PERIPHERAL DIAGNOSTIC AND EXERCISE SOFTWARE SUBSYSTEM DESCRIPTION 2-WIRE NO. 1 AND NO. 1A ELECTRONIC SWITCHING SYSTEMS

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1. GENERAL

INTRODUCTION

1.01 This section describes the functional operation of programs used to exercise and diagnose the peripheral equipment in a No. 1/1A Electronic Switching System (ESS) central office.

1.02 When this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 Part 8 provides a list of abbreviations and acronyms used in this section.

PURPOSE OF PERIPHERAL DIAGNOSTIC AND EXERCISE SUBSYSTEM

1.04 The purpose of the peripheral diagnostic and exercise subsystem is to localize peripheral equipment faults, reconfigure associated peripheral units, and alert maintenance personnel concerning the status.

SCOPE OF SECTION

1.05 This section includes:

(a) Brief Description of Programs

(b) Subsystem Interface

(c) Subsystem Functional Description

(d) Program Functional Description

2. BRIEF DESCRIPTON OF PROGRAMS

A. Central Pulse Distributor (CPD) Diagnostic and Exercise Programs—PR-6A023

2.01 The peripheral diagnostic and exercise subsystem programs can be categorized into the following groups:

- Network and Signal Distributor Controller Diagnostic—NMDP (PR-6A028), NMMX (PR-6A043)
- Scanner and Scanner Answer Bus Diagnostic—SCDG (PR-6A027)
- Central Pulse Distributor Diagnostic—CPBD (PR-6A023), CPDG (PR-6A023)
- Central Pulse Distributor Exercise—CPDX (PR-6A023), CPRX (PR-6A023)
- Scanner and Scanner Answer Bus Exercise—SCDX (PR-6A027), SCRX (PR-6A027)
- Peripheral Unit Bus Diagnostic—PUBD (PR-6A048)

2.02 CPBD—This program provides the control structure for the purpose of diagnosing the central pulse distributor (CPD) bus system. The CPD enable address and verify answer buses are diagnosed using all in-service CPDs.

2.03 CPDG—This program provides all the diagnostic tests necessary for testing the internal circuitry of the CPDs and each CPD's accessibility over all leads of both the CPD enable and verify answer buses.

2.04 CPDX—This program provides the routine tests for exercising the CPD on demand when certain alarm conditions are detected, eg, fuse alarm or CPD power off.

2.05 CPRX—This program provides a series of routine tests to be run on a scheduled basis. This program also prints the total peripheral error counter and resets it.

B. Scanner Diagnostic and Exercise Programs—PR-6A027

2.06 SCDG—This program provides diagnostic capabilities for the scanner and its associated answer bus. Several preliminary checks are first performed on the scanner before the program proceeds to the actual diagnosis.

2.07 SCDX—This program will exercise the scanner, the scanner answer bus, and the peripheral unit bus on demand via a teletypewriter (TTY) input message or as the result of a change in an alarm scan point.

2.08 SCRX—This program will routinely (on a schedule) exercise the accessibility of the scanner answer bus upon entry from the maintenance control program (MACR) (Reference D).

C. Network and Signal Distributor Controller Diagnostic Program—PR-6A028

2.09 NMDP—This program exists primarily for the purpose of detecting and isolating faults in the signal distributor and network controller. Subsidiary functions are also performed, such as allowing maintenance personnel to alter the status of various units via the maintenance TTY.

D. Network Matrix Programs—PR-6A043

2.10 NMMX—The major function of this program is to exercise any network matrix of relays in the No. 1/1A central office. Control is transferred to NMMX to exercise the relay matrices of network frames from MACR (Reference D), or via the maintenance TTY.

E. Peripheral Unit (PU) Bus Diagnostic Program—PR-6A048

2.11 PUBD—The primary functions of this program is to isolate a fault within the repeater and fan-out or fan-in circuits of the PU bus to a small number of replaceable circuit packages. The PU bus includes the peripheral address bus and the peripheral reply or scanner answer bus. The results of the diagnostics are reported by way of the maintenance teletypewriter.

SUBSYSTEM INTERFACING

2.12 The programs described above collectively interface with other software subsystem functions. The major interfaces (Fig. 1) are provided below.

