeat the steps above except press and hold the **REV** pushbutton.

The keystroke chart below shows the sequence of steps required to display the track sequence function.

DISPLAYING THE FWD TRACK SEQUENCE PROGRAM IN MEMORY

PRESS	PRESS & HOLD	INDICATIONS			
DSPL				TRK SEQ ϟ	SHTL ϟ
		FEET	IPS		
TRK SEQ SET		1	BLANKS	TRK SEQ ϟ	
	FWD	FWD PROGRAM PASS NUMBERS	FWD TRK SEQ PROGRAM	TRK SEQ ϟ	

ϟ = FLASHING

***Program will be displayed sequentially as long as FWD pushbutton is held pressed.**
NOTE: If FAST is preset as a shuttle point, the IPS counter will display an *F* .

DISPLAYING THE REV TRACK SEQUENCE PROGRAM IN MEMORY

PRESS	PRESS & HOLD	INDICATIONS			
DSPL				TRK SEQ ϟ	SHTL ϟ
		FEET	IPS		
TRK SEQ SET		1	BLANKS	TRK SEQ ϟ	
		FEET	IPS		
	REV	REV PROGRAM PASS NUMBERS	REV TRK SEQ PROGRAM	TRK SEQ ϟ	

ϟ = FLASHING

NOTE: If FAST is preset as a shuttle point, the IPS counter will display an *F* .

Preamble Mode

The preamble recording mode allows you to optimize data quality when the tape is reproduced for processing. In the preamble mode you can record on all channels at the same time. By cycling the **FREQ/DEV** pushbutton on the control panel, you apply the outputs of the frequency synthesizer and dc voltage source of the calibrator to the normalized inputs of the direct and FM record amplifiers, respectively.

When recorded on tape ahead of data, these test signals can be used to align the reproduce electronics of the playback machine reproducing the tape.

To enter the preamble mode, you must *not* be operating in the tape or track sequence mode. However, you can enter the preamble mode while in the record or stop mode.

How To Preamble Using Internal System

1. Select speed that you will record at.
2. Select **STOP.**
3. Select **PREAMBLE.**
4. Select **INT.**
5. Select **FWD/REC.**
6. Record test signals by alternately pressing and releasing the **FREQ/DEV** stimulus control pushbutton on the control panel. Apply test signals as long as desired and at the rate desired.
7. To exit the preamble mode, press **PREAMBLE, STOP** or **FAST** pushbutton.

How To Preamble Preceding Track Sequence Mode Using Internal System

1. Program **REV** (high) shuttle point (see page 3-2) or set **REV** shuttle switch (S1) on control logic card to position 1 **(LT DRIVE)** if you wish to use **EOT** as the high shuttle point. (See page 3-4.)
2. Enter track sequence program desired. (See page 3-6.)
3. Select **STOP.**
4. Select **speed.**
5. Select **PREAMBLE.**
6. Select **INT.**
7. Select **FWD/REC.**
8. Record test signals by alternately pressing and releasing the **FREQ/DEV** stimulus control pushbutton for as long as desired and at the rate desired.
9. Select **STOP.**
10. Set low shuttle point. This can be done in several ways. You can reset the footage counter and use "O" footage, use the indicated footage value on the counter or program a desired shuttle point from the keyboard.
11. Select **TRK SEQ.**
12. Select **FWD/REC.**
13. To exit the preamble mode, press **PREAMBLE, STOP,** or **FAST** pushbutton.

How To Preamble Using An External Source

You can record test data on tape ahead of data from an external source in the preamble mode. This allows you to use your own format of signals as preamble data.

> **NOTE**
>
> When in the EXT preamble mode, signals applied to the CAL IN BNC are routed by the calibrator to the variable cal bus. So each record card affects the record level on that channel according to the individual setting of each GAIN adj.

1. Select **STOP.**
2. Select **speed.**
3. Select **PREAMBLE.**
4. Connect your external preamble source to the **CAL IN BNC** on the input/output panel.
5. Select **FWD/REC** or **REV/REC.**
6. Select **STOP** or Press **PREAMBLE** pushbutton to exit preamble mode when desired.

Tape Mode

Description of Mode

The tape mode allows the capstan to servo off a tape control reference signal recorded on tape. Selecting the tape mode arms the tape servo circuitry. When phase lock is achieved, the **PHASE LOCK/TAPE** LED lights to indicate the capstan servo is being controlled by the tape control signal. If the tape signal drops out, the system switches automatically to tach control.

How To Enter Tape Mode

To enter the mode, press the **TAPE** pushbutton. The **TAPE** indicator lights to show the mode is energized.

You can't enter the tape mode if the system is in the preamble mode.

How To Exit Tape Mode

Press the **TAPE** pushbutton.

Master Clear

You can clear all operator programmable functions from memory. These are footage, shuttle points, track sequence program, selected speed, selected operating mode and ready. Tape must not be moving when the master clear function is initiated.

To clear:

a. Make sure tape is stopped.

b. Press and hold **FOOTAGE RESET** pushbutton.

c. Press and release **STOP** pushbutton; then release **FOOTAGE RESET** pushbutton.

d. Observe that the **LOW TAPE** indicator lights and both the footage and IPS counter display Zero.

How To Enter Footage Values From Keyboard

1. Press and hold pressed the FOOTAGE RESET pushbutton.
2. Press respective number keys on the keyboard to enter footage values. The values entered will appear on the footage counter.
3. Release FOOTAGE RESET pushbutton to enter new footage values in memory.

How To Place Channel Selector In Auto-Scan Mode

The auto-scan mode causes the channel selector to automatically increment [△] or decrement [▽] through the channels sequentially. Each channel is selected for approximately 6 seconds

To Increment Channels

Press both [△] [▽]; then let up on [▽]; then let up on [△]

To Decrement Channels

Press both [△] [▽]; then let up on [△]; then let up on [▽]

To Exit Auto-Scan Mode

Press either [△] or [▽] once.

How To Place Channel Selector In Manual Scan Mode

To Increment Channels Sequentially

Press and hold pressed [△] pushbutton. The channel selector will increment through the channels sequentially as long as you hold the [△] pushbutton pressed. Releasing pushbutton will select channel indicated on the channel selector display.

To Decrement Channels Sequentially

Press and hold pressed [▽] pushbutton. The channel selector will decrement through the channels sequentially as long as you hold the [▽] pushbutton pressed. Releasing [▽] pushbutton will select channel indicated on the channel selector display.

Channel Mismatch Monitoring

The channel type LED's (**DIRECT, MBFM** and **WBFM**) and the **REPRO** and **REC** LED's on the channel selector flash when the record amplifier and reproduce amplifier or monitor amplifier in a particular channel are not the sametime type if the system is in the record mode. Here is an example:

EXAMPLE 1: **DIRECT** and **REC** LED's are lighted; **MBFM** and **REPRO** LED's are flashing.
RESULT: The reproduce amplifier is **MBFM.** It should be changed to **direct** to correct the channel mismatch.

EXAMPLE 2: **MBFM** and **REPRO** LED's are lighted; **DIRECT** and **REC** LED's are flashing.
RESULT: The record amplifier is direct. It should be changed to **MBFM** to correct the mismatch.

How To Use Monitor Cards

16 Record/16 Reproduce Channels System

This system has 16 record amplifiers and 16 reproduce amplifiers. It is referred to as the 16 × 16 system.

The 16 × 16 system, if equipped with a preamplifier switching circuit card, can be reconfigured as a 16 × 2 × 14 (16 record × 2 monitor × 14 reproduce). In this configuration, reproduce channel 15 is used as monitor channel B and channel 16 is used as monitor channel A. Thus, you can use 1 or 2 reproduce cards to calibrate or monitor outputs of 16 record cards.

If the system has both FM and direct data cards, use one of each as monitors. This selection is arbitrary, but the two monitor cards must match the record amplifier mix you're using.

In the record mode, the microcomputer automatically matches the record amplifier and monitor amplifier type, connects the appropriate monitor amplifier output to the meter monitor, and displays the amplifier type on the channel selector.

In the reproduce mode, use the SEL pushbutton to select either monitor A or monitor B. The card type is displayed as before.

To use channels 15 and 16 as monitor cards, position the three toggle switches on the preamplifier switching circuit card to MON AMP position. (See page 2-4.)

32 Record/2 Monitor Channels System

In the 32 × 2 system, only monitor cards are used. The operation is the same as the 16 × 2 × 14 system.

To use the two monitor channels, position the toggle switch on the preamplifier switching circuit to **MON AMP** position.

To reproduce all 32 channels, an auxiliary housing unit is necessary. It's available as an option.

To use with auxiliary housing, position the toggle switch on the preamplifier switching circuit to **REPRO AMP** position (Figure 2-3). In this position the system will ignore the monitor cards.

How To Record a Servo Reference Signal

To use the tape mode, the servo reference signal must be recorded on the tape control track at the same time the data is recorded.

Any direct record amplifier may be used for recording a tape control servo reference signal by positioning a jumper.

You can record the servo reference signal on any track except edge tracks.

The servo reference signal is generated by the bias clock and reference generator circuit card. The signal is 1 Vrms at the input of the record amplifier.

A Jumper on the bias clock and reference generator circuit card allows you to select IRIG standard X/2, X, and 2X.

The servo reference record option consists of a buffer amplifier and a gain control. The option is used to control the amplitude of the reference signal when multiplexing.

1. On bias clock and reference generator circuit card (Figure 5-5), position Jumper J2 for IRIG standard desired.

   J2 — C to 2X (400 KHz/120 IPS)
   C to X (200 KHz/120 IPS)
   C to X/2 (100 KHz/120 IPS)

2. Make sure the direct record card is calibrated for overbias and record level for the channel you intend to record the servo reference signal on.
3. On direct record amplifier, position Jumper J2 to position 1 and 2.
4. If you don't have the servo reference record option, proceed with normal record operation.
5. If the servo reference record option is on the record amplifier, adjust **SERVO REF GAIN** control (R36) for desired amplitude at TP-5.

NOTE

When multiplexing the data frequency should not exceed 1/10 of the servo reference frequency for a data signal amplitude that is equal to the amplitude of the reference signal.

6. If multiplexing, connect data to the RECORD INPUT BNC on the input/output panel (Figures 1-13 and 1-14). Then on the record amplifier, adjust **SERVO REFERENCE GAIN** (R36), **INPUT GAIN** (R30) and position Jumper J3 to obtain the desired combination of signals at TP-5.
7. Proceed with normal record operations.

How To Servo From Tape Using Direct Reproduce Amplifier — Non-Multiplex

You can use a direct reproduce amplifier to servo the capstan from a tape controlled track if the servo reference signal is not multiplexed with data. However, if multiplexed, you will need the special servo reproduce amplifier. It is available as an option.

1. On a direct reproduce amplifier (Figure 5-2), position Jumper J1 to **SER REP** position. Make sure J1 on reproduce amplifiers for all other channels is off.
2. Plug the direct reproduce amplifier, set for **SER REP**, into the channel slot for the channel where the tape control servo reference signal was recorded.
3. On data housing driver card (Figure 5-9), position Jumper J4 to 2X or (1X and X/2) position. Use (1X and X/2) position for IRIG 1X operation.

NOTE

You cannot servo from tape at IRIG X/2 without the servo reproduce option.

4. On the capstan servo circuit card, adjust R52 **(TAPE GAIN HIGH SPEED)** and R51 (**TAPE GAIN** 15/16 **IPS**) per instructions in the Transport Manual (16783820-001).
5. Proceed with normal reproduce operations.

How to Servo from Tape-Using Optional Servo Reproduce Amplifier—Non-Multiplex

1. On data housing driver card (Figure 5-9), position Jumper J4 as desired:
   Use 2X for IRIG 2X operation
   Use X/2, X for IRIG 1X or X/2 operation
2. On servo reproduce card (Figure 5-11), set S1 and S2 as follows:

   S1—1 to PREAMP
   S1—2, 3, 4, 5, 6, 7 to IRIG standard (2X, 1X or X/2) for either mediumband or wideband as desired. Positions are marked on the switch.
   S2—1 to ON
   2 to ON for 1X or 2X; OFF for X/2
   3 to OFF for 1X or 2X; ON for X/2
   4 to ON for 2X; OFF for 1X or X/2
   5 to ON for 1X; OFF for 2X or X/2
   6, 7 } Both ON if large signal on tape is expected (for saturated recording)
   6, 7 } Both OFF if normal signal is expected.

3. Insert the servo reproduce card into channel slot for track that carrier has been recorded. Make sure no direct reproduce card has J1 set to SER REP position.
4. Load the tape that has the prerecorded tape servo reference signal and establish the ready condition, STOP indicator lighted.
5. ON meter monitor, select RMS.
6. ON channel selector, select the channel being used for tape servoing and REPRO (reproduce monitor bus).
7. Select TAPE mode.
8. Select speed.
9. Select FWD.
10. Observe PHASE LOCK TAPE LED lighted.
11. On servo reproduce cards, adjust R51 (GAIN) for 1 Vrms with the channel output BNC unloaded or 0.5 Vrms if loaded with 50 ohms.

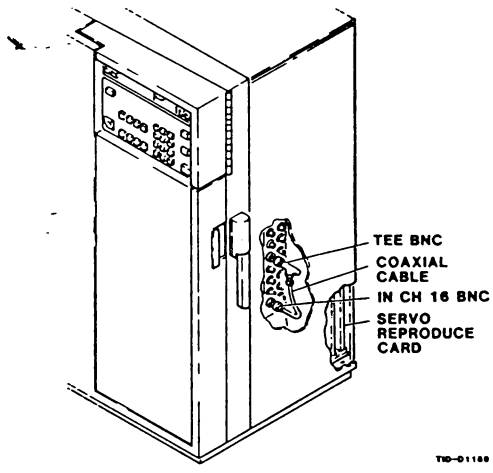
NOTE

It may be necessary to adjust capstan servo TAPE GAIN pots R52/R51 to obtain specified TBE performance on the selected track. (See Transport Manual).

How to Servo from Tape-Using Optional Servo Reproduce Amplifier—Multiplex

1. On data housing driver card (Figure 5-9) position Jumper J4 as desired:
   Use 2X for IRIG 2X operation.
   Use X/2, X for either IRIG 1X or X/2 operation.
2. On servo reproduce card (Figure 5-11), set 7-position switch packs S1 and S2 as follows:
   S1-1 to OFF
   S1-2, 3, 4, 5, 6, 7 to IRIG standard desired for either mediumband or wideband. Positions are marked on the switch.
   S2-1 to ON
   2 to ON for 1X or 2X; OFF for X/2
   3 to OFF for 1X or 2X; ON for X/2
   4 to ON for 2X; OFF for 1X or X/2
   5 to ON for 1X; OFF for 2X or X/2
   6, 7 } both ON

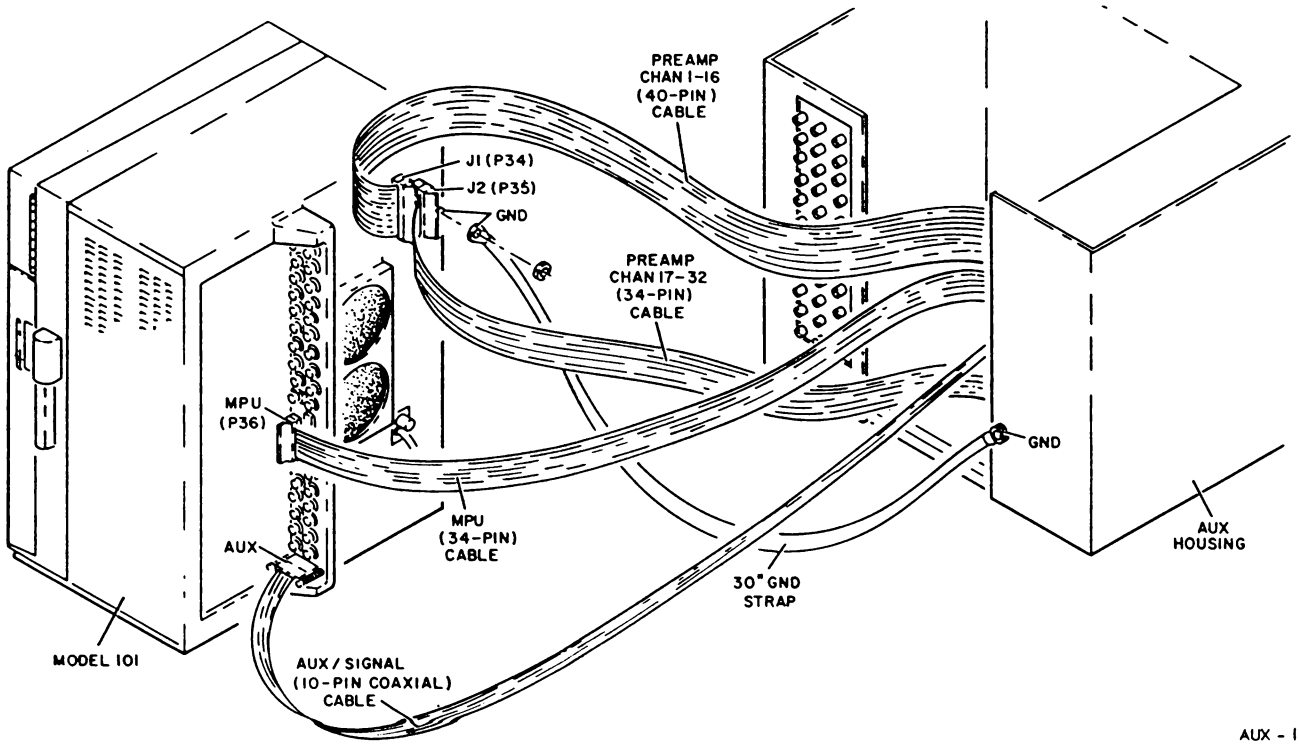
3. Insert the servo reproduce card into channel 16 only. If auxiliary housing, use channel 32.



4. Connect the BNC TEE to the direct channel output BNC for channel being used for tape servoing. Extract data signal (mixed with carrier) from one side of the TEE. Connect a BNC cable from the other side of the TEE to the IN CH 16 (AUX IN CH 32 for auxiliary housing) on the Input/Output panel.
5. Load the tape that has the prerecorded tape servo signal and establish the ready condition, STOP indicator lighted.
6. On meter monitor, select RMS.
7. On channel selector, select channel being used for tape servoing and REPRO (reproduce monitor bus).
8. Select speed.
9. Select FWD.
10. On the direct reproduce card being used for tape servoing, adjust GAIN (R10) for 1 Vrms.
11. On channel selector, select channel 16 (32 if aux housing) and REPRO.
12. On servo reproduce card, adjust GAIN (R51) for 1 Vrms for no load or 0.5 Vrms for 50 Ohm load.

How To Use The Auxiliary Housing

- With power off on both the Model 101 and aux housing, connect cables as shown below.
- Use the 30-inch ground strap supplied or shorter if noise floor of recorded data is critical. The shortest possible ground strap gives optimum noise floor. The harmonics of the MPU fundamental frequency (500 kHz) can affect the spectral characteristics of the data if the ground strap is longer than 30 inches.
- Don't operate the Model 101 with the aux housing connected unless power is on. If you desire to use the Model 101 without the aux housing, disconnect the aux housing cables from the Model 101.



AUX - 1

How To Use the Voice Option

Data or edge tracks may be used for voice recording.

Calibration and set up procedure are in Section 4 of this manual.

The voice record card has a 4-position mode switch. Switch positions for each mode or function are listed in Table 3-4, and for your convenience they are also listed on the voice record card.

TABLE 3-4. MODE SWITCH POSITIONS

FUNCTION	S2 SECTION			
	1	2	3	4
PTT	OFF	OFF	ON	OFF
STR	ON	OFF	ON*	OFF
STR-PTT	OFF	ON	OFF	OFF
VOX	OFF	OFF	ON	ON
CAL	ON	OFF	OFF	OFF

*Set to OFF when using more than one voice record circuit card in the STR function.

PTT—(Push-To-Talk)

Use this mode if you want to activate the voice record card only with the microphone switch.

STR (Selective Track Recording)

In this mode, voice channel operation is the same as the data channels.

Use this mode if you want to activate the voice channel with the REC command.

Use this mode if you want to activate the voice channel as part of the track sequence mode. In this case, be sure to include the voice channel in the track sequence program.

The microphone switch is always active in this mode.

STR—PTT

Activates voice channel only if both functions are invoked.

VOX—(Voice Operated Switching)

Use this channel if you want to record voice only when a voice signal is present at the microphone.

CAL—(Calibration)

Use for calibration. Enables calibration of the voice cards using the internal calibration system and inhibits the record squelch to allow simultaneous record and reproduce.

1. On the voice record card, position toggle switch S1 to ON (UP)
2. On the voice record card, set program switch S2 as desired. See Table 3-4.
3. On Model 101 Input/Output panel, connect 18-inch BNC cable from MICROPHONE BNC jack to record input BNC of channel being used for voice.
4. Connect microphone plug to MICROPHONE jack on Input/Output panel or voice portion of slide-out tray if using rack mount.
5. Connect head set to the voice reproduce channel output on the Input/Output panel or slide-out tray if you wish to use the head set. Volume control on rack mount is active for either speaker or headset.

CAUTION

VOX over recording is possible in rewind or playback modes if microphone receives high enough level to exceed threshold.

To prevent over recording, disconnect microphone plug or reprogram S2 to mode other than VOX after recording is made.

NOTE

To do voice annotation during preamble mode, select the PTT mode and place toggle switch S1 to off (down) to prevent calibration signals from being recorded. Then use microphone switch to turn on microphone.

If rack mount voice assembly is used, the VOLUME control must be turned fully CCW when using the VOX function.

Remote Mode

In order to operate the Model 101 in the remote mode, you'll need the remote control unit (Figure 1-15) and your Model 101 must be equipped with the remote interface circuit card. These are available as optional accessories.

The remote mode transfers control of the FWD, REV, REC, and FAST transport functions to the remote unit.

STOP, FOOTAGE RESET, and speed change are active from both control panels if the remote mode is selected.

The indicators on the remote unit display panel are active any time it is plugged in.

The REMOTE LED lights only when the remote mode is activated from the Model 101.

How to Select Remote Mode

Connect the remote unit to the RMT receptacle on the Model 101 input output panel. Press the RMT pushbutton. The indicator above the button will light if the remote unit and remote interface card are connected to show that the mode is active. The REMOTE LED on the remote unit will also light.

How to Exit the Remote Mode

Press the RMT pushbutton when the RMT indicator is lighted.

How to Select Speed with Remote Unit

Press and hold pressed the DISPLAY Pushbutton; then press and release the RESET Pushbutton to increment speed one step. Each time you press the RESET Pushbutton with the DISPLAY Pushbutton pressed will increment speed one step through range; if 120 is selected, pressing RESET will selected 120 IPS.

NOTE

Speed change is not active if the Model 101 is equipped with control logic card 16781081-001.

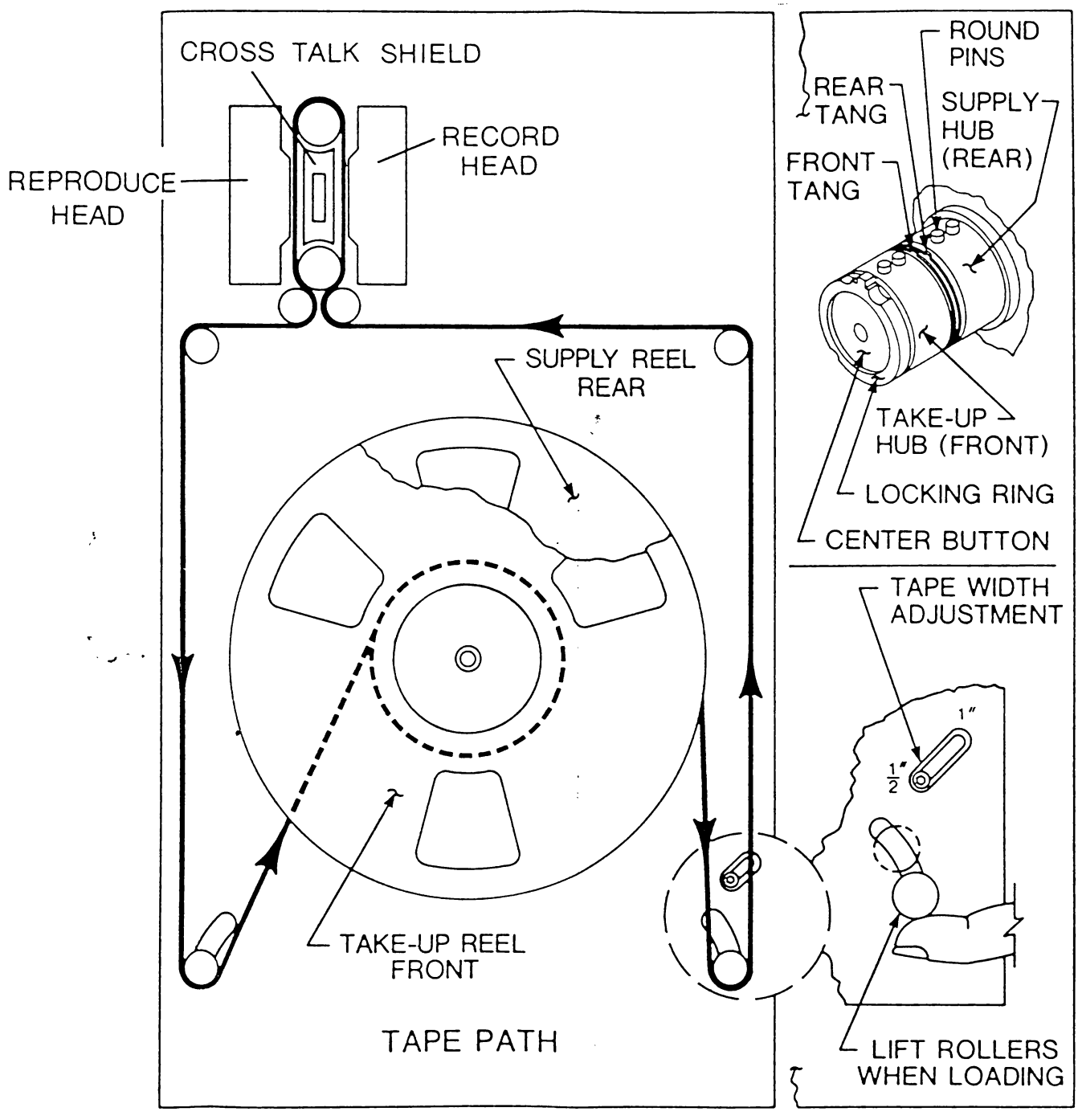


FIGURE 3-1. THREADING DIAGRAM

Transport Sequence

Description Of Modes

The transport sequence modes allow two Model 101's to operate in tandem. The modes are especially useful when you need to record a large amount of data continuously.

There are three distinct transport sequence modes. Mode 1 is two Model 101's operating in response to the low tape signals (BOT/EOT). The other two modes operate in conjunction with the track sequence mode.

To operate in any of the transport sequence modes, both Model 101's must be equipped with the transport sequence option.

The transport sequence cable (16784958-001) is also necessary to interconnect two Model 101's.

Model 101 s with Serial Numbers 0001 through 0093 and 0095 contain control logic card (16781081-001). To accept the transport sequence option, this card will have to be modified to the 16781081-002 configuration. This modification can be simply done in the field by incorporating a field modification kit and inserting a new PROM kit.

