



SOFTWARE FOR THE BUS-65518 AND BUS-65517II IDEA CARD

DESCRIPTION

These runtime software libraries have been developed to expand the capabilities of the BUS-65518 and BUS-65517II IDEA (Integrated Development Emulation Analysis) Simulator/Tester Cards to be used in realtime test, simulation, and demo applications.

The BUS-65518 or BUS-65517II allow the PC to simultaneously simulate a MIL-STD-1553B Bus Controller (BC), multiple (up to 31) Remote Terminal (RT) units, and an intelligent Bus Monitor (MT). Errors can be injected into the BC messages and any of the emulated RT responses. The boards come equipped with user-friendly, menu driven software for DOS, Windows 3.1, Windows 95 and Windows NT. This allows the user to be operating in a matter of minutes without extensive programming or 1553 expertise.

Runtime libraries (RTL) supporting DOS, Windows 3.1, Windows 95 and Windows NT which are supplied with the card, allow the user to bypass the menu-driven software and control the IDEA Card directly through Microsoft C/C++, Borland C/C++, Metaware High C, GNU C, and Borland (Turbo) Pascal. All functions supported by the menu software are provided in the form of function or subroutine calls.

This real time Application Programming Interface (API) allows for dynamic modification of simulated bus traffic. RT and BC data tables support automatic double buffering to ensure data consistency. Flexible interrupt generation and masking provides the framework for developing efficient, event-driven applications.

1553A Support allows the IDEA Cards to emulate multiple RTs (up to 31) that meet MIL-STD-1553A response time. These emulated devices meet the more stringent status response timing requirements imposed by the 1553A standard.

The DLL for Windows 3.1 may be used to develop 16-bit Windows applications while the DLL/drivers for Windows 95 and Windows NT may be used to develop 32-bit applications.

The APIs for the Windows 3.1, Windows 95 DLL and the Windows NT DLL/driver are identical to the API for the real-mode RTL which allows existing DOS applications to be easily ported to Windows 3.1, Windows 95 or Windows NT.

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FEATURES

- **Menu for DOS & Windows 3.1, Windows 95 & Windows NT**
- **“C” Library which consist of Microsoft C/C++, Borland C/C++, and Metaware High C libraries**
- **RECONSTRUCTOR**
- **1553A Support**
- **PMON (Parameter MONitor)**
- **Pascal library for DOS**
- **PTP (Production Test Plan)**
- **BUS-69023/123 Package Plus**
- **VTP (Validation Test Plan)**

PARAMETER MONITOR(PMON) SOFTWARE FOR REAL-TIME DATA ANALYSIS AND DISPLAY

STANDARD WITH ALL SOFTWARE PACKAGES:

BUS-69023, BUS-69024, BUS-69035

BUS-69123, BUS-69124, BUS-69135

DESCRIPTION

The Parameter Monitor (PMON) software for the BUS-65518 and BUS-65517II IDEA cards provides a powerful tool for analysis of MIL-STD-1553B data.

As opposed to the standard IDEA Monitor, which deals with the "low-level" protocol (i.e., encoding and timing of messages), the Parameter MONitor focuses on the data domain.

Selected parameters are stored to disk and displayed in several available formats. The stored data can be replayed using replay options: single-step, go to time, go to a marked event, etc.

It can also be viewed with the standard IDEA monitor at the message level, since the same storage method is used.

The software package supports real-time engineering unit conversions, a variety of alarm detection criteria, and real time processes. It consists of a user-friendly menu driven environment with extensive hypertext help system, bottom help line, and a project management system.

The PMON software package together with either the BUS-65518 or BUS-65517II board serve as an ideal instrument for application engineers and system integrators. It provides an integrated analysis and simulation tool which is indispensable for developing and displaying MIL-STD-1553B applications ranging in complexity from a single box to a complete communication system.

FEATURES

- **Friendly Menu Software**
- **Data Format Conversion**
- **Real-Time Scale Display**
- **User Defined Equations**
- **Real-Time Storage To Hard Disk**
- **High & Low Alarm Detection**
- **Post Processing Analysis of Data**

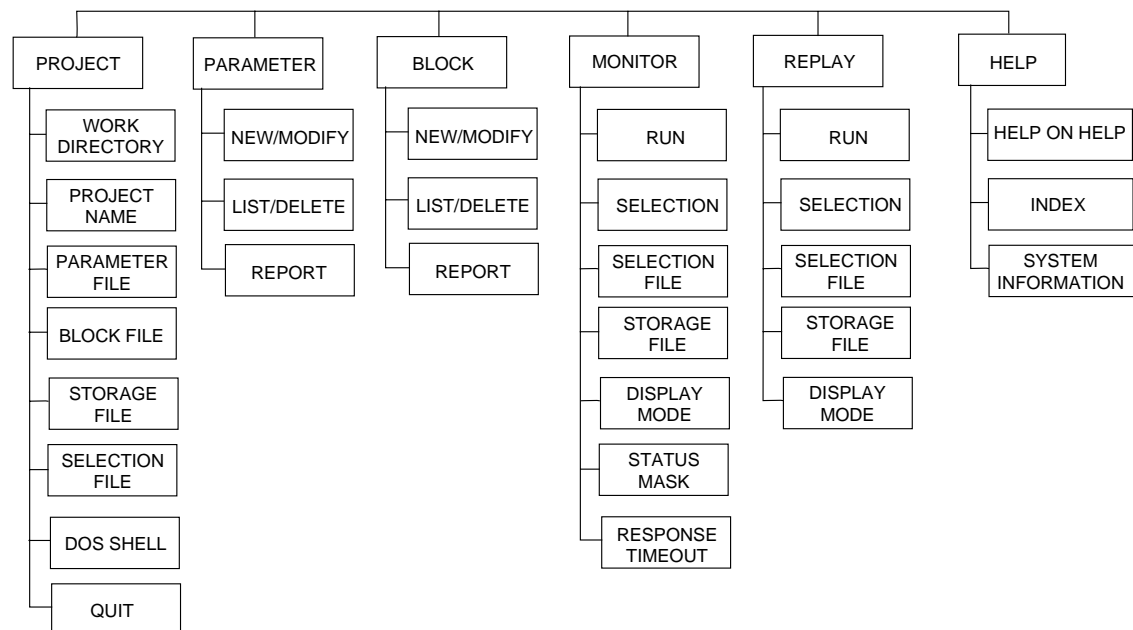


FIGURE 1. MENU STRUCTURE

| TABLE 1. SYSTEM REQUIREMENTS |
|--|
| HARDWARE REQUIREMENTS |
| <ul style="list-style-type: none"> ■ IBM PC/XT/AT or Compatible with 640k bytes of RAM and VGA Monitor ■ DDC's BUS-65517II or BUS-65518 IDEA Board |
| SOFTWARE REQUIREMENTS |
| <ul style="list-style-type: none"> ■ PC DOS 3.0 or higher |

GENERAL

The main parts in the PMON program tree are PARAMETER and BLOCK. A parameter represents an application variable or a physical parameter. A block is defined by a sequence of parameters and their relative locations within the block. A 1553 command and an optional header are assigned to every block.

The monitor setup consists of 4 phases:

- Phase 1. The user defines the project environment.
- Phase 2. Parameter attributes are defined (name, type, length, alarm, etc.).
- Phase 3. Parameters are mapped into blocks of 1553 communications.
- Phase 4. User defines the format and contents of the real-time display and storage attributes.

DETAILED DESCRIPTION

The 1553 PMON software package provides a menu driven user interface. The menus are organized in a tree structure as shown in FIGURE 1.

DEFINING PROJECT ENVIRONMENT

The PROJECT MENU allows the user to define the name of the file to be used, name of the saved file, quit to DOS shell and quit the program.

DEFINING PARAMETER ATTRIBUTES

The PARAMETER PAGE allows the user to DEFINE PARAMETERS BY name. The parameters may then be copied, modified, deleted, listed or printed. In this page the user is able to assign engineering units to the raw data being passed over the 1553 bus.

The PARAMETER PAGE is shown in FIGURE 2.

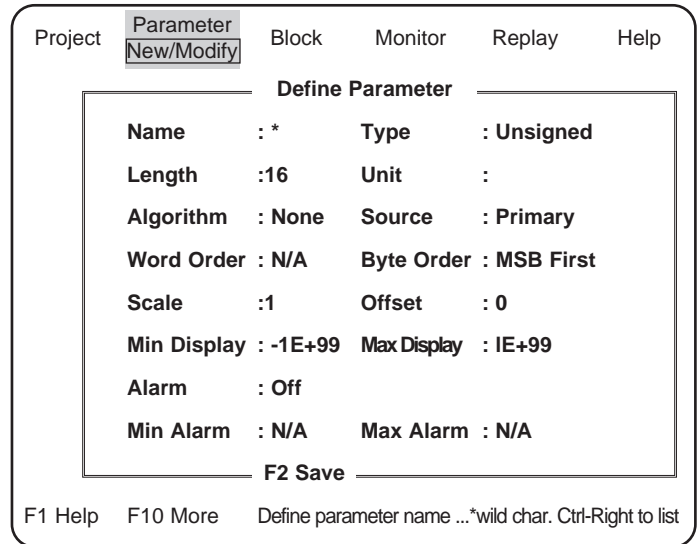


FIGURE 2. PARAMETER PAGE

PARAMETER OPTIONS

Name—Any alphanumeric string with up to 12 characters.

Type—The possibilities are:

- Signed integer
- Unsigned integer
- IEEE floating point
- MIL-STD-1 750A floating point
- Data General floating point
- Sign & Magnitude
- Offset Binary

Length—The length in bits (1-32).

Unit—Any alphanumeric string with up to 10 characters used in conjunction with the scale and offset fields for display.

Algorithm—The following algorithms can be applied to a parameter:

- In Limits
- Out of Limits
- Nth Word
- Bit Change
- Match
- No Match
- Bit Compression
- Discrete - A parameter can be defined as a discrete variable. An ASCII string of up to 15 characters can be associated with each value.

Word & Byte Order

Scale & Offset—

Displayed parameter = Scale * Raw parameter + Offset.

Min/Max Display—The minimum and maximum of a bar graph display.

Alarm - The alarm definition: Off, Out of limits, In limits.

Low/High Alarm Values—The upper and lower boundaries for alarms.

DEFINING BLOCK PARAMETERS

The BLOCK PAGE allows the user to map parameters into blocks by name. The blocks may then be copied, modified, deleted, listed or printed.

The BLOCK PAGE is shown in FIGURE 3.

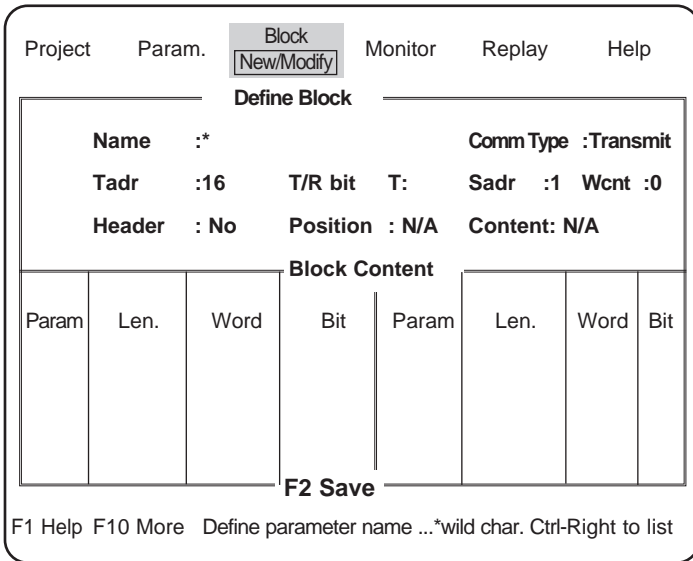


FIGURE 3. BLOCK PAGE

BLOCK OPTIONS

Name—Similar to parameter.

Comm. Type—The 1553 communication type: Receive, Transmit, RT_RT Mode Command.

Tadr, T/R bit, Sadr, Wcnt—The 1553 command content.

Header—Toggle header option.

Position—Header position in block (1 - wcnt).

Content—Header pattern.

Block Content—In this part of the page the parameters #are mapped into the block.

DEFINING DISPLAY AND STORAGE ATTRIBUTES

The operator chooses either the MONITOR or REPLAY operating mode.

Both the MONITOR and REPLAY operating modes may be displayed numerically or graphically. An example of the numerical real-time display is shown in FIGURE 4.

This display shows the Project Name, Disk Filename, and Screen Refresh rate which can be varied in run mode. Parameter names are also displayed along with its value, units of measurement and graphical display (as a bar graph, hex value, decimal value or word).

MONITOR MODE

The MONITOR mode allows the user to display previously selected parameters in several available formats while simultaneously performing disk storage.

In addition the user selects a response timeout of 14, 16, 18 or 20 microseconds and mask status bits.

REPLAY MODE

The REPLAY mode allows the user to select from “go to” options such as; marked event, time, block, parameter or single step through the stored data. The stored data can also be sent to a spooler while replaying.