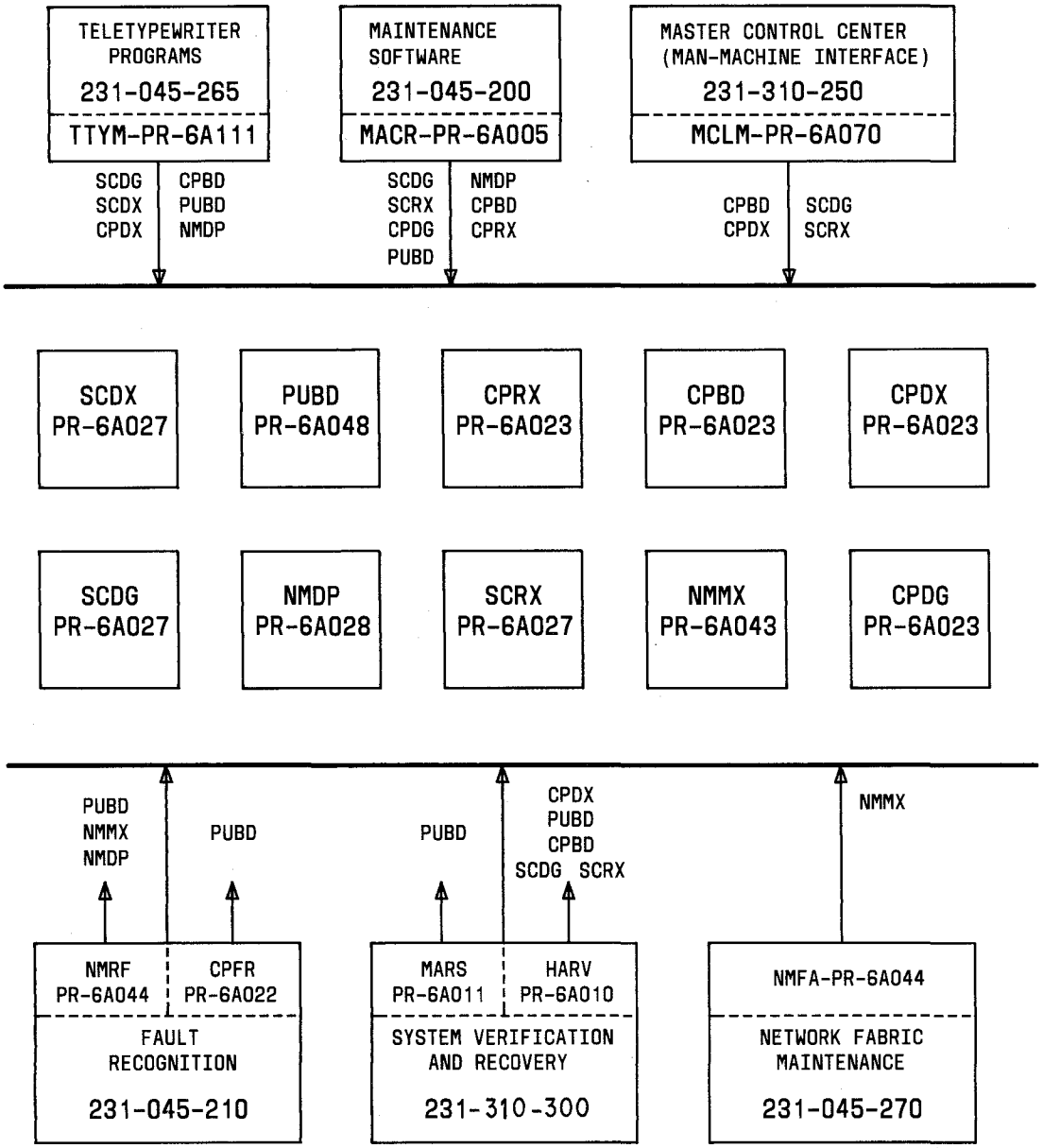


Fig. 1—Interfacing Subsystems

A. Maintenance Software

2.13 The peripheral diagnostic and exercise programs interface with the maintenance software programs (Reference D) administering the diagnostic requests and initiating the programs. This subsystem will also process the results of the diagnostics and exercises by formulating the data into a trouble number to be printed out on the maintenance TTY which is used in conjunction with a trouble location manual.

B. System Verification and Recovery

2.14 The peripheral diagnostic and exercise programs interface with the system verification and recovery programs (Reference E) by performing the diagnostics and any other actions that are necessary to assist in recovering from a B-level

emergency action interrupt in restoring a working system configuration.

C. Fault Recognition

2.15 The peripheral diagnostic and exercise programs interface with the fault recognition programs (Reference F) indirectly when it requests diagnostics to be performed because of a malfunction in one of the peripheral units. A direct interface occurs when a diagnostic program needs to switch the mode of some controller. In this case it will schedule a switch request which will be serviced by the fault recognition programs before returning to the diagnostic segment. The fault recognition programs will then update all routes around any incapacitated unit.

D. Master Control Center (Man-Machine Interfacing)

2.16 The peripheral diagnostic and exercise programs interface with the master control center (MCC) programs (Reference G) by performing the appropriate diagnostic as a result of the MCC programs detecting a change in the state of the peripheral units, eg, power off, inhibits, or from the detection of a fuse alarm.

E. Teletypewriter Programs

2.17 The peripheral diagnostic and exercise programs interface with the TTY programs (Reference H) when a manual request for a diagnostic or demand exercise is required of a peripheral unit or peripheral unit bus. The TTY programs also handle several diagnostic and exercise messages. These are printed to inform maintenance personnel of the results of the diagnostic and exercise tests and of the peripheral error counters. Manual TTY requests are also used to reconfigure the peripheral units and/or peripheral unit buses.

F. Network Fabric Maintenance

2.18 The peripheral diagnostic and exercise programs interface with the network fabric maintenance programs (Reference I) in the administration of the TTY message to repeatedly send any valid controller order to any frame in the No. 1/No. 1A office when marginal faults or chattering relays are suspected.

3. SUBSYSTEM FUNCTONAL DESCRIPTION

A. Peripheral Unit Diagnostic Programs

3.01 The peripheral unit (PU) diagnostic programs are used to localize faults within the peripheral unit to a small number of circuits. The initiation of these programs is normally done by way of the fault recognition (FR) programs (Reference F) or manually from the maintenance TTY (see IM-6A001). The diagnostic request is scheduled via a maintenance control block request which is administered by MACR (Reference D) or by setting the appropriate request bit in the unit status word.

3.02 The diagnostic programs under MACR control can be divided into control operations and functional testing. The control operations will perform the following:

(a) Determine whether or not the requested diagnostic can be performed

(b) Establish the appropriate system configuration for diagnosis

(c) Initialize the unit to be diagnosed

(d) Process the test results in a form suitable to input to the processing of diagnostic results program (Reference D) for the generation of a trouble number

(e) Generate TTY messages pertaining to the results of the diagnosis

(f) Establish a working system configuration depending on the results of the diagnosis.

3.03 The functional testing performed by the diagnostic programs on the peripheral equipment consists of a fixed sequence of tests. The results are compared with expected results or by monitoring strategic points within the unit.

B. Peripheral Unit Exercise Programs

3.04 The peripheral unit exercise programs are also administered by MACR on a base-level, low priority basis to:

(a) Check for faults that might otherwise go undetected

(b) Supplement trouble detection circuits

(c) Check trouble detection circuits

(d) Exercise infrequently used hardware.

3.05 Exercise programs are classified into the following categories:

(a) Scheduled automatic routine exercises which are run at prescheduled intervals of time

(b) Demand exercises which are run at the request of another program or by maintenance personnel via the TTY.

4. NETWORK AND SIGNAL DISTRIBUTOR CONTROLLER DIAGNOSTIC PROGRAM (PR-6A028)

4.01 The network and signal distributor controller diagnostic program (Fig. 2) is entered at one of two GLOBAL addresses. The program is entered at NMSWCH if the request for diagnostic is made from the TTY and at NMDIP if the request is made under program control. The flow of the program is such that, after certain conditions are set up and the TTY request is for raw data or normal diagnosis, the program will proceed to the starting address of NMDIP.

4.02 When the TTY entry point NMSWCH is entered, the program seizes the MACR scratch pad. A check is then made to determine if the requested frame is equipped in the office and if it is truly a Network or Signal Distributor (SD) frame. The program will terminate if these conditions are not met.

4.03 The TTY request is then checked to determine if the request is for raw data or normal diagnosis. In addition to normal diagnosis, a raw data request will set a flag bit in the Dictionary Output Control Program (DOCT) (Reference D) which will perform the task of printing out the results on the TTY.

> ***Note:*** If the mate controller (the controller opposite the one picked for diagnosis) is out of service, the diagnosis is denied and a message is printed before the program is terminated.

4.04 In the case where the mate controller is not out of service, the program proceeds to GLOBAL address NMDIP. At this location the diagnostic is allowed to continue if the Terminate Network Maintenance key is not set at the MCC. If this key is set, the diagnostic is aborted.

NETWORK CONTROLLER DIAGNOSTICS

4.05 The network controllers are duplicated and paired in such a way that if one of the controllers is malfunctioning and cannot tend to its portion of the network, the mate will handle the entire burden. This will release the faulty controller so that diagnostics can be performed and the controller repaired without interruption of service. The faulty controller is placed in the QUARANTINE MODE and cannot access the network until it is repaired and operating normally. The mate controller is placed in the COMBINED MODE and has access to its own share of the network in addition to that of its quarantined mate.