How to Operate in Low Tape Transport Sequence Mode 1 Only

Recorder operation during this mode is depicted in Figure 3-2. The basic operation is as follows.

When low tape point (EOT) on the first Model 101 is reached, a transfer signal is sent to the second Model 101. When the second unit reaches phase lock, the microcomputer directs the first Model 101 to rewind in the fast mode. There is a 5-second record overlap at the transfer points so data is not lost.

You can program the Model 101 to unspool tape after rewind or to stop at BOT by positioning jumper J11 on the MPU card. Jumper locations are shown in Figure 5-10.

Jumpers J13 and J9 are not active during this mode. They can be either in or out.

Figure 3-2A shows recorder operation with J11 out. Note that recorder 1 rewinds in the fast mode and spools tape off the takeup reel, and recorder 2 spools tape off of the supply reel at EOT. This ends the sequence.

However, if you reload recorder 1 and establish the ready condition before recorder 2 reaches EOT, recorder 2 then will send a transfer signal to recorder 1. When recorder 1 reaches phase lock, recorder 2 will rewind in the fast mode and spool tape off its takeup reel. The sequence will continue indefinitely as long as the spent recorder is reloaded and put in ready.

With jumper J11 in, operation is as shown in Figure 3-2B. Note that when both recorders reach EOT, they rewind fast and stop at BOT to wait for the transfer signal from the recording Model 101. And, the sequence continues indefinitely.

Here's how to set up two Model 101's to operate in the transport sequence mode 1 only:

1. Interconnect the RMT receptacles of two Model 101's using the special transport sequence cable, 16784958-001. The black index mark on the plastic pull tab of the cable plugs must go to the top of the RMT receptacle for proper connection.
2. On both Model 101's:
   - Load tape and establish the ready condition, STOP indicator lighted.
   - Position J11 as desired, see Figures 3-2 and 5-10.

   NOTE

   The preset low tape switches S1 and S2 on the control logic card are not active during this mode. The low tape points are selected by the transport sequence program.

   - Select LOW TAPE.
   - Select TRANS SEQ.
   - Select Speed.

(Cont. on page 3-18)

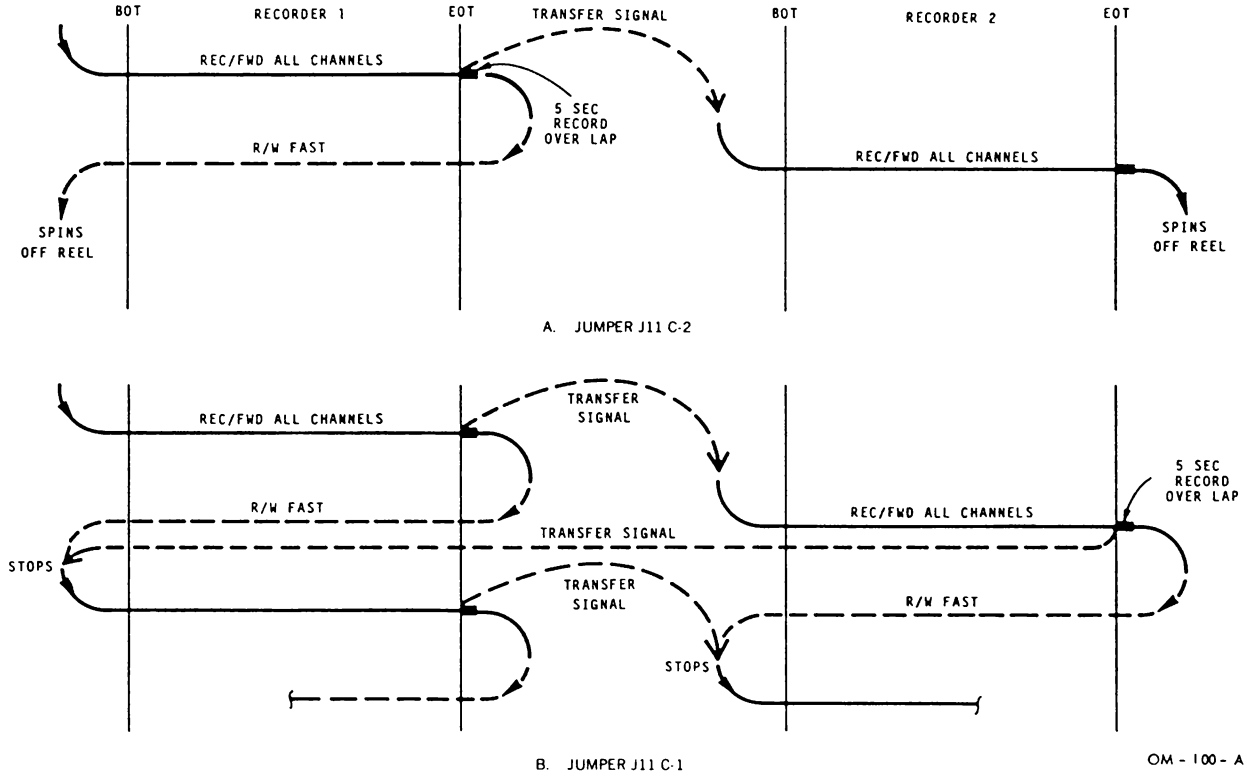


FIGURE 3-2. LOW TAPE TRANSPORT SEQUENCE MODE 1

3. Select FWD/REC (Not REV) on one of the recorders.
4. **To exit the mode,** deselect TRANS SEQ or LOW TAPE. You can also exit the mode by selecting STOP and either TRK SEQ, SHTL, or CAL

NOTE

If you want to drive tape FWD or REV when unspooling or loading tape, deselect TRANS SEQ on the standby recorder. Then reselect, TRANS SEQ to continue the mode.

How to Operate in Track SEQ/Transport SEQ Mode 2

The operation is the same as track sequence (page 3-6) except the second Model 101 is instructed to start recording when the first Model 101 has completed its track sequence program.

In this mode, most features of the track sequence and shuttle programs are active. You can program the Model 101's to record FWD or REV on selected tracks between desired shuttle points or you can program it to record FWD, rewind fast or slow, etc.

Figure 3-3 shows two examples of this mode. Figure 3-3A shows operation with both recorders programmed to stop after their tapes have been recorded. Transfer occurs when the track sequence program is completed. If the track sequence program ends at the high shuttle point, the recorders will rewind and stop. If the program ends at the low shuttle point, the recorders stop at that point.

Both recorders can be programmed to stop after completing their respective track sequence programs or to repeat the Jumper J13 on the MPU card.

Jumper J9 selects mode 2 or 3. Jumper J11 is not active during modes 2 or 3. It can be in or out. Here's how to set up two Model 101's to operate in the combined trace sequence/transport sequence mode 2.

1. Interconnect the RMT connectors of two Model 101's using the special transport sequence cable, 16784958-001. The black index mark on the plastic pull tab of the cable plug must go toward the top of the RMT receptacle for proper connection.
2. On both Model 101's:
   - Insert jumper J9 on the MPU card. See Figure 5-10.
   - Position jumper J13 as desired. See transport seq/track seq mode 2 diagram (Figure 3-3) and Figure 5-10.

NOTE

—If fast reverse is selected, the memory for the reverse track must be blank

—Fast forward from low tape or a shuttle point is an invalid mode.

—A shuttle stop at low tape or a shuttle point is an invalid mode.

   - Program desired track sequence program. See page 3-6.
   - Program desired shuttle points from keyboard (page 3-2), or use preset low tape shuttle points (page 3-4).
   - Load tape and establish the ready condition, STOP indicator lighted.
   - Select TRK SEQ.
   - Select TRANS SEQ.
   - Select speed.
3. Select FWD/REC (not REV) on either recorder.
4. **To exit mode,** deselect TRANS SEQ. You can also exit the mode by selecting LOW TAPE or SHTL modes.

How to Operate in Track SEQ/Transport SEQ Mode 3

Recorder operation is depicted in Figure 3-4. In this mode, both Model 101's must have identical track sequence programs and be programmed to record in the forward direction only. Rewind in the fast mode is automatically fixed by the program.

Here's how to set up two Model 101's to operate in the combined track sequence/transport sequence mode 3.

1. Interconnect the RMT receptacles of two Model 101's using the special transport sequence cable, 16784958-001. The black index mark on the plastic pull tab of the cable plugs must go toward the top of the RMT receptacle for proper connection.
2. On both Model 101's:
   - Remove jumper J9 on the MPU card. See Figure 5-10.
   - Position jumper J13 as desired. See transport seq/track seq. mode 3 diagram (Figure 3-4) and Figure 5-10.
   - Program desired track sequence program. See page 3-6. Both units must be programmed identically for recording in the forward direction only.
   - Program desired shuttle points from keyboard (page 3-2), or use preset low tape shuttle points (page 3-4).
   - Load tape and establish the ready condition, STOP indicator lighted.
   - Select TRK SEQ.
   - Select TRANS. SEQ.
   - Select speed.
3. Select FWD/REC (not REV) on either recorder.
4. **To exit mode,** deselect TRANS SEQ. You can also exit the mode by selecting LOW TAPE, or SHTL modes.

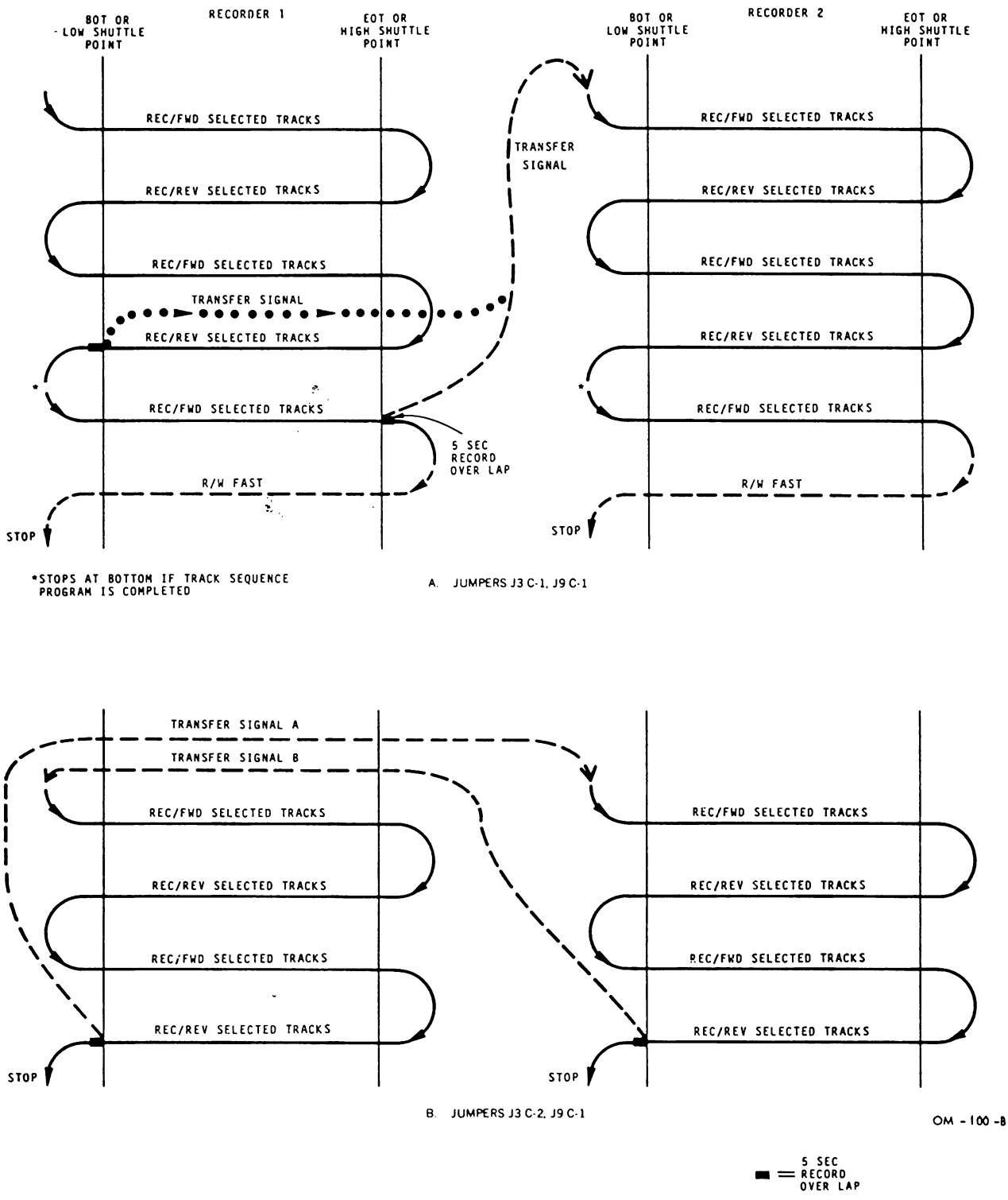


FIGURE 3-3. TRACK SEQUENCE/TRANSPORT SEQUENCE MODE 2

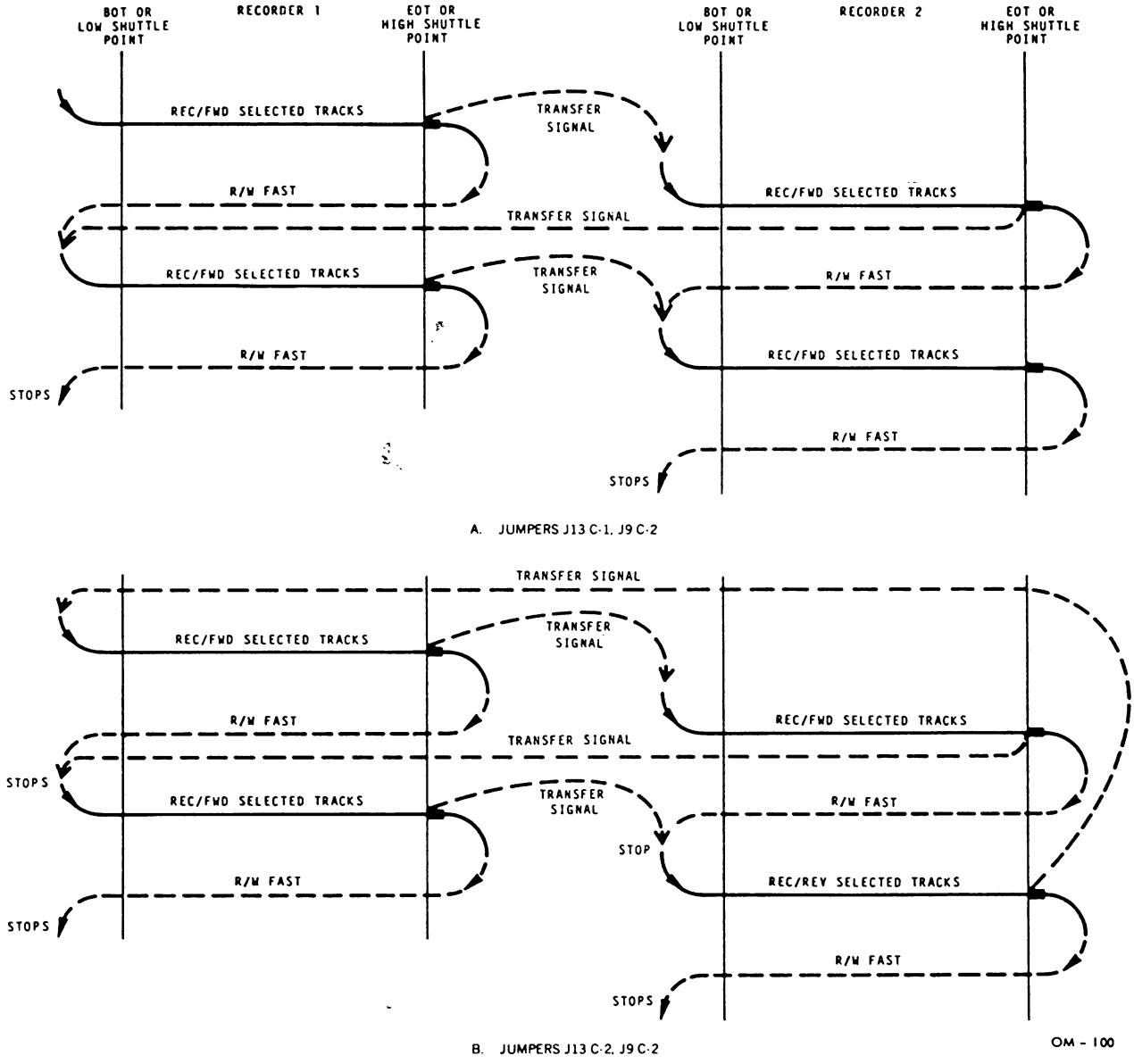


FIGURE 3-4. TRACK SEQUENCE/TRANSPORT SEQUENCE MODE 3

Summary of External Connections

Proper signal levels, input loading and output loading are essential to satisfactory operation of the Model 101. The following paragraphs are intended to give you an overview by input and output connector.

Most input and output connectors are on the Input/Output panel (see Section 1.) Input and output specifications for the Model 101 and its built-in calibration and measurement system are listed in the Back Matter, see Section 7.

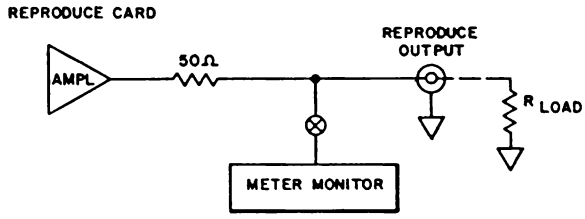
Record Input BNC's

1. Input Impedance = 20K ohms or 76 ohms, selected by jumper pins on the record card, see Section 5.
2. Input Level = 0.1 to 7 volts RMS (direct cards)
   0.5 to 10 volts peak (FM cards)
   Adjustable by Gain Pots

Reproduce Outputs BNC's (16 x 16)

1. Output Level = 1 volt RMS into 50 ohms
2. Output Impedance = 50 ohms
3. Meter Monitor
   Point of measurement is the actual output signal to the REPRODUCE OUTPUT BNC as indicated below.

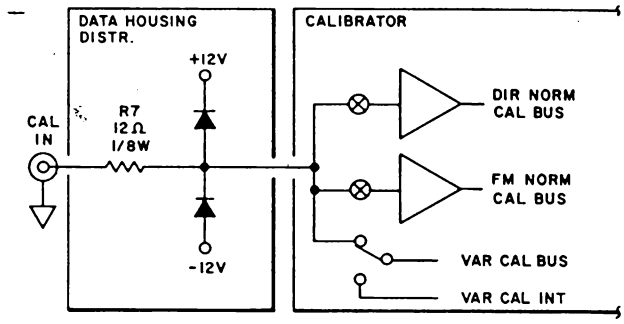
Any change in output loading will show up in the meter monitor reading and affect the auto test measurements (see Section 4).



4. Because the output voltage is affected by the output load, it is recommended that the load used for auto test be the same as the load used for calibration. If this is not possible then the calibrated voltage must account for any expected loading change. For example, if the Model 101 was calibrated using no loads (open circuit) and you want to run auto test with 50 ohms loads, make the following adjustments: Adjust the reproduce output gain for 2.000 VRMS (direct cards) or 2.828 VDC (FM cards). Now when the 50 ohm load is added the voltage will drop to 1.000 VRMS and 1.414 VDC. There is an additional tolerance error caused by the tolerance of the output impedance/load impedance tolerances.

External Cal In

The CAL IN BNC allows you to apply externally generated calibration signals to the Model 101. You can select the CAL IN BNC from the control panel. If the EXT LED on the control panel is lit, the CAL IN BNC is applied to the selected CAL bus as shown below.

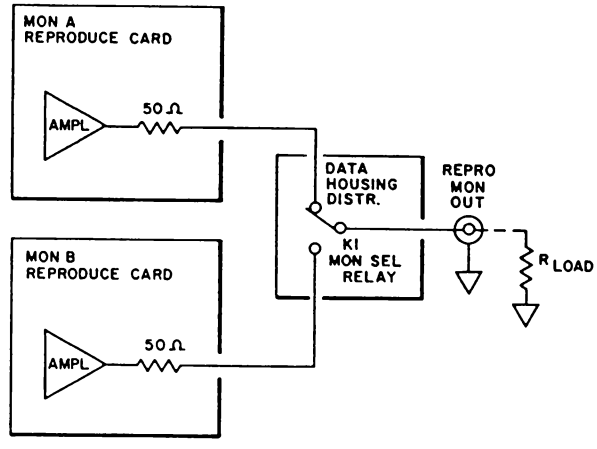


The external CAL signal should not exceed 10 volts peak or distortion will result. Higher signals may destroy R7 which provides circuit protection for the calibrator and record cards.

Reproduce Monitor (32 x 2)

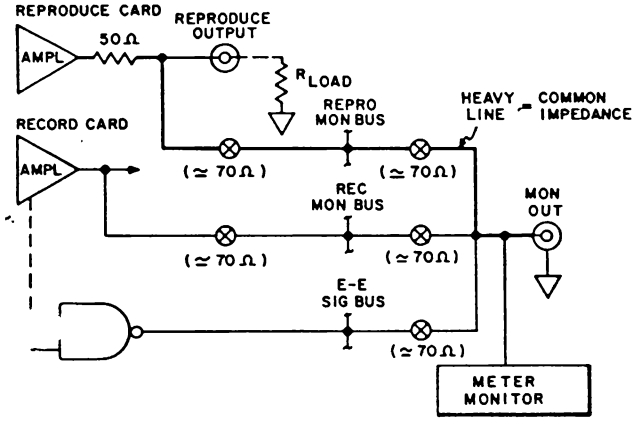
The reproduce monitor output (REPRO MON OUT BNC) for Model 101 with the 32 x 2 data housing is similar to the reproduce outputs of the 16 x 16 versions. So all the information for reproduce (16 x 16) above applies to the reproduce monitor output.

The signal appearing at the BNC is either MON A or MON B as selected automatically by the MPU or manually from the channel selector (MON SEL).



Monitor Output

The MON OUT BNC provides a convenient means of monitoring the input to the internal meter monitor. Any load applied to the MON OUT BNC affects meter monitor readings because of common internal impedances. The recorder REPRODUCE OUTPUTS may also be affected by low impedance loads on the MON OUT BNC.



Microphone

The Model 101 headset assembly microphone plugs into the MICROPHONE jack. The BNC connector is for patching the microphone output to the desired RECORD INPUT BNC. Instruction for using these connectors are covered under the side head "How to use the Voice Option" in this section.

Auxiliary Input BNC's

The AUX in CH 16 or AUX in 32 BNC is used to reinject the servo reference carrier into the optional servo reference card when extracting multiplexed data. Complete instructions for using this connector are covered under the side head "How to Servo from Tape using Optional Servo Reproduce Amplifier-Multiplex" in this section.

External Ref

The EXT REF BNC allows you to use an externally generated servo reference signal. The external reference signal is applied to the bias, clock, and reference generator card. A jumper on the card selects internal or external reference clock.

SECTION 4
Calibration

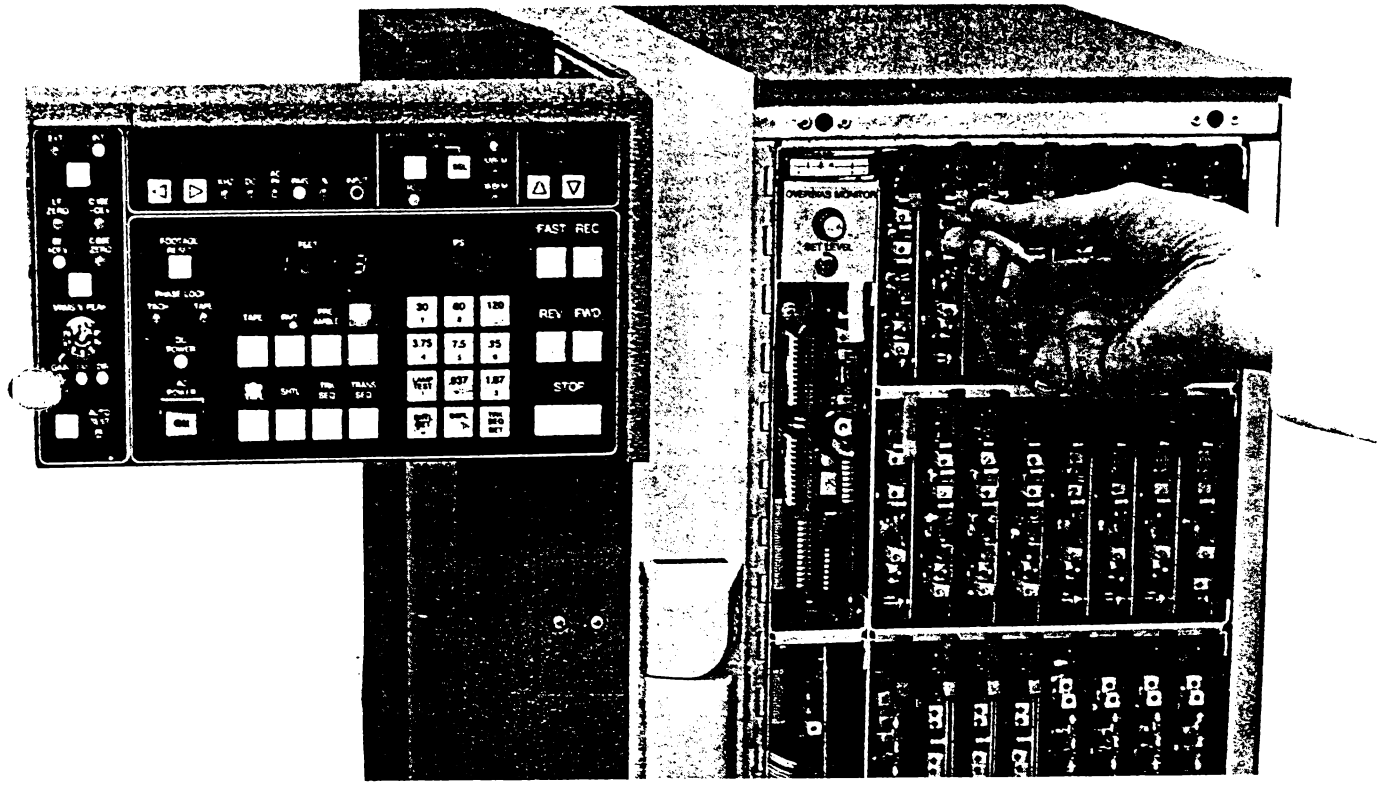


FIGURE 4-1. MODEL 101 SETUP FOR CALIBRATION

What This Section Contains

This section contains the information necessary for you to understand the built-in calibration and measurement system, and how to calibrate the system. You should read and understand the description before calibrating the system.

The Model 101 is easy to calibrate. The control panel swings out so you can see it while adjusting the data cards in the data housing.

Figure 4-1 shows the Model 101 setup for calibration.

So to begin, just remove the data housing cover, position the control panel door, open the flap of Figure 4-2 or observe the adjustment locations on the front door, then follow the step-by-step procedures in this section.