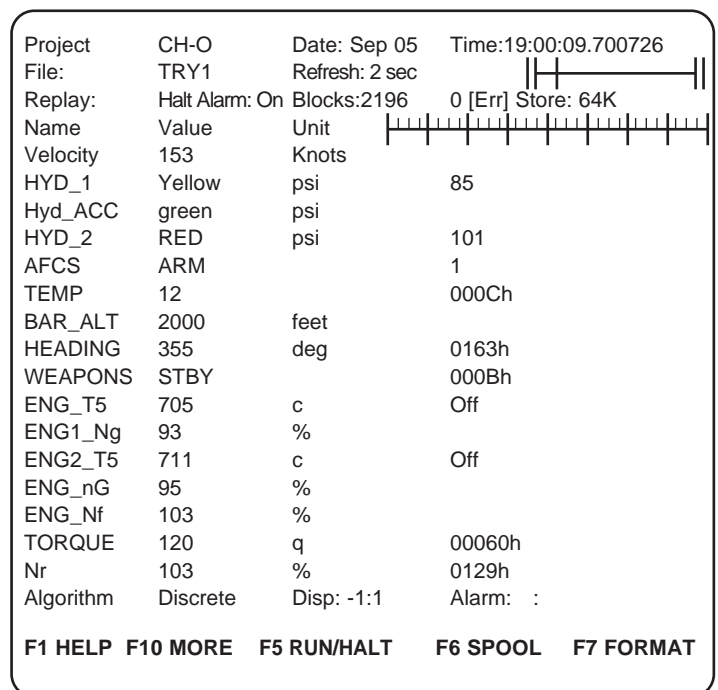


FIGURE 4. TYPICAL REAL-TIME NUMERICAL DISPLAY

RECONSTRUCTOR SOFTWARE FOR BUS MONITORING / PLAYBACK STANDARD WITH ALL SOFTWARE PACKAGES

FEATURES

- **User-Friendly Menu Software**
- **Record and Playback Bus Traffic**
- **Reconstruct BC, Multi-RT Messages**
- **Monitor Storage Capability**
- **Compatible with the IDEA MENU Communication Stack**
- **Extensive Hyper-Text Help System**

DESCRIPTION

The RECONSTRUCTOR software has been developed to expand the capability of the BUS-65518/BUS-65517II card series. The software is supplied standard with all IDEA Software Packages.

The BUS-65518 or BUS-65517II allows the PC to simultaneously simulate a MIL-STD-1553B Bus Controller (BC), multiple (up to 31) Remote Terminal Units (RTs), or an intelligent Bus Monitor (MT). In the MT mode, 1553 communications can be stored in real time as it occurs.

The RECONSTRUCTOR has two modes of operation, Bus Monitoring and 1553 Playback / Reconstruction Mode. Messages can be monitored by either the IDEA MENU or the RECONSTRUCTOR software package. Thousands of messages can be stored on a hard disk and later replayed for further analysis. Both the IDEA Menu and the RECONSTRUCTOR Software have the capability of Selection & Capture methods. Messages can be selectively stored by Terminal address, T/R and Subaddress bits in the command

word. Messages can be captured based on different events. These events are; Immediate, Command Template, Exception or Trigger.

In Playback mode, the software can reconstruct valid MIL-STD-1553 messages as a BC, Multi-RT or BC & Multi-RT. Messages will be replayed with their original contents and timing. For BC and/or RT Reconstruction, the IDEA hardware will be connected to a system with active RT's on it. The inter-message gaps are based on the time tags stored by the monitor. The reconstructed timing is accurate to within 5µs. The Bus controller does not reconstruct erroneous messages and ignores errors introduced by the external RTs during replay. When replaying only the RTs, the external BC must send the same sequence of commands that were originally stored by the monitor. If the messages deviate from what was stored, the reconstructor will halt. The program serves as a powerful tool for system integration and debugging.

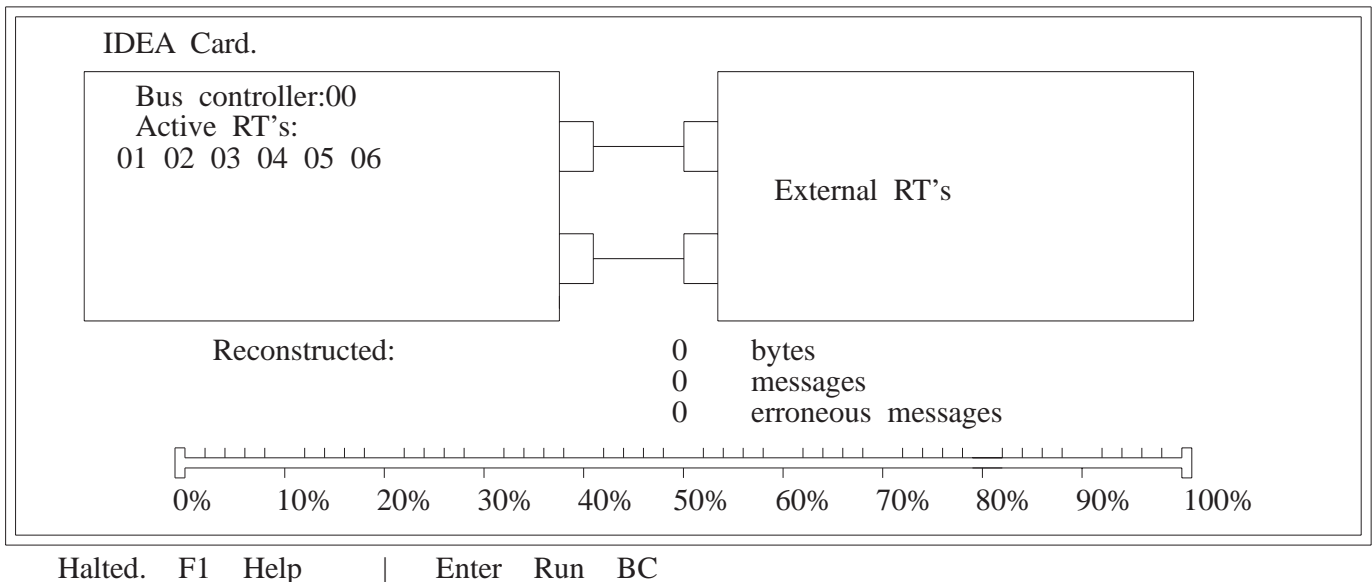


FIGURE 1. TYPICAL RECONSTRUCTOR OPERATING ENVIRONMENT

MIL-STD-1553 RT PRODUCTION TEST PLAN (PTP) SOFTWARE BUS-69123 AND BUS-69023

FEATURES

- **Implements Complete SAE RT Production Test Plan (PTP) Protocol Tests Including NOTICE II Tests**
- **Complies With Latest PTP SAE Release AS4112**
- **Completes PTP Test in Less Than 20 Seconds**
- **Disk Storage of PTP-Subset and RT Configurations**
- **User-Friendly Menu Driven Displays With Help Screens**
- **Includes "C" and PASCAL Libraries**
- **Optional Discrete I/O Board (Control RT Address And Status Bits)**

DESCRIPTION

The BUS-69123 PTP software option for the BUS-65518 card and the BUS-69023 PTP software option for the BUS-65517II card provide a turn-key implementation for the protocol section of the Production Test Plan for Remote Terminals (SAE standard AS-4112).

AS-4112 Production Test Plan for Remote Terminals is a standard written by the Armament Systems Division (ASD) of the Society of Automotive Engineers (SAE). This test plan defines the industry recommended minimum set of tests which should be run on every MIL-STD-1553 remote terminal at the box level assembly. The PTP performs tests intended to verify basic protocol operation, error detection

circuits, decoder operation and encoder operation.

The PTP software consists of a user-friendly menu driven application that completes the RT production test plan in less than 20 seconds. The interactive setup menus allow the test to be tailored based on the characteristics of the RT under test. An online monitor displays failures in real-time.

The BUS-65518 and BUS-6517II represent a hardware platform which provides for all of your 1553 test needs from bus simulation to software development to production testing and even RT validation testing making it the most versatile 1553 tester/simulator in the market.

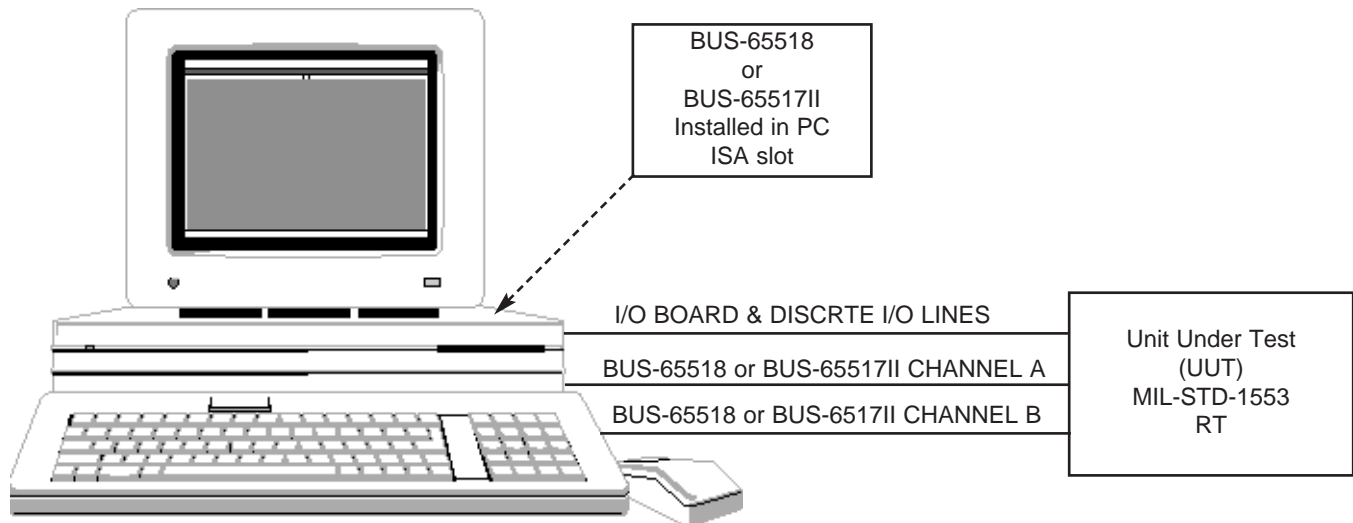


FIGURE 1. BUS-65518 OR BUS-65517II OPERATING ENVIRONMENT

TABLE 1. BUS-69123 AND BUS-69023 REQUIREMENTS AND CAPABILITIES

| |
|--|
| HARDWARE REQUIREMENTS |
| <ul style="list-style-type: none"> ■ IBM PC/XT/AT or Compatible with 640k bytes of RAM ■ DDC's BUS-65518 or BUS-65117II BOARD ■ METRABYTE'S PIO-12 PARALLEL I/O CARD (OPTIONAL) |
| SOFTWARE REQUIREMENTS |
| <ul style="list-style-type: none"> ■ PC DOS 3.0 or higher |

GENERAL

This data sheet contains the operating instructions for the BUS-69123 and BUS-69023 MIL-STD-1553 Protocol Software to perform the tests listed in TABLE 4, SAE RT Production Test Plan Section 5.2. The user can use the optional discrete I/O board to select discrete I/O signals, listed in TABLE 3, on the unit under test.

BUS-69123 and BUS-69023 software packages include Production Test Plan(PTP), "C" and Pascal Function libraries for DOS and Windows 3.1, and user-friendly menu software for DOS and Windows 3.1.

The paragraphs which follow describe the operation of the PTP software.

MAIN MENU

When the PTP program is loaded, the MAIN MENU, as shown in FIGURE 2, will be displayed. All configuration, editing, test execution, and result options are accessed from this menu. The complete menu tree is shown in FIGURE 3.

SPECIAL FUNCTION KEYS

Special function keys are used to access the help screens, abort operation, and exit.(See TABLE 2 for further information).