4.06 When the controller is placed in the TEST POINT ACCESS MODE, the state of the following internal check points are gated onto a special diagnostic bus for interrogation:

(a) S and F points which indicate the state of the unit

(b) Voltage Cut-Through (VCT) point which monitors the current flowing through the path selecting devices

(c) Scan points G1 to G5 and 0G which monitors the closure of selected wire spring relay contacts

(d) Short to Ground (STG) scan point which monitors the path across the pulser terminals in ferreed-type frames

(e) The FST binary representation corresponding to the states of the F and S flip-flops (assigned to points on the master scanner) and the T scan point which will give a unique indication of the state of the controller.

DIAGNOSTIC TESTS

4.07 The phase 1 group of tests are used to determine if the main body of diagnostic tests can be performed and to inform the user that certain conditions existed during diagnosis or that a request was not executed properly.

4.08 In the following typical case where it is not advisable to run the diagnostic tests, the diagnostic is aborted because:

(a) Frame to be diagnosed is unequipped

(b) Fuse alarm is marked

(c) Diagnostic bus is hung up

(d) Power is off on one of the controllers.

4.09 Phase 1 is marked ALL TESTS PASS (ATP) if diagnostics can be run and phase 2 is begun with the enable reset test.

A. Enable Reset and F, S Scan Point Tests

4.10 The unit to be diagnosed is released at the outset of these tests for the purpose of initialization. An enable is then sent out on the bus and the F and S scan points are read. An enable verify check is made after the controller is enabled; then another enable pulse is issued and the enable verify is rechecked for its absence. A reset pulse is next issued and a verification check is made to assure that the controller is in the reset state.

4.11 The purpose of this set of tests is to check the ability of the F and S flip-flops to take on their expected state after an enable and then to flip back again after the reset.

B. Mode Tests

4.12 The ability of the controller to enter the quarantine and test point access mode is verified by switching modes and reading the F, S, and T scan points. The expected results for the different modes are as follows:

(a) Controller switched into quarantine mode should result in FST = 011.

(b) Controller switched into quarantine mode and test point access mode should result in FST = 001.

(c) Controller switched into test point access mode should result in FST = 101.

C. Group Check Tests

4.13 A number of illegal orders are sent out on the peripheral unit bus to the controller to test the Group Check (GC) circuitry. The controller should detect that the order is illegal and set one of the GC flip-flops. Group check flip-flop 0 (GC0) should be set whenever the order has one or more groups with no device specified. Group check flip-flop 1 (GC1) should be set whenever any group has more than one device specified.

4.14 "Less than" orders are sent to the controller and in each set there is one group with no device action specified while only one device operation is requested in each of the other groups.

> ***Note:*** The set of "less than" orders is exhaustive; ie, corresponding to each group there is at least one order with no device specified in that group.

4.15 "More than" orders are next sent to the controller and in each set there is one group with more than one device operation specified.

> ***Note:*** The set of "more than" orders is also exhaustive in the sense that each bit appears in at least one order as part of an overloaded group.

4.16 Satisfactory results from both the "less than" and "more than" group check tests verify that the group check circuits, the cable receivers, the group check flip-flops and input gates are free from hard faults.

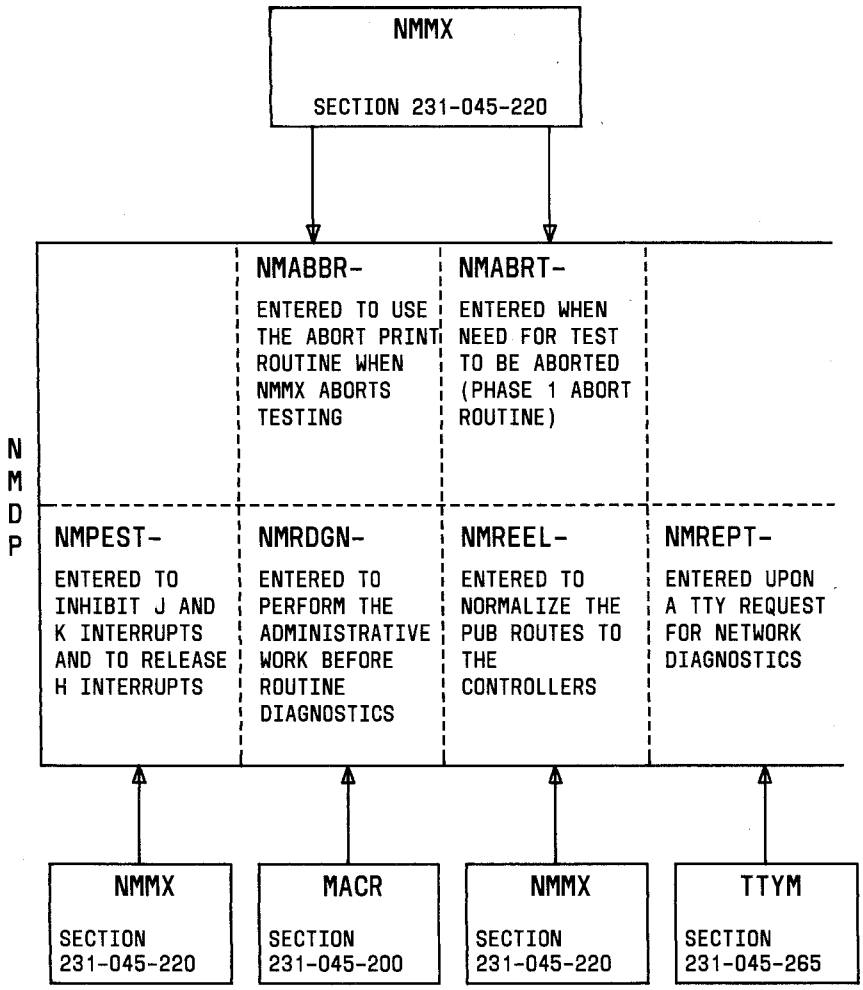
D. Voltage Cut-Through Test

4.17 This test examines the capability of the VCT to take on a zero value and therefore verifies the VCT flip-flops and input gates. This test will also verify the logic chain that tests the order for the proper selection of controller.

4.18 An order is sent out for multiple "less than" failures and no controller bit choice. An order of this type should put the VCT flip-flop in the zero state under normal operation.