Description of Calibration

To calibrate a magnetic tape recorder/reproduce system certain test equipment is necessary:

FM SYSTEM	
DC Voltage Source	Stimulus
Frequency Counter	Measurement
DC Voltmeter	Measurement
AC Voltmeter	Measurement
DIRECT SYSTEM	
Frequency Generator	Stimulus
AC Voltmeter	Measurement
Distortion Analyzer	Measurement

In the Model 101, this equipment is built-in.

The stimulus generator portion of the calibrator contains a sine wave synthesizer that generates the sine wave frequencies required to calibrate the direct channels. The dc voltage source necessary to calibrate the FM channels is also in the calibrator.

The channel selector dictates the channel to be stimulated and from which measurements are taken.

The meter monitor contains both an AC and DC voltmeter, frequency counter and distortion analyzer.

The overbias monitor is an analog meter for setting bias.

Figure 4-3 is a block diagram of the system, showing typical data channels connected to the measurement system. The diagram shows the 16 × 16 or 16 × 2 × 14 system. However, the principle of internal calibration is the same for all versions of the Model 101.

You can see from Figure 4-3 that the Model 101 includes the internal busing network to interconnect the measurement system and the data electronics, making possible a complete calibration without external cables.

Gain Calibration

(See Figure 4-3.) The variable VRMS/V PEAK dial potentiometer can be set to simulate voltages for different record amplifier input levels. Thus each channel can be adjusted for different input levels. The channel input gain is then set for a normalized 1 Vrms.

The calibrator generates a low frequency sine wave. The

Open This Flap

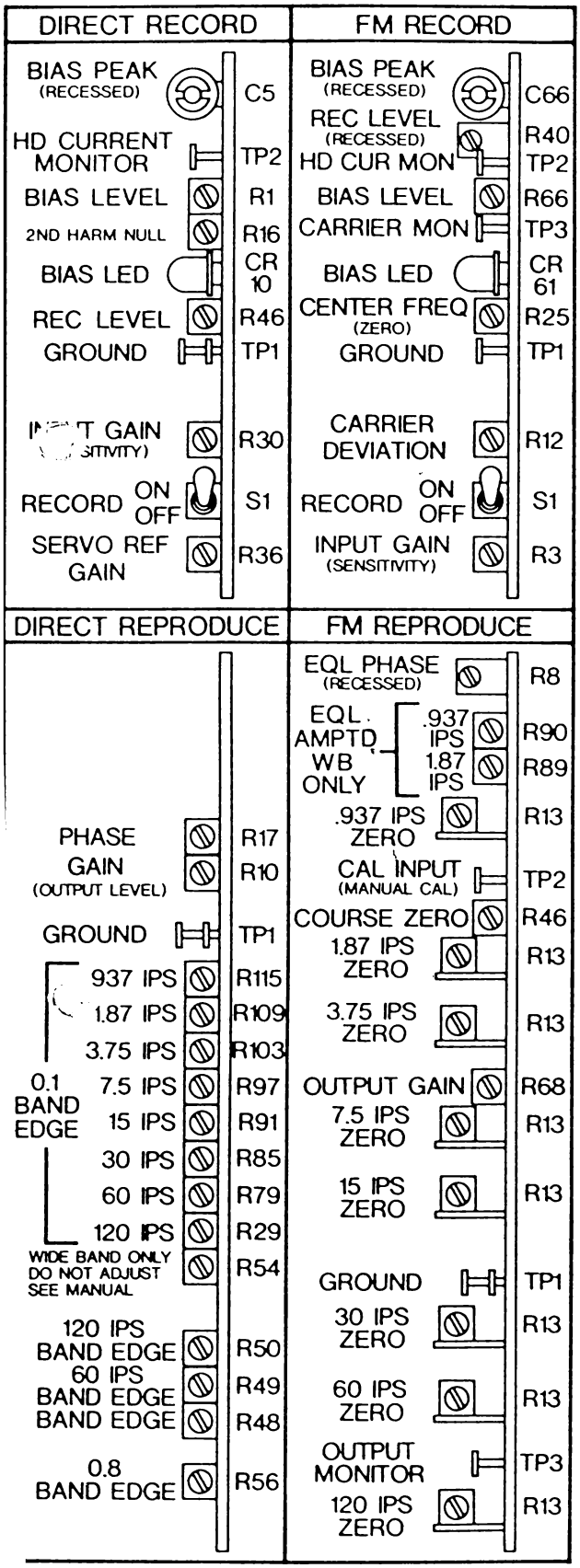


FIGURE 4-2. ADJUSTMENT LOCATIONS AND DATA

FM SPEED, BANDWIDTH, DEVIATION					
MEDIUM BAND		TAPE SPEED IPS		WIDEBAND II	
Bandwidth	Deviation kHz −40/0/+40%	Inter-mediate	WBI WBII	Deviation kHz −30/0/+30%	Bandwidth
80	259.2/432 604.8	–	120	630 900 1170	500
40	129.6 216 302.4	120	60	315 450 585	250
20	64.8 108 151.2	60	30	157.5 225 292.5	125
10	32.4 54 75.6	30	15	78.75 112.5 146.25	62.5
5	16.2 27 37.8	15	7-1/2	39.37 56.25 73.12	31.2
2.5	8.1 13.5 18.9	7-1/2	3-3/4	19.68 28.12 36.56	15.6
1.25	4.05 6.75 9.45	3-3/4	1-7/8	9.84 14.06 18.28	7.1
0.625	2.025 3.375 4.725	1-7/8	15/16	4.92 7.03 9.14	3.9
0.312	1.012 1.687 2.362	15/16	–	———	–
0.156	0.506 0.843 1.181	–	–	———	–

RECORDING TIME – TAPE LENGTH – REEL DIAMETER									dB - Ratio Conversion	
Tape Speed	¼" Plastic Reel-7"		10½" Reel		14"	14"/15"	15"/16"	16"	dB	E/E
(ips)	1200'	2400'	3600'	4600'	7200'	9200'	10800'	12500'	1	1.12
240	1 m	2 m	3 m	3.8 m	6 m	7.7 m	9 m	10.4 m	2	1.26
120	2 m	4	6 m	7.7 m	12 m	15.3 m	18 m	20.8 m	3	1.41
60	4 m	8	12 m	15.3 m	24 m	30.6 m	36 m	41.7 m	4	1.58
30	8 m	16	24 m	30.6 m	48 m	1.0 h	1.2 h	1.4 h	5	1.78
15	16 m	32	48 m	1.0 h	1.6 h	2.0 h	2.4 h	2.8 h	6	1.99
7½	32 m	64	1.6 h	2.0 h	3.2 h	4.1 h	4.8 h	5.6 h	7	2.24
3¾	64 m	2.1 h	3.2 h	4.1 h	6.4 h	8.2 h	9.6 h	11.1 h	8	2.50
1⅞	2.1 h	4.3 h	6.4 h	8.2 h	12.7 h	16.3 h	19.2 h	22.2 h	9	2.82
15/16	4.3 h	8.5 h	12.7 h	16.3 h	25.6 h	32.7 h	38.4 h	44.4 h	10	3.16
RECORD TIME IN NEAREST 1/10 HOUR OR 1/10 MINUTE									11	3.55
									12	3.98
									13	4.46
									14	5.01
									15	5.63
									16	6.30
									17	7.08
									18	7.95
									19	8.92
									20	10.00
									40	100
									60	1000
									80	10000

WIDE BAND kHz				
SPEED IPS	LF	0.1BE	0.8BE	BE
120	3	200	–	–
60	3	100	800	1000
30	3	50	400	500
15	3	25	200	250
7.5	1.5	12.5	100	125
3.75	1.5	6.25	50	62.5
1.87	0.75	3.125	25	31.25
.937	0.75	1.5625	12.5	15.625

MEDIUM BAND kHz				
SPEED IPS	LF	0.1BE	0.8BE	BE
120	1	60	480	600
60	1	30	240	300
30	1	15	120	150
15	1	7.5	60	75
7.5	0.5	3.75	30	37.5
3.75	0.5	1.875	15	18.75
1.87	0.25	0.9375	7.5	9.375
.937	0.25	0.46875	3.75	4.6875

amplitude of the sine wave is controlled by the dial potentiometer.

When you select the calibration and stop modes at the control panel, the microcomputer opens the data channel and connects the **VAR CAL (GAIN) BUS** to the input of the selected channel. The **RECORD MON BUS** is also connected to the meter monitor so the output of the record channel can be measured. The microcomputer also selects the **RMS** scale for measurement and lights the **GAIN** indicator. Now all you have to do is set the dial potentiometer to the input level desired and adjust the input GAIN on the record amplifier for 1 Vrms on the meter monitor.

In this same manner, you can quickly adjust input gain on all channels. Just select channels as desired.

The dial potentiometer is calibrated in Vrms for direct channels and V peak for FM channels.

See page 4-2 for the step-by-step gain calibration procedure.

Overbias

The overbias monitor is used to monitor bias.

When you select the calibration mode, the microcomputer connects the overbias output of the channel selected to the overbias monitor.

Selecting the **FWD/REC** mode automatically applies the bandedge (BE) stimulus to the normalized input of the selected channel if the channel is direct or the +DEV stimulus if the channel is FM.

Now all you have to do is set overbias. The overbias is the first step of the calibration procedure (see Table 4-1 for FM calibration procedure and Table 4-2 for the direct procedure).

FM Calibration

The way to calibrate an FM channel is to apply zero volts and dc voltages that will cause plus (+) and minus (−) full scale deviation of the carrier frequency to the VCO in the record amplifier and measure the output frequency with a frequency counter. The Model 101 does just that.

You initiate FM calibration by pressing the **CAL** and **REC** pushbuttons.

The calibration is performed without moving tape. This is defined as electronics-to-electronics (E-to-E) or end-to-end calibration.

When CAL and REC is initiated, the microcomputer connects the **FM NORM CAL BUS** to the normalized input of the selected record amplifier and applies the zero stimulus. It also automatically connects the **FREQ MON BUS** (output of record amplifier VCO) to the **E-E SIG BUS.** This is accomplished through the data housing logic.

The microcomputer then connects the **E-E SIG BUS** to the meter monitor and selects **KHZ** for measurement. Thus the output frequency of the VCO is connected to the meter monitor for frequency measurements.

Now you can set the VCO for center frequency and carrier deviation by cycling the Freq/Dev stimulus control switch and adjusting the appropriate potentiometer.

The E-E bus is also connected to the selected channel reproduce amplifier, but the output is not connected to the meter monitor until you select the **REPRO MON BUS** for measurement by pressing the **REPRO/REC** pushbutton on the channel selector.

When the **REPRO/REC** pushbutton is pressed the microcomputer automatically connects the REPRO MON BUS to the meter monitor and selects the **DC** scale for measurement.

Now you can make the adjustments for the reproduce amplifier. See Table 4-1 for the step-by-step calibration procedure.

Direct Calibration.

The direct channels are calibrated by applying four speed-dependent sine wave frequencies at 1 Vrms to the normalized input of the record amplifier selected for calibration and measuring the output of the reproduce amplifier.

The calibrator generates the four sine wave signals corresponding to low frequency (LF), 0.1 bandedge (BE), 0.8 BE and BE for the tape speed selected.

You can select these frequencies by pressing the Freq/Dev stimulus control (rotary-action) pushbutton on the front of the calibrator. The four indicators above the pushbutton indicate the particular sine wave frequency applied to the **DIR NORM CAL BUS.**

Calibration of a direct channel is made with tape moving. You initiate the calibration by pressing the **CAL** and **FWD/REC** pushbuttons.

The microcomputer then opens the data input to the selected channel, connects the **DIR NORM BUS** to its normalized input, selects the BE stimulus, and connects the **REPRO MON BUS** to the meter monitor.

The system is now ready for you to perform the step-by-step calibration procedure, see Table 4-2.

Auto Test

The auto test is a complete channel-by-channel self-test of the Model 101. It lets you make a last-minute verification of calibration before recording data.

The microcomputer, using the stimulus generators in the calibrator, connects test signals to the record amplifier and simultaneously disconnects the data input. The output of the reproduce amplifier is connected to the meter monitor. The measurements displayed are compared to a GO/NO-GO table in memory. If all parameters for a channel are within limits, the program advances to the next channel. If an output is outside the limits, tape motion stops and the **CAL** indicator flashes. If an output falls outside the limits you can either increment to the next channel and continue the sequence or bring the rejected channel within limits, by entering the CAL mode and making the appropriate adjustment.

If all active channels pass the auto test, the AUTO TEST indicator will extinguish.

Amplifier slots with no cards installed and amplifiers that have been disabled by the card-edge switches are bypassed.

When the test is initiated by pressing **CAL, AUTO TEST** and **FWD/REC** pushbuttons, the microcomputer will step to the first active channel.

If the channel is FM, it will apply the stimulus in sequence: ZERO, −DEV, and +DEV.

If the channel is direct, it will apply the 1 Vrms sine wave frequency in sequence: LF, 0.1 BE, 0.8 BE and BE.

The system will not auto test direct channels at 120 IPS.

For the auto test procedure, see page 4-9.

Procedures

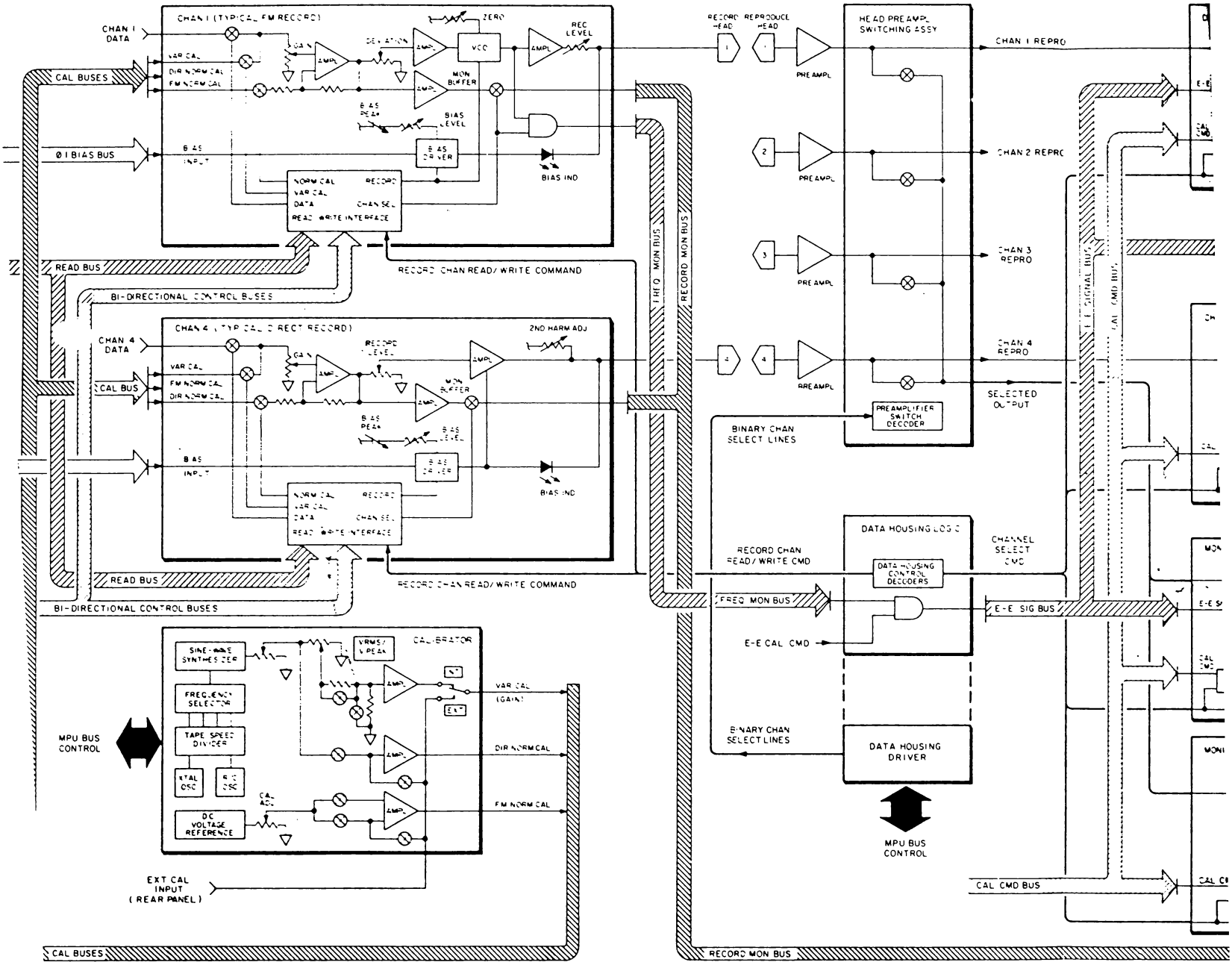
How To Set Input Gain—Direct or FM

Using the variable VRMS/V PEAK dial potentiometer (Figure 2-1), each channel can be calibrated for a different input level. The record channel input gain (sensitivity) is then adjusted for a normalized 1 Vrms for the level set on the dial potentiometer.

NOTE

The dial is calibrated in Vrms for direct record and V peak for FM record amplifiers.

(continued on page 4-9)


CHAN 1 (TYPICAL FM RECORD)
CHAN 1 DATA
VAR CAL
DIR NORM CAL
FM NORM CAL
CAL BUSES
GAIN
AMPL
DEVIATION
ZERO
VCO
MON BUFFER
REC LEVEL
BIAS PEAK
BIAS LEVEL
Ø1 BIAS BUS
BIAS INPUT
BIAS DRIVER
BIAS IND
NORM CAL
VAR CAL
DATA
READ
WRITE
RECORD
CHAN SEL
INTERFACE
READ BUS
RECORD CHAN READ/WRITE COMMAND
BI-DIRECTIONAL CONTROL BUSES
CHAN 4 (TYP CAL 2 RECT RECORD)
CHAN 4 DATA
2ND HARM ADJ
RECORD LEVEL
FM NORM CAL
DIR NORM CAL
CAL BUS
BIAS PEAK
BIAS LEVEL
BIAS INPUT
BIAS IND
READ BUS
RECORD CHAN READ/WRITE COMMAND
BI-DIRECTIONAL CONTROL BUSES
FREQ MON BUS
RECORD MON BUS
RECORD HEAD
REPRODUCE HEAD
HEAD PREAMP SWITCHING ASSY
PREAMP
CHAN 1 REPRO
CHAN 2 REPRO
CHAN 3 REPRO
CHAN 4 REPRO
SELECTED OUTPUT
PREAMPLIFIER SWITCH DECODER
BINARY CHAN SELECT LINES
DATA HOUSING LOGIC
DATA HOUSING CONTROL DECODERS
RECORD CHAN READ/WRITE CMD
CHANNEL SELECT CMD
E-E SIG BUS
E-E CAL CMD
DATA HOUSING DRIVER
MPU BUS CONTROL
CAL CMD BUS
CALIBRATOR
SINE-WAVE SYNTHESIZER
VRMS/VPEAK
FREQUENCY SELECTOR
TAPE SPEED DIVIDER
XTAL OSC
DC VOLTAGE REFERENCE
CAL ADJ
INT
EXT
VAR CAL (GAIN)
DIR NORM CAL
FM NORM CAL
MPU BUS CONTROL
EXT CAL INPUT (REAR PANEL)
CAL BUSES
RECORD MON BUS

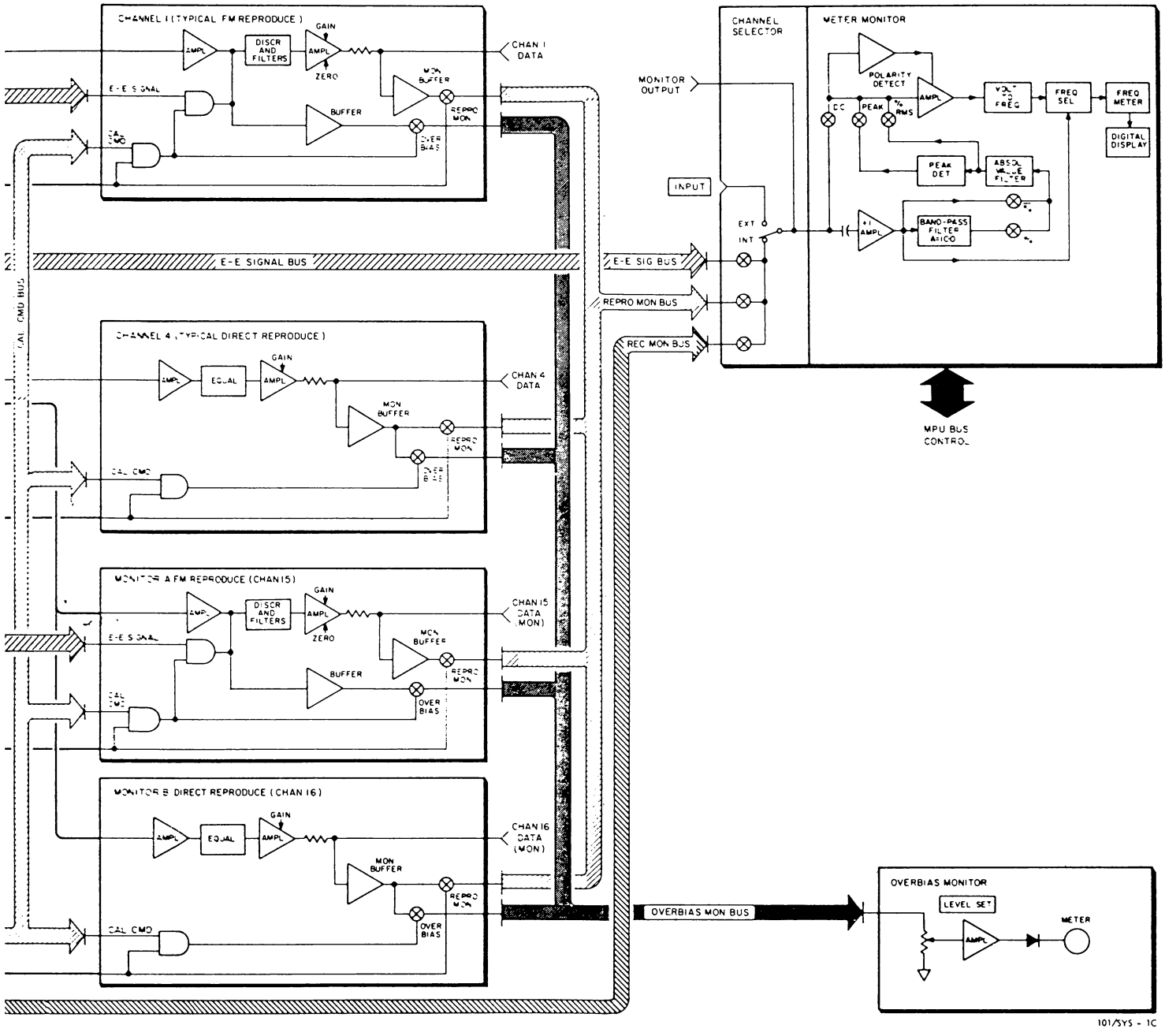


FIGURE 4-3. CALIBRATION SYSTEM BLOCK DIAGRAM

FM Channel Calibration Procedure

This procedure explains how to calibrate an FM channel using the internal calibration system, calibrator, meter monitor, channel selector and overbias monitor.

1. Load a clean well-degaussed test tape of the proper type and place the transport in a ready condition.
2. Set the main control panel, calibrator, meter monitor and channel selector as indicated for each step as shown in the table.
3. After establishing the control panel conditions, perform the indicated operations listed in the procedure column. The complete control panel status is shown for each step. The changes you must make from step-to-step are highlighted by the black arrow. To change the stimulus, press the Freq/Dev pushbutton until the stimulus indicator listed in the CAL STATUS COLUMN is lighted.

   The location of adjustments are shown on the front door and in Figure 4-2. All adjustments can be made with an alignment tool without using card extenders. FM speed, bandwidth and deviation data is also shown in Figure 4-2.

NOTE

The **RECORD LEVEL** (R40) is set at the factory. It does not normally need adjustment as part of the routine calibration procedure. However, should you need to adjust RECORD LEVEL, the procedure is in Section 5 of the FM Record Manual.

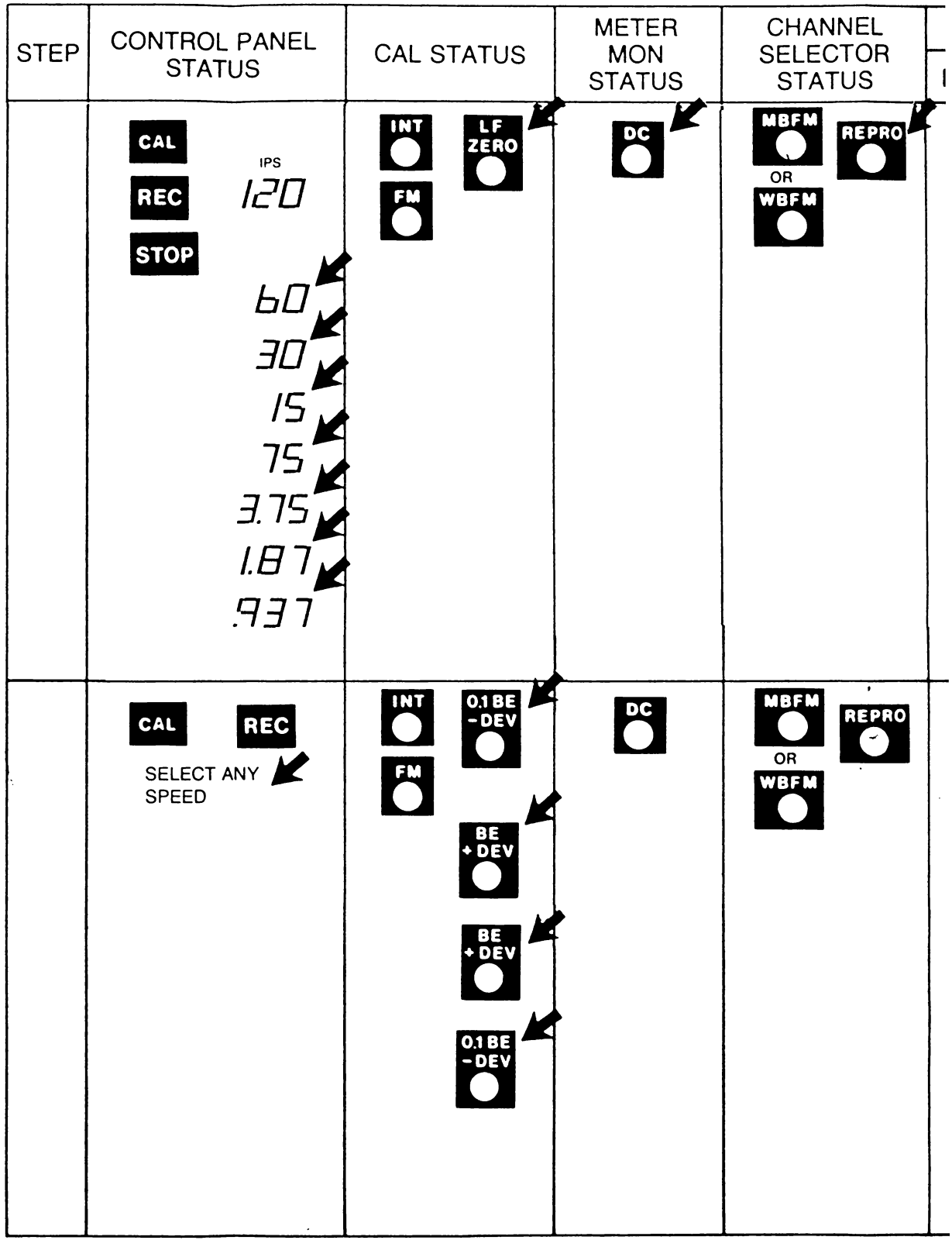
The **MON ZERO** (R5) is set at the factory. It is used to balance the input buffer circuit. Adjustment will usually not be necessary unless there is a failure of one of the buffer circuit components. This adjustment procedure is also in Section 5 of the FM Record Manual.