TABLE 2. SPECIAL FUNCTION KEYS

| FUNCTION KEY | DESCRIPTION |
|--------------|---|
| ESC | EXIT SCREEN : LEAVE SCREEN AFTER MAKING CHANGES |
| F1 | HELP MENU : DISPLAY VALID VALUES FOR OPTION |
| F2 | ABORT WITHOUT UPDATE : LEAVE WITHOUT MAKING CHANGES |
| F9 | TOGGLE SOUND : TURN SOUND ON OR OFF |
| RETURN | TERMINATE FIELD ENTRY : GO TO NEXT OPTION IN THE MENU |

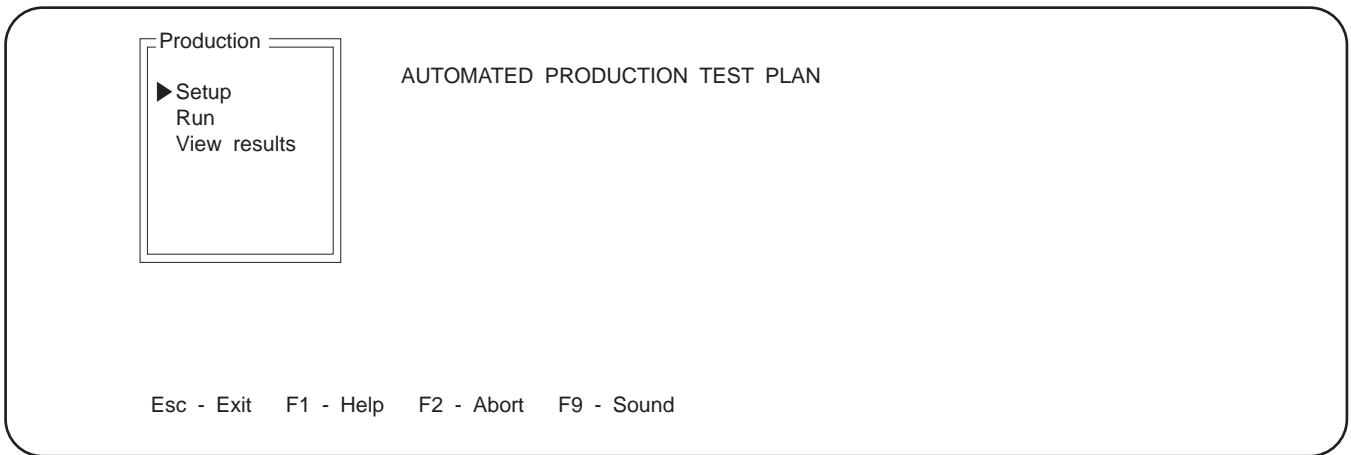


FIGURE 2. MAIN MENU

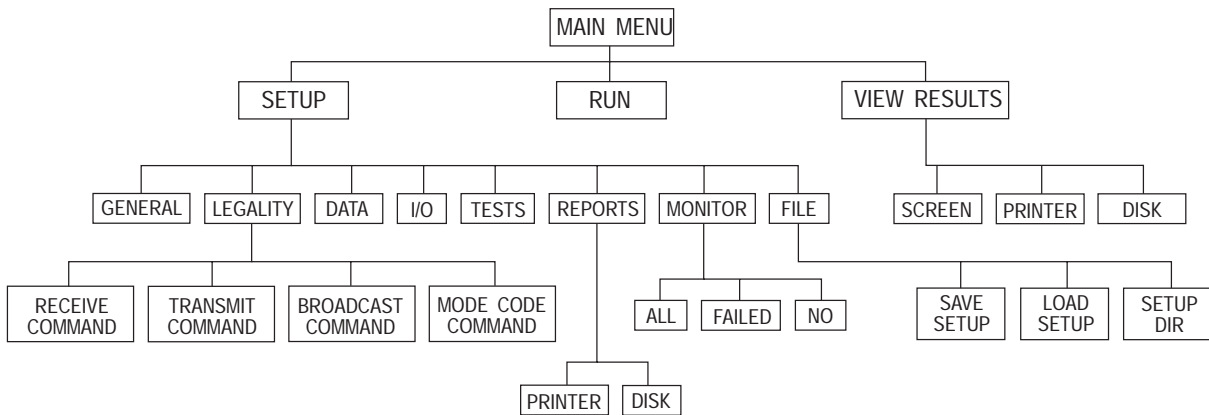


FIGURE 3. MAIN MENU STRUCTURE

GENERAL SETUP MENU SCREEN

The General Setup Menu Screen permits the user to select the RT operating Characteristics and Notice II optional Characteristics. (See FIGURE 4)

| RT OPERATING CHARACTERISTICS | | |
|---|--------------|---|
| NAME | VALID VALUE | DESCRIPTION |
| RT ADDRESS | 00-30 | UUT Address |
| NUMBER OF BUSES | 01-99 | NO. of UUT BUSES |
| VARIABLE RT ADDRESSES | YES or NO | |
| DBC ACCEPTANCE | YES/NO/BOTH | |
| TIME TO NEXT MESSAGE | 001-999 | Global delay before the next message, in μ sec. |
| MODE COMMAND "SELF TEST": TIME UNTIL COMPLETION | 002-999 | Time in ms which guarantees that SELF TEST was completed. |
| MODE COMMAND "RESET RT": TIME UNTIL COMPLETION | 02-99 or F | Time in ms or F = Forever until KEY PRESSED which guarantees that RESET RT was completed. |
| RESPONSE FOR NEXT COMMAND AFTER "RESET RT" | CS BUSY NR | CLEAR STATUS CS WITH BUSY BIT SET NO RESPONSE |
| DELAY AFTER HW RESET | 001-999 or F | Time in ms or F = Forever until KEY PRESSED |
| NOMINAL TX (2.1Vpp) AMP. | 00-99 | Calibrate the transmitter amplitude by attaching a scope to the RT. |

| NOTICE II OPTIONAL CHARACTERISTICS | | |
|---|-------------------|--|
| NAME | VALID VALUE | DESCRIPTION |
| MODE COMMAND "SELF TEST": TIME BEFORE COMPLETION | 001-998 | Time in ms must be less than TIME UNTIL COMPLETION. |
| RESPONSE | CS BUSY NR CS/NR | Required response before time is completed. |
| MODE COMMAND "RESET RT": TIME BEFORE COMPLETION | 01-98 | Time in ms must be less than TIME UNTIL COMPLETION. |
| RESPONSE | CS BUSY NR CS/NR | Required response before time is completed. |
| DATA WRAP AROUND Rx SUBADDRESS Tx SUBADDRESS WORD COUNT | 01-30 01-30 00-31 | |
| HALT ON ERROR | YES or NO | Y=HALT on Failure N=Halt at the end of all tests. |
| REPEAT TEST PLAN | 0001-9999 or F | Number of times or F = Forever until KEY PRESSED to run complete test. |
| SINGLE STEP | YES or NO | Y=HALT after each test N=HALT at the end of all test. |

| RT Characteristics | Notice 2 Characteristics |
|---|---|
| RT Address 01 Number of Buses 02 Variable RT Address. Both DBC Acceptance No Time to Next Message 001 usec Mode Command "Self Test" : Time Until Completion 100 milsec Mode Command "Reset RT" : Time Until Completion 05 milsec Response for Next Cmd CS Delay After HW Reset 100 milsec | Mode Command "Self Test" : Time Before Completion 090 milsec Response CS Mode Command "Reset RT" : Time Before Completion 04 milsec Response CS Data Wrap-Around : Rx Subaddress 30 Tx Subaddress 30 Word Count 00 |
| Transmit Characteristics | Run Parameters |
| Nominal TX (2.1Vpp) Amp. 100 | Halt on Error No Repeat Test Plan 0001 times Single Step No |

FIGURE 4. GENERAL SETUP MENU SCREEN (DEFAULT VALUES)

LEGALITY MENU SCREEN

The user has a choice of 4 different types of commands to choose from:

- Receive
- Transmit
- Broadcast
- Mode Codes.

For Receive and Transmit commands, refer to FIGURE 5. The user may define the legality of any WORD COUNT and SUBADDRESS for those particular commands.

For MODE CODE Commands, refer to FIGURE 6.

The user may define the legality of each mode command for both TRANSMIT and RECEIVE commands.

The user defines:

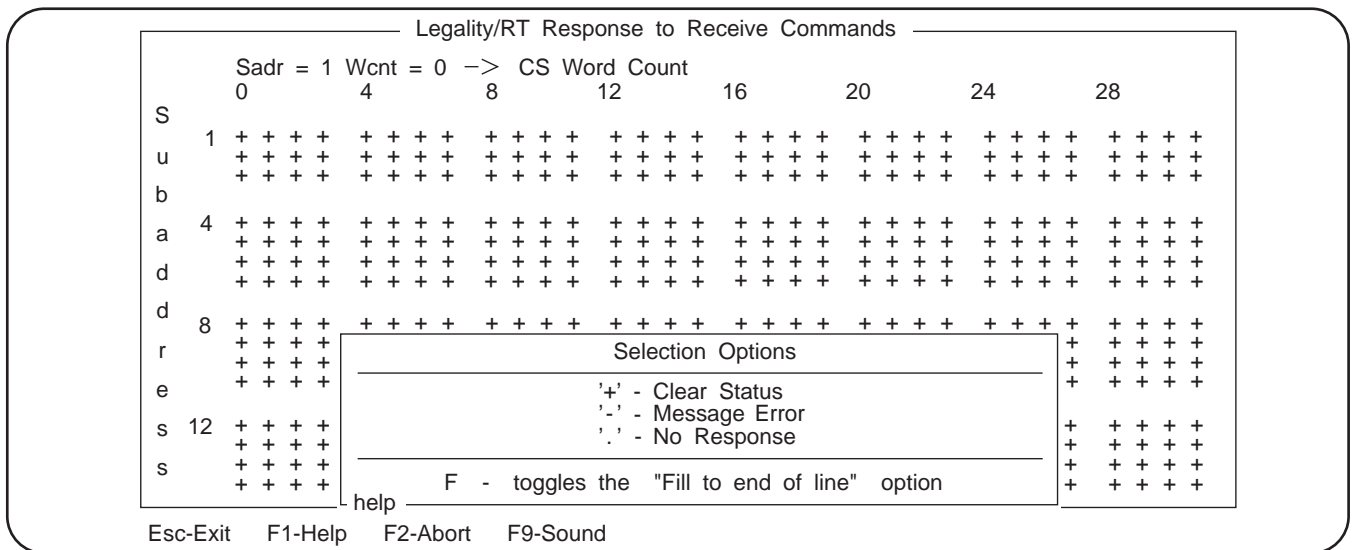
- CLEAR STATUS by typing “+”
- MESSAGE ERROR by typing a “-”.
- NO RESPONSE by typing a “.”.

for a particular SUBADDRESS AND WORD COUNT.

For BROADCAST COMMANDS, The user defines:

- CLEAR STATUS with BCR (Broadcast Command Received) by typing “+”
- MESSAGE ERROR with BCR by typing a “-”.
- NO RESPONSE by typing a “.”.

for any SUBADDRESS AND WORD COUNT.



Note: Shown for RECEIVE COMMANDS, similar menu for TRANSMIT and BROADCAST COMMANDS.

FIGURE 5. LEGALITY MENU

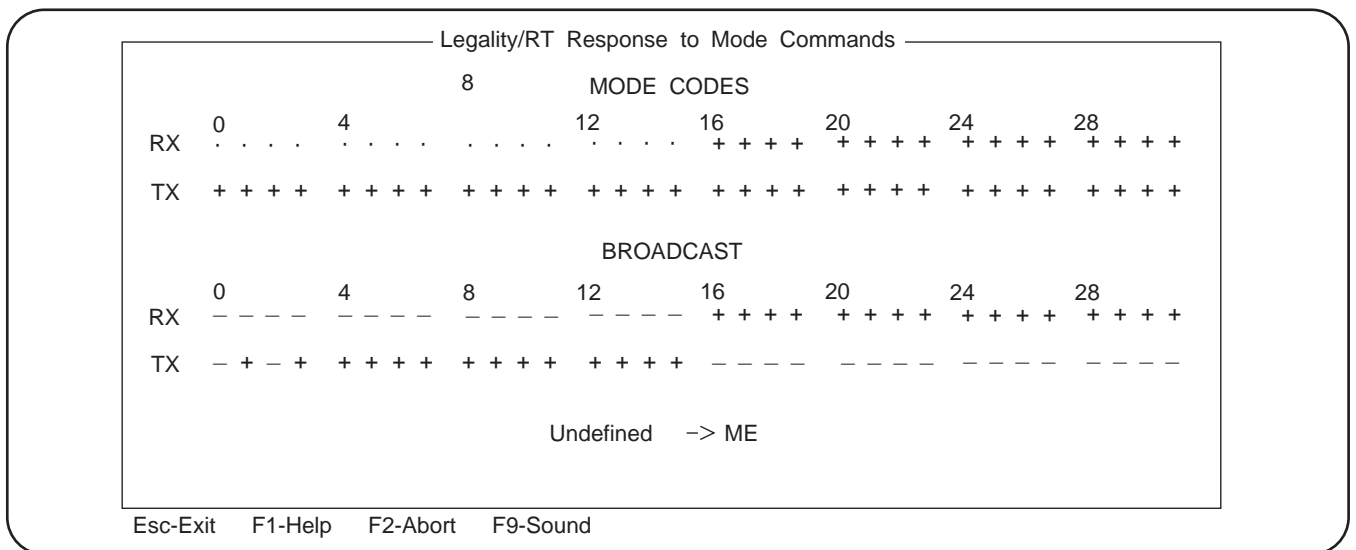


FIGURE 6. LEGALITY MODE CODE MENU(DEFAULT VALUES)

| TABLE 3. DISCRETE I/O PIN OUT | |
|-------------------------------|-------------------------------|
| PIN # | DESCRIPTION |
| 3 | Time Out (Terminal Fail-Safe) |
| 4 | Power ON/OFF |
| 5 | Dynamic BUS Acceptance |
| 6 | Sub System Flag |
| 7 | Busy |
| 8 | Service Request |
| 9 | Terminal Flag |
| 10 | Hardware Reset |
| 21 | GND |
| 32-36 | RT Address (Pin # 32 = MSB) |
| 37 | RT Address Parity |

TEST MENU

This menu allows the user to select the tests to be executed (see FIGURE 9). The user may scroll through the list; pressing a `Y` will select the line item, a `N` will deselect it; furthermore, selecting (Y) or deselecting (N) for items that have subordinate tests will select or deselect all the subordinate tests. (e.g., selecting test 5.2.1.1 will select every test; selecting 5.1 test will select all 5.1 subordinate tests up to, but not including, 5.2.1.2 tests.) The "Home" key takes you to the top of the list, and the "End" key takes you to the bottom of the list. TABLE 4 is a complete listing of the PTP tests, by paragraph.

REPORTS MENU

This menu sends a report to either the disk or printer. The user may specify "N" for NO RESULTS, "F" for FAILED RESULTS, or "A" for ALL RESULTS (see FIGURE 10).