E. Live Orders Test

4.19 This test will send out a group of actual "live orders" which are actually pulsed


NMMX
SECTION 231-045-220
NMDP
NMABBR-
ENTERED TO USE THE ABORT PRINT ROUTINE WHEN NMMX ABORTS TESTING
NMABRT-
ENTERED WHEN NEED FOR TEST TO BE ABORTED (PHASE 1 ABORT ROUTINE)
NMPEST-
ENTERED TO INHIBIT J AND K INTERRUPTS AND TO RELEASE H INTERRUPTS
NMRDGN-
ENTERED TO PERFORM THE ADMINISTRATIVE WORK BEFORE ROUTINE DIAGNOSTICS
NMREEL-
ENTERED TO NORMALIZE THE PUB ROUTES TO THE CONTROLLERS
NMREPT-
ENTERED UPON A TTY REQUEST FOR NETWORK DIAGNOSTICS
NMMX
SECTION 231-045-220
MACR
SECTION 231-045-200
NMMX
SECTION 231-045-220
TTYM
SECTION 231-045-265

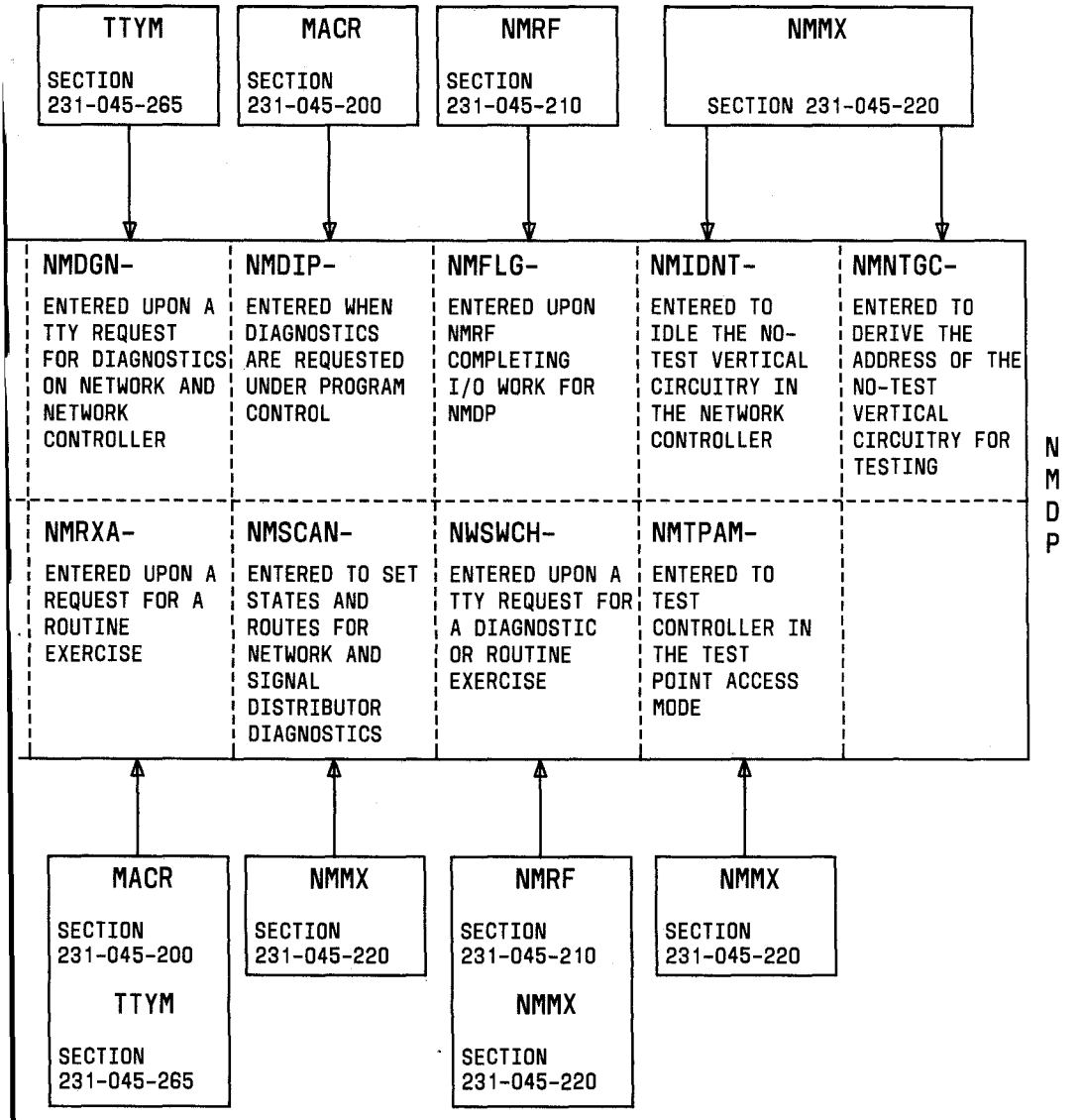


Fig. 2—Entries to Network and SD Controller Diagnostics (NMDP)

through the network to make connects and disconnects.

Note: Reference Section 231-045-120, No. 1/1A ESS Peripheral Control Software Subsystem Description, for information on how connects and disconnects are made through the network.

4.20 To avoid interacting with actual calls, the program will set up different sets of links depending on the state of the network. The network map is examined to find idle links to be used for the test. Live orders are sent out and at the completion of each order the expected results from the following selected bits are:

VCT flip-flop set to 1

S flip-flop set to 0

F flip-flop set to 0

4.21 The sequence of "live orders" that is issued varies depending on the type of frame that is being diagnosed. The sequence of live orders that are issued depending on the type frame are shown as follows:

TYPE FRAME	SEQUENCE OF LIVE ORDERS
Line Switch Frame (LSF)	Connect with cutoff open Connect with False Cross and Ground (FCG) High and dry Connect with cutoff closed Restore cutoff
Junctor Switch Frame (JSF)	Connect Connect with FCG Operate no test Connect and verify ground Remove no test
Trunk Switch Frame (TSF)	Connect
Service Link Frame (SLF)*	Connect normal Connect reverse Open first stage

* This sequence of orders are used only in No. 1 ESS offices that are equipped with an SLF.

F. Crossfire Test

4.22 Assuming that no failures are detected in the preceding tests, the CROSSFIRE TEST sequence is next run. The crossfire test verifies the ability of the unit to operate in the combined mode and control the switches in the mate controller bay. This is achieved by switching the mate controller into the quarantine mode and running the test controller in the combined mode. Running in this configuration, the entire set of group check tests and the VCT test is repeated.

G. No-Test Vertical

4.23 Tests on a junctor switch frame (JSF) are made using the no-test vertical circuitry. The no-test circuitry of another controller must be used to diagnose the no-test circuitry of the controller under test. The controller of the no-test circuit not under test must be on another frame and its status bits must indicate that it is not in any trouble before it is used. This check is performed in an attempt to ensure that the no-test

circuit being tested is the only circuit of the two that may be faulty.

TERMINATE ROUTINES

4.24 The table of test data is reconfigured to be acceptable to DOCT (Reference D) to process the diagnostic results. After setting the terminate flag and adjusting the all-tests-pass (ATP) flag, the transfer is made to DOCT. Upon return the data is examined to determine if the normal configuration should be set up in the case where no failures are found. If any failures were encountered, the test controller is left in the quarantine mode and its mate in full control of the network.

MINIMIZING CALL INTERFERENCE

4.25 In order to minimize call interference while diagnosing network controllers, the following conditions must be avoided.