TABLE 4-1. FM CALIBRATION PROCEDURE (SHEET 1 OF 2)

STEP	CONTROL PANEL STATUS	CAL STATUS	METER MON STATUS	CHA SELE STA
1	CAL, IPS 60, REC, FWD	INT, BE +DEV, FM, DIRECT	RMS	MB M OR WB M
2	CAL, IPS 120, REC, STOP	INT, LF ZERO, FM	KHZ	MB M OR WB M
3	CAL, IPS 120, REC, STOP	INT, 0.1 BE -DEV, FM	KHZ	MB M OR WBFM
4	CAL, IPS 120, REC, STOP	INT, BE +DEV, FM	KHZ	MBFM OR WBFM
5	CAL, IPS 120, REC, STOP	INT, BE +DEV, FM	KHZ	MBFM OR WBFM
6	CAL, IPS 120, REC, STOP	INT, 0.1 BE -DEV, FM	KHZ	MBFM OR WBFM

NOTE: Only lighted indicators are shown

CHANNEL SELECTOR STATUS	ADJUST		PROCEDURE
	REC.	REPRO	
MBFM REPRO OR WBFM	X		**a.** Turn **BIAS LEVEL** (R66) CCW until reading on the over-bias monitor (OBM) is well below peak. Use LEVEL SET ON OBM to keep meter near center of scale. **b.** Adjust **BIAS PEAK** (C66) for peak on OBM. **c.** Adjust **BIAS LEVEL** (R66) CW for peak on OBM. **d.** Repeat steps a thru c until C66 requires no further adjustment.
MBFM REC OR WBFM	X		Adjust **CENTER FREQ** (R25) for reading on meter monitor IB 216(±.1)kHz WBI 432(±.1)kHz WBII 900(±.1)kHz
MBFM REC OR WBFM	X		Adjust **CARRIER DEVIATION** (R12) for: IB 129.6(±.1)kHz WBI 259.2(±.1)kHz WBII 630(±.1)kHz
MBFM REC OR WBFM			Check Frequency + deviation for: IB 302.4(±.9)kHz WBI 604.8(±1.7)kHz WBII 1170.0(±2.7)kHz
MBFM REC OR WBFM	X		Adjust **CARRIER DEVIATION (R12)** to reduce error in step 4 to one-half its former value. IB 302.4(±.45)kHz WBI 604.8(±.85)kHz WBII 1170.0(±1.35)kHz
MBFM REC OR WBFM			Check Frequency deviation for: IB 129.6(±.45)kHz WBI 259.2(±.85)kHz WBII 630(±1.35)kHz



NOTE: Only lighted indicators are shown

TABLE 4-1. FM CALIBRATION PROCEDURE (SHEET 2 OF 2)

IEL 'OR JS	ADJUST REC.	ADJUST REPRO	PROCEDURE
EPRO			
		X	a. Adjust **120 IPS ZERO (R13)** for middle of potentiometer range.
		X	b. Adjust **COURSE ZERO (R46)** for 0 ±.05.
		X	c. Adjust **120 IPS ZERO (R13)** for 0 ±.002.
		X	d. Adjust **60 IPS ZERO (R13)** for 0 ±.002.
		X	e. Adjust **30 IPS ZERO (R13)** for 0 ±.002.
		X	f. Adjust **15 IPS ZERO (R13)** for 0 ±.002.
		X	g. Adjust **7.5 IPS ZERO (R13)** for 0 ±.002.
		X	h. Adjust **3.75 IPS ZERO (R13)** for 0 ±.002.
		X	i. Adjust **1.87 IPS ZERO (R13)** for 0 ±.002.
		X	j. Adjust **.937 IPS ZERO (R13)** for 0 ±.002.
EPRO			
		X	a. Adjust **OUTPUT GAIN (R68)** for −1.414 (±.002) V dc.
			b. Check for +1.414 (±.028) V dc.
		X	c. Adjust **OUTPUT GAIN (R68)** to reduce error in step b above to one-half its former value (+1.414 ±.014).
			d. Check for −1.414 (±.014).

Direct Channel Calibration Procedure

This procedure explains how to calibrate a direct channel (mediumband or wideband) using the internal calibration system, calibrator, meter monitor, channel selector, and overbias monitor (OBM). (See Figure 4-2.)

1. Load a clean, well-degaussed test tape of the proper type and place the transport in the ready condition.
2. Set the main control panel, calibrator, meter monitor and channel selector as indicated for each step as shown in Table 4-2.
3. After establishing the complete control panel conditions, perform the indicated operations in the procedure column. The complete control panel status is shown for each step.

   The changes you must make from step-to-step are highlighted by the black arrow. To change the stimulus, press and release the Freq/Dev pushbutton until the stimulus indicator listed in the **CAL STATUS** column is lighted.

   The locations of the adjustments are shown on the front door and in Figure 4-2. All adjustments can be made with an alignment tool without using card extenders.

NOTE

On 32 track direct record/reproduce machines signal strength rolls off when on 120 ips at 700 Hz. This is due to a high pass filter switched in at 120 ips only. This filter can be disabled with decreased signal to noise by cutting jumper W7 on reproduce card or if reproducing a signal below 700 Hz at 120 ips, gain may be turned up to account for this roll off. Direct Reproduce Maintenance Manual (Section 4).

TABLE 4-2. DIRECT CALIBRATION PROCEDURE (SHEET 1 OF 2)

STEP	CONTROL PANEL STATUS	CAL STATUS	METER MON STATUS	CHA SELE STA
1	CAL, FWD, IPS 60, REC	INT, BE +DEV	RMS	DIRECT
2	CAL, FWD, IPS 60, REC	INT, LF ZERO	RMS	DIRECT
3	CAL, FWD, IPS 60, REC	INT, 0.1 BE -DEV	RMS	
4	CAL, FWD, IPS 60, REC	INT, 0.1 BE -DEV	%	DIRECT
5	CAL, FWD, IPS 60, REC			
6	CAL, FWD, IPS 7.5, REC	INT, LF ZERO	RMS	DIREC
7	CAL, FWD, IPS 7.5, REC	INT, 0.1 BE -DEV, 0.8BE ZERO, BE +DEV		DIREC

CHANNEL SELECTOR STATUS	ADJUST		PROCEDURE
	REC	REPRO	
DIRECT ● REPRO ●	X		a. Turn **BIAS LEVEL (R1)** CCW until reading on the overbias monitor meter (OBM) is below peak. Use **LEVEL SET** on OBM to keep meter needle near middle of scale.
	X		b. Adjust **BIAS PEAK (C5)** for peak on OBM.
	X		c. Adjust **BIAS LEVEL (R1)** CW for peak on OBM.
	X		d. Repeat steps a thru c until C5 requires no further adjustment.
	X		e. Adjust **LEVEL SET** on OBM for 0 dB.
			f. Adjust **BIAS LEVEL (R1)** CW for —2dB (WB) or —3dB (MB) reading on OBM.
DIRECT ● REPRO ●		X	Adjust **GAIN (R10)** for 1 Vrms ±.020 RMS on meter monitor.
		X	Adjust **0.1 BE, 60 IPS (R79)** for 1 Vrms ±.020.
DIRECT ● REPRO ●	X		Adjust **REC LEVEL (R46)** for 1.0 ±0.1%.
			Repeat steps 2, 3, and 4 until all are within requirements. If Step 4 required much change, adjust **R1 CCW** for peak. Then repeat Steps **1c** and **1e (BIAS LEVEL adj).** Then repeat Steps **2, 3,** and **4** until all are within requirements.
DIRECT ● REPRO ●		X	Adjust **GAIN (R10)** for 1 Vrms ±0.010. (*See Note)
DIRECT ● REPRO ●		X	a. Adjust **0.1 BE 7.5 IPS (R 97)** for 1 Vrms ±0.010.
		X	b. Adjust **0.8 BE (R56)** for 1 Vrms ±0.010. **NOTE** **If heads are worn the bandedge tolerances may be extended to 0.707 and 1.414.**
		X	c. Adjust **BE (R48)** for 0.9 Vrms ±0.020.
			d. Repeat steps a, b, and c until all are within requirements with no further tuning.

STEP	CONTROL PANEL STATUS	CAL STATUS	METER MON STATUS	CHANNEL SELECTOR STATUS	AD / REC
8	CAL, FWD, REC, IPS .937 → 1.87 → 3.75 → 15 → 30	INT, 0.8BE ZERO	RMS	DIRECT, REPRO	
9	60	INT, 0.1 BE -DEV, BE +DEV	RMS	DIRECT, REPRO	
10	CAL, FWD, REC, IPS 120	INT, 0.1 BE -DEV, BE +DEV	RMS	DIRECT, REPRO	
11	CAL, FWD, REC, IPS 60	INT, BE +DEV			
12	FWD, IPS 120				

TABLE 4-2. DIRECT CALIBRATION PROCEDURE (SHEET 2 OF 2)

ADJUST		PROCEDURE
REC	REPRO	
		NOTE **Make the following 0.1 BE adjustments with the calibrator stimulus frequency set at 0.8 BE.**
	X	**a.** Adjust **0.1 BE, .937 IPS (R115)** for 1 Vrms ±.020.
	X	**b.** Adjust **0.1 BE, 1.87 IPS (R109)** for 1 Vrms ±.020.
	X	**c.** Adjust **0.1 BE, 3.75 IPS (R103)** for 1 Vrms ±.020.
	X	**d.** Adjust **0.1 BE, 15 IPS (R91)** for 1 Vrms ±.020.
	X	**e.** Adjust **0.1 BE, 30 IPS (R85)** for 1 Vrms ±.020.
	X	**a.** Adjust **0.1 BE, 60 IPS (R79)** for 1 Vrms ±.020.
		b. Adjust **60 IPS BE (R49)** for 0.900 Vrms ±0.050.
	X	**c.** Repeat steps a and b until both are correct.
	X	**a.** Adjust **0.1 BE, 120 IPS (R29)** for 1 Vrms ±0.020.
	X	**b.** If medium band, adjust **120 IPS, BE (R50)** for 0.900 Vrms ±0.050.
		c. If wideband, do steps 11 and 12.
		NOTE **Perform Steps 11 and 12 for wideband units only.** **a.** Record the BE signal. Use enough footage to permit adjustment of 120 IPS BE at 120 IPS. **b.** Rewind tape to the footage point that you started recording the BE signal. Then select **STOP.**
	X	Play back recorded signal and adjust **120 IPS BE (R50)** for 0.900 (±.050).

(continued from page 4-2)

1. Select channel.
2. Select **STOP.**
3. Press **CAL** pushbutton. Observe that the following indicators light:

   GAIN on cal panel.

   RMS on meter monitor.

   REC on channel selector.
4. Select **INT.** Observe that the LF/ZERO and INT LED's light.
5. Adjust **VRMS/V PEAK** for desired sensitivity. **REMEMBER** that the dial is calibrated in Vrms for direct and V peak for FM.
6. Adjust **INPUT GAIN** (Figure 4-2) control (R30-DIR) or (R3-FM) for 1 Vrms.
7. Repeat for remaining channels.

How To Auto Test The System

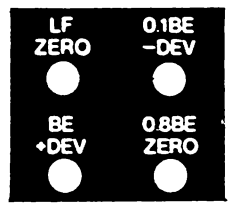
1. Load a clean, well-degaussed test tape of the proper type and place the transport in a ready condition.
2. Select:

   Speed
   CAL
   INT
   AUTO TEST
   FWD/REC
3. Observe that the following indicators are lighted:

   CAL
   AUTO TEST
   INT
   FM
   DIR
   Selected speed
   REC
   FWD

STIMULUS INDICATORS

AT PHASE LOCK THE STIMULUS INDICATOR LIGHTS AS STIMULUS IS APPLIED FOR EACH CHANNEL



4. **If all channels pass auto test,** the control panel status will be as follows:

   AUTO TEST Indicator — Extinguished
   REC Indicator — Extinguished
   FWD Indicator — Extinguished
   STOP Indicator — Lighted
   CAL Indicator — Lighted
5. **If a channel fails auto test,** the control panel status will be as follows:

   CAL Indicator —Flashing
   AUTO TEST Indicator —Lighted
   REC Indicator —Extinguished
   FWD Indicator —Extinguished
   STOP Indicator —Lighted
   CHANNEL DISPLAY —Displays Failed Channel
   Stimulus indicator for out-of-limits test —Lighted

NOTE

Because a speck of dirt or blemish on the tape may cause failure of auto test, always repeat auto test on the failed channels at least once.
To repeat test, push FWD/REC pushbuttons.

6. **If a channel fails auto test the second time,** you can recalibrate immediately or select the next active channel and continue the auto test. Then recalibrate all the out-of-limits channels using the calibration procedures.

   To continue the auto test, increment to the next active channel by pressing [△] on channel selector. Then press **FWD/REC** simultaneously.

   To recalibrate the channel immediately:
   Press **AUTO TEST** Pushbutton to disable. Then calibrate the channel according to the calibration procedures.

NOTE

When you restart the auto test after entering the calibrate mode, the auto test will start at the first active channel. However, you can advance to the desired channel by pressing and holding pressed [△] pushbutton on the channel selector.

How To Adjust Phase-Direct Reproduce

Equipment Required,

SQUAREWAVE GENERATOR: 470 Hz — 2 MHz
OSCILLOSCOPE: dc — 2 MHz
0 — 3 Vp-p

1. Connect squarewave generator to channel input BNC on input/output panel. Adjust generator for 1 Vp-p output at 0.1 BE frequency for 15 IPS (7.5 KHz Mediumband — 25 KHz wideband). See Figure 4-2 for Speed/frequency tables and adjustment locations.
2. Connect oscilloscope to proper channel output BNC.
3. Select 15 IPS.
4. On direct reproduce amplifier, adjust **PHASE** (R17) for waveform below.

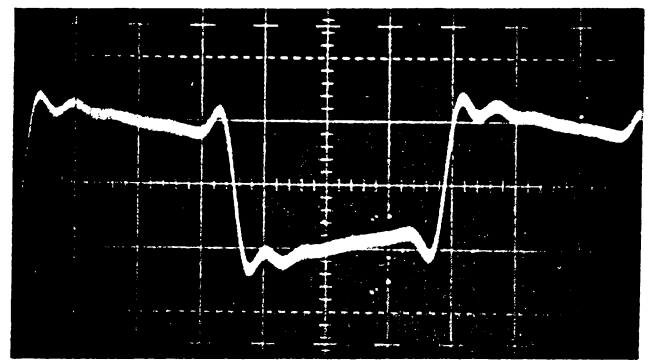


FIGURE 4-4. PHASE-CHECK WAVEFORM

NOTE

The phase adjustment may be optimized for any speed, by applying 0.1 BE squarewave for the speed desired.

5. If test equipment is not available, set PHASE adj (R17) for midrange.

How to Set Up and Calibrate the Voice Option

NOTE

You can make measurements at the test points using the meter monitor in external mode or with external test equipment. If you use the meter monitor, set S7 inside of the panel to **EXT**, select **RMS**, and patch between **INPUT** jack and test point on record card.

1. Before installing the voice record card, set the 4-position program switch pack S2 to CAL function. See Table 3-4.
2. Install voice record card in any desired channel slot. Edge tracks may be used for voice.
3. On voice record card, position toggle switch S1 to ON (up).
4. Install voice reproduce card in the channel slot being used for voice in the reproduce section of the data housing.
5. On Input/Output panel, patch 18-inch BNC cable from MICROPHONE BNC jack to record input BNC of channel being used for voice. Do not insert headset phone plug into MICROPHONE jack at this time.
6. On voice record card, turn BIAS adj (R7) fully CW.
7. Load tape and establish the ready condition.
8. On control panel, select low speed (7.5 IPS is preferred), CAL, FWD/REC, LF/ZERO, and channel being used for voice.
9. On voice record card, adjust REC LEV (R49) for approximately 35 mVrms at TP-2.
10. Select BE/+DEV. The adjust BIAS (R7) for approximately 150 mVrms on wideband systems and 100 mVrms for medium band systems at TP2.
11. On Control panel, select STOP and deselect CAL.
12. Connect microphone by inserting plug into MICROPHONE jack.

NOTE

The GAIN adj (R26) on the voice record card is set at the factory. It does not normally need adjustment. However, if adjustment becomes necessary in the field, peform step 13; otherwise go to step 14.

13. On Control panel, select CAL and REC. Then, while whistling a constant tone into the microphone, adjust GAIN (R26) on the voice record card for approximately 1 Vrms at TP3.
14. On control panel, select CAL, FWD/REC, LF/ZERO, and channel being used for voice.
15. On the voice reproduce card, turn VOLUME adj (R24) fully CW. Set ALC GAIN adj (R14) for approximated 1 Vrms reading on the meter monitor.
16. Connect the headset BNC to the reproduce output BNC of the channel being used for voice. On the control panel, deselect CAL and while talking into the microphone, set volume control adj (R24) for desired level. Readjust record card gain (R26) as required for clear voice reproduction.
17. Turn off power, set 4-position program switch S2 on voice record card for VOX, and re-establish the ready condition.
18. With the microphone and headset connected, and with the microphone very close to your lips, speak and turn the threshold adj (R35) until the first syllable will turn on the LED. This completes the voice option calibration.
19. On voice record card, set program switch S2 to position desired for normal operation. See Table 3-4. Refer to Section 3 for routine operating procedures.

SECTION 5
Internal Jumper Control Setting

This section lists and locates all the internal jumper controls you'll need to operate the Model 101.

The U-shape jumper pins are mounted on circuit cards in their normal position when shipped form the factory.

The function and position of each jumper are listed on the particular circuit card illustration. Only jumpers that affect operation are listed. Jumper controls that are used for troubleshooting, circuit interrupt, etc are covered in the equipment manual for the particular unit.

The following circuit cards have jumped controls with operator significance:

- DIRECT RECORD
- DIRECT REPRODUCE
- FM RECORD
- FM REPRODUCE
- FM REPRODUCE FILTER
- BIAS CLOCK & REFERENCE GENERATOR
- DATA HOUSING DRIVER
- CONTROL LOGIC
- VOICE
- DUAL REEL SERVO