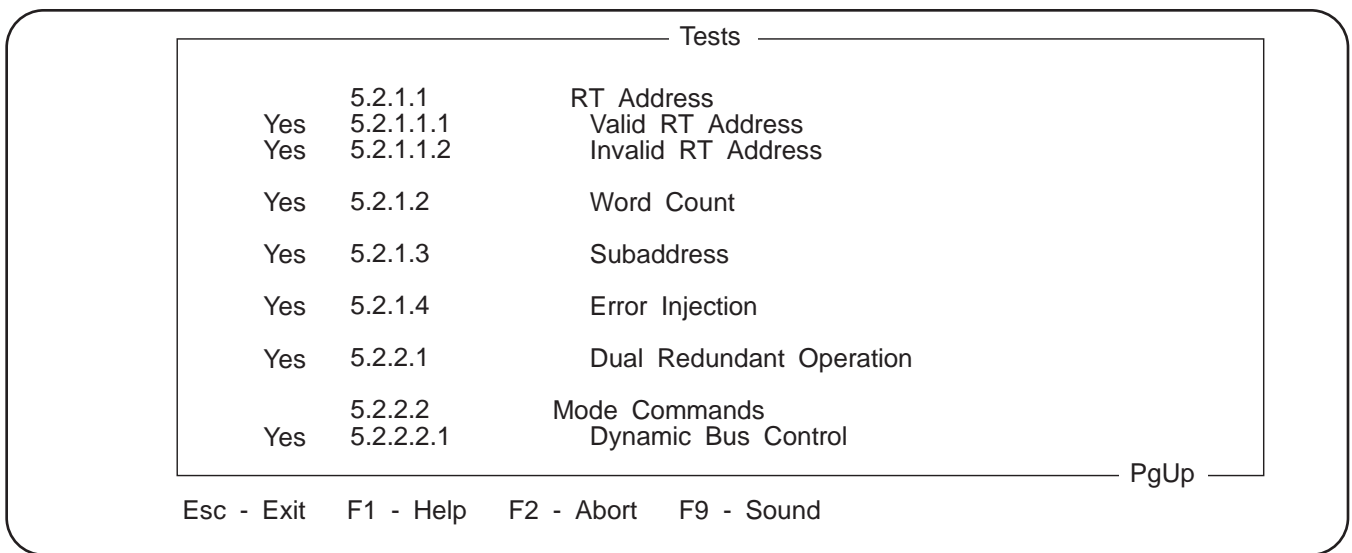


FIGURE 9. TEST MENU WINDOW

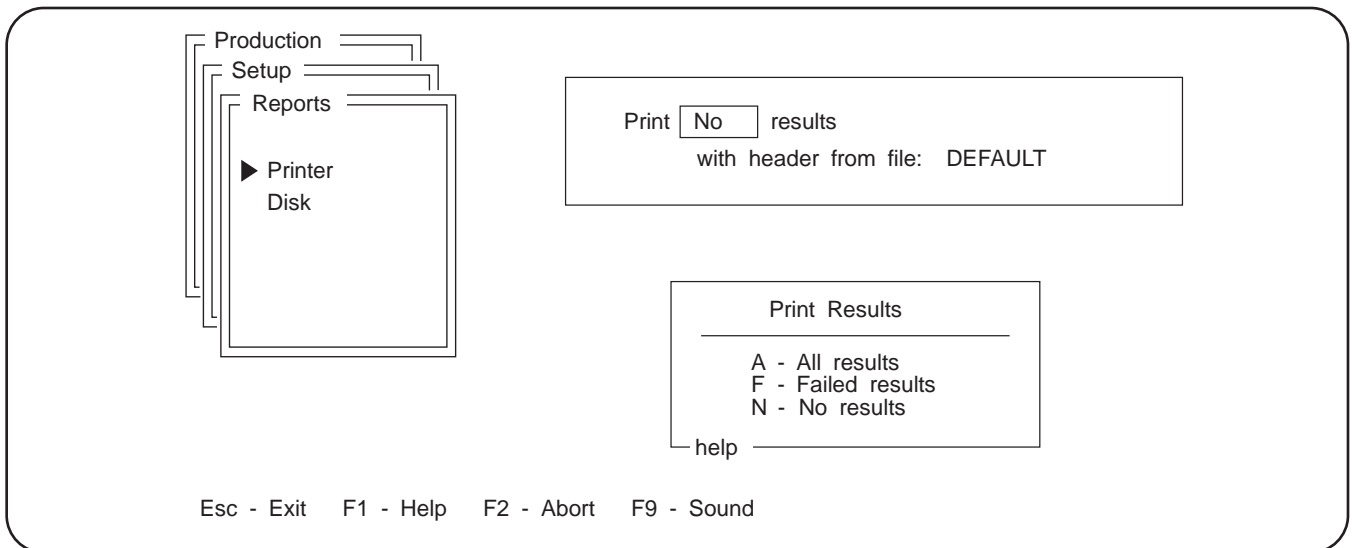


FIGURE 10. REPORTS MENU SCREEN

| Tests | | |
|-----------------|-----------------|---|
| | 5.2 | Protocol Tests |
| | 5.2.1 | RT Response to Command Words |
| | 5.2.1.1 | RT Address |
| Yes | 5.2.1.1.1 | Valid RT Address |
| Yes | 5.2.1.1.2 | Invalid RT Address |
| Yes | 5.2.1.2 | Word Count |
| Yes | 5.2.1.3 | Subaddress |
| Yes | 5.2.1.4 | Error Injection |
| Yes | 5.2.2.1 | Dual Redundant Operation |
| | 5.2.2.2 | Mode Commands |
| Yes | 5.2.2.2.1 | Dynamic Bus Control |
| | 5.2.2.2.2 | Synchronize |
| Yes | 5.2.2.2.2.1 | Synchronize (Without Data Word) |
| Yes | 5.2.2.2.2.2 | Synchronize (With Data Word) |
| Yes | 5.2.2.2.3 | Transmit Status |
| Yes | 5.2.2.2.4 | Initiate Self-Test |
| Yes | 5.2.2.2.5 | Transmit BIT Word |
| | 5.2.2.2.6 | Transmitter Shutdown and Override |
| Yes | 5.2.2.2.6.1 | Dual Redundant Shutdowns and Overrides |
| Yes | 5.2.2.2.6.2 | Selective Bus Shutdowns and Overrides |
| Yes | 5.2.2.2.7 | Terminal Flag Bit Inhibit and Override |
| Yes | 5.2.2.2.8 | Reset Remote Terminal |
| Yes | 5.2.2.2.9 | Transmit Vector Word |
| Yes | 5.2.2.2.10 | Transmit Last Command |
| | 5.2.2.3 | Status Word |
| Yes | 5.2.2.3.1 | Service Request |
| Yes | 5.2.2.3.2 | Broadcast |
| Yes | 5.2.2.3.3 | Busy |
| Yes | 5.2.2.3.4 | Subsystem Flag |
| Yes | 5.2.2.3.5 | Terminal Flag |
| | 5.2.2.4 | Broadcast Messages |
| | 5.2.2.4.1 | Response to Bcst Commands |
| Yes | 5.2.2.4.1.1 | BC to RT Bcst Commands |
| | 5.2.2.4.1.2 | Bcst Mode Commands |
| Yes | 5.2.2.4.1.2.1 | Bcst Synchronize (Without Data Word) |
| Yes | 5.2.2.4.1.2.2 | Bcst Synchronize (With Data Word) |
| Yes | 5.2.2.4.1.2.3 | Bcst Initiate Self-Test |
| | 5.2.2.4.1.2.4 | Bcst Transmitter Shutdown and Overrides |
| Yes | 5.2.2.4.1.2.4.1 | Bcst Dual Redundant Shutdowns and Overrides |
| Yes | 5.2.2.4.1.2.4.2 | Bcst Selective Bus Shutdowns and Overrides |
| Yes | 5.2.2.4.1.2.5 | Bcst Terminal Flag Bit Inhibit Override |
| Yes | 5.2.2.4.1.2.6 | Bcst Reset Remote Terminal |
| Yes | 5.2.2.4.1.3 | RT to RT Bcst Commands |
| | 5.2.2.5 | RT to RT Transfers |
| Yes | 5.2.2.5.1 | RT to RT Transmit |
| Yes | 5.2.2.5.2 | RT to RT Receive |
| Yes | 5.2.2.5.3 | RT to RT Timeout |
| Yes | 5.2.2.6 | Illegal Commands |
| | A | Notice II |
| Yes | A1 | Unique Address |
| Yes | A2 | Mode Codes |
| Yes | A3 | Reset Remote Terminal |
| Yes | A4 | Initiate Self-Test |
| Yes | A5 | Power On Response |
| Yes | A6 | Data Wrap-Around |
| Yes | A7 | RT to RT Validation |
| < End of List > | | |

TABLE 4. TESTS INCLUDED IN PTP PROGRAM

MONITOR

This menu, shown in FIGURE 11, allows the user to activate the sophisticated MIL-STD-1553 Monitor.

The user may specify:

- “A” to display ALL the messages
- “F” to halt on a failure and then to trace back and forward in order to analyze the cause of the failure
- “N” for NO MONITOR DISPLAY.

FILE MENU

This menu, shown in FIGURE 12, allows the user to save the current setup to a disk or load a previously saved PTP-subset and RTU configuration from a disk. This provides the user a convenient way of setting up a variety of products to be tested.

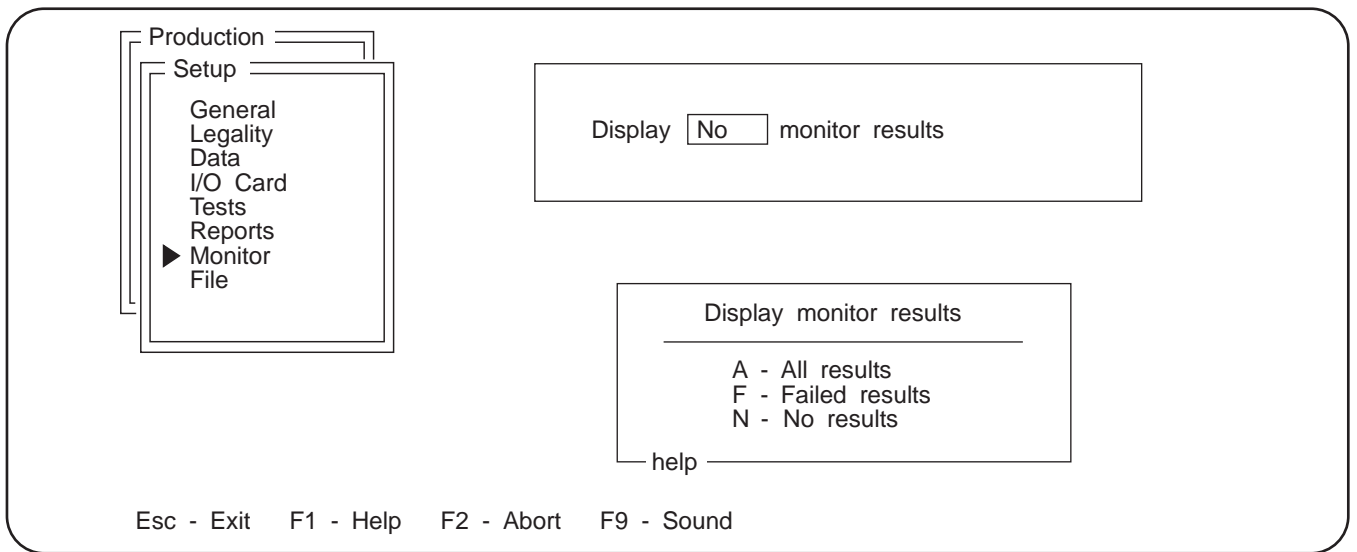


FIGURE 11. MONITOR MENU SCREEN

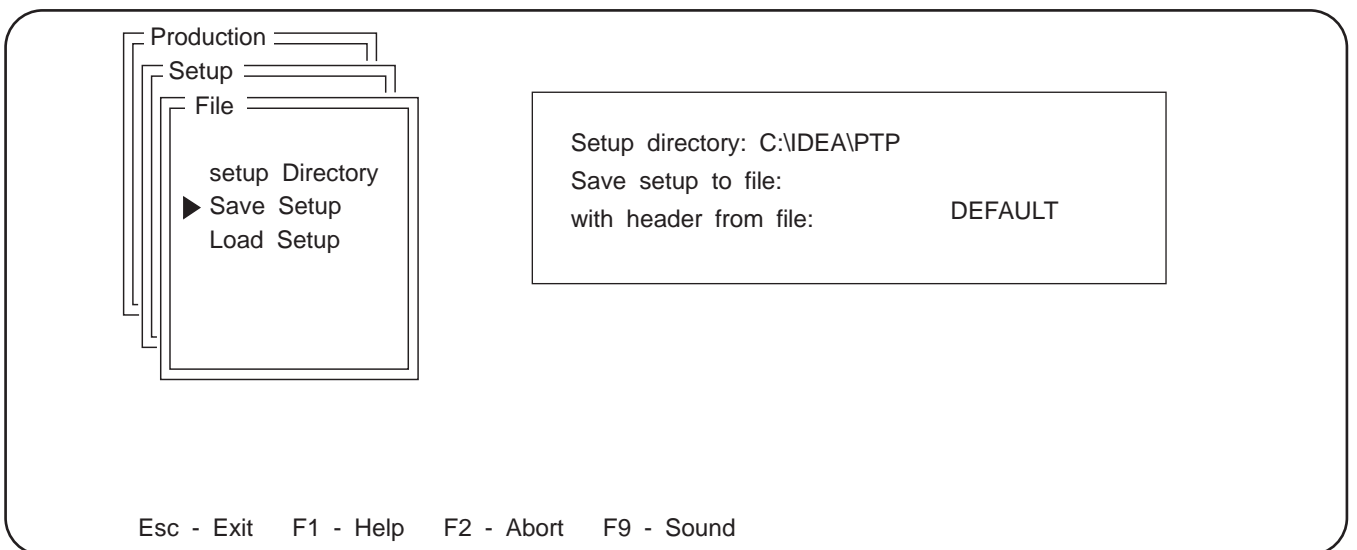


FIGURE 12. FILE MENU SCREEN

RUN MENU

After the user has gone through all the setup menus or selected a previous setup file, this selection will run all tests selected in the TEST MENU. As each test is being run, it will be displayed on the screen (see FIGURE 13) and if any errors occur they also will be displayed.