- If one controller of a pair is in trouble and the other one is put into the quarantine mode, then the troubled controller would assume full control of the network.
- Overloaded orders would look legal under certain conditions and would actually be pulsed through the network tearing down an existing connection.
- Live orders might be sent to a link which may then be chosen on J level to establish a call.

4.26 These conditions are avoided by the proper choice of test orders and repeated consultation with the network map and test result tables. A test may also be aborted under certain conditions to avoid the above conditions from occurring.

SIGNAL DISTRIBUTOR DIAGNOSTICS

4.27 Maintenance facilities provided for the SD are similar to those found in the network controllers. The three master scanner points (S, F, and T) are used to monitor the state of each controller. There is also a special diagnostic bus onto which the following information is gated:

(a) The F point which monitors the busy or idle state of a signal distributor controller

(b) The apex point (AP) which indicates whether or not a proper path has been set up

(c) Scan points which monitor the different groups of the orders received on the bus.

4.28 The signal distributor has three modes of operation similar to those of the network controllers:

(a) Normal mode

(b) Quarantine mode

(c) Test point mode.

When the SD is in the quarantine mode, the unquarantined controller can operate or release points assigned to its quarantined mate.

DIAGNOSTIC TESTS

4.29 The PHASE 1 test and the ENABLE RESET test are basically the same as those performed on the network controllers (refer to 4.07 through 4.11).

A. Mode Test

4.30 The MODE test is essentially the same as that described for the network controllers in 4.12. The coding of the S, F, and T scanner points are somewhat different for the signal distributor as noted below:

(a) Controller switched into quarantine mode should result in FST = 001.

(b) Controller switched into quarantine mode and test point access mode should result in FST = 011.

(c) Controller switched into the test point access mode should result in FST = 110.

B. One Bit or One Relay Test

4.31 This group of tests is designed to test the ability of the controller to detect an overloaded condition, two wire spring relays energized or two mercury relays energized within a group. The circuitry associated with the detection scheme is also being tested along with the relays. The groups

are tested to ensure that no pulse path is formed under these conditions.

C. Live Orders Test

4.32 A sequence of legal release orders is first sent out to initialize the test magnetic latching relays (MLRs) with no data being observed. A sequence of orders is next sent out.

> *Note:* No signal distributor point can be operated twice consecutively without first being released nor can it be released twice consecutively without first being operated.

4.33 The sequence of orders which is sent out will test this by issuing two consecutive operate orders to the same MLR and then two consecutive release orders to the same MLR. The purpose of these tests is to verify the functioning of the maintenance relays as well as the pulse steering circuits in the logic path from the enable flip-flop.

D. Crossfire Live Orders Test

4.34 This test is the same as that described in 4.32 except that the mate controller is in the quarantine mode giving the controller under test access to the test MLRs of its mate.

E. Crossfire and Additional Relay Test

4.35 This test is primarily designed to check the ability of the controller to detect the operation of the two wire spring relays of the mate controller.

TERMINATE ROUTINE

4.36 The terminate routine for the signal distributor controller is the same as that for the network controllers described in 4.24.

SWITCHING FUNCTIONS

4.37 In addition to being able to request either normal or raw diagnostics of a network or signal distributor controller, maintenance personnel can use the diagnostic program to change the mode of a particular unit. The following may be requested:

(a) Switch to quarantine mode which gives full control to its mate

(b) Split mode which places both controllers in the normal mode.

RELAY INITIALIZATION PROCEDURE

4.38 The entire call store is reinitialized when a PHASE 4 emergency action is called and in particular, the network map is wiped out along with any information about the present states of signal distributor points in the office. It is imperative that all signal distributor points be released and all line ferrods restored in order for the state of the office to be consistent with the newly written records. This function is performed by the relay initialization routine.

INTERACTION BETWEEN NETWORK DIAGNOSTIC AND FAULT RECOGNITION PROGRAMS

4.39 The network and signal distributor controller diagnostic programs interact with the network and signal distributor fault recognition program (Reference D) when the fault recognition program observes some malfunction in one of its units.

4.40 Another area of interaction involves the use of a linked list containing requests to change the mode of the controllers. This is processed by the fault recognition request to switch a controller and takes the form of a link entry specifying the unit to be switched and a code indicating the switching action to be performed. Whenever the diagnostic program needs to switch the mode of some controller, it adds its request to the linked list and terminates its present maintenance segment. A period of call processing and executive control program routines then follows. At least once before control is returned to the diagnostic program, the network fault recognition program is called in and among other things services the linked list.

NETWORK AND SIGNAL DISTRIBUTOR ROUTINE EXERCISES

4.41 The routine exercise is an administrative program in which frames are tested using various sections of the network and signal distributor normal diagnostic program. The routine exercise will test only the hardware normally not used by call processing. If any controller fails during the routine exercise, a request is made by the program to diagnose the controller with the normal diagnostic program. The complete diagnostics are also used

on any controller out-of-service or with route trouble.

4.42 The two methods used to start and to terminate the routine exercise are:

(a) MANUAL CONTROL—initiated by TTY input message (IM-6A001)

(b) PROGRAM CONTROL—initiated by MACR (Reference D) periodically.

A. Program Flow

4.43 A manual request to run the routine exercise causes the network and signal distributor controller diagnostic program to be entered at the same symbolic location (NMSWCH) as other TTY requests. Upon detection that the request is for a routine exercise, the program will set a flag and terminate. MAC will discover the routine exercise flag set and will transfer to NMRDGN in the network and signal distributor controller diagnostic program. The program will then determine the next frame to be routinely exercised and will then request it via the routine request table.

B. Program Tests

4.44 The basic tests that are performed on the frames by the routine exercise are:

(a) The enable, the enable verify, and the scan point test

(b) Tests to determine whether the group check circuits are functioning properly in the crossfire and noncrossfire modes.

(c) Test the ability of a controller to assume its maintenance states

(d) Test for the controllers ability to crossfire, ie, the ability to operate paths normally assigned to its mate controller

(e) Test for false cross and ground (FCG) circuitry in junctor switching frames.

4.45 The routine exercise is an abbreviated version of the normal diagnostics. A request for routine exercise causes a transfer to be made to skip certain portions of the normal diagnostics.

NETWORK MATRIX PROGRAMS (PR-6A043)

4.46 The network matrix programs (Fig. 3) are used to exercise any network matrix in a No. 1/No. 1A ESS office. Associated with each network frame is a relay matrix which is used by the frame's two controllers when a pulsing path is selected. Malfunctioning contacts within this matrix are, in general, nondiagnosable as far as the network and signal distributor controller diagnostic programs are concerned and the network matrix programs handle this deficiency.

4.47 A matrix exercise may be initiated either manually by way of the TTY (see IM-6A001) or by the fault recognition program (Reference F) when a particular order fails using all combinations of controller, bus, and central pulse distributor (CPD). In either case of initiation, the matrix exercise program receives control from the maintenance control program (Reference D) on diagnostic priority. Prior to starting the matrix exercise, a check is made to ensure that ***both*** controllers on the frame are in the normal mode (neither quarantined) and that the frame-half to be exercised is equipped.