NOTE: JUMPER LOCATIONS ARE THE SAME FOR BOTH MEDIUMBAND AND WIDEBAND

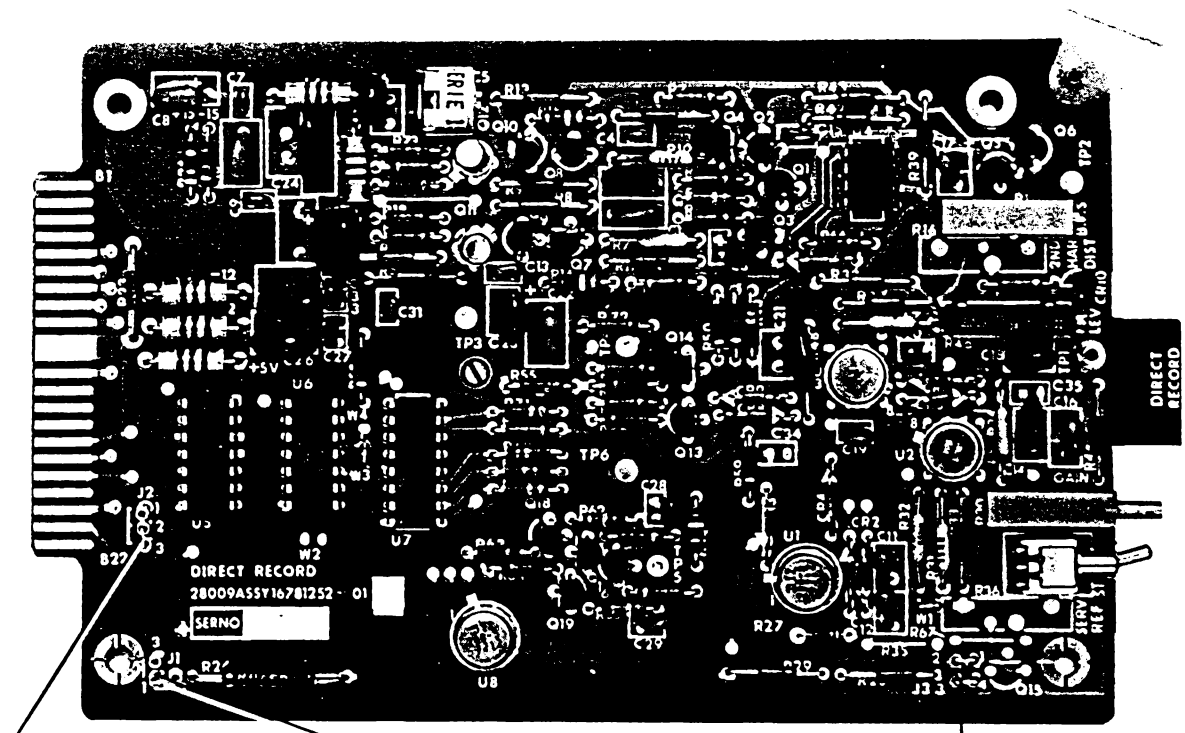


FIGURE 5-1. DIRECT RECORD CARD

NOTE: JUMPERS THE SAME FOR BOTH MEDIUMBAND AND WIDEBAND

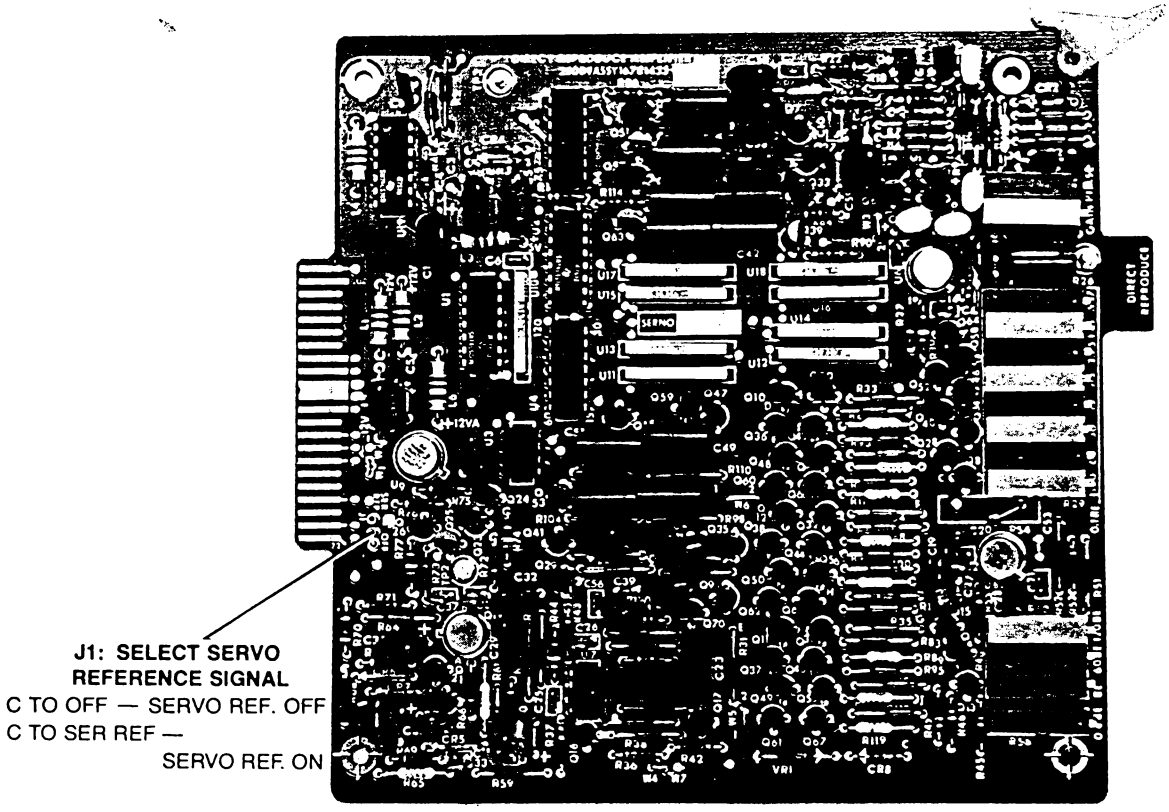


FIGURE 5-2. DIRECT REPRODUCE

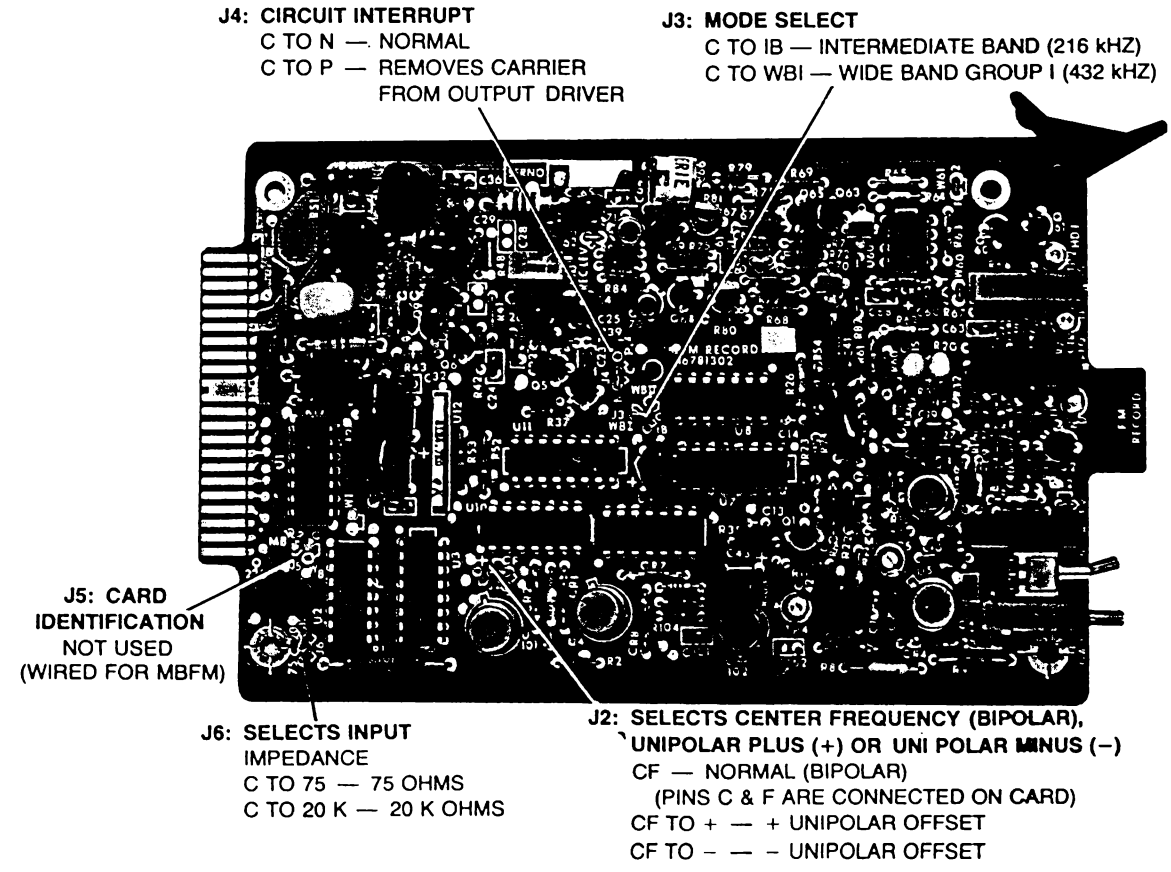


FIGURE 5-3. FM RECORD MBFM

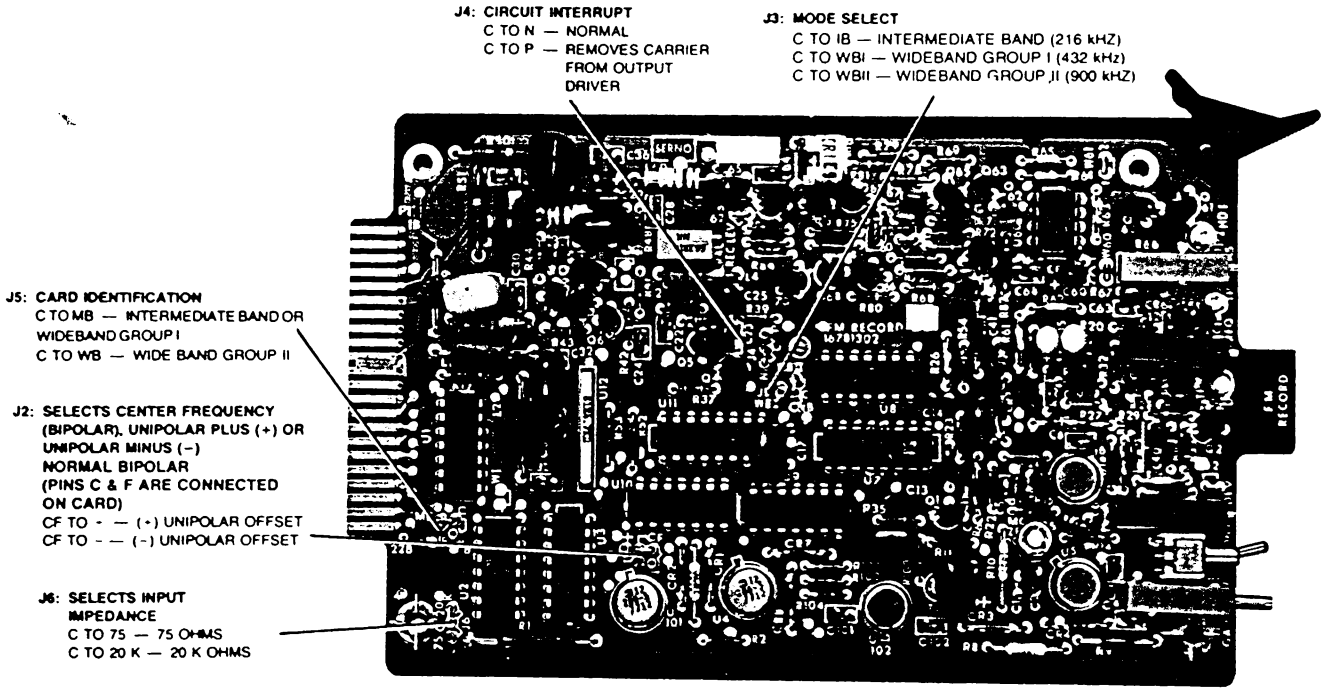


FIGURE 5-4. FM RECORD CARD WBFM

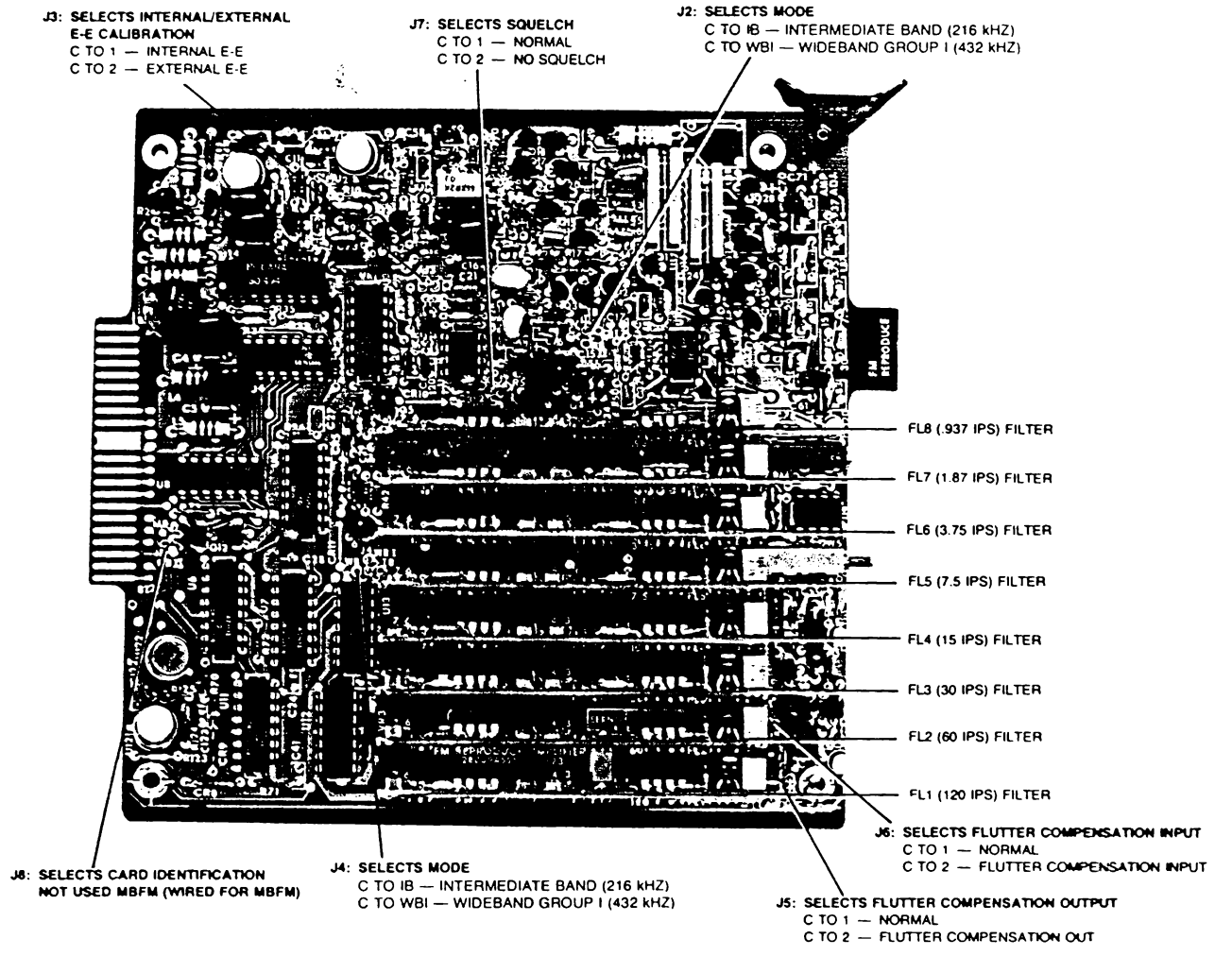


FIGURE 5-5. FM REPRODUCE CARD (MBFM)

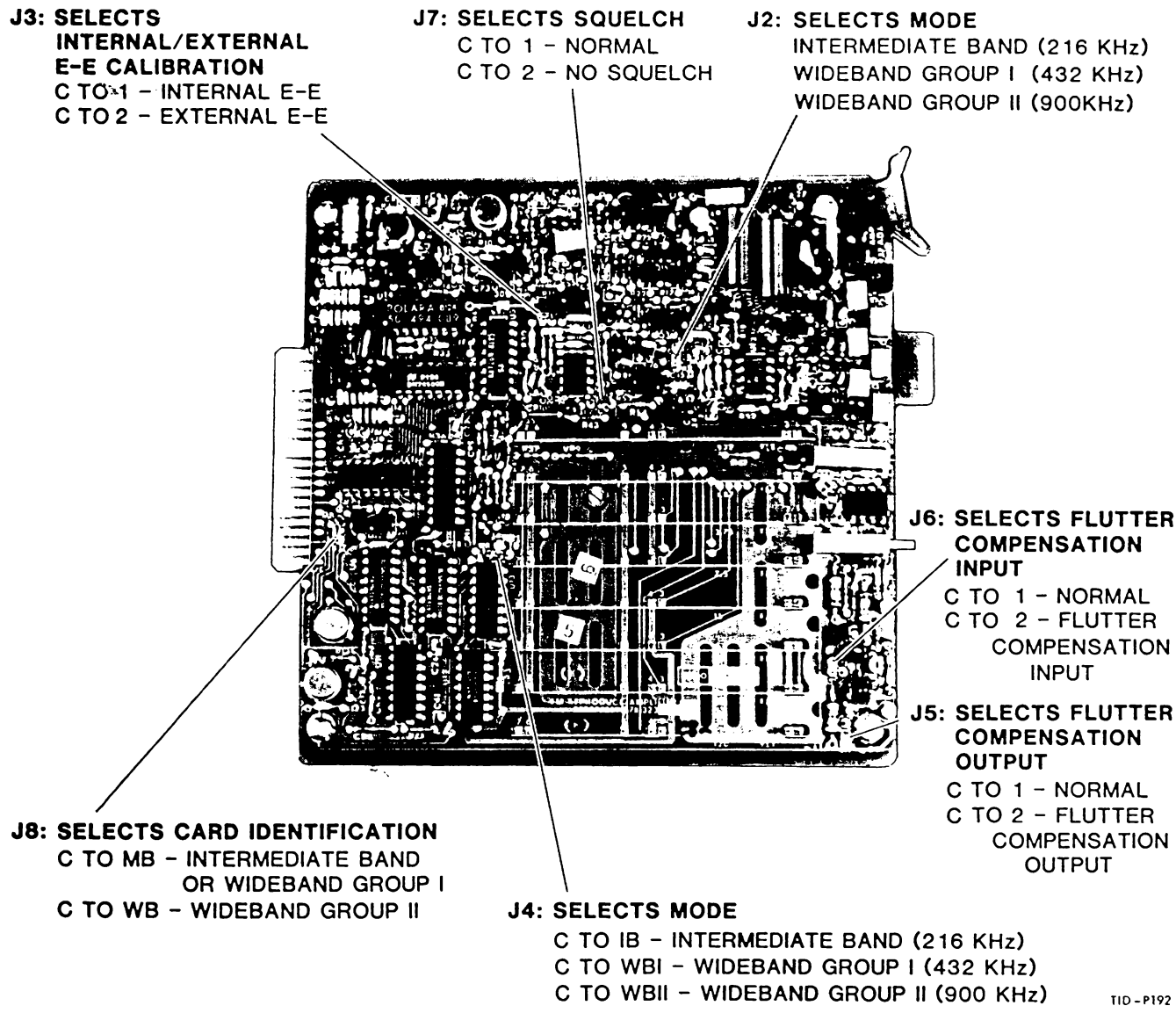


FIGURE 5-6. FM REPRODUCE CARD (WBFM)

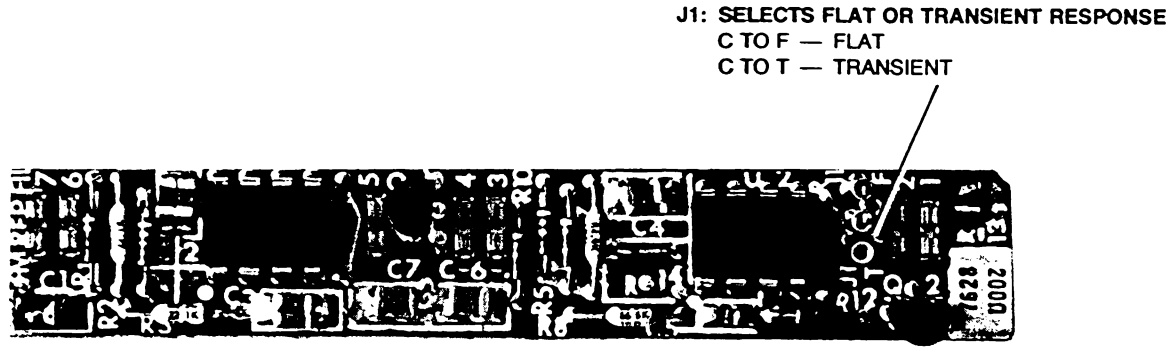


FIGURE 5-7. FM REPRODUCE FILTERS (TYPICAL

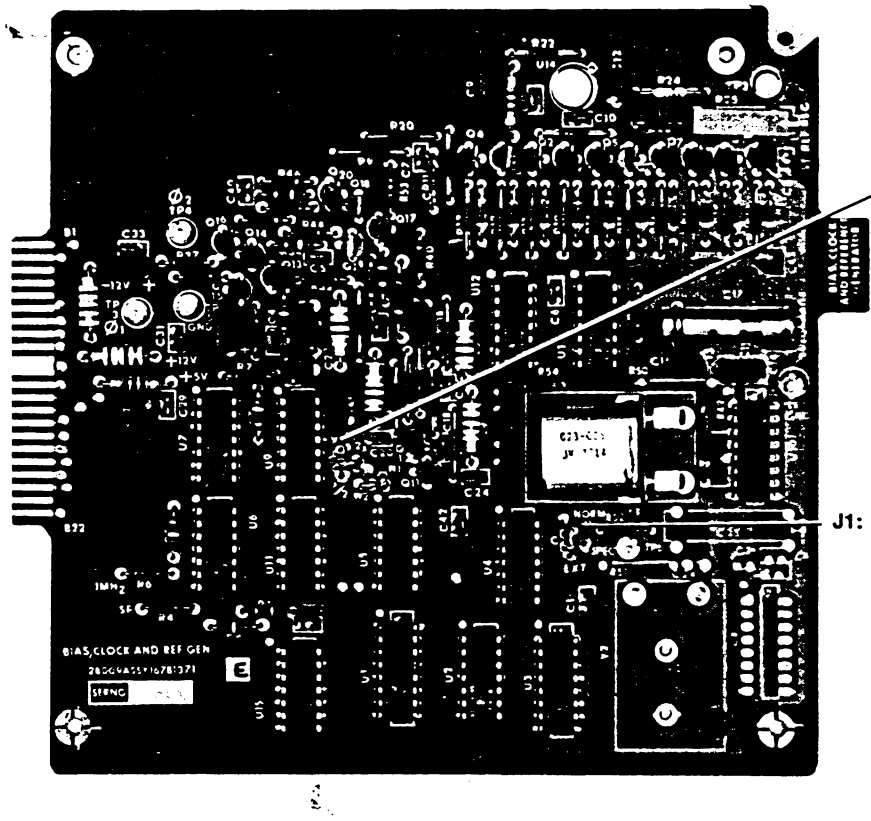


FIGURE 5-8. BIAS CLOCK AND REFERENCE GENERATOR CARD

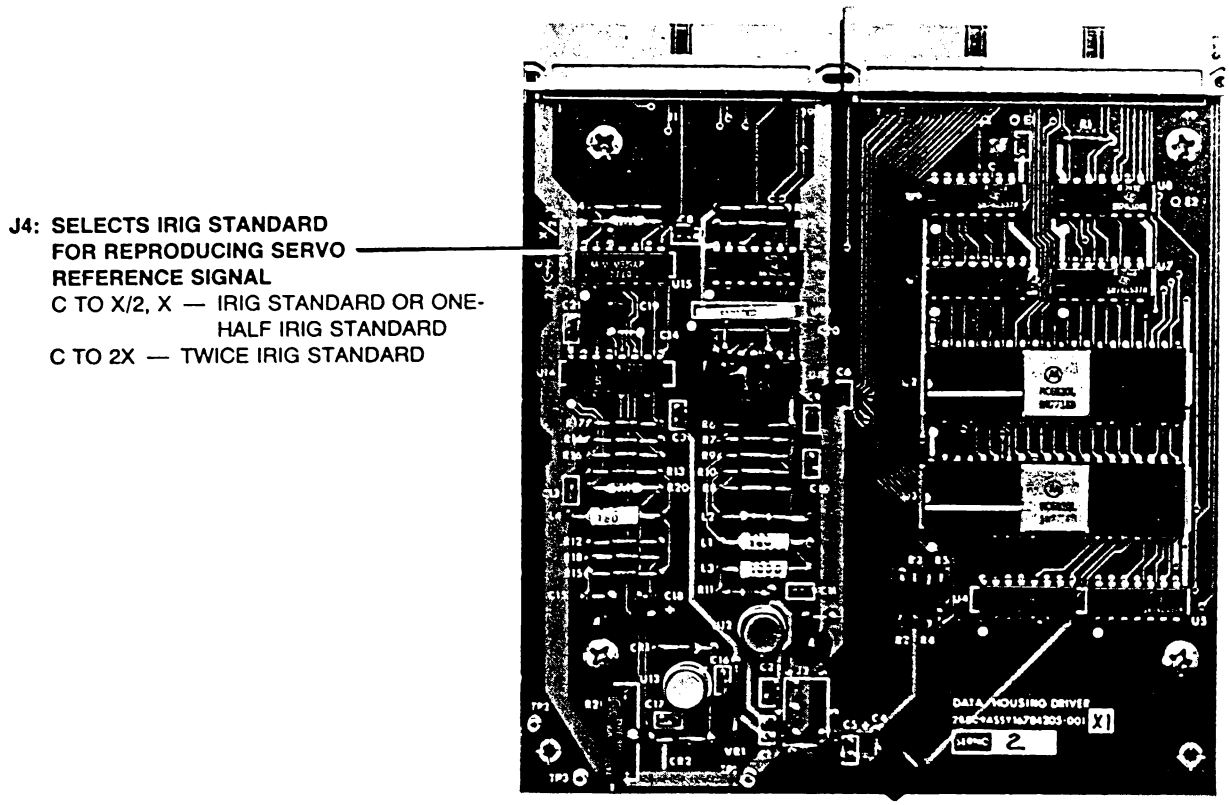
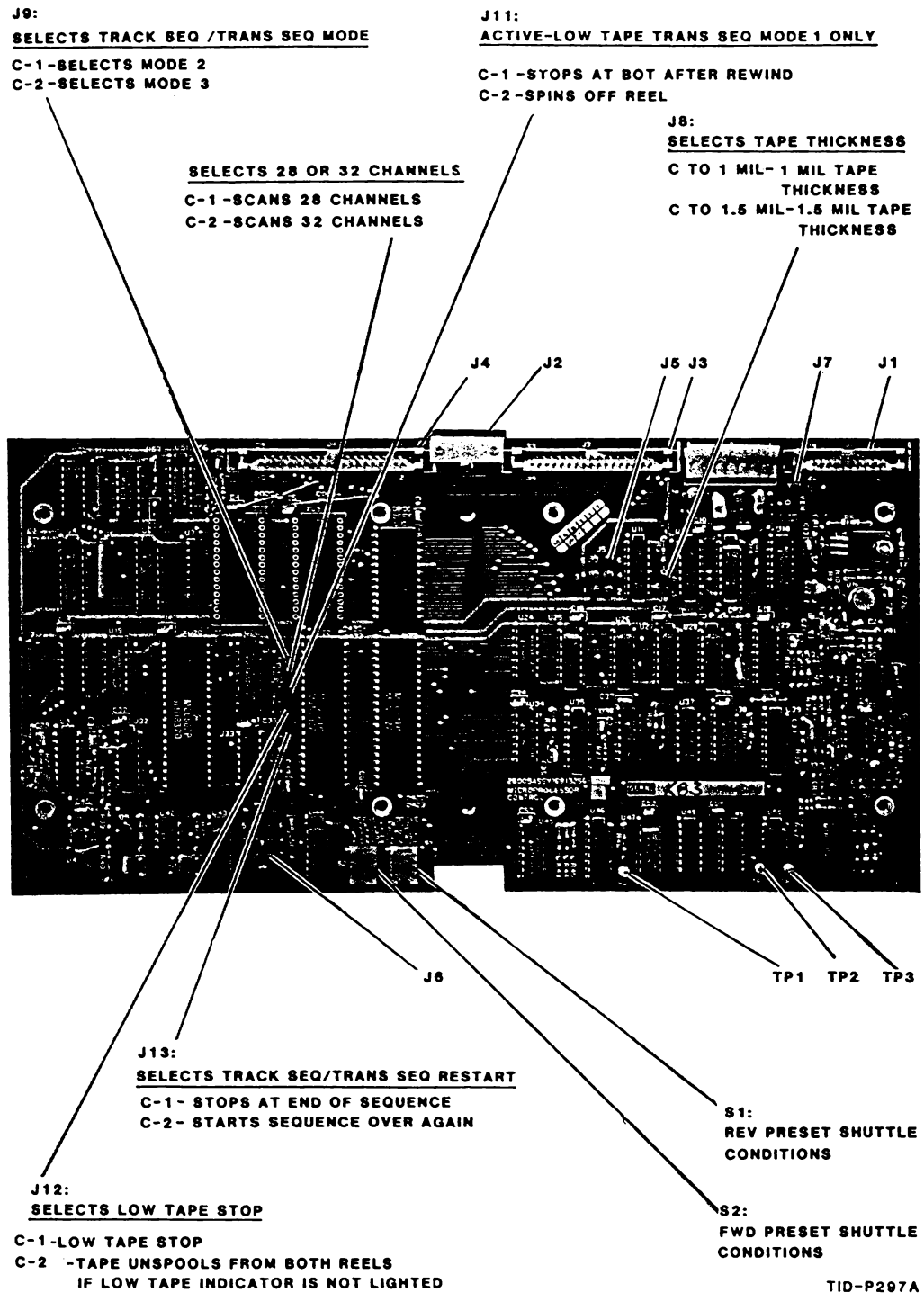


FIGURE 5-9. DATA HOUSING DRIVER CARD


J9:
SELECTS TRACK SEQ /TRANS SEQ MODE
C-1-SELECTS MODE 2
C-2-SELECTS MODE 3
J11:
ACTIVE-LOW TAPE TRANS SEQ MODE 1 ONLY
C-1 -STOPS AT BOT AFTER REWIND
C-2 -SPINS OFF REEL
J8:
SELECTS TAPE THICKNESS
C TO 1 MIL- 1 MIL TAPE THICKNESS
C TO 1.5 MIL-1.5 MIL TAPE THICKNESS
SELECTS 28 OR 32 CHANNELS
C-1 -SCANS 28 CHANNELS
C-2 -SCANS 32 CHANNELS
J4
J2
J5
J3
J7
J1
J6
TP1
TP2
TP3
J13:
SELECTS TRACK SEQ/TRANS SEQ RESTART
C-1- STOPS AT END OF SEQUENCE
C-2- STARTS SEQUENCE OVER AGAIN
S1:
REV PRESET SHUTTLE CONDITIONS
J12:
SELECTS LOW TAPE STOP
C-1-LOW TAPE STOP
C-2 -TAPE UNSPOOLS FROM BOTH REELS IF LOW TAPE INDICATOR IS NOT LIGHTED
S2:
FWD PRESET SHUTTLE CONDITIONS
TID-P297A

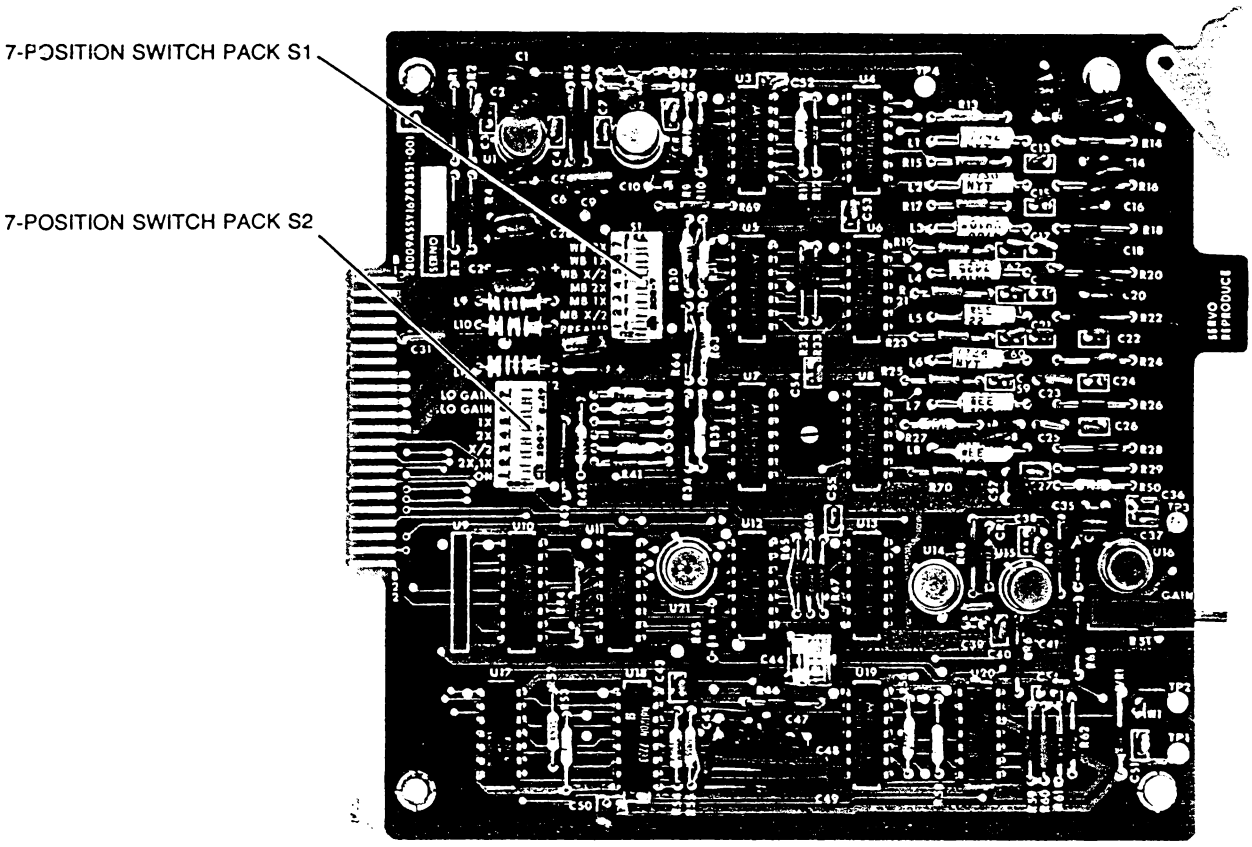
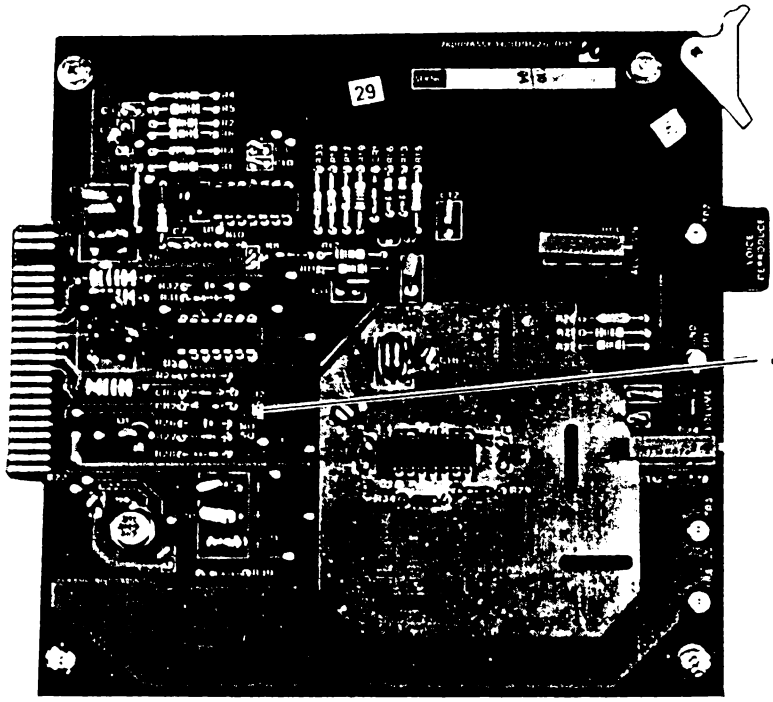