If the MONITOR is selected to display ALL or FAILED RESULTS, a separate screen will be displayed as shown in FIGURE 14.

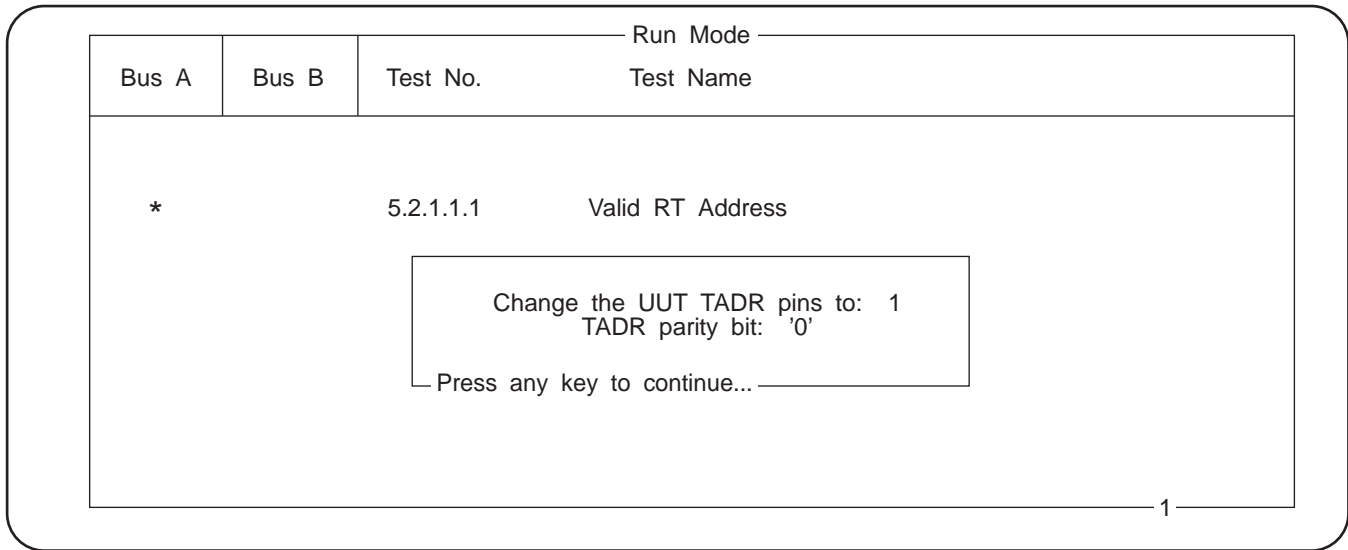


FIGURE 13. RUN MENU SCREEN

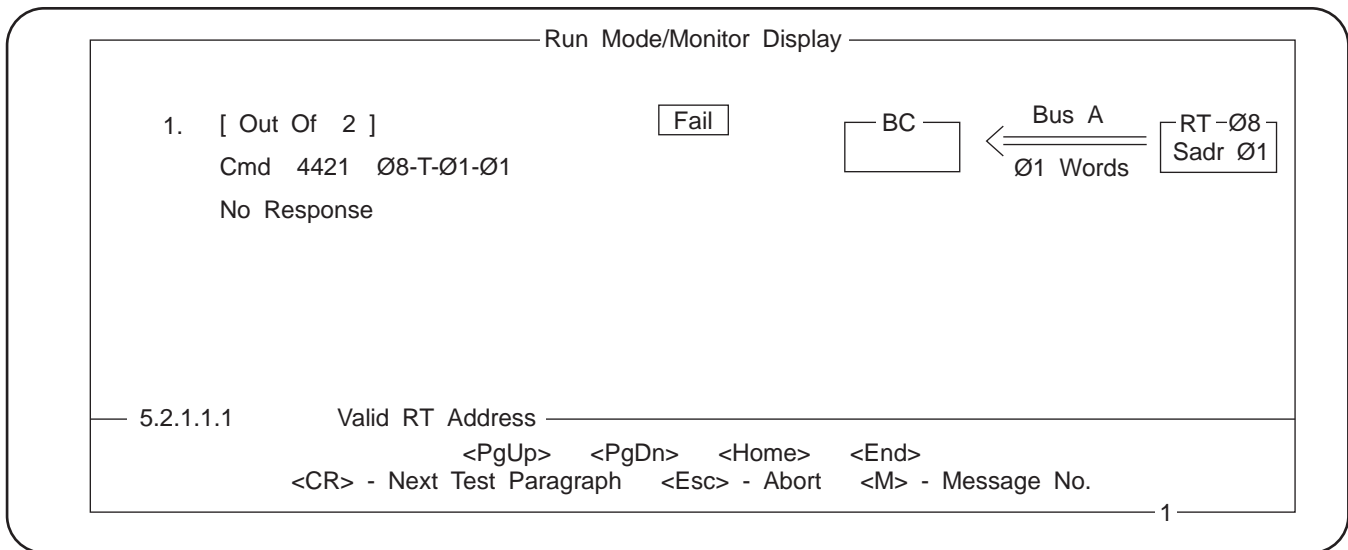


FIGURE 14. RUN/MONITOR MENU SCREEN

RESULTS MENU

After all the tests are completed, the Results menu will display both channels and the list of all tests with their outcomes, PASS or FAIL. (see FIGURE 15).

| Test Results | | | | Passed |
|--------------|-------|-----------|---------------------------|--------|
| Bus A | Bus B | Test No. | Test Name | |
| PASS | PASS | 5.2.1.1.1 | Valid RT Address | |
| PASS | PASS | 5.2.1.1.2 | Invalid RT Address | |
| PASS | PASS | 5.2.1.2 | Word Count | |
| PASS | PASS | 5.2.1.3 | Subaddress | |
| PASS | PASS | 5.2.1.4 | Error Injection | |
| PASS | PASS | 5.2.2.1 | Dual Redundant Operations | |
| PASS | PASS | 5.2.2.2.1 | Dynamic Bus Control | |

FIGURE 15. RESULTS MENU SCREEN

MIL-STD-1553 RT VALIDATION TEST PLAN (VTP) SOFTWARE,

DESCRIPTION

The BUS-69124 software option for the BUS-65518 card and the BUS-69024 software option for the BUS-65517II card provide a low cost alternative to performing RT Validation Testing in accordance with MIL-HDBK-1553A Section 100. The BUS-65518 or BUS-65517II tester simulator card, when combined with the RT Validation Test Plan software, a programmable noise source, and standard lab test equipment, provides a turn-key implementation for RT Validation Testing.

DDC's premier MIL-STD-1553 tester simulators, the BUS-65518 and the BUS-65517II, feature specialized hardware specifically designed to meet the stringent requirements of RT validation testing. These features include programmable zero crossing errors on any edge in a message with sub-nanosecond resolution, programmable rise and fall time of the transceiver (required for waveform compatibility testing), variable amplitude transceiver programmable from less than 200 millivolts to over 28 volts, comprehensive bus monitor which satisfies the general monitoring requirements of the RT valida-

tion test plan (including checking for high bit errors on the last word in a message), support for BC commands with an inter-message gap time of 4 to 7 microseconds, support for concurrent transmissions on both buses with a programmable skew of 250 nanoseconds (required for the bus switching test), and a comprehensive error injection unit capable of injecting all protocol and encoding errors required by the RT validation test plan.

The key to keeping the cost of this RT validation test setup low stems from the use of common in-house test equipment, minimizing the required investment in custom test equipment. The incurred capital equipment cost is a fraction of the cost of a full custom validation test system.

The BUS-65518 and BUS-65517II represents a hardware platform which provides for all of your 1553 test needs from bus simulation to software development to production testing and even RT validation testing making it the most versatile 1553 tester/simulator in the market.

FEATURES

- **Implements Complete RT Validation Test Plan as per Section 100 of MIL-HDBK-1553A.**
- **Completes Protocol Tests in Less Than 1 Hour**
- **Includes Support For All Electrical and Noise Rejection Tests**
- **User-Friendly Menu Driven Displays With Help Screens**
- **Disk Storage of VTP-Subset And RT Configurations**
- **Threshold, Noise, and Rise/Fall Time Tests**
- **Built-In Concurrent MIL-STD-1553 Monitor for Failure Analysis**
- **Includes Menu, PTP Test Plan, "C," and Pascal Library Software**

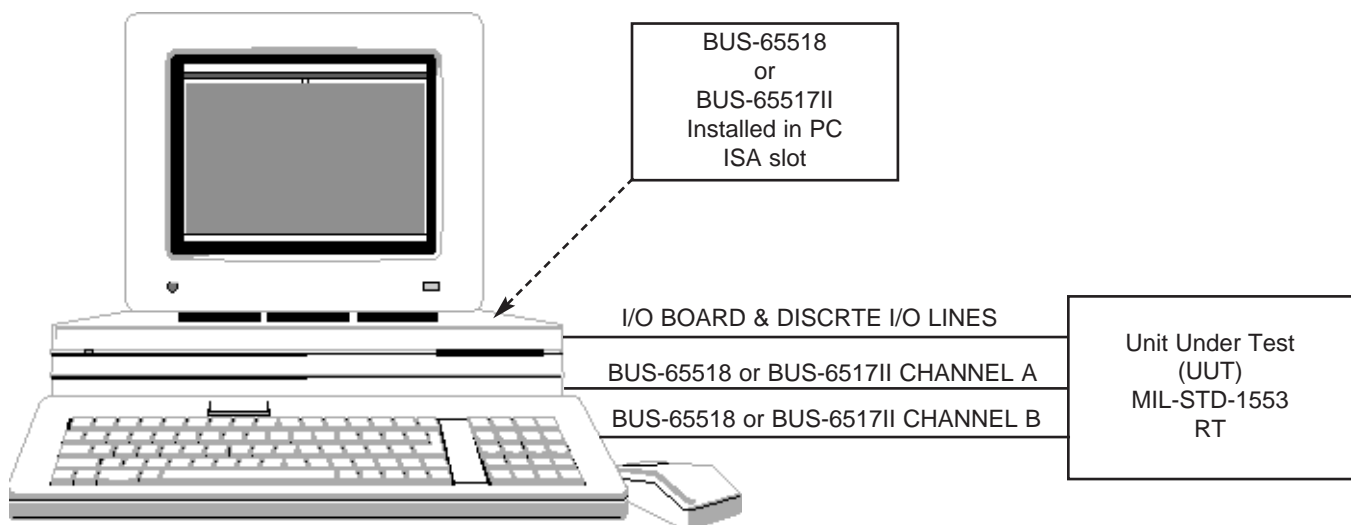


FIGURE 1. BUS-65518 OR BUS-65517II OPERATING ENVIRONMENT

TABLE 1. BUS-69124 AND BU-69024 REQUIREMENTS AND CAPABILITIES

| |
|---|
| HARDWARE REQUIREMENTS |
| <ul style="list-style-type: none"> ■ IBM PC/XT/AT or Compatible with 640k bytes of RAM and VGA Monitor ■ DDC's BUS-65518 or BUS-65517II IDEA Board ■ METRABYTE'S PIO-12 PARALLEL I/O CARD (OPTIONAL) |
| SOFTWARE REQUIREMENTS |
| <ul style="list-style-type: none"> ■ PC DOS 3.0 or higher |

GENERAL

This data sheet contains the operating instructions for the BUS-69124 and BU-69024 Software packages to perform the tests listed in Table 5, Section 100 of the MIL-HANDBOOK-1553A RT Validation Test Plan. The user can use the optional discrete I/O board to control the discrete I/O signals listed in TABLE 4 in this data sheet. The paragraphs which follow describe the operation of the RT Validation Test Plan (VTP) software.