4.48 The diagnostic bus is then connected to the controller associated with the frame-half to be exercised by placing that controller in the test point access mode (TPAM). An exhaustive number of live orders are then sent to the frame-half being exercised and all pulser failures and short-to-ground failures are recorded. The orders are exhaustive in the sense that, providing traffic conditions permit, every relay contact in the matrix will be used at least once during the exercise. Subroutines contained within the program ensure that the network map is idle before a path is selected, therefore eliminating the possibility of a talking path being pulsed.

4.49 Upon completion of the matrix exercise, the controller is restored to its normal mode of operation and all failures (up to a predetermined maximum) are printed on the maintenance TTY. The failing orders are printed in raw form as they appeared on the peripheral unit address bus (PUAB) and the logical product of all failures are also printed since there is a direct relationship between relay and bit position on the PUAB, a faulty relay can be readily detected providing only a single relay has failed.

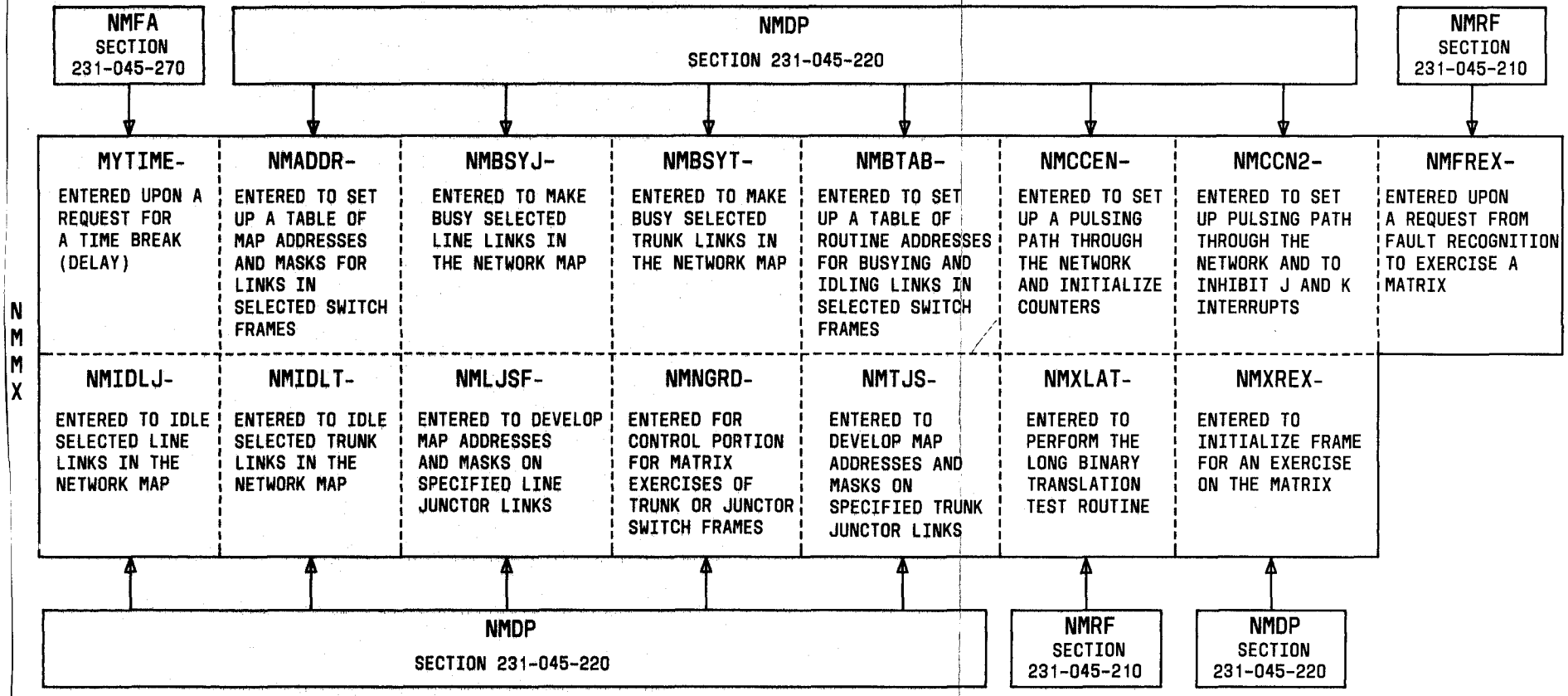


Fig. 3—Entries to Network Matrix Routine Exercises (NMMX)

A. Premature Termination

4.50 The following conditions will cause the matrix exercise to terminate prematurely:

(a) A maintenance interrupt in which case all information up to the interrupt is lost.

(b) An excessive number of pulser failures—test results to this point are printed and diagnostics on the controller are requested.

(c) Unexpected failures occur on the frame—test results to this point are printed and diagnostics on the controller are requested.

5. PERIPHERAL UNIT BUS AND CENTRAL PULSE DISTRIBUTOR DIAGNOSTICS

PERIPHERAL UNIT BUS DIAGNOSTIC PROGRAM (PR-6A048)

5.01 The peripheral unit bus (PUB) (Fig. 4) is the communication link between the central control (CC) and the peripheral units. The PUB is a term used to collectively describe the following buses:

(a) Peripheral unit address bus (PUAB)

(b) CPD enable address and verify answer buses (CPDB)

(c) Scanner answer (peripheral reply) bus (SCAB)

(d) Coded enable peripheral unit bus (CEB)

5.02 The primary objective of this program is to isolate a fault within the repeater fan-out or fan-in circuits of the PUAB or SCAB of the PUB to a small number of replaceable circuit packages. This objective is met by performing a series of tests on the peripheral bus and comparing the test results with the expected results and reporting the results of the comparison via the maintenance TTY.

5.03 The PUAB and SCAB are made up of an address group of leads and an answer group of leads. The address group contains 36 leads which are used for addressing peripheral units or for transferring data to output equipment. There are also two additional leads in the PUAB; one lead is the Network Reset lead and the other lead is the False Cross and Ground (FCG) test lead.

5.04 The peripheral answer bus is made up of 17 leads, 16 of which carry scanner answer information or data from input units which are received in the CC logic register. The 17th lead is an All-Seems-Well (ASW) scanner lead which is used for maintenance purposes and is received in a special flip-flop located on the peripheral unit maintenance summary buffer bus.

A. Requested Bus Reconfigurations

5.05 During the normal mode of transmitting and receiving peripheral data, the peripheral unit address and answer buses are not in direct communication with each other. For maintenance purposes, however, a direct link between the peripheral address and answer buses can be established at any CPD frame from which these buses fan in or fan out.