FIGURE 5-11. SERVO REPRODUCE CARD



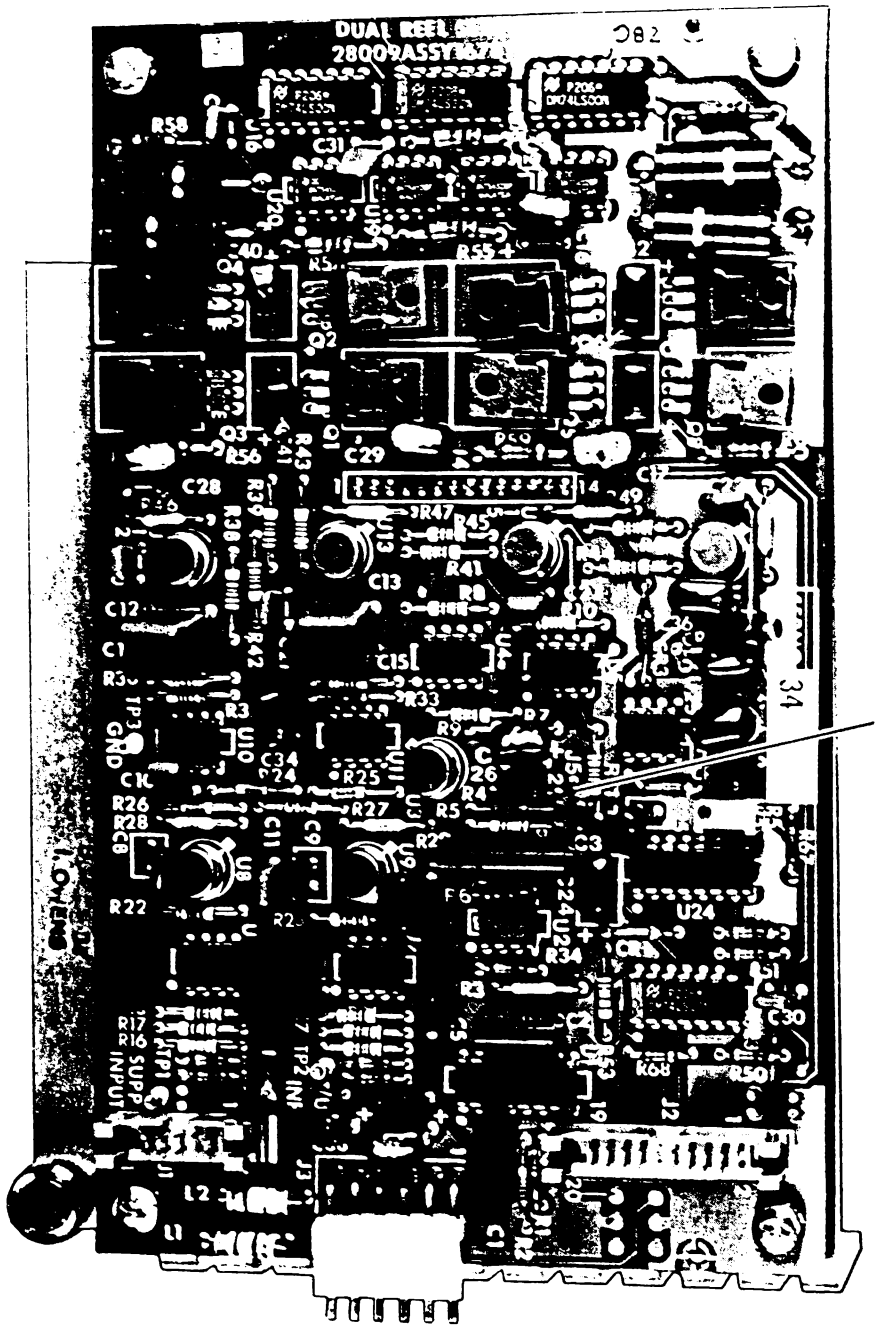
J2: SELECTS SQUELCH

C TO SQUELCH - NORMAL
(SQUELCHED WHEN RECORDING OR NOT IN PHASE LOCK)

C TO NO SQUELCH - USE WHEN YOU DO NOT WANT TO SQUELCH DURING RECORDING OR SEARCHING

TID-P193

FIGURE 5-12. VOICE CARD



TID-P194

FIGURE 5-13. DUAL REEL SERVO

SECTION 6
Operator Maintenance

What This Section Contains

This section contains the recommended operator level maintenance. It includes a periodic inspection list, cleaning procedures, head demagnetization procedures and a recommended spare parts list. Table 6-1 is a periodic inspection list.

Cleaning

Maximum cleanliness is essential for optimum performance of any tape system. This is especially true of the tape path area. And, clean tape is essential for keeping the tape path clean.

Remove dust and foreign matter from the tape deck using a lint-free cloth.

Use a low-pressure vacuum hose instead of a pressure hose to prevent blowing dust into the heads and internal areas.

Use a cotton swab and alcohol to clean stubborn areas.

How to Clean Magnetic Head and Tape Path

CAUTION

Use only Freon TF solvent or pure grain alcohol for cleaning heads, rollers, and tape path areas. Do not allow freon and alcohol to contact the tape.

Once a day or more often if usage is heavy, clean magnetic heads with a cotton swab and Freon TF or pure grain alcohol. Use a single stroke across the pole faces, rotating the swab after each stroke. Clean the tape path and rollers using the same procedures as for magnetic heads.

NOTE

Ferrite heads exhibit some tendency to "varnish" after being exposed to several million feet of tape at drive speeds. Normal solvent cleaning procedures cannot remove this varnish which must be cut away mechanically. The most obvious indication of varnish build-up is a loss of SNR or the inability to equalize. Should these conditions exhibit themselves contact your nearest Honeywell Metrology Office for assistance in special head cleaning.

How to Demagnetize Heads

Magnetization of the heads may occur due to certain types of high-level signals, close proximity to strong magnetic fields, or using the equipment for long periods of time. This condition results in signal loss or high noise level on the tape. In addition, items within the tape path can also become magnetized, causing deterioration of the tape signal-to-noise ratio. **Demagnetize the heads and tape rollers using a standard head degausser as follows:**

1. Turn off power and move any recorded tape from the immediate area.
2. Remove crosstalk shield and place a clean gauze covering across the head poles.
3. Hold the degausser about three feet from the head and then apply power to the degausser.

NOTE

Do not allow the degausser to touch the face of the magnetic heads.

4. Slowly move the degausser toward the protected head faces. Move degausser around protected head faces; then slowly withdraw it to a distance of at least three feet.
5. Slowly move the degausser in close proximity to the tape path and capstan rollers; move it around each roller several times before going to the next roller.
6. Slowly withdraw the degausser from the unit to about three feet and remove power from the degausser.
7. Remove the protective gauze from the heads and replace crosstalk shield.

Table 6-1. Periodic Inspection

ITEM	RECOMMENDED TIME INTERVAL	INSPECT FOR	ACTION
Tape Path	Daily	Tape oxide deposits or other foreign matter.	Clean tape path per instructions
Magnetic heads and tape path	Daily	Signal dropouts or high noise level on tape.	Demagnetize heads and tape path.
Power Supply	Weekly	Correct output voltages.	See Power Supply Manual.
Entire System	Weekly	Dust or any foreign matter, especially in tape-handling areas.	Clean with a vacuum hose.
System Performance Checks	Monthly	Correct values.	See Section 4.
Fans	Monthly	Binding, wear and accumulated dust.	Clean.
Fan Filter	Monthly	Accumulated dust.	Clean.
All Assemblies	Monthly	Dust, loose hardware and loose or broken circuit card connections; worn or broken interconnecting cables or ground straps.	Clean or repair assembly.

How to Replace Control Panel Lamps

Replacement of LED's are covered in the system manual.

To replace control panel lamps:

a. Remove the 6 screws that mount the display driver assembly and control panel switching assembly.

b. Disconnect the control panel switching assembly from the display driver assembly.

c. Pull the defective lamp from its socket and replace with one of the same type. Lamp description is listed in the recommended spare parts list.

d. Reverse this procedure to replace the two circuit boards.

How to Replace Fuses

Replace blown fuses with one of the same value and type. The system uses four fuses: Two are on the power supply assembly, one is on the power interface assembly at the rear of the transport, and one is inside the control panel. Exact location is shown in Section 1.

Periodic Maintenance

Replace the 4.5-volt battery on the power regulator card (Figure 1-12) every 6 months of sooner if the battery has been exposed to temperature of 38° (100F) for more than 7 days.

Recommended Spare Parts List

This recommended spare parts list contains parts that are operator replaceable. Complete parts lists are provided in the applicable Maintenance Manuals.

The manufacturer's code and part number columns list the manufacturer's **Federal Supply Code** as contained in the **Federal Supply Code for Manufacturers** (Cataloging Handbook H4-2) and manufacturer's part number. The Federal Supply Codes for manufacturers are listed below.

CODE	NAME AND ADDRESS
28009	Honeywell, Inc Test Instruments Division P.O. Box 5227 Denver, Colorado 80217
71400	Bussman Manufacturing Division of McGraw and Edison Co. 2536 University Street St. Louis, Missouri 63017
71744	Chicago Miniature Lamp Works 4433 Ravenswood Avenue Chicago, Illinois 60640
90303	Mallory Battery Co. Div. of PR Mallory and Co. Inc. S. Broadway Tarrytown, New York 10591

Table 6-2. Recommended Spare Parts List

ITEM NO.	HONEYWELL PART NO.	DESCRIPTION	MANUFACTURER'S CODE	MANUFACTURER'S PART NUMBER	QTY. PER ASSY.	RECM. QTY. SPARES
1	16779822-001	LAMP, incandescent, 14V, 80 mA	71744	CM7-7382-209	13	6
2	16750231-028	FUSE, cartridge, .5 Amp, 250V, S-B	71400	MDL-500	1	5
3	16750231-030	FUSE, cartridge, 1 Amp, 250V, S-B	71400	MDL-1	1	5
4	16750231-032	FUSE, cartridge, 2 Amp, 250V, S-B	71400	MDX-2	1	5
5	16750231-036	FUSE, cartridge, 10 Amp, 250V, S-B	71400	MDA-10	2	5
6	16750231-046	FUSE, cartridge, 5 Amp, 250V, S-B	71400	MDA-5	2	5
7	16783081-001	Extender Card, Record	28009	16783081-001	1	1
8	16783081-002	Extender Card, Reproduce	28009	16783081-002	1	1
9	16783147-001	Extraction Tool, Pre-Amp	28009	16783147-001	1	1
10	16776706-001	Extraction Tool, Electrical Connector	28009	16776706-001	1	1
11	16781703-001	Battery, Storage 4.5 Volts	90303	PX-19	1	2

How to Adjust Reproduce Head Azimuth

See Figure 1-6 for head stack adjustment and preamp test point locations.

CAUTION

Don't adjust record head azimuth. It's optimized at the factory.

Here's how to adjust reproduce head azimuth.

a. Load a clean, well-degaussed test tape of the proper type, and place the transport in the ready condition.

b. Simultaneously record a 5 kHz sine wave on both outside tape tracks of either the odd-track stack or even-track stack with tape moving at 120 IPS.

c. Using dual trace oscilloscope (set for triggering from one channel only), display the preamp outputs for the selected odd or even track pair.

d. Using 2.5 mm hex wrench, adjust the selected odd or even stack alignment screw (Figure 1-6) slightly until the two signals are in phase.

e. Check the alignment at 50 Hz and 100 Hz. Adjust the alignment screw until optimum phasing is obtained at the highest frequency.

f. Repeat the procedure for the remaining head stack.

NOTE

Perform remaining portion of this procedure to fine adjust wideband direct record/reproduce systems only. This procedure may slightly degrade the static skew adjustment previously made. The purpose of the next 2 steps is to minimize bandedge amplitude variations.

g. Select **CAL, FWD/REC, BE/+DEV, RMS** and **60 IPS** on the control panel.

h. Adjust the azimuth adjustment odd or even for maximum reproduce output on the meter monitor. This adjustment must be made on each head stack. Any track in the stack may be used.

Warranty

The company warrants all equipment purchased from and/or manufactured by it or bearing its nameplate to be free from defects in workmanship and material, under normal use and service as follows: (a) equipment not installed by the Company which (1) is returned transportation prepaid to the Company's originating factory within 12 months after date of shipment, and (2) is found by the Company's inspection to be defective in workmanship or material at the Company's option will be repaired or replaced free of charge and return-shipped lowest-cost transportation prepaid; and (b) equipment installed by the Company which is within 12 months after date of installation by the Company and found by the Company's inspection to be defective in workmanship or material, at the Company's option will be repaired or replaced free of charge. If inspection by the Company does not disclose any defect in workmanship or material, the Company's regular service charges will apply. Items specifically excluded from the 12 month warranty and which will not be repaired or replaced free of charge include flash tubes, galvanometer lamps, tubes, fuses, batteries, and similar components subject to wear or burnout through usage. Magnetic tape recording heads, cathode ray tubes, and similar components are excluded from the 12 month warranty, and will be repaired or replaced according to the terms of the particular contract. The foregoing warranty does not apply to contracts for repair, maintenance, or calibration. WITH EXCEPTION OF THE TWELVE MONTH WARRANTY SET FORTH ABOVE, THE COMPANY MAKES NO EXPRESS WARRANTIES, NO WARRANTIES OF MERCHANTABILITY, AND NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. In no event will the Company be responsible for consequential damages of any nature whatsoever.

10/1/77
HONEYWELL INC.
TEST INSTRUMENTS DIVISION
DENVER, COLORADO

MAGNETIC TAPE RECORDER HEAD WARRANTY

The company warrants magnetic tape heads, bearing its name and serial number, if used under normal use and service with proper preventive maintenance on the below listed model tape recorders and using Honeywell recommended tape, to be free of defects in material and workmanship, and to perform to specifications of record at time of sale as tested under factory test conditions.

Model 101 Series Medium Band (600 KHz @ 120 IPS)*
Model 101 Series Wide Band (2.0 MHz @ 120 IPS)*
*Equivalent Wave Length

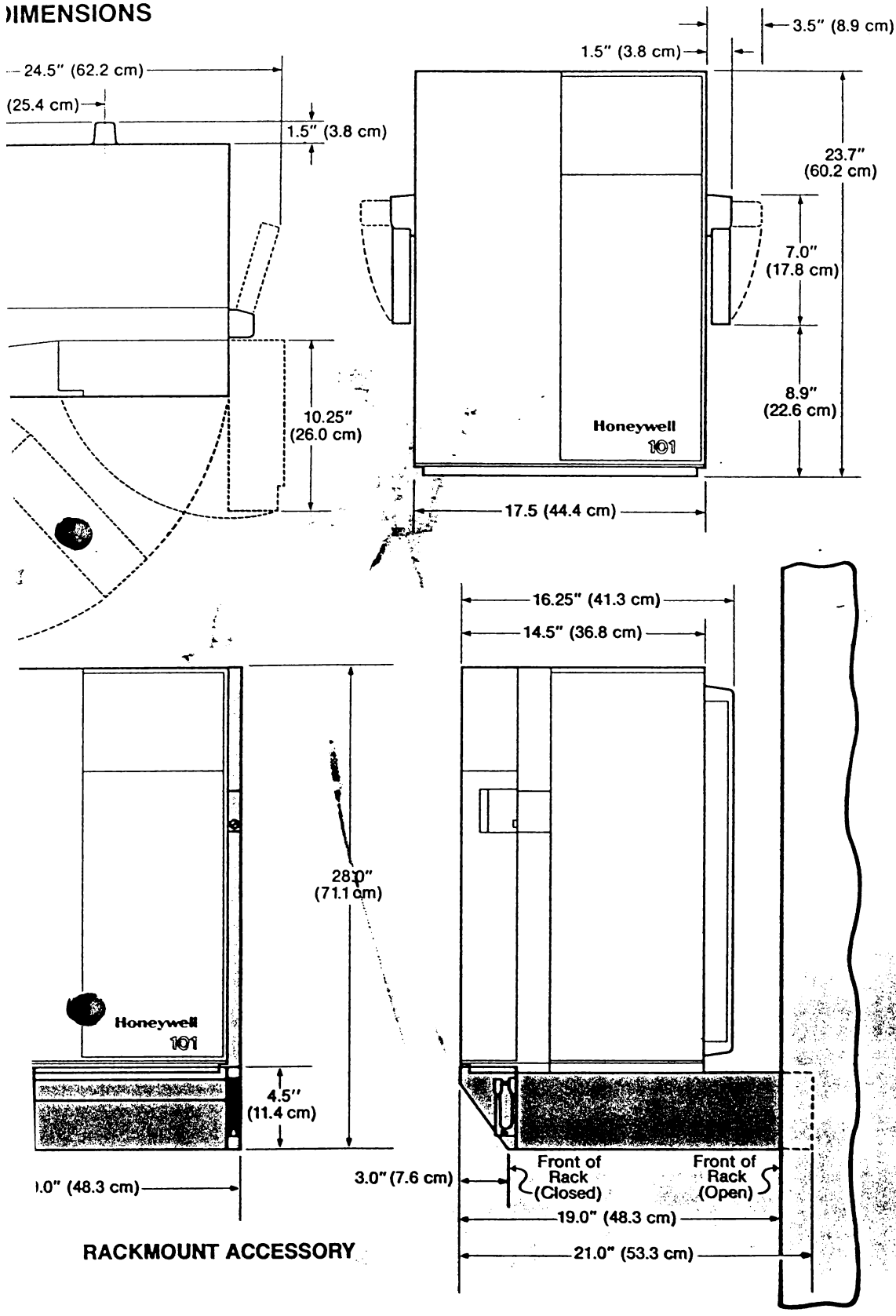
In the first three years from date of shipment from the factory, magnetic heads failing to perform under the conditions as stated above with 1000 operating hours (measured on a running time meter) or less in the record/reproduce mode will be repaired or replaced without charge, or

In the first three years from date of shipment from the factory magnetic heads failing to perform under the conditions as stated above with over 1000 operating hours and less than 3000 hours (measured on a running time meter) in the record/reproduce mode will be replaced on a prorated use charge equal to that portion of 3000 hours life used at the time of failure times the current published list price, i.e. at 1200 hours life the charge for a new head set equals 1200/3000 multiplied by the current list price. The head so replaced will carry a full new head warranty.

LIST OF RELATED MANUALS

TITLE	HONEYWELL PART NUMBER
MODEL 101 MAINTENANCE MANUAL ASSY.	16785158-001
IEEE-488 MAINTENANCE MANUAL	16809407-001
RS-232 MAINTENANCE MANUAL	16809408-001

)IMENSIONS



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5 Years - 5,000 Hours
Unprorated

Magnetic Tape Recorders/Reproducers

MODEL 101 PORTABLE SYSTEM

PRODUCT SPECIFICATIONS

atures

crocomputer control
planar tape drive
ɔgrammable electronic shuttle
ɔgrammable selective track recording
lid-state end-of-tape sensing
ilt-in measurement system
ilt-in bias meter
amble recording
ctronic channel selector

- Remote manual or computer control
- Automatic calibration verification
- Direct electronics from 50 Hz to 600 kHz
- Direct electronics to 2 MHz
- ±40% FM electronics to 80 kHz
- ±30% FM electronics to 500 kHz
- 8 tape speeds—0.937 to 120 ips
- Solid ferrite heads — 5000 hr warranty
- Vibration-isolated transport
- 15-inch reel capacity

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Honeywell

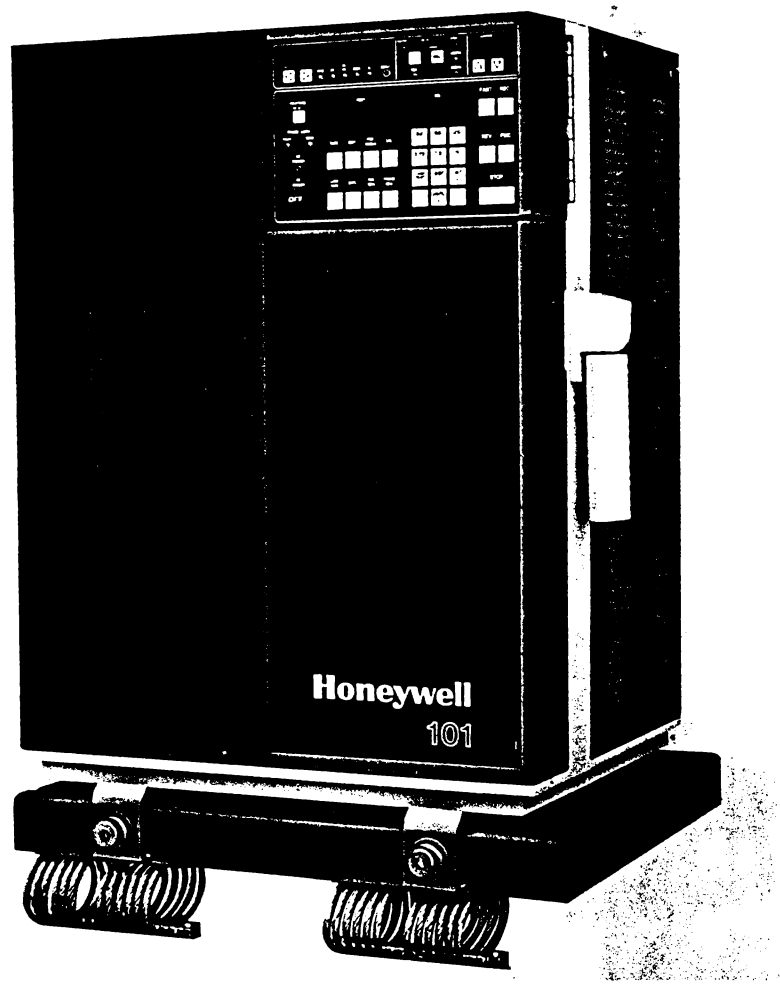
New
Head Warranty
5 Years - 5,000 Hours
Unprorated

Magnetic Tape Recorders/Reproducers

VIBRATION ISOLATOR FOR MODEL 101

PRODUCT DESCRIPTION

Mounting accessory permits operation of the Model 101 portable tape system in a high vibration environment.



Description

Operating the Model 101 in high vibration environments such as aboard aircraft, ships or ground vehicles may require the use of vibration isolation to maintain recorder performance. The vibration isolator is available in kit form for portable versions of the Model 101.

The kit consists of a rigid plate to be attached to the bottom of the tape recorder, and a platform on four isolators that are to be permanently bolted to the supporting surface. The recorder can be easily removed from the platform by loosening two clamps on the platform that grip the front edge of the plate. Sliding the recorder forward disengages the plate from two heavy pins at the rear of the platform. The Model 101 is reinstalled on the platform simply by pushing the recorder back to engage the pins and retightening the clamps.

The record/reproduce amplifiers and other circuit cards on the side of the Model 101 are accessible without removing the recorder from the platform. Easy access is also provided to the input/output connector panel at the rear of the unit.

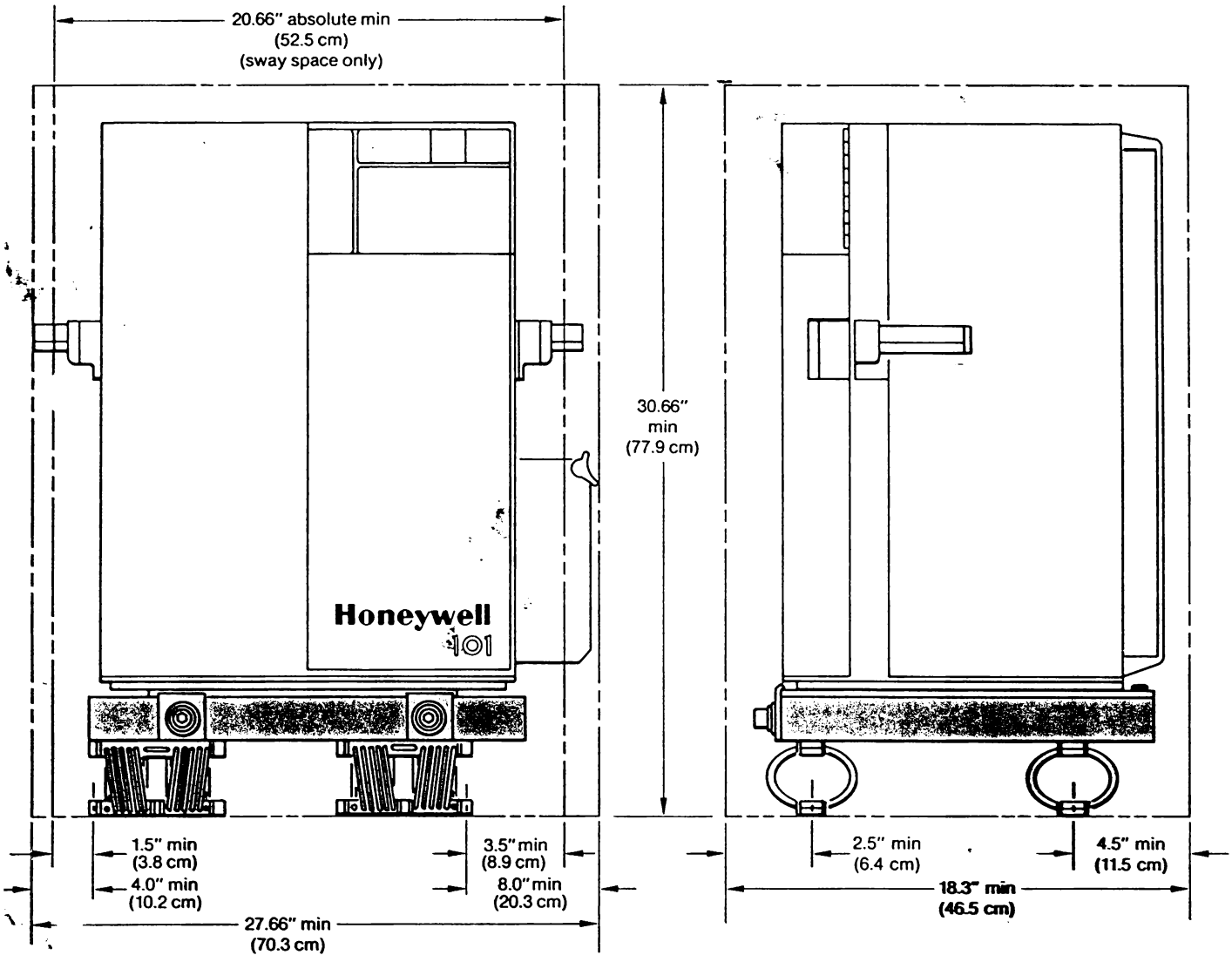
Specifications

Vibration	Pk-pk flutter will not exceed two times the specified value at speeds greater than 7½ ips with the following inputs in any axis:
5 to 14 Hz	0.10 inch double amplitude
14 to 23 Hz	1.0 g's
23 to 51 Hz	0.036 inch double amplitude
51 to 500 Hz	5.0 g's (Curve IIIa, MIL-E-5400R)
Shock	No damage will occur from a shock of 15 g's applied in any axis, 11 msec duration, half sine (MIL-STD-810C, Method 516.2, Procedure I).
Crash Safety	30 g's, 11 msec, half sine (MIL-STD-810C, Method 516.2, Procedure III).
Dimensions	30.7" (78.0 cm)H x 27.7" (70.4 cm)W x 18.3" (46.5 cm)D. (Includes sway and access space.)
Weight	17 lb

Ordering Information

Specify Honeywell:	Part Number
M101 Vibration Isolator	16783856-001

Mounting Space Requirements



(preferred for ease of installation and access to cards)

Specifications subject to change without notice

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APPENDIX A
RS-232C OPTION

16785372-001A

Description of Option

The RS-232C option allows control of certain Model 101 transport functions from an external device capable of sending and receiving ASCII (American Standard Code for Information Interchange) coded characters. In addition, the external device port has to conform to the RS-232C requirements. The external controlling device typically will be a computer, but may also be a terminal. In certain applications where control over long distances is required, a MODEM may be used to connect the Model 101 to a telephone line or some other data communications channel.