MAIN MENU SCREEN

When the VTP program is loaded, the MAIN MENU, as shown in FIGURE 2, will be displayed. All configuration editing, calibration, and test execution options are accessed from this menu. (See FIGURE 3 for the MAIN MENU structure)

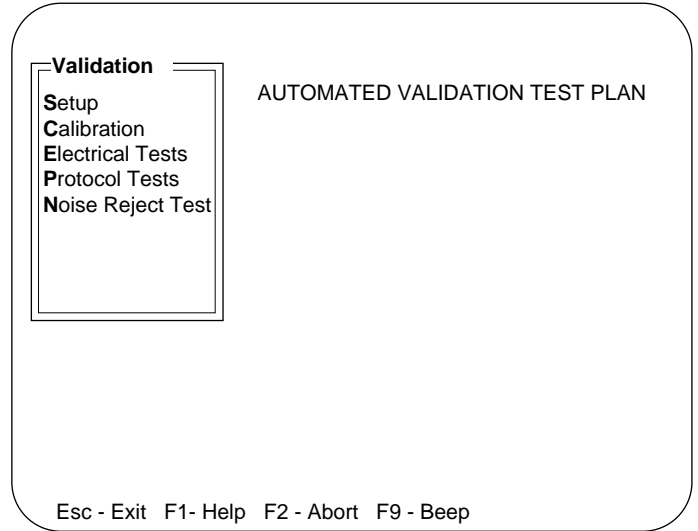


FIGURE 2.MAIN MENU

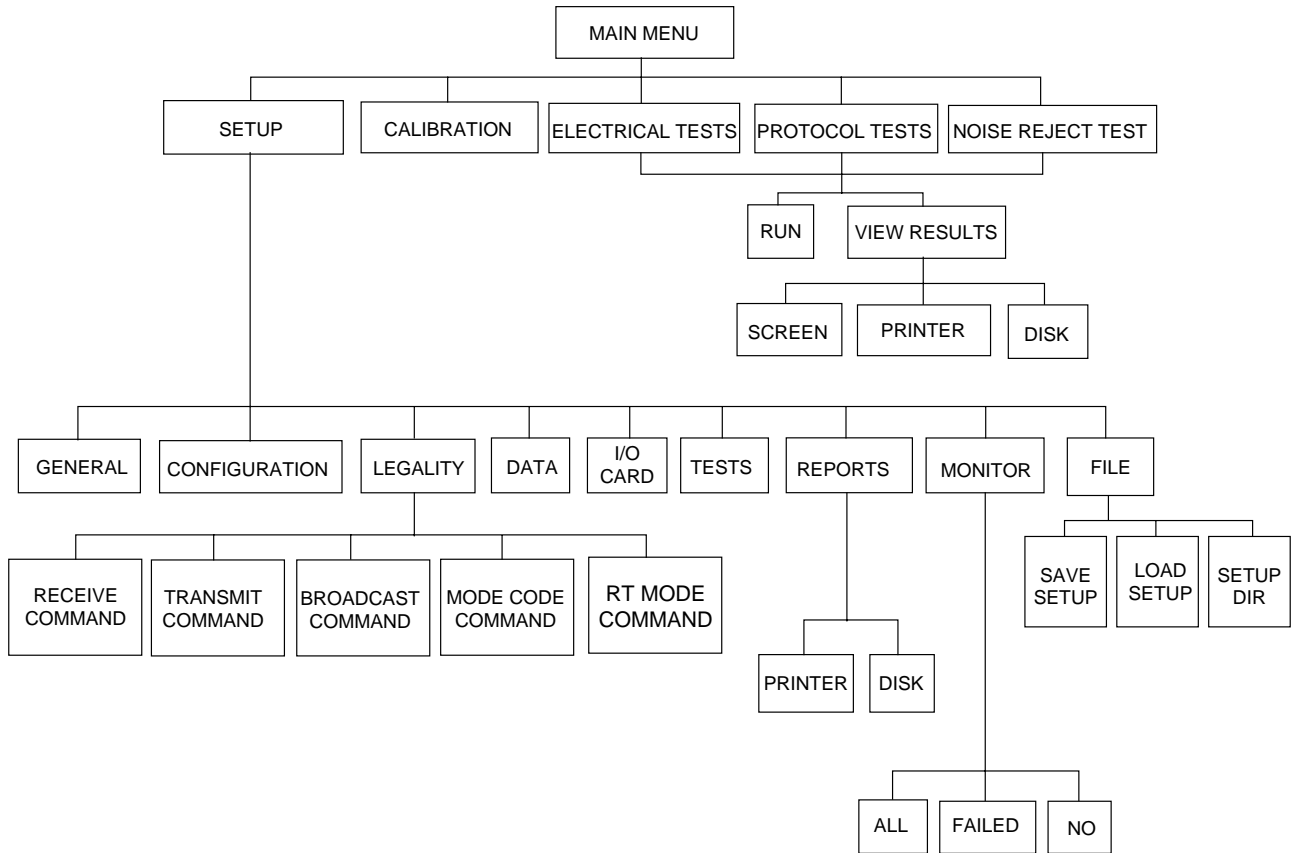


FIGURE 3. MAIN MENU STRUCTURE

GENERAL SETUP MENU SCREEN

The General Setup Menu permits the user to select the RT operating characteristics, see FIGURE 4.

| Setup/General | |
|---|---|
| <p style="text-align: center;">RT Characteristics</p> RT Address 01 Number of Buses..... 02 Variable RT Addresss Yes DBC Acceptance No Time to Next Message 001µ sec Mode Codes indicator Both Data Wrap-Around Rx Subaddress 30 Tx Subaddress 30 Word Count 00 Intermessage Gap [µ sec] .000010 Delay After HW Reset.....100msec <p style="text-align: center;">Electrical Test</p> RT Bus Name A | <p style="text-align: center;">Special Commands</p> Mode Command "Self Test": Time Until Completion 100 msec Response - T < 100 msec CS Response - T > = 100 msec ... CS Mode Command "Reset RT": Time Until Completion 05 msec Response - T < 5msecCS Response - T > = 5 msec.....CS Ignore Service Request: Command Rx Subaddress 30 Word Count 01 <p style="text-align: center;">Run Parameters</p> Halt on Error No Repeat Test Plan 0001 times Single Step No |
| Esc - Exit F1- Help F2 - Abort F9 - Beep | |

FIGURE 4. GENERAL SETUP MENU

Special function keys are used to access the help screens, abort, operate and exit, see TABLE 2.

| TABLE 2. SPECIAL FUNCTION KEYS | |
|--------------------------------|--|
| FUNCTION KEY | DESCRIPTION |
| ESC | EXIT SCREEN : LEAVE SCREEN AFTER MAKING CHANGES |
| F1 | HELP MENU : DISPLAY VALID VALUES FOR OPTION |
| F2 | ABORT WITHOUT UPDATE : LEAVE WITHOUT MAKING CHANGES |
| F9 | BEEP : TURN SOUND ON OR OFF |
| RETURN (ENTER) | END FIELD ENTRY : GO TO NEXT OPTION IN THE MENU |

TABLE 3 explains the RT operating characteristics.

| TABLE 3. RT OPERATING CHARACTERISTICS | | |
|---------------------------------------|-----------------|--|
| NAME | VALID VALUE | DESCRIPTION |
| RT ADDRESS | 00-30 | UUT Address |
| NUMBER OF BUSES | 01-99 | NO. of UUT BUSES |
| VARIABLE RT ADDRESSES | YES or NO | |
| DBC ACCEPTANCE | YES/NO/ BOTH | |
| TIME TO NEXT MESSAGE | 001-999 | Global delay before the next message, in µsec. |

| TABLE 3. RT OPERATING CHARACTERISTICS (CONTINUED) | | |
|---|---|---|
| NAME | VALID VALUE | DESCRIPTION |
| MODE CODE INDICATOR | ZEROES/ ONES/ BOTH | Mode SADR field value: Zeroes = The UUT meets the pass criteria with a sub-address field mode code indicator of all 0's Ones = The UUT meets the pass criteria with sub-address field mode code indicator of all 1's Both = The UUT meets the pass criteria with sub-address field mode code indicator of both 0's and 1's |
| Data Wraparound | | |
| Rx Subaddress | 01-30 | |
| Tx Subaddress | 01-30 | |
| Word Count | 01-31 | |
| Intermessage Gap | 10-999999 | Time in µs used only for "Transmission rate" |
| Delay After Hardware Reset | 001-999 or F | Time in ms or F=FOREVER until KEYPRESSED |
| RT Bus Name | 'A'-'Z' | BUS Name for electrical test |
| Mode Command "Self Test" | | |
| Time Until Completion | 001-999 | Time in ms |
| Response - T < 100 msec | CS,BUSY,NR, CS/NR | UUT response |
| Response - T ≥ 100msec | CS,or CS W/ BUSY bit reset (NO-BUSY) | UUT response |
| Mode Command "Reset RT" | | |
| Time Until Completion | 01-99 or F | Time in ms. F= FOREVER |
| Response - T < 5 msec | CS,BUSY,NR, CS/NR | UUT Response |
| Response - T > = 5 msec | CS,or CS W/ BUSY bit reset (NO-BUSY) | UUT Response |
| Ignore Service Request | | A command that does not service the request while the service request bit is set. |
| Command | Rx or Tx | |
| Subaddress | 01-30 | |
| Word Count | 00-31 | |
| Halt On Error | YES/NO | Y= Halt on Failure N= Halt at the end of all tests |
| Repeat Test Plan | 0001-9999 or F | Number of times to run complete test or FOREVER. |
| Single Step | YES/NO | Y= Halt after each test N= Halt at the end of all tests |

CONFIGURATION MENU SCREEN

FIGURE 5A-5D, illustrate the four connection methods available.

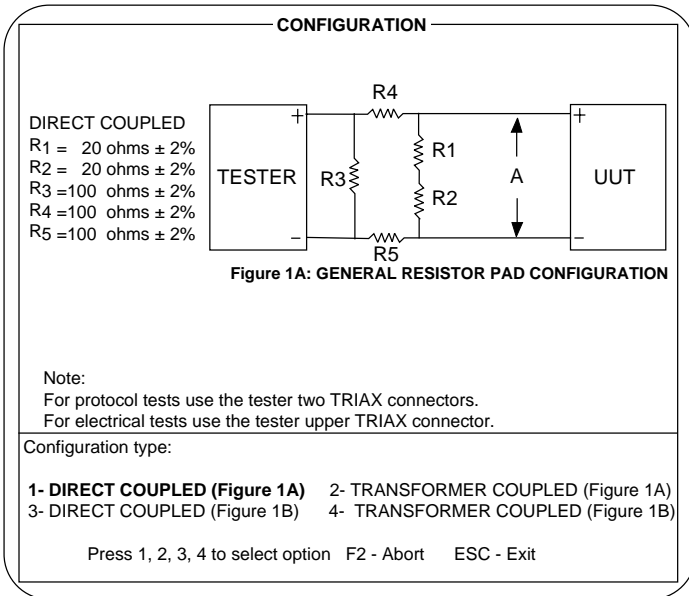


FIGURE 5A. DIRECT COUPLED (FIGURE 1A)

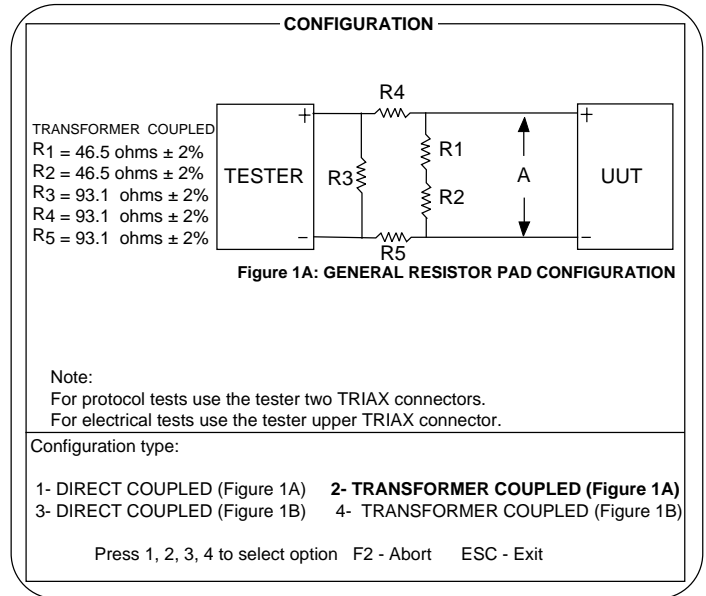


FIGURE 5B. TRANSFORMER COUPLED (FIGURE 1A)

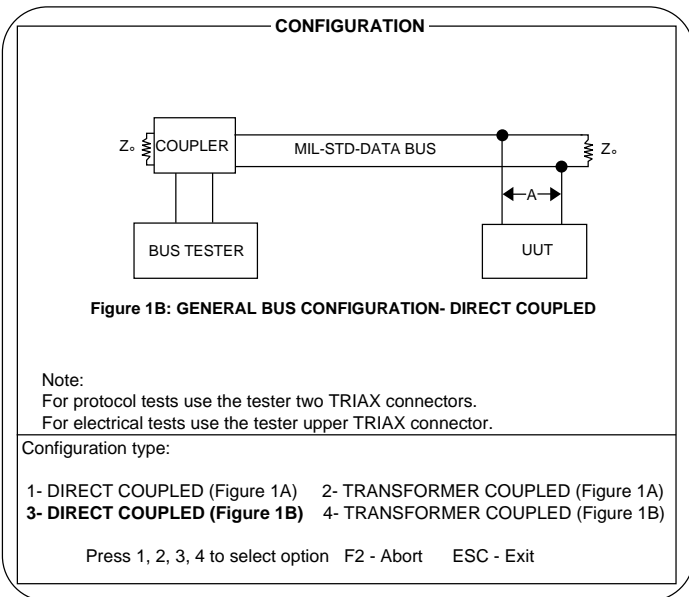


FIGURE 5C. DIRECT COUPLED (FIGURE 1B)