5.06 The peripheral unit diagnostics test the peripheral address bus by sequentially connecting sections of the 39 lead (WRMI included) address bus onto the 17 lead (ASW scanner included) answer bus under CPD control.

B. Initiating Peripheral Bus Diagnostics

5.07 The peripheral unit bus diagnostics are initiated by any of the following:

(a) Restoring power to the address bus cable drivers at the master control console (MCC)—recognized by the Alarm Scan Program (Reference G) which will request diagnostics via MACR (Reference D) on the repeater and fan-out and fan-in circuits at every CPD frame through which the bus passes

(b) Restoring power to a particular repeater at the CPD frame—recognized by the Alarm Scan Program which will request diagnostics via MACR on that particular repeater and fan-in/fan-out circuits

(c) Requesting diagnostics on all repeaters on a bus or any particular one via a maintenance TTY input message (see IM-6A001).

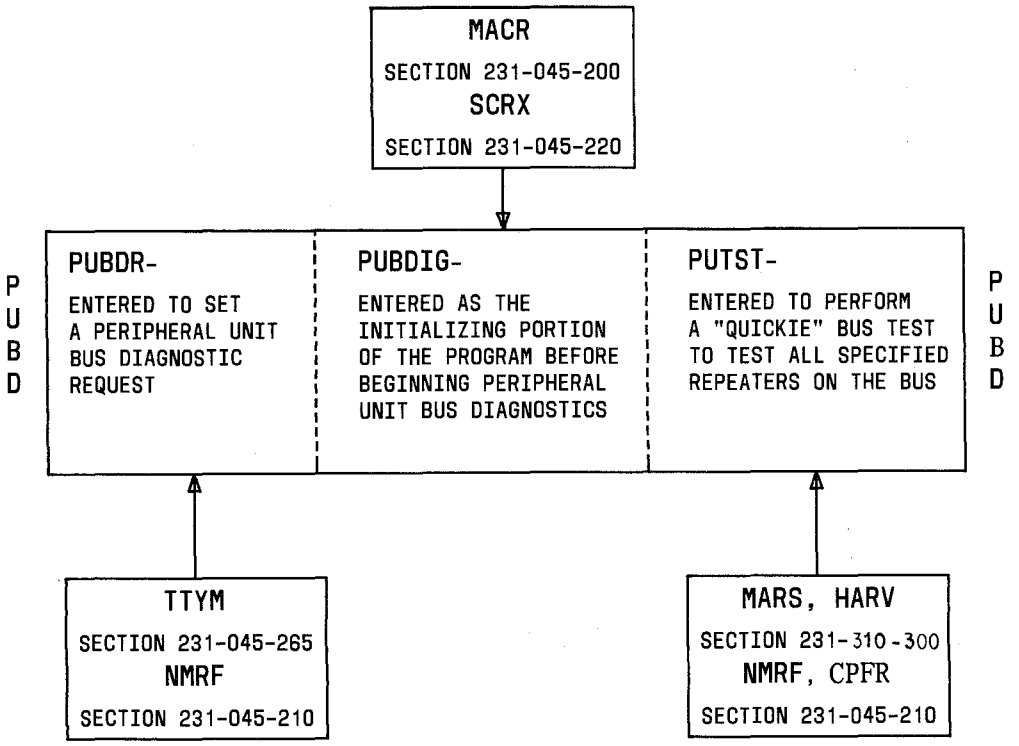


Fig. 4—Entries to Peripheral Unit Bus Diagnostics and Exercises (PUBD)

C. Administration of PUB Diagnostics

5.08 The PUB diagnostics are performed using the maintenance control register scratch pad area which is administered by MACR. The diagnostic program is entered at PUBDIG from MACR when a peripheral bus diagnostic request is recognized. The identity of the bus, for which diagnosis is requested, is stored in the MACR scratch pad and a request is also made to return to the diagnosis if segmenting becomes necessary.

5.09 The initialization required for diagnostic testing is handled upon entry at GLOBAL PUBSTA from MACR. The first action carried out by this segment is to store the system answer bus configuration in the MACR scratch pad so the system can be properly reconfigured at the end of each segment. MACR scratch area is zeroed and both the active and standby CCs are forced into the reply bus to be diagnosed. A check is then made to determine whether or not the reply bus is properly set up and, if not, a transfer is made to the ABORT address for the program.

5.10 If none of the repeater diagnostic request bits are set indicating that all diagnostic requests have been answered and serviced, a transfer is made to the status updating and exit portion of the program. If a repeater request bit is found set, then a check is made with the office parameter indicating the highest equipped CPD pair in the office to determine if the requested repeater is in a valid range. An invalid range will result in all repeater diagnostic request bits being set to zero since the answer bus status word contains some error and a transfer is made to the ABORT address of the program. A repeater diagnostic request in range will result in a transfer being made to the test execution portion of the program.

TEST EXECUTION

A. Peripheral Address Leads

5.11 The first 36 leads of the PU address bus and the 16 leads of the PU reply bus are simultaneously tested using six groups of alternate 1s and alternate 0s test patterns. The 36 PU

address leads are divided into three groups: 0-15, 16-31, and 32-35. Each of these groups is further subdivided into two fan-out groups yielding six distinct fan-out groups for diagnostic purposes. The six fan-out groups are sequentially connected to the 16 PU reply bus leads. The complete pattern of failing data is stored in the MACR scratch area for subsequent analysis.

B. Reset and False Cross and Ground (FCG) Test

5.12 The last two PU address leads, the reset pulse lead, and the FCG pulse lead, cannot be transmitted by the PUB diagnostic program because of the danger of destroying or altering network information. These two leads will be tested, upon request, by the network fault recognition program (Reference F).

C. "We Really Mean It" (WRMI) Test

Note: This test is not used in No. 1A ESS.

5.13 Initialization for the WRMI test begins with restoring the answer bus test configuration following the FCG/reset tests. The CC enable register is set up with the CPD address controlling the WRMI fan-out. The CPD, from which the bus switch enabling is to be done, is forced to be the odd CPD of the pair if PU bus 1 is being diagnosed or the even CPD if bus 0 is being diagnosed.

5.14 Following the initialization process, the WRMI pulse is sent from the CC and looped through the repeater being diagnosed onto the ASW scanner lead of the peripheral reply bus under the control of the appropriate CPD enable. The WRMI pulse is then returned to the ASW scanner flip-flop on the CC buffer bus. The ASW scanner flip-flop is read into the CC acumulator register and a check is made to determine if the CPD which enabled the bus switch control for the WRMI test returned an ASWCPD reply to the CC. A failure to return the ASWCPD reply to the CC will result in a dummy success for the ASW scanner being generated to prevent the bus from being marked in trouble for a CPD problem. The entire WRMI test sequence is then repeated for the other WRMI fan-out. The diagnostics then make a final check on WRMI to determine if WRMI is erroneously being looped in the absence of a proper enable.