The basic system is shown in Figure A-1.

The Model 101 may include the option when shipped from the factory or it may be installed in the field.

The Model 101, when equipped with the RS-232C, is capable of interpreting ASCII characters and responding to commands as if being controlled from the control panel. Commands as well as interrogation of the transport operating status are possible. In some cases, the Model 101 sends status information without being interrogated or commanded.

In order to write software for your computer or use the terminal to operate the Model 101, you must be thoroughly familiar with the operating principles and know how to operate the Model 101. You also must be thoroughly familiar with the command and interrogate protocol used to control the Model 101.

For operation of the Model 101, refer to the Operator's Manual, 16783818-001.

This appendix tells you how to use the RS-232C option with Model 101 and defines the protocol necessary to perform various functions.

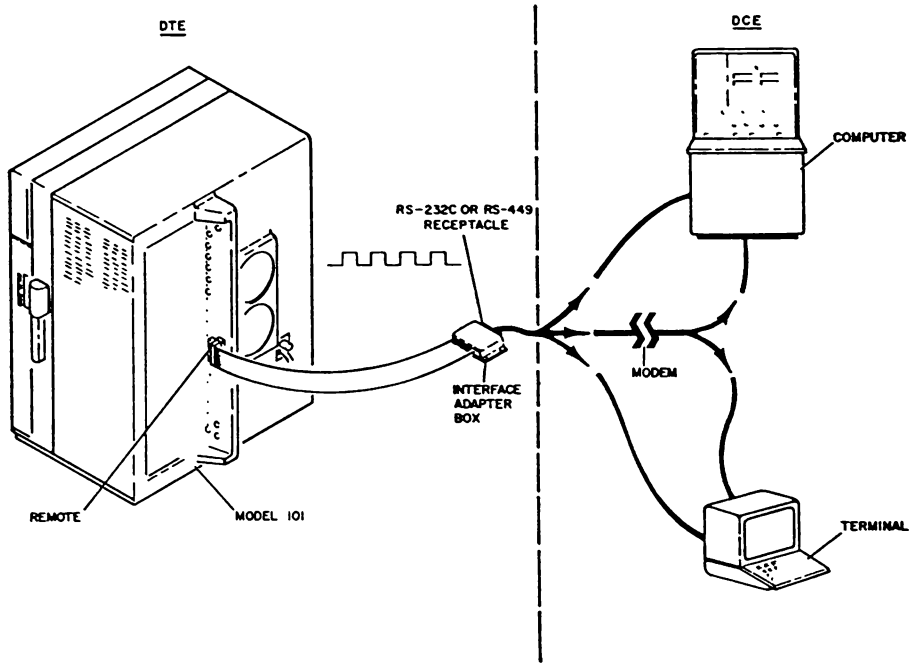


FIGURE A-1. RS-232C OR RS-449 BLOCK DIAGRAM

Familiarity with certain EIA Standards will also be helpful. Here's a list:

RS-232C - Interface between Data Terminal Equipment and Data Communication Equipment.

RS-422 - Electrical Characteristics of Balanced Voltage Digital Interface Circuits.

RS-423 - Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits.

Bulletin No. 12 - Application Notes on Interconnection Between Interface Circuit Using RS-449 and RS-232C.

These standards explain the system of interface between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE). The Model 101 is DTE and the computer, terminal, and MODEM are DCE.

Description of Equipment

Only two pieces of optional equipment are required to add the RS-232C option to your basic Model 101. These are the interface circuit card and prom which is installed on the control logic card.

RS-232C Serial Interface Circuit Card (Figure A-2)

The interface card is piggy-back mounted to the control logic card above the data housing driver card. The serial interface card replaces the remote interface card.

The interface card has two ribbon cable receptacles. The 34-pin receptacles (J1) permits connection to the MPU bus. The 40-pin receptacle permits connection to the RMT receptacle on the Input/Output panel.

The serial interface card contains an asynchronous communications interface adapter (ACIA) chip. This chip provides the data formatting and control to interface serial asynchronous data with the MPU in the Model 101. The MPU performs the data processing function.

The ACIA chip provides for transmitting, receiving, formatting and error checking of the bit-serial data, and it provides a direct interface with the MPU bus. It handles all formatting tasks. This includes generating and interpreting the ASCII characters, and the insertion of start bit, stop bits, and parity bit.

The circuit card also contains a PIA. The PIA reads the option selector switch and loads the control registers of the ACIA.

The circuit card contains a bit rate generator chip which provides the transmit-and-receive clock time required by the ACIA. The generator chip divides down the outputs to eight different speeds.

Other components on the interface card include address decoders, drivers and two eight-position switch packs.

Description of Data Format

The ASCII code requires only seven bits to define a character or word unit. To this, a start bit and a stop bit must be added. Even or odd parity bit selection may be added for checking purposes.

The ACIA chip has the capacity for 8 data bits per character.

Thus, each character or word transmitted or received by the Model 101 consists of one start bit, seven or eight character bits and at least one stop bit. Two stop bits may be used. Even, odd, or no parity bits may be used. So a character may contain as few as 9 bits or as many as 11 bits.

Figure A-3 shows typical word formats. Table A-1 (page A-10) shows eight word formats that you can select by positioning the option switch on the serial interface card.

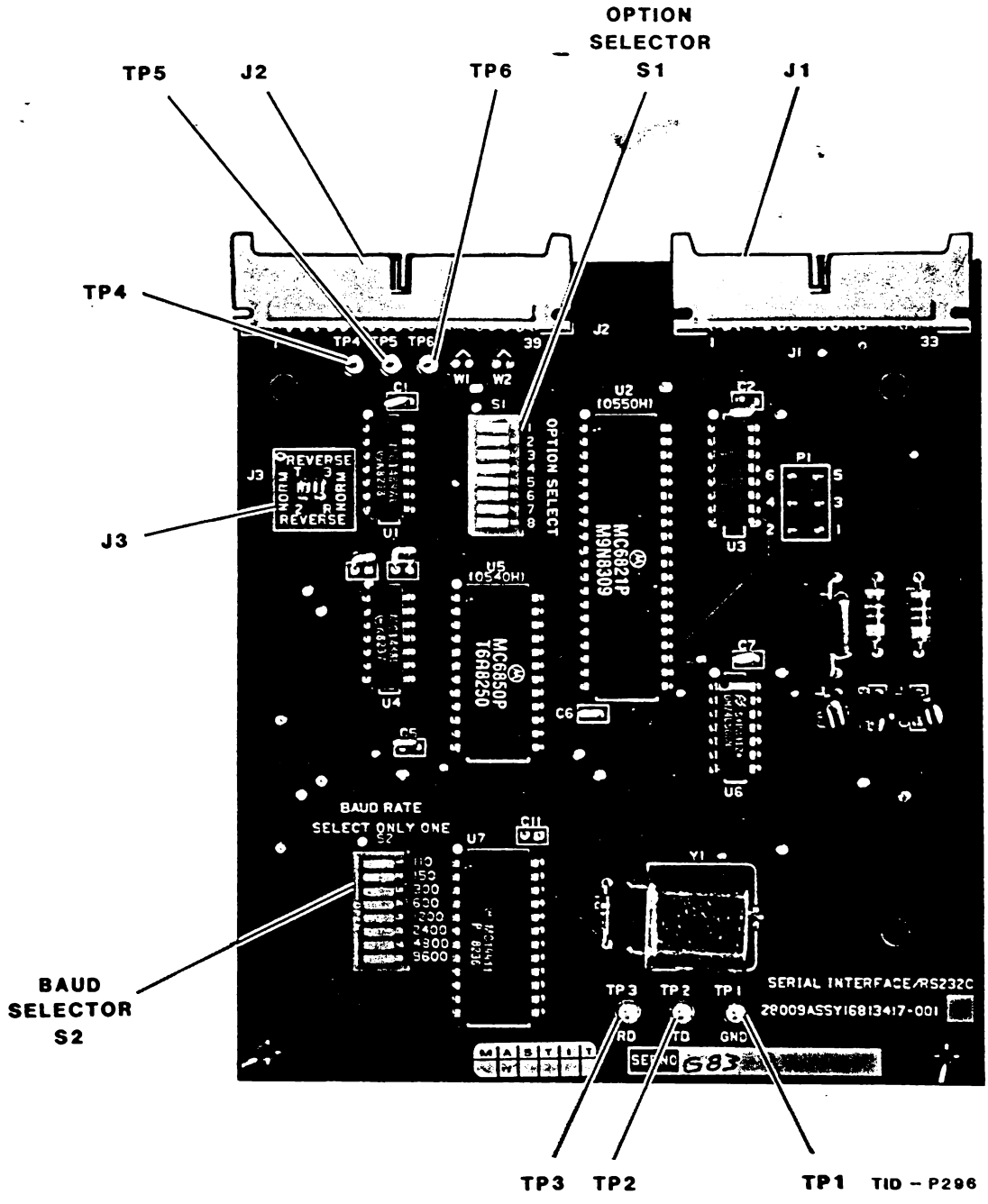


FIGURE A-2. SERIAL INTERFACE CIRCUIT CARD

Description of Data Transmission

The data is sent serially by bit. Transmission speed is switch selectable by an 8-position switch on the interface card. The switch positions are labeled by baud rate (bits-per-second). The selectable rates are 110, 150, 300, 600, 1200, 2400, 4800, and 9600. If baud 110 is selected, the transmission rate is 10 characters per second, or if baud 300 is selected, the transmission rate will be 30 characters per second, etc.

The baud rate only determines the bit transfer rate over the communications link. The character rate is determined by the polling sequence in the Model 101. The resulting rate is approximately 12ms per character.

If a baud rate above 1200 is used, allow 15 ms between characters.

Baud rate selection on the Model 101 must be the same as the interfacing computer or data terminal.

Null Selection

Option selection of 0, 6, 10 or 20 null periods are provided to allow for mechanical delays in the system such as terminal carriage return. One null period is equal to the time it takes to transmit one character.

Echo Selection

An optional echo of the inputs to the Model 101 may be selected. If a terminal is used, the echo allows verification of a character received by the Model 101.

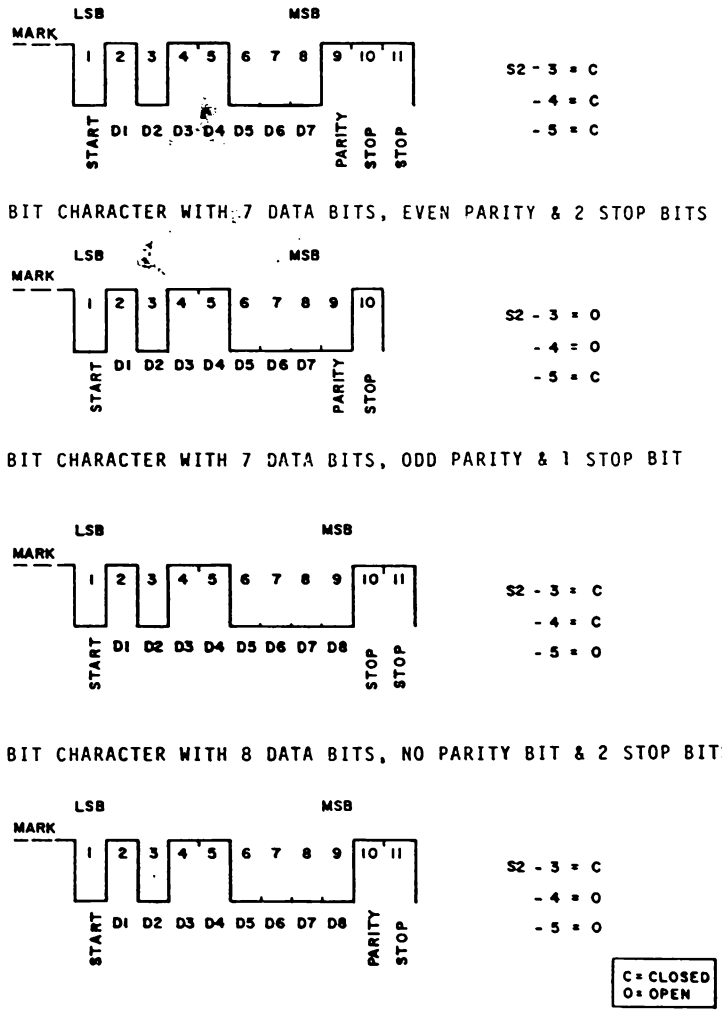


FIGURE A-3. TYPICAL INPUT/OUTPUT WORD STRUCTURE

How To Use Protocol To Operate The Model 101

The protocol is the defined procedure for the operations between the Model 101 and computer or terminal. Selecting the proper protocol character will cause the proper ASCII character to be sent from the terminal or computer to the Model 101 or from the Model 101 to the computer or terminal.

The protocol presentation is separated into two lists: command (**C**) and interrogate (**I**).

Command protocol is the characters that must be sent to the Model 101 to command the required functions.

Interrogate protocol is the characters that must be sent to and returned from the Model 101 to indicate its status.

Study the protocol so you'll know the language required to talk to the Model 101 remotely through the data link. Observe that there are certain routines that you must follow for command or interrogate.

First, the terminal or computer must send a message to the Model 101 stating that it is "ready to send" data. The Model 101 replies that it is "ready to receive" data. The next character transmitted signals the Model 101 as to the nature of the command it will receive next such as basic transport operations, speed commands, operating mode selection, etc. The third character transmitted tells the Model 101 what you want it to do. The next character transmitted is the execute character.

When the Model 101 receives the execute character, it analyzes the total message and converts it into the required operation as if you had push buttons on the control panel.

If the Model 101 did not understand your entry, it transmits a carriage return, line feed and a question mark, and resets its logic which requires you to retransmit all the characters in a particular message. This gives you a chance to check your entry.

If you're interrogating the Model 101 to determine its status, you do not have to transmit an execute character. Just enter an I for interrogate. The Model 101 will reply with a carriage return, line feed and a prompt, indicating ready to receive. Now, transmit the function character which delineates the nature of the interrogation such as transport, speed, operating mode, etc.

When the Model 101 receives the function interrogate character, it analyzes the message and replies with the requested data. If your entry was not in accordance with the protocol, the Model 101 will reply with a carriage return, line feed and a question mark.

When using the RS-232C, the Model 101 must be in the RMT mode.

Protocol

NOTE

Underline indicates a character sent to the Model 101. A circled symbol indicates a non-printing character.

Command Protocol

A. How to Select A Transport Mode

C Enter C. Refer to Note 1.

NOTE 1

The Model 101 will reply with a carriage return (CR), line feed (LF), and a prompt (S) indicating ready to receive.

$M Enter the character M which instructs the Model 101 to accept one of the following mode commands. Enter character for mode desired:

- S Stop (Stop function will persist for 3.5 seconds to allow for tensioning of tape.)
- F Forward
- R Reverse
- FF Fast Forward
- FR Fast Reverse
- WF Record Forward
- WR Record Reverse

(CR) Any one of the seven transport commands will be executed when terminated with a carriage return (CR) character entry.

EXAMPLE: How to Load Tape (Tension Tape).

1. Enter C, indicating ready to send a command.
2. The Model 101 replies with a carriage return (CR), line feed (LF), and a prompt ($), indicating ready to receive a command.
3. Enter M which indicates that the nature of the command is to be a transport function.
4. Enter S which instructs the transport to tension tape or to stop if moving tape when the execute command is entered.
5. To execute, enter (CR).

B. How to Select Tape Speed

C Enter C. Refer to Note 1.

$S Enter S to instruct the transport to accept one of the following eight speed selection commands.

.937
1.87
3.75
7.5
15
30
60
120

Enter any one of these eight commands to select the desired speed.

(CR) The selected speed will be executed when terminated by a (CR) entry.

NOTE

Although the above entries will be accepted by the Model 101, abbreviated format may also be used. The abbreviated format, starting with .937 is as follows:

.
1
3
7
15
30
6
12

EXAMPLE: How to Select Speed

1. Enter C.

   Transport replies with a (CR) (LF) and $.

3. Enter S to designate speed selection.

4. To select .937 IPS, enter . (a decimal point) or .937.

5. To execute, enter (CR) .

C. How to Select or Deselect Shuttle Mode

C Enter C. Refer to Note 1.

$B Enter B to instruct the Model 101 to accept one of the following shuttle commands. Enter desired character:

- S Select shuttle mode.
- D Deselect shuttle mode.

(CR) One of the above shuttle commands will be executed when terminated by a (CR) .

D. How to Set Shuttle Points

C Enter C. Refer to Note 1.

$T Enter T to instruct the Model 101 to accept a command to set shuttle points. Enter desired character:

- F Set forward shuttle point from the current reading of the footage counter.
- R Set reverse shuttle point from the current reading of footage counter.

(CR) One of the above commands will be executed when terminated by a (CR) .

E. How to Select Either Auto Test, Preamble, Trk Seq, Cal or Reset Footage Counter

C Enter C. Refer to Note 1.

$I Enter I to instruct the Model 101 to accept a command concerning the auto test, preamble, track sequence footage counter or calibrator. Enter desired character:

- A Initiate auto test and calibrate.
- B Initiate calibrate.
- P Initiate preamble.
- S Terminate preamble
- C Clear auto test (remains in calibrate).
- D Clear calibrate.
- E Select tape mode (must be in reproduce).
- G Select tach mode.
- T Initiate track sequence.
- R Reset footage counter.

(CR) Any of the eight commands will be executed when terminated with a (CR) entry.

NOTE

Above commands have the same prerequisites as when operating the Model 101 from the front panel.

EXAMPLE: How to Auto Test the System

Refer to page 4-9 of the Operator's Manual. Prior to entering auto test, the Model 101 should be loaded with a clean, well degaussed tape, be in the ready condition (**STOP** indicator lighted), and have a speed selected.

1. Enter C.
2. Model 101 responds with a (CR) (LF) and $.
3. Enter I.
4. Enter A.
5. Enter (CR) . (You have just selected the auto test mode. Now, you must select the **FWD/REC** mode to move tape and start the auto test.)
6. Enter C.
7. Model 101 responds with (CR) (LF) and $.

8. Enter M.

9. Enter characters W and F (for record **FWD**).

10. To start auto test, enter character (CR). The Model 101 will now run the auto test as if initiated from the control panel.

F. How to Select A Change Operation

C Enter C. Refer to Note 1.

$K Enter K to inform the Model 101 that the next command will result in a change operation. Enter desired characters:

U XX XX indicates that channel number to which the channel selector will advance. Ranges are 01-16,01-28, or 01-32 depending on the data housing used. Leading zeros must be included.

S II II may be LF, .1, .8 or BE designating the stimulus generator switch position. (Must be in **CAL/INT** or **PREAMBLE/INT.**)

R Change **REC/REPRO** selector.

SE Selects **EXT CAL** (Must be in **CAL** or **PREAMBLE** mode).

SI Selects **INT CAL** (Must be in **CAL** or **PREAMBLE** mode).

(CR) Any of the above commands will be executed when terminated by a (CR) entry.

G. How to Select or Deselect Low Tape

C Enter C. Refer to Note 1.

$L Enter L to instruct the Model 101 to accept one of the following Low Tape commands. Enter desired characters:

S Select **LOW TAPE**

D Deselect **LOW TAPE**

(CR) One of the low tape commands will be executed when terminated by a (CR).

Interrogate Protocol

NOTE

Space (SP) indicates end of message from Model 101. Asterisk (*) indicates interrogate prompt.

A. What Is Condition Of Transport

I Enter I. Refer to Note 2.

NOTE 2

The Model 101 will reply with a carriage return, line feed, and a prompt indicating ready to receive.

*M Enter M to request the transport to indicate its mode of operation. Model 101 will reply with one of the following:

F (SP) Transport operating in the forward direction.

S (SP) Transport stopped.

N (SP) Transport not ready

R (SP) Transport operating in the reverse direction.

WF (SP) Transport recording in the forward direction.

WR (SP) Transport recording in the reverse direction.

FF (SP) Transport operating fast in the forward direction.

FR (SP) Transport operating fast in the reverse direction.

EXAMPLE: Interrogate Transport to Indicate Mode of Operation

1. Enter I, indicating ready to send interrogate request.

2. Transport replies with a (CR) (LF) and interrogation prompt (*).

3. Enter M.

4. Transport replies with an S followed by a space (SP), indicating that it is ready. If the transport was not ready, it would reply with an N followed by a (SP).

B. What is Operating Mode

I Enter I. Refer to Note 2.

*O Enter O to interrogate whether auto test, calibration, preamble, track sequence, or shuttle operation are in progress. Model 101 will reply with one of the following:

A (SP) Auto Test

C (SP) Cal

P (SP) Preamble

T (SP) Track Sequence

S (SP) Shuttle

L (SP) Low Tape

N (SP) None of the above

C. What Is Tape Speed

I Enter I. Refer to Note 2.

*S Enter S to request the operating speed of the transport. Model 101 will reply with one of the following:

000 (SP) No speed selected.

.937 (SP)
1.87 (SP)
3.75 (SP)
7.5 (SP)
15 (SP)
30 (SP)
60 (SP)
120 (SP)

The operating speed of the transport is indicated directly.

EXAMPLE: Interrogate Selected Speed

1. Enter I.
2. Transport replies with a (CR) (LF) and *.
3. Enter S.
4. The transport replies with the speed selected followed by a space (SP) .

D. Which Channel is Being Displayed

I Enter I. Refer to Note 2.

*C Enter C to request the channel number currently in the channel selector display:

XX (SP) The selected number is displayed directly.

E. What is Status of Calibrator

I Enter I. Refer to Note 2.

*B Enter B to request the status of the calibrator. Model 101 will reply with one of the following:

LF (SP) Low frequency/zero
0.1 (SP) 0.1 bandedge/-deviation
0.8 (SP) 0.8 bandedge/zero
BE (SP) bandedge/+deviation

Must be in **CAL/INT** or **PREAMBLE/INT.**

N (SP) All Off (If in CAL/EXT or PREAMBLE/EXT or if **CAL** is not selected.)

F. What is Status of REC/REPRO and MON Selectors

I Enter I. Refer to Note 2.

*N Enter N to request status of the **REC/REPRO** selector. Model 101 will reply with one of the following:

W (SP) REC

R (SP) REPRO

M (SP) MON

G. What is Footage Counter Reading

I Enter I. Refer to Note 2.

*F Enter F to request the footage reading and sign. Model 101 will reply as follows:

XXXXXX (SP) Sign and five digits representing footage displayed.

H. What is Status of Phase Lock

I Enter I. Refer to Note 2.

*L Enter L to request phase lock status information. Model 101 will reply with one of the following:

CN (SP) Tach mode, phase lock not achieved

CC (SP) Tach mode, phase lock achieved

PN (SP) Tape mode, phase lock not achieved

PP (SP) Tape mode, phase lock achieved

PC (SP) Tape mode, phase lock to tach achieved

I. What is Status of Auto Test

I Enter I. Refer to Note 2.

*A Enter A to request status of auto test. Model 101 will reply with one of the following:

XX T (SP) Two digits and character T indicates that the transport is ready for auto test or that test is in progress on that channel.

XX F (SP) Two digits and character F indicates the number of the channel that has failed auto test.

NF (SP) Characters NF indicate that no active channels have failed auto test. This same indication will occur when not in auto test.

Illegal Entries

An illegal entry is any character not specified in the protocol. If you send an illegal entry to the Model 101, it will reply with a carriage return, line feed and a question mark. The logic is reset so you must retransmit a complete message. That is, the Model 101 will only accept a **C** or an **I** character which are required to initiate any message.

The same action occurs as a result of a framing of parity error in data. Also, a question mark is sent if **FWD**, **FAST/FWD**, **REV** or **FAST/REV** is transmitted while the Model 101 is in **CAL** mode.

Alarm Indication

If the transport stops for any reason or should the tension arms drop, the Model 101 will terminate its current dialogue and send a sequence carriage return, line feed, **X**, and a space.

An **X** will also be sent when the transport stops due to pushing the **STOP** button on the front panel of the Model 101.

Limitations of RS-232C

There are a few features of the Model 101 operation which are not active with the RS-232C.

You cannot program shuttle points or selective track sequence routines via the data link. However, these programs may be entered from the control panel in the normal way and then selected via the data link.

Shuttle points may be set from the footage counter via the data link as described in the protocol.

The transport sequence mode and normal remote operation are not possible if the Model 101 is equipped with a serial interface card. However, the Model 101 is easily converted for these operations by replacing the serial interface card with the remote interface card.

The E-E Cal Mode (**CAL/REC**) cannot be selected remotely and the meter monitor and data card types cannot be interrogated remotely.

How To Set Up The RS-232C Option

The Model 101 may include the option when shipped from the factory, or you may install it in the field.

The kit consists of a serial interface circuit card, interface adapter box, one PROM and mounting hardware.

1. If the interface kit is supplied, remove the remote interface board from control logic card and install the serial interface card in its place. (Refer to installation procedures in Section 2 of the Model 101 Control System Manual.) Install PROM in U8 socket of the MPU card.

2. Connect the interface adapter box to the RMT receptacle on the Input/Output panel of the Model 101.

3. Connect the DCE to the RS-232C receptacle on the card.

NOTE

Baud rate, clock rate, word format, and echo selections on DTE and DCE must match.

4. On the serial interface card (see Table A-1 and Figure A-2):

NOTE

Allow 15 ms delay between characters when using above 1200 baud rate.

- Select baud rate using S1.
- Select clock rate. Use 16 or 64 if using internal clock.
- Select ECHO ON or OFF.
- Select word format.
- Select NULLS.

5. On the Model 101, load tape, apply power and select the RMT Mode.
6. The Model 101 is now ready to be operated remotely from DCE in accordance with the protocol. See pages A-5 through A-9.
7. The RS-232C option may be checked out completely by exercising the machine using the entire protocol.
8. The Model 101 can be operated from the control panel in the normal way by deselecting the RMT mode. The LOAD-STOP-READY function is always active from the control panel. Transport pushbuttons (FWD, REV, REC, and FAST) are not active from the control panel when in the remote mode.

NOTE

Maintenance instructions are in the Model 101 Control System Manual.

TABLE A-1 OPTIONS

SWITCH S2 POSITIONS								
8	7	6	5	4	3	2	1	
-	-	-	-	-	-	C	C	1 } CLOCK RATE SELECTION
-	-	-	-	-	-	O	C	16 }
-	-	-	-	-	-	O	O	64 }
-	-	-	C	C	C	-	-	7 DATA BITS + EVEN PARITY + 2 STOP BITS
-	-	-	C	C	O	-	-	7 DATA BITS + ODD PARITY + 2 STOP BITS
-	-	-	C	O	C	-	-	7 DATA BITS + EVEN PARITY + 1 STOP BIT
-	-	-	C	O	O	-	-	7 DATA BITS + ODD PARITY + 1 STOP BIT
-	-	-	O	C	C	-	-	8 DATA BITS + 2 STOP BITS
-	-	-	O	C	O	-	-	8 DATA BITS + 1 STOP BIT
-	-	-	O	O	C	-	-	8 DATA BITS + EVEN PARITY + 1 STOP BIT
-	-	-	O	O	O	-	-	8 DATA BITS + ODD PARITY + 1 STOP BIT
-	-	C	-	-	-	-	-	ECHO OFF } ECHO SELECTION
-	-	O	-	-	-	-	-	ECHO ON }
C	C	-	-	-	-	-	-	0 NULLS } NULL SELECTION
C	O	-	-	-	-	-	-	10 NULLS }
O	C	-	-	-	-	-	-	6 NULLS }
O	O	-	-	-	-	-	-	20 NULLS }

O = SWITCH OPEN = LOGIC "1"
C = SWITCH CLOSED = LOGIC "0"
- = DON'T CARE

APPENDIX B
IEEE 488-1978 INTERFACE OPTION

16786270-001

Description of Option

The IEEE 488-1978 Interface Option allows control of the Model 101 from an external device capable of sending and receiving ASCII (American Standard Code for Information Interchange) coded characters.

Control of the Model 101 is via the General Purpose Interface Bus (IEEE STD 488-1978). The bus provides for controlling multiple instruments from different manufacturers and unambiguously moving data between instruments.

System configuration typically consist of a bus controller interconnected with various instruments such as the Model 101, frequency counter, digital printer, etc. See Figures B1 and B2.

All devices on the bus are connected in parallel, thereby enabling any one device to transfer data to one or more other participating devices.

Each device connected to the bus must be able to perform one of the roles of talker, listener or controller.

The controller manages the operation of the bus by designating which devices are to send and receive data. It sends interface messages to command specific actions in an operating measurement system. These include scheduling measurement activities, setting up individual instruments, monitoring progress of measurements, interpreting the results of measurements, etc.

A talker can transmit data to other devices on the bus.

A listener can only receive data from other devices on the bus.

The Model 101 can be a talker or a listener. It listens to receive its control instructions and talks to send its status to the controller or to another instrument on the bus.

Only one device at a time may be an active controller. Only one device at a time may be an active talker. Several bus devices may simultaneously be listeners.

The bus consists of a 24-line passive cable. Eight of these lines are used for ground connections. The remaining 16 lines are organized into three categories:

— 8 data bus signal lines
— 3 handshake lines
— 5 management lines

The eight data lines (DI01 thru DI08) carry coded messages in bit-parallel, byte-serial form. Data flow is bidirectional. Data is exchanged asynchronously.

The three handshake lines enable the transfer of each byte of coded data on the eight data lines.

The five management lines ensure orderly flow of information within the bus system.

All 16 lines are discussed in detail in the IEEE — Standard-488-1978.

Each device on the bus has an address. The Model 101 has 31 selectable addresses.

The model 101 when equipped with the IEEE-488-1978 Option is fully compatible with the IEEE-488-1978 Standard.

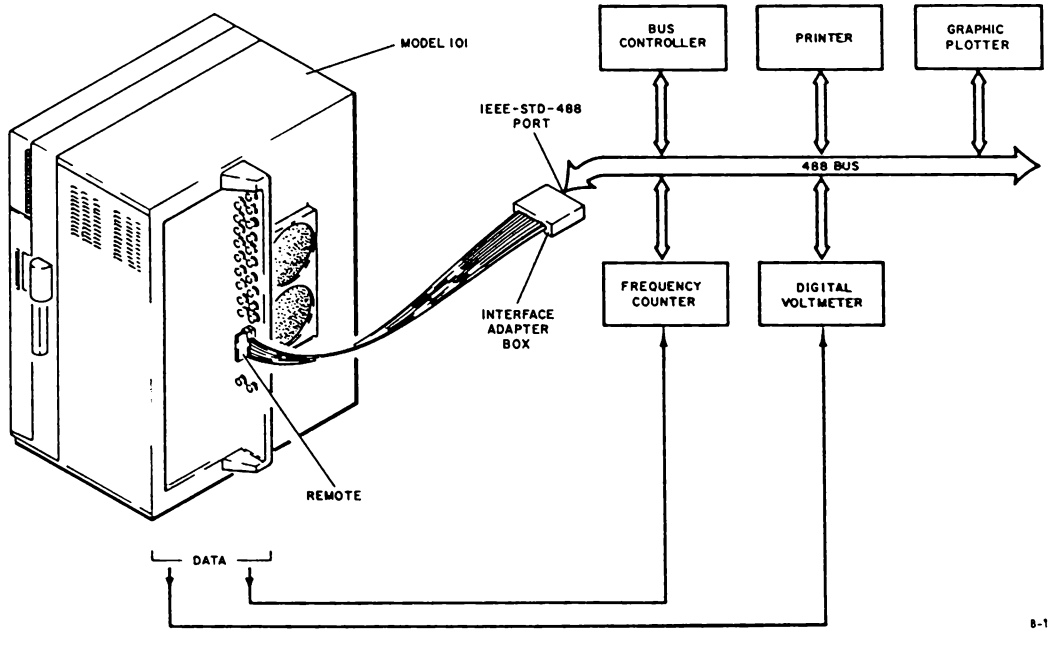


FIGURE B-1. MODEL 101/488 BUS SET UP — REPRODUCE MODE

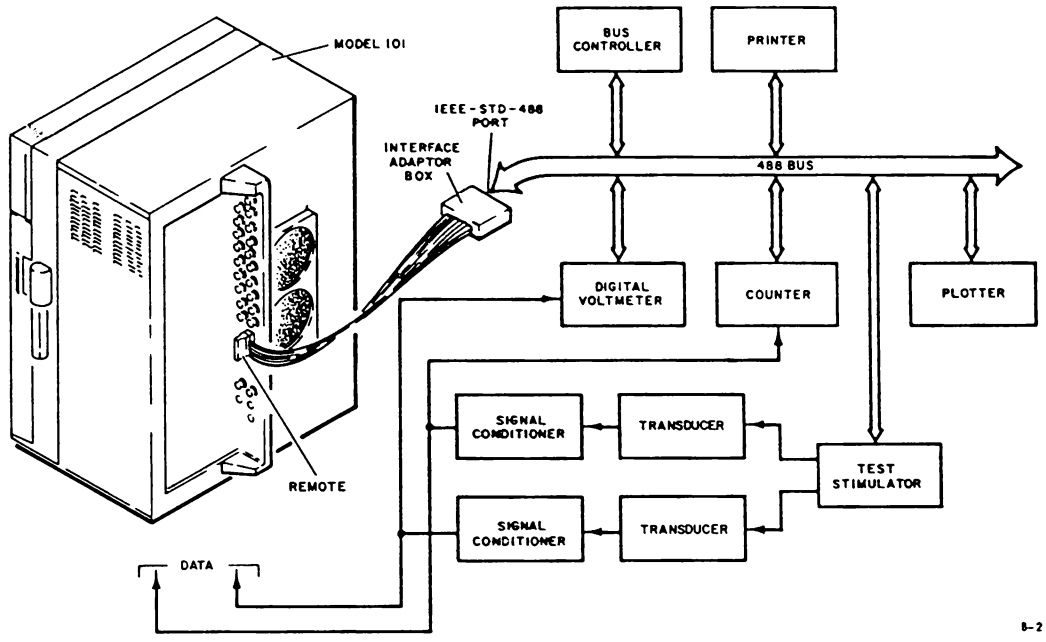


FIGURE B-2. MODEL 101/488 BUS SET UP - RECORD MODE

The Model 101 interprets ASCII characters and responds to commands as being controlled from the control panel, commands as well as interrogation of the transport operating conditions are possible. Tape stoppage (for any reason), syntax errors, and certain illegal commands causes the Model 101 to initiate a service request (SRQ).

The controller can be programmed to respond to the SRQ or to ignore it. However, the controller must clear the SRQ line before further commands will be accepted by the Model 101.

The Model 101 only responds to serial polling techniques.

In order to write software for your controller, you must be thoroughly familiar with the operating principles and how how to operate the Model 101. You also must be thoroughly familiar with the command and interrogate protocol used to control the Model 101.

For operation of the Model 101, refer to the Operator's Manual, 16783818-001.

This appendix tells you how to use the IEEE 488-1978 Interface Option with the Model 101 and defines the protocol necessary to perform various functions.

Familiarity with the following documents will also be helpful:

— IEEE Standard 488-1978 *

— Getting Aboard the 488-1978 Bus **

— Description of the Hewlett-Packard Interface Bus (HP-IB) ***

— Condensed Description of the Hewlett-Packard Interface Bus ***

— An HP-IB Overview ***

* *Copies may be purchased from IEEE, 345 E. 47th St., NY., NY 10017*

** *Copies may be obtained from Motorola Semiconductor Products Inc., Box 20912, Phoenix, Arizona 85036.*

*** *Copies may be obtained through your local HP Sales and Service Office.*

Description of Equipment

Only two pieces of equipment are required to add the IEEE 488-1978 interface option. These are the interface circuit card and the interface adapter box.

IEEE 488-1978 Interface Circuit Card

The interface card (Figure B-3) contains the circuitry necessary to interface the 488-1978 bus and the 6800 MPU in the Model 101. The MPU performs the processing function.

The circuitry contains a 68488 type IC that handles the bus interface functions, address decoding IC's, buffers and an address selection switch.

The 488 interface card replaces the remote interface card or the RS-232C serial interface card. Only one interface card can be used at one time.

488 Interface Adapter Box

The 488 interface adapter box provides the connection between the Model 101 and the 488-1978 bus. The adapter contains a 34-pin ribbon cable, circuit card and standard 488 bus connector. The ribbon cable is hardwired to the circuit card. The cable has a plug on one end that connects to the **RMT** receptacle on the input/output panel of the Model 101.

Connection can be made at any point on the 488 bus by plugging into the standard 488 bus connector on the adapter box.

Interconnecting Cable

The interconnecting cable is not supplied by Honeywell. However, it is fully specified in the IEEE STD 488-1978. Interconnecting cables used with the interface have connector blocks at both ends, each connector block has a plug on one side and a matching receptacle on the other, so that several cables may be connected in parallel. Metric threaded, lock screws provided for secure mounting on each connector block.

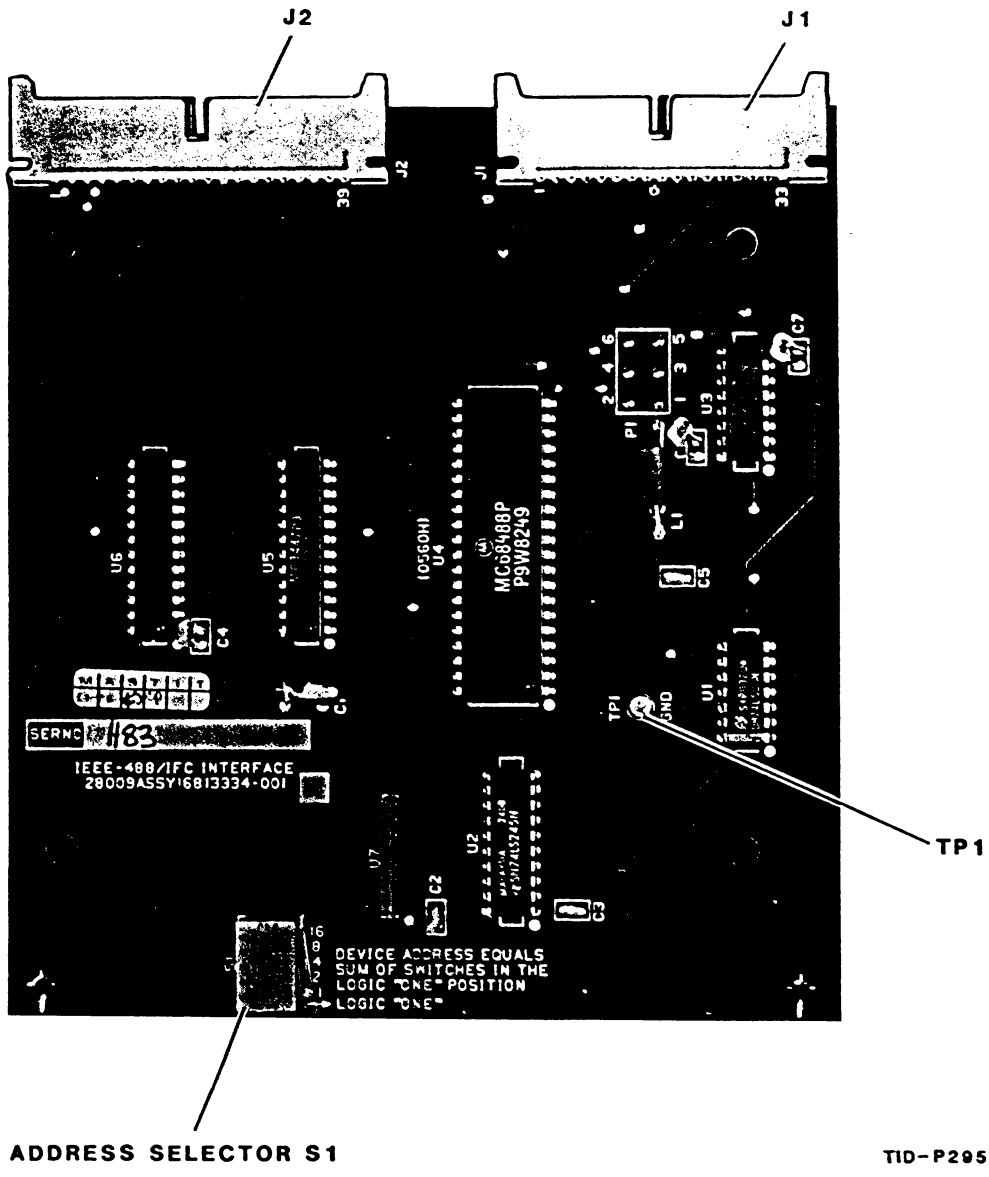


FIGURE B-3. 488 INTERFACE CIRCUIT CARD

Interconnecting cables with various lengths are available from your local Hewlett-Packard office and other suppliers.

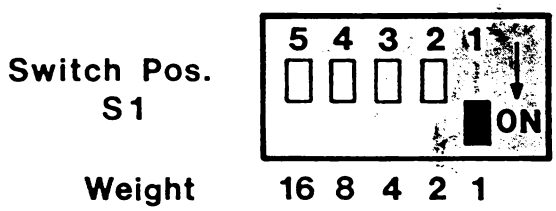
Interconnection Path

The total transmission path length may not exceed more than 2 meters of cable per unit on the bus or 20 meters whichever is less. Bus extenders are commercially available.

How to Select Address

Five-position slide switch S-1 on the interface card (Figure B-3— lets you select any of 31 different address for the Model 101. The weight of each switch position is shown in Figure B-4.

The address, in decimal notation, is the sum of the switched positions activated. Only decimal addresses 0 through 30 are allowed.



B-4

T protocol is the defined procedure for operating the Model 101 via the IEEE-488 bus. The protocol presentation is separated into two lists: Command (**C**) and interrogate (**I**).

Command protocol delineates the ASCII characters that must be sent to the Model 101 to command the required functions.

Interrogate protocol delineates the characters that must be sent to and returned from the Model 101 to indicate its status.

Study the protocol so you'll know the language to talk and listen to the Model 101.

Command Protocol

Each command is initiated by sending a group of ASCII characters to the Model 101. All command groups are started by entering the character C, and terminated by sending a line feed ((LF)) character. The carriage return ((CR)) following the line feed ((LF)) is optional. A circled symbol indicates a non-printing character.

A. How to select a Transport Mode

Enter character group for mode desired.

CMS	(LF) (CR)	Stop (Stop function persists for approximately 3.5 seconds to allow for tensioning tape. Model 101 cannot receive additional command during the 3.5 second period)
CMF	(LF) (CR)	Forward
CMR	(LF) (CR)	Reverse
CMFF	(LF) (CR)	Fast
CMFR	(LF) (CR)	Fast Reverse
CMWF	(LF) (CR)	Record Forward (Tape must be stopped or moving in forward)
CMWR	(LF) (CR)	Record Reverse (Tape must be stopped or moving in reverse)

EXAMPLE: How to Tension Tape

1. Enter C, indicating ready to send a command.
2. Enter M which indicates that the nature of the command is to be a transport function.
3. Enter S which instructs the Model 101 to tension tape or to stop if moving tape when the (CR) (execute) character is received.
4. To execute, enter (CR). Remember F is optional.

B. How to Select Tape Speed

NOTE

When entering a speed, you can use either the numerical speed value or its abbreviation.

Enter character group for speed desired:

			Abbreviation
CS.937	(LF) (CR)	Select 0.937 ips.	**.**
CS 1.87	(LF) (CR)	Select 1.87 ips.	**1**
CS 3.75	(LF) (CR)	Select 3.75 ips.	**3**
CS 7.5	(LF) (CR)	Select 7.5 ips.	**7**
CS15	(LF) (CR)	Select 15 ips.	**15**
CS30	(LF) (CR)	Select 30 ips.	**30**
CS60	(LF) (CR)	Select 60 ips.	**60**
CS120	(LF) (CR)	Select 120 ips.	**120**

C. How to Select or Deselect Shuttle Mode

Enter character group desired:

CBS (LF) (CR) Select shuttle mode.

CBD (LF) (CR) Deselect shuttle mode.

D. How to Set Shuttle Points

CRF (LF) (CR) Set forward shuttle point from current reading of the footage counter

CTR (LF) (CR) Set reverse shuttle point from current reading of the footage counter

E. How to Select Either Auto Test, Preamble, Trk Seq, Cal or Reset Footage Counter

CIA (LF) (CR) Initiate auto test and calibrate.

CIB (LF) (CR) Initiate calibrate.

CIP (LF) (CR) Initiate preamble.

CIS (LF) (CR) Terminate preamble.

CIC (LF) (CR) Clear auto test (remains in calibrate)

CID (LF) (CR) Clear calibrate.

CIT (LF) (CR) Initiate track sequence.

CIR (LF) (CR) Reset footage counter.

NOTE

Above commands have the same prerequisites as when operating the Model 101 from the front panel.

EXAMPLE: How to Auto Test the System

Refer to page 4-9 of the operator's Manual. Prior to entering auto test, the Model 101 should be loaded with a clean, well degaussed tape, be in the ready condition (**STOP** indicator lighted) and have a speed selected.

1. Enter characters CIA and (CR) which puts the Model 101 in auto test mode.

2. Enter characters CMWF and (CR) for REC/FWD. The Model 101 will now run the auto test as if initiated from the control panel.

F. How to Advance the Channel Selector

Enter characters:

CKUXX (LF) (CR) **XX** indicates the channel number to which the channel selector will advance. Ranges are 01-16, 01-28 or 01-32 depending on the housing used. Leading zeros must be used.

G. How to Select Calibration Stimulus

Enter characters:

CKSYY (LF) (CR) **YY** may be LF, .1, .8, or BE, designating the stimulus generator switch position.

H. How to change REC/REPRO Selector

Enter Characters:

CKR (LF) (CR) Change **REC/REPRO.**

NOTE

Each time the above command is sent the channel selector alternately selects either the record monitor bus or the reproduce monitor bus if allowed by the program in effect at the time the command is sent.

I. How to Select or Deselect Low Tape

Enter characters:

CLS (LF) (CR) Select low tape.

CLD (LF) (CR) Deselect low tape.

J. How to Select Remote Operation from the Controller

Make the REN (Remote Enable) management line true and send the Model 101 address.

K. How to Select Tape or Tach Mode

Enter Characters:

CIE (LF) (CR) Select Tape Mode (Must be in reproduce).

CIG (LF) (CR) Select Tach Mode.

L. How to Select Internal or External Cal Source

Enter characters:

CKSI (LF) (CR) Selects **INT.**

CKSE (LF) (CR) Selects **EXT.**

} Must be in Cal or preamble mode

Interrogate Protocol

All interrogate commands start with the character I and terminate with line feed ((LF)) and carriage return ((CR)) characters. The use of the line feed character is optional. The transport sends a reply as indicated in the subsequent paragraphs. All replies are terminated with a line feed ((LF)) character.

A. What is Condition of Transport

Enter characters **IM** ((LF)) ((CR)). The transport will respond with one of the following eight possible replies:

F (LF) Operating forward.

S (LF) Stopped.

N (LF) Not ready.

R (LF) Operating reverse.

WF (LF) Recording forward.

WR (LF) Recording reverse.

FF (LF) Operating fast.

FR (LF) Operating fast reverse.

EXAMPLE: How to Interrogate the Model 101 to Indicate Mode of Operation

1. Send ASCII characters **IM** (LF) (CR).
2. If transport is recording in the forward mode, it will reply with WF (LF).

B. What is Operating Mode

Enter characters **IO** (LF) (CR). The six possible replies e:

A (LF) Auto test selected.

P (LF) Preamble selected.

T (LF) Track Sequence selected.

S (LF) Shuttle selected.

L (LF) Low tape selected.

N (LF) None of the above.

C (LF) Cal in progress.

C. What is Tape Speed

Enter **IS** (LF) (CR) characters. The nine possible replies are:

000 (LF) No speed selected.

.937 (LF) .937 ips

1.87 (LF) 1.87 ips

3.75 (LF) 3.75 ips

7.5 (LF) 7.5 ips

15 (LF) 15 ips

30 (LF) 30 ips

60 (LF) 60 ips

120 (LF) 120 ips

D. Which Channel is Selected

Enter **IC** (LF) (CR) :

XX (LF) The channel number selected is displayed directly.

E. What is Footage Counter Reading

Enter **IF** (LF) (CR) :

XXXXXX (LF) Sign and five digits represent footage counter reading.

F. What is status of Phase Lock

Enter **IL** (LF) (CR). The five possible replies are:

CN (LF) Tach mode, phase lock not achieved.

CC (LF) Tach mode, phase lock achieved.

PN (LF) Tape mode, phase lock not achieved.

PP (LF) Tape mode, phase lock achieved.

PC (LF) Tape mode, phase lock to tach signal achieved.

G. What is Status of Auto Test

Enter **IA** (LF) (CR). The three possible replies are:

XXT (LF) Two digits and letter T indicate ready for auto test or test in progress.

XXF (LF) Two digits and letter F indicate the number of the channel that has failed auto test.

NF (LF) Letters NF indicate that no active channel has failed auto test. This same indication occurs when not in auto test.

H. What is Status of Calibrator

Enter **IB** (LF) (CR). The five possible replies are:

LF (LF) Low frequency/zero

0.1 (LF) 0.1 bandedge/ - deviation

0.8 (LF) 0.8 bandedge/zero

BE (LF) Bandedge/ + deviation

Must be in **CAL/INT** or **PRE-AMBLE INT**

N (LF) All off if in **EXT CAL** or **EXT PREAMBLE.**

I. What is Status of REC/REPRO and MON Selectors

Enter **IN** (LF) (CR). The three possible replies are:

W (LF) REC

R (LF) REPRO

M (LF) MON

J. What is Forward Shuttle Point

Enter **ITF** (LF) (CR). The two possible replies are:

XXXXX (LF) Indicates shuttle point directly in feet.

LT (LF) Low tape selected for shuttle point.

K. What is Reverse Shuttle Point

Enter **ITR** (LF). The two possible replies are:

XXXXX (LF) Indicates shuttle point directly in feet.

LT (LF) Low tape selected for shuttle point.

L. What is Data Card Type

Enter **ID** (LF) (CR). The five possible replies are:

NOTE
If in the record mode, card identification cannot be accomplished.

WB (LF) Wideband FM card

MB (LF) Mediumband FM card

DR (LF) Direct card

NO (LF) No card ID light on

REC (LF) REC light on

How to Determine Transport Status After Syntax Error or Stop

If the Model 101 transport stops or receives an improperly formatted message, it replies by causing the Service Request (SRQ) line to assume the TRUE (low) state. The controller then may read the status register of the 68488 chip on the 488 Interface Card to determine transport status. The contents of the status register has the following significance:

Register Contents*	Significance
41_{16}	Syntax error or a FWD or REV command given without tape speed being selected.
44_{16}	Tape stopped manually, at shuttle point or at the end of Auto Test.
48_{16}	Tape stopped at low tape point at the beginning of tape (BOT).
50_{16}	Tape stopped at low tape point at the end of tape (EOT).
42_{16}	Tape not tensioned.
60_{16}	Tape stop caused by failure of auto test.

*Status register contents in hexadecimal notation.

How to Set Up
The IEEE-488-1978 Option

The Model 101 may include the option when shipped from the factory or it may be shipped as a kit to be installed in the field. The kit consists of a 488 interface card, 488 adapter box, two PROM's hardware and instructions.

1. Remove the control logic card from the Model 101 and install the 488 interface card according to Section 2 of the Model 101 Control System Manual.

   NOTE
   If kit is supplied, installation procedures are included with the kit.

2. Install PROM in slot U8 of the MPU card. Part numbers are listed in the Control System Manual or included with the kit.

3. On interface card, set Model 101 address. See page B-4.

4. Connect the 488 Interface Adapter Box ribbon cable plug to the RMT receptacle on the Model 101.

5. Connect 488 Bus Interconnecting cable to the 24-pin receptacle on the interface box and to the bus. See page B-4.

6. On the Model 101, load tape, apply power and select the remote mode.

7. The Model 101 is now ready to be operated remotely via the 488-Bus in accordance with the protocol. See pages B-4 through B-7.

   NOTE
   The remote selection may also be made via the 488 Bus Systems.

8. The 488 Option may be checked out completely by exercising the machine using the entire protocol.

9. The Model 101 may be operated from the control panel in the normal way by deselecting the remote mode. The **load-stop-ready** function is always active from the control panel. Transport pushbuttons **FWD, REV, REC,** and **FAST** are not active from the control panel when in the remote mode. When the Model 101 is turned off, it does not affect the 488 Bus System.

   NOTE
   Maintenance instructions, schematics, parts list, and wiring information are in the Model 101 Control System Manual, or supplied with the kit.