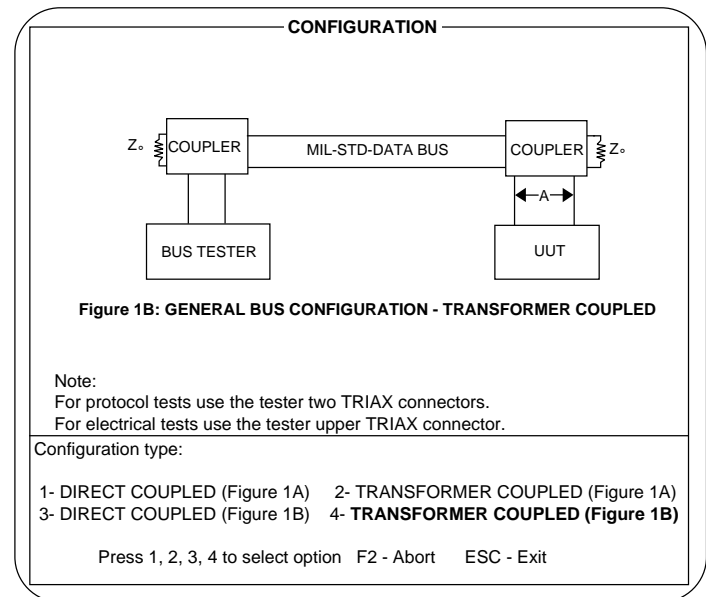


FIGURE 5D. TRANSFORMER COUPLED (FIGURE 1B)

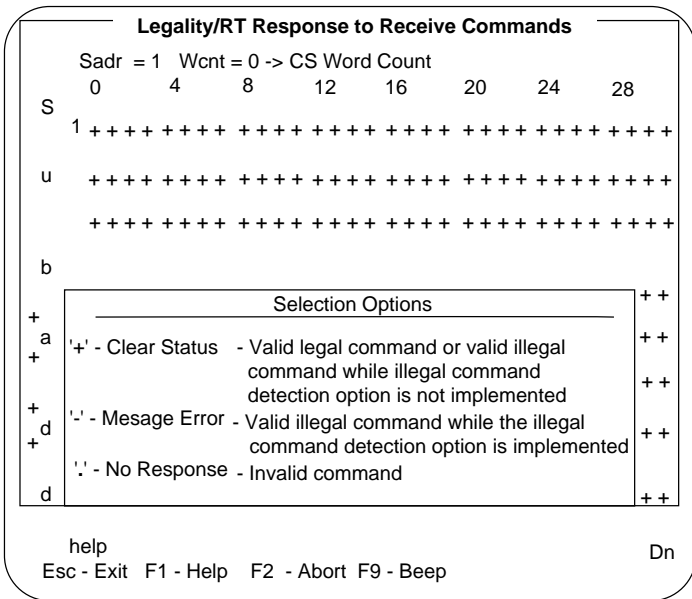


FIGURE 6A. LEGALITY MENU (RX/TX)

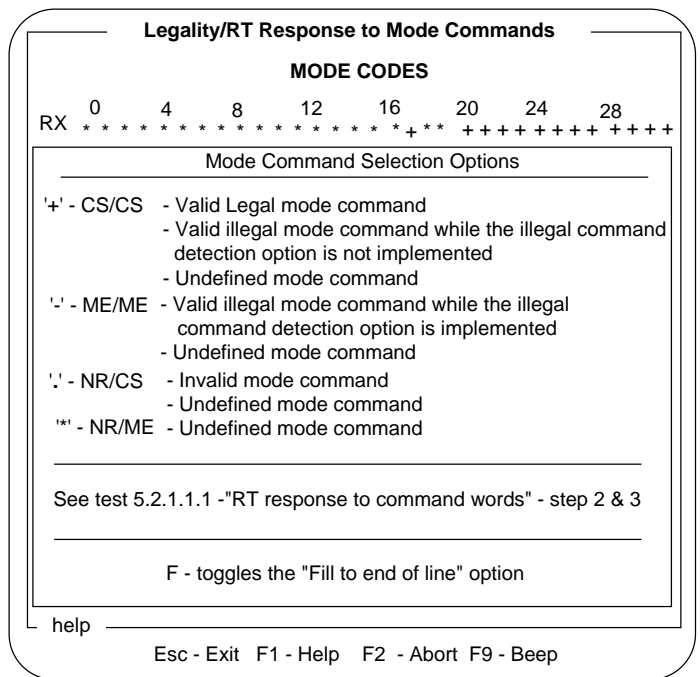


FIGURE 6B. LEGALITY MENU (MODE COMMANDS)

LEGALITY MENU SCREEN

The user has a choice of 5 different types of legality to choose from: Receive, Transmit, Broadcast, Mode Codes, and RT-RT mode commands. For the first two choices (see FIGURE 6A) the user may define the legality of any WORD COUNT and SUB-ADDRESS for those particular commands. For MODE CODE and RT-RT MODE CODE COMMANDS (see FIGURE 6B) the user may define the legality of each WORD COUNT for both TRANSMIT and RECEIVE Commands.

For Receive and Transmit Commands, the user may define CLEAR STATUS (CS) by typing a "+", MESSAGE ERROR (ME) by typing a "!" and a NO RESPONSE (NR) by typing a "*" for any SUBADDRESS and WORD COUNT.

For Broadcast Commands, the user may define CS with BCR by typing a "+", ME with BCR by typing a "!" and a CS by typing a "*" for any SUBADDRESS and WORD COUNT.

DATA MENU SCREEN

The DATA MENU SCREEN, FIGURE 7, allows the user to define data for MODE CODE and NON-MODE CODE commands. The first three fields are data associated with the particular mode code command sent to the UUT. For the TRANSMITTED DATA field, the user may enter data of his choice to be transmitted to the UUT during non-mode receive commands. For specific VTP tests, the user can change the associated DATA to be either Random or Controlled, by using the RANDOM DATA option.

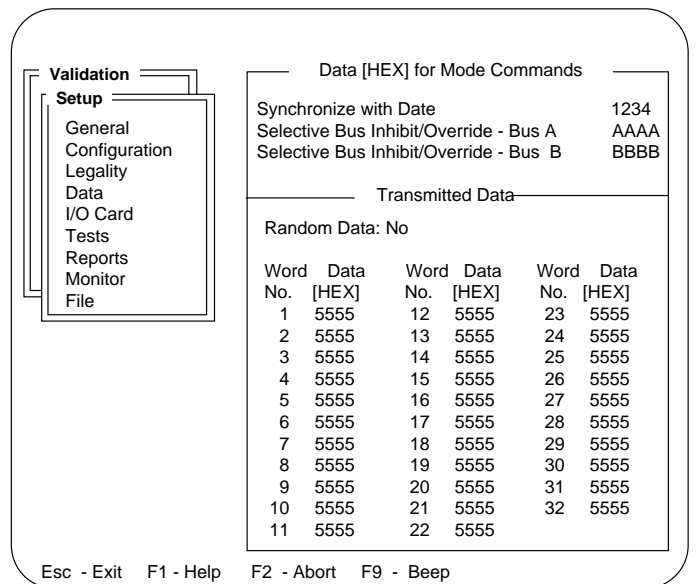


FIGURE 7. DATA MENU SCREEN

I/O CARD MENU SCREEN

An optional I/O card can be used for selecting discrete output options, see FIGURE 8. The user can program the delay time after these discrete outputs have been changed. For the discrete output options, a YES value means that the associated I/O line will be active. A NO value means that the user will be prompted for appropriate action. The DELAY after CHANGING OUTPUT specifies the settling time required by external hardware, within the range of 001 to 999 milliseconds. The output lines can be active high or low.

| PIN | DESCRIPTION |
|-------|-------------------------------|
| 3 | Time Out (Terminal Fail-Safe) |
| 4 | Power ON/OFF |
| 5 | Dynamic BUS Acceptance |
| 6 | Subsystem Flag |
| 7 | Busy |
| 8 | Service Request |
| 9 | Terminal Flag |
| 10 | Hardware Reset |
| 21 | Gnd |
| 32-36 | RT Address (Pin 32 = MSB) |
| 37 | RT Address Parity Bit |

TEST MENU SCREEN

This menu is used to enable and disable selected tests (see FIGURE 9). The user may scroll through the list; pressing a 'y' will select the line item, a 'n' will deselect it; furthermore, selecting (y) or deselecting (n) items that have subordinate tests will select or deselect all the subordinate tests (e.g., selecting test 5.0 will select every test; selecting test 5.1 will select all 5.1 subordinate tests up to, but not including, 5.2 tests.). The "Home" key takes you to the top of the list, and the "End" key takes you to the bottom of the list. TABLE 5, contains a complete listing of the VTP tests.

| Discrete Output Options | | Automated | Active |
|-------------------------------------|-----|-----------|--------|
| Service Request..... | Yes | High | High |
| Busy | Yes | High | High |
| Subsystem Flag | Yes | High | High |
| Dynamic Bus Control | Yes | High | High |
| Terminal Flag | Yes | High | High |
| | | | |
| Hardware Reset | Yes | Low | Low |
| Power On/Off | Yes | Low | Low |
| Time Out | Yes | Low | Low |
| | | | |
| RT Address | Yes | High | High |
| Reset UUT to Latch RT Address | Yes | High | High |
| | | | |
| Delay After Changing Output | 100 | milsec | milsec |

Esc - Exit F1 - Help F2 - Abort F9 - Beep

| Tests | |
|--------------|-----------------------------------|
| 5.0 | Validation Tests |
| 5.1 | Electrical Tests |
| 5.1.1 | Output characteristics |
| Yes 5.1.1.1 | Amplitude |
| Yes 5.1.1.2 | Risetime/falltime |
| No 5.1.1.3 | Zero crossing stability |
| No 5.1.1.4 | Distortion, overshoot and ringing |
| No 5.1.1.5 | Output symmetry |
| No 5.1.1.6 | Output noise |
| No 5.1.1.7 | Output isolation |
| 5.1.1.8 | Power on/off |
| No 5.1.1.8.1 | Power on/off noise |
| No 5.1.1.8.2 | Power on response |
| No 5.1.1.9 | Terminal response time |
| No 5.1.1.10 | Frequency stability |
| 5.1.2 | Input characteristics |
| 5.1.2.1 | Input waveform compatibility |
| No 5.1.2.1.1 | Zero crossing distortion |
| No 5.1.2.1.2 | Amplitude variations |

Esc - Exit F1 - Help F2 - Abort F9 - Beep PgDn

FIGURE 8. I/O CARD MENU SCREEN(DISCRETE OUTPUT OPTIONS)

FIGURE 9. TEST MENU SCREEN

| | | | |
|-------------|------------------------------------|-------------|--|
| 5.0 | Validation Tests | 5.2.1.4 | Superseding commands |
| | | 5.2.1.4.1 | RT to RT superseding command |
| 5.1 | Electrical Tests | | |
| 5.1.1 | Output characteristics | 5.2.1.5 | Required mode commands |
| | | 5.2.1.5.1 | Transmit status |
| | | 5.2.1.5.2 | Transmitter shutdown and override |
| | | 5.2.1.5.3 | Reset remote terminal |
| 5.1.1.1 | Amplitude | | |
| 5.1.1.2 | Risetime/falltime | | |
| 5.1.1.3 | Zero crossing stability | 5.2.1.6 | Data wrap-around |
| 5.1.1.4 | Distortion, overshoot and ringing | 5.2.1.7 | RT to RT message errors |
| 5.1.1.5 | Output symmetry | 5.2.1.7.1 | RT to RT timeout |
| 5.1.1.6 | Output noise | 5.2.1.7.2 | RT to RT message format errors |
| 5.1.1.7 | Output isolation | 5.2.1.7.3 | Transmitting RT errors |
| 5.1.1.8 | Power on/off | 5.2.1.8 | Bus switching |
| 5.1.1.8.1 | Power on/off noise | | |
| 5.1.1.8.2 | Power on response | 5.2.1.9 | Unique address |
| 5.1.1.9 | Terminal response time | 5.2.2 | Optional operation |
| 5.1.1.10 | Frequency stability | | |
| 5.1.2 | Input characteristics | 5.2.2.1 | Optional mode commands |
| 5.1.2.1 | Input waveform compatibility | 5.2.2.1.1 | Dynamic bus control |
| 5.1.2.1.1 | Zero crossing distortion | 5.2.2.1.2 | Synchronize |
| 5.1.2.1.2 | Amplitude variations | 5.2.2.1.2.1 | Synchronize without data word |
| 5.1.2.1.3 | Rise and fall time | 5.2.2.1.2.2 | Synchronize with data word |
| 5.1.2.1.3.1 | Trapezoidal | 5.2.2.1.3 | Initiate self-test |
| 5.1.2.1.3.2 | Sinusoidal | 5.2.2.1.4 | Transmit BIT word |
| | | 5.2.2.1.5 | Selective transmitter shutdown and override |
| | | 5.2.2.1.6 | Terminal flag bit inhibit and override |
| 5.1.2.2 | Common mode rejection | 5.2.2.1.7 | Transmit vector word |
| 5.1.2.3 | Input impedance | 5.2.2.1.8 | Transmit last command |
| 5.2 | Protocol Tests | 5.2.2.2 | Status word bits |
| 5.2.1 | Required remote terminal operation | 5.2.2.2.1 | Service request |
| 5.2.1.1 | Response to command words | 5.2.2.2.2 | Broadcast command received |
| 5.2.1.1.1 | RT response to command words | 5.2.2.2.3 | Busy |
| 5.2.1.1.2 | RT-RT response to command words | 5.2.2.2.4 | Subsystem flag |
| | | 5.2.2.2.5 | Terminal flag |
| 5.2.1.2 | Intermessage gap | 5.2.2.3 | Illegal command |
| 5.2.1.2.1 | Minimum time | | |
| 5.2.1.2.2 | Transmission rate | 5.2.2.4 | Broadcast mode commands |
| 5.2.1.3 | Error injection | 5.2.2.4.1 | Bcst synchronize without data word |
| 5.2.1.3.1 | Parity | 5.2.2.4.2 | Bcst synchronize with data word |
| 5.2.1.3.1.1 | Transmit command word | 5.2.2.4.3 | Bcst initiate self-test |
| 5.2.1.3.1.2 | Receive command word | 5.2.2.4.4 | Bcst transmitter shutdown and override |
| 5.2.1.3.1.3 | Receive data words | 5.2.2.4.5 | Bcst selective transmitter shutdown and override |
| 5.2.1.3.2 | Word Length | 5.2.2.4.6 | Bcst terminal flag bit inhibit and override |
| 5.2.1.3.2.1 | Transmit command word | 5.2.2.4.7 | Bcst reset remote terminal |
| 5.2.1.3.2.2 | Receive command word | 5.2.2.4.8 | Bcst dynamic bus control |
| 5.2.1.3.2.3 | Receive data words | | |
| 5.2.1.3.3 | Bi-phase encoding | 5.2.2.5 | Error injection - broadcast messages |
| 5.2.1.3.3.1 | Transmit command word | 5.2.2.5.1 | Parity: bus controller (BC)-RT broadcast |
| 5.2.1.3.3.2 | Receive command word | 5.2.2.5.1.1 | Command word error |
| 5.2.1.3.3.3 | Receive data words | 5.2.2.5.1.2 | Data word error |
| 5.2.1.3.4 | Sync encoding | 5.2.2.5.2 | Message length, BC to RT broadcast |
| 5.2.1.3.4.1 | Transmit command word | | |
| 5.2.1.3.4.2 | Receive command word | | |
| 5.2.1.3.4.3 | Data word | 5.3 | Noise rejection test |
| 5.2.1.3.5 | Message length | | |
| 5.2.1.3.5.1 | Transmit command | | |
| 5.2.1.3.5.2 | Receive command | | |
| 5.2.1.3.5.3 | Mode command word count error | | |
| 5.2.1.3.5.4 | RT to RT word count error | | |
| 5.2.1.3.6 | Contiguous data | | |
| 5.2.1.3.7 | Terminal fail-safe | | |