D. Updating Bus Status

5.15 Following the final diagnostic test, a check is made to determine if any of the diagnostic tests has failed. No test failures result in the dictionary number production program's all-test-pass (ATP) bit to be marked and the repeater trouble bit in the bus status word to be zeroed. If a failure has been recorded during the testing, then a second check is made to determine if the failure was in one of the three WRMI tests. Any failure pattern which is completely WRMI oriented results in the repeater trouble bit being zeroed. Bus failures which are not completely isolated to WRMI tests result in the repeater trouble, overall trouble, and out-of-service bits being set in the bus status word.

Note: The second check above is not used in No. 1A ESS.

E. Initiializing the Dictionary Number Production Program (DOCT)

5.16 A request for raw data by the diagnostic user will result in setting the raw data bit in DOCT. DOCT term bit will be set, for either raw or normal diagnosis, when all the data has been assembled into the MACR scratch area and is ready for processing. DOCT then processes the test results into a trouble number which is used for consulting the Trouble Location Manual (TLM). If previously requested, DOCT will initiate the printing of this trouble number and the associated raw data. Upon completion of the TTY printout a return is made to PUB diagnostic program until all repeater diagnostic requests have been answered and serviced, at which time the exiting portion of the program is entered.

PROGRAM TERMINATION

5.17 The overall trouble and out-of-service bits in the bus status word are set if any of the eight repeater trouble bits are set. If no repeater trouble bits are set, then the overall trouble and out-of-service bits in the bus status word are reset. Any failure of a repeater or a bus to pass diagnostics results in the corresponding scanner answer bus being marked out-of-service and a diagnostic request entered for that scanner answer bus.

SUBROUTINES

A. Setting a PU Bus Diagnostic Request

5.18 This subroutine, entered at GLOBAL PUBDR, does the initialization required for a PUB diagnosis. The following conditions are set at entry:

(a) The identification of the bus for which a diagnostic request is to be entered is contained in the CC enable verify register.

(b) The number of the repeater or bus for which a diagnosis is requested and whether the request is for the whole bus or a single repeater and whether or not raw data is desired.

5.19 This subroutine will not enter a diagnostic request for a bus or a repeater on a bus if the other bus is in trouble or out-of-service. A non-TTY entry results in a normal diagnostic request being entered for all equipped repeaters on the selected bus. For a TTY entry, the type of diagnostic request to be entered is determined by the TTY input message. (Refer to IM-6A001.)

B. ABORT

5.20 The ABORT subroutine is used by the PUB diagnostic program as an exit point if the diagnosis is aborted automatically by way of an interrupt or by the diagnostic program itself. The peripheral reply buses are restored to their original configuration at the time MACR answers the diagnostic request. The TTY then prints out a message indicating that the diagnosis has been aborted.

C. Abbreviated Bus Test

5.21 The abbreviated bus test routine performs a series of tests on the 36 peripheral address leads and the 16 reply leads. The tests are carried out on all equipped repeaters of the bus which is specified in the CC enable verify register. These tests are run with the F-level interrupt inhibited. A bus failing the tests in this subroutine will be marked in trouble and have a diagnosis requested. The test sequence is first performed using the even CPD of the pair to enable the bus switch circuits. A failure in any of the tests will result in the entire test sequence being performed again using the odd CPD of the pair for enabling of the bus switch circuits. A failure of the tests with both CPDs indicates bus trouble whereby a failure of the tests with one CPD but not the other indicates a CPD problem.

CENTRAL PULSE DISTRIBUTOR DIAGNOSTIC AND EXERCISE PROGRAMS (PR-6A023)

5.22 The central pulse distributor (CPD) diagnostic program (Fig. 5 through 8) checks the internal circuitry of the CPD as well as access over all leads of both of the CPD enable and verify buses. The CPD diagnostic program is initiated by MACR when it finds a CPD marked for diagnosis. A series of tests are then performed on the CPD and the results are sent to DOCT (Reference D) for reporting on the maintenance TTY in the form of a trouble location number.

> ***Note:*** In the case of a manually requested diagnosis, a raw data output may be requested on the maintenance TTY.

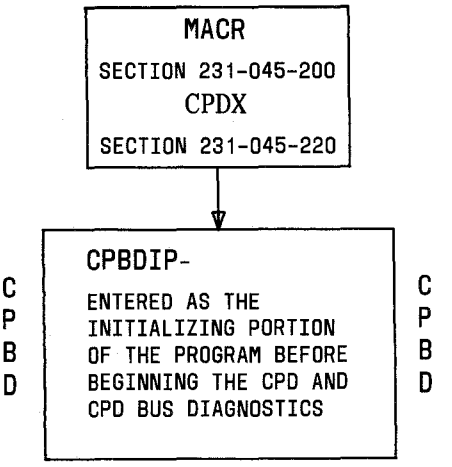


Fig. 5—Entries to Enable and Verify Bus Diagnostics (CPBD)

5.23 The CPD diagnostic program tests CC-to-CPD communication over all pairs of CPD enable and verify buses on CPDs that are not already marked in trouble. If any bus lead fails, communication over that lead is again attempted from the standby CC. Any failure from this configuration would indicate a CPD or CPD bus problem. That CPD is marked for diagnosis and a message is printed on the maintenance TTY

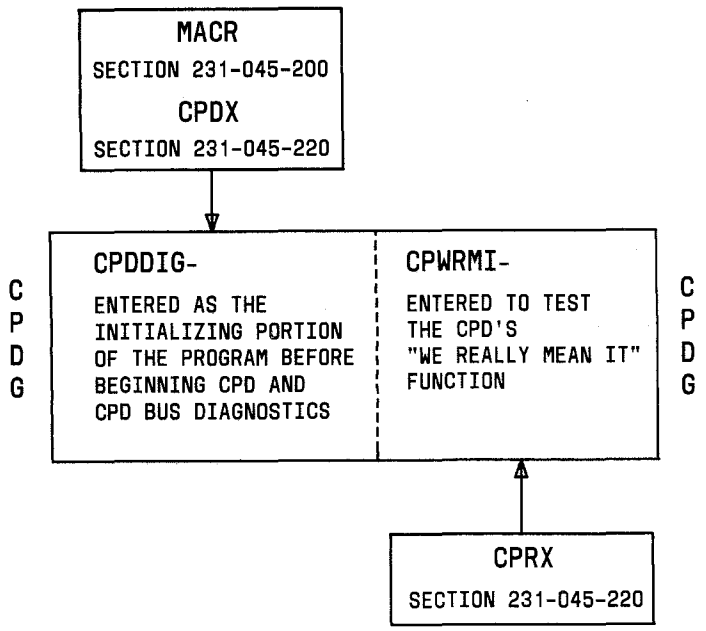


Fig. 6—Entries to Central Pulse Distributor Diagnostics (CPDG)

indicating the CPD and CPD bus on which the failure occurred. A successful diagnosis using the standby CC would indicate a faulty CC and a request to switch CCs is