TABLE 5. VTP TEST LISTING

REPORTS MENU SCREEN

This menu, shown in FIGURE 10, allows the user to send a report to either the disk or printer. The user may specify "N" for NO RESULTS, "F" for FAILED RESULTS or "A" for ALL RESULTS.

FILE MENU SCREEN

This menu, shown in FIGURE 11, allows the user to save the current setup or load a previously saved setup to or from disk.

This setup contains: UUT characteristics, RT configuration, and calibration values. This provides the user with a convenient way to set-up testing for a variety of products.

MONITOR

This menu, shown in FIGURE 12, allows the user to activate the sophisticated MIL-STD-1553 Monitor. The user may specify "A" to display ALL the messages, "F" to halt on a failure and then to trace back and forward in order to analyze the cause of failure, or "N" for NO MONITOR DISPLAY.

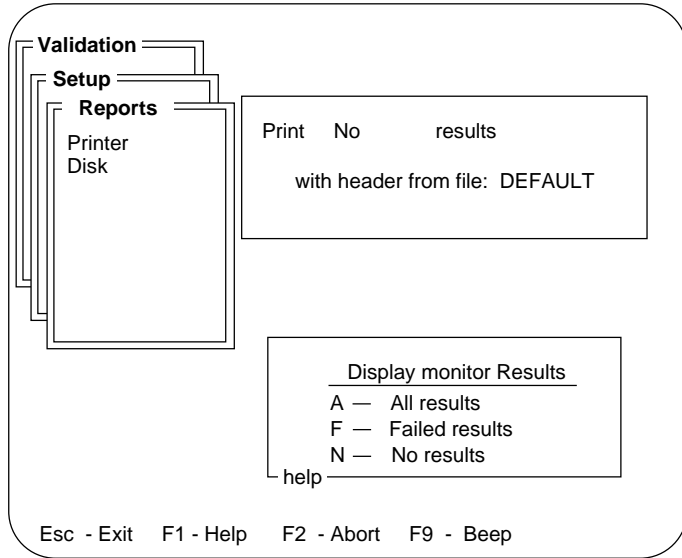


FIGURE 10. REPORTS MENU SCREEN

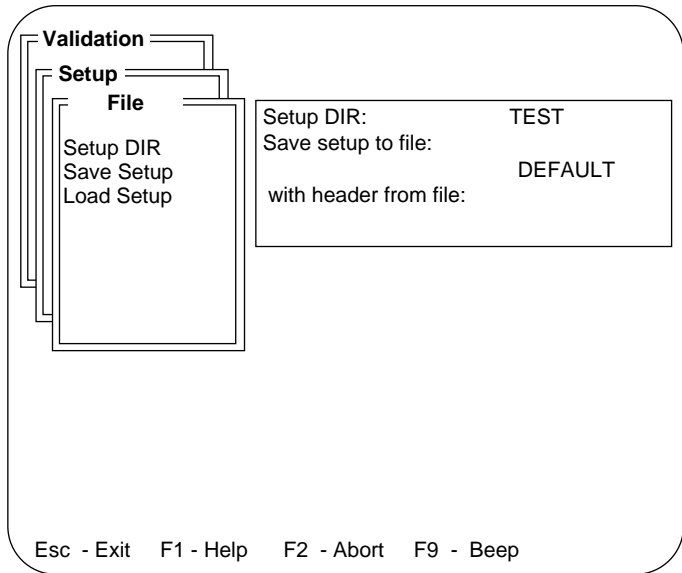


FIGURE 11. FILE MENU SCREEN

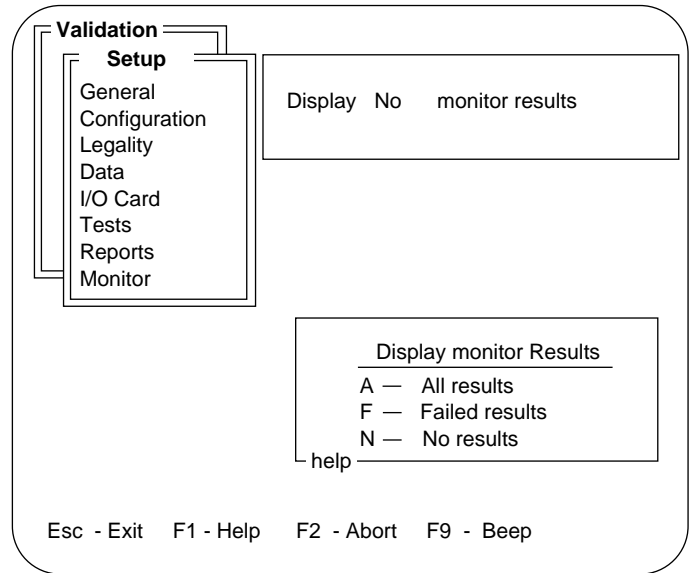


FIGURE 12. MONITOR MENU SCREEN

CALIBRATION MENU SCREEN

This menu (see FIGURE 13), is used to perform calibration on the BUS-65518 or BUS-65517II card to the amplitudes required for the VTP electrical tests.

RUN MENU SCREEN

(Submenu to Electrical Tests, Protocol Tests, or Noise Rejection Test)

After the user has gone through all the selections in the SETUP menu or selected a previous file, the VTP software will run all

tests selected in the TEST MENU. As test is being run, it will be displayed. In long tests, pop-up messages inform the user of the current state, see FIGURE 14.

RESULTS MENU SCREEN

After all the tests are completed, or interrupted by the user, the RESULTS MENU will display a list of all test results, see FIGURE 15.

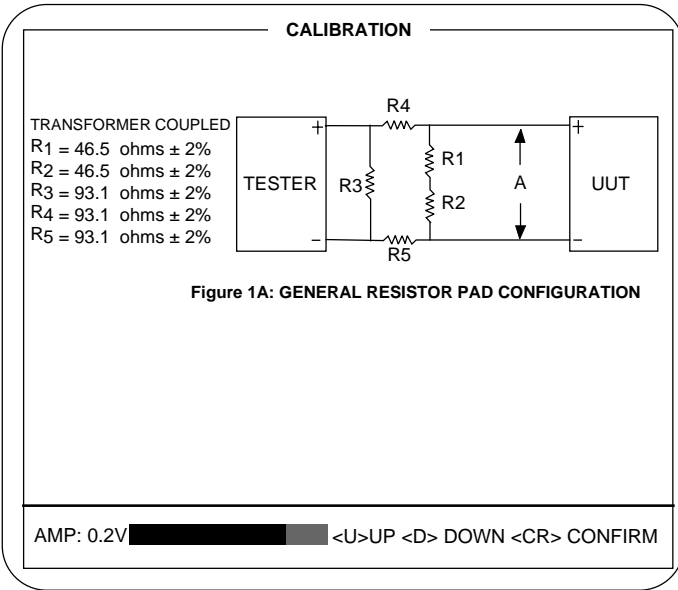


FIGURE 13. CALIBRATION MENU SCREEN

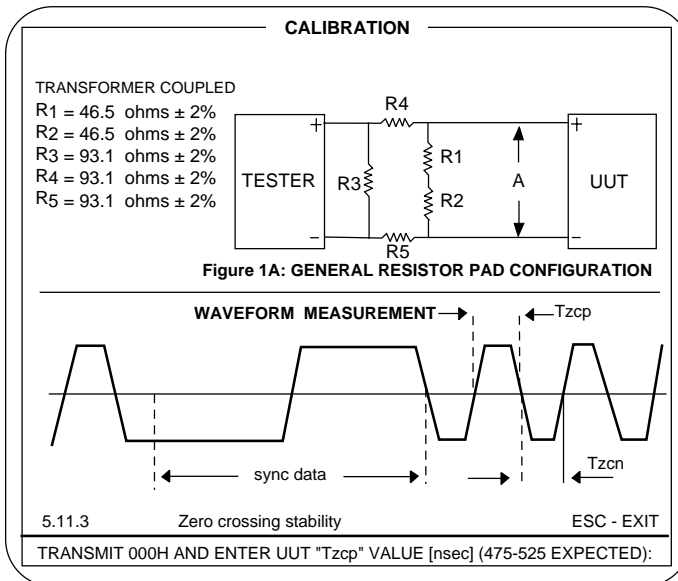


FIGURE 14. RUN MENU SCREEN

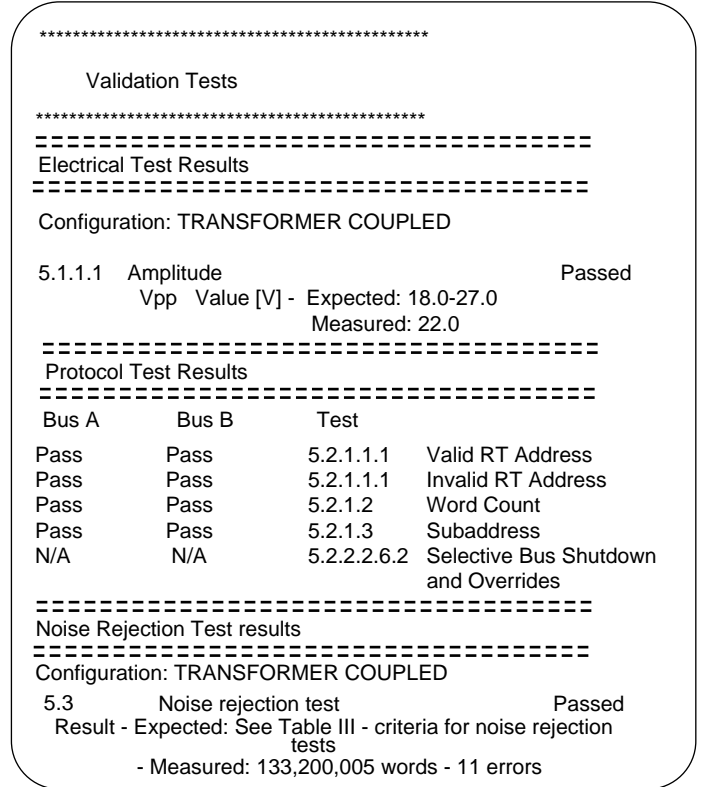


FIGURE 15. VIEW RESULTS MENU

ORDERING INFORMATION

BUS-690XXII

BUS-65517II IDEA Card Software: (See Note 1 & 2)

23 = Production Test Plan, plus 690035 components

24 = Validation Test Plan, Production Test Plan, plus 690035 components,

35 = Reconstructor, Parameter Monitor, "C" libraries (RTL) for DOS, Windows 95 and NT,
and Menu for DOS, Windows 3.1X, 95 and NT, support for MIL-STD-1553 A and B

BUS-69XXX

BUS-65518 IDEA Card Software: (See Note 3 & 4)

123 = Production Test Plan, plus 690135 components

124 = Validation Test Plan, Production Test Plan, plus 69135 components,

135 = Reconstructor, Parameter Monitor, "C" libraries (RTL) for DOS, Windows 95 and NT,
and Menu for DOS, Windows 3.1X, 95 and NT, support for MIL-STD-1553 A and B

Notes:

1. Above configurations are supported by Rev. E, U54 PALs.
2. The following part numbers are superceded by BUS-69035:
BUS-69008, BUS-69009, BUS-69012, BUS-69018,
BUS-69019, BUS-69025, BUS-69028 and BUS-69029
3. Above configurations are supported by Rev. E, U2 PALs.
4. The following part numbers are superceded by BUS-69135:
BUS-69125, BUS-69128 and BUS-69129

NOTES

NOTES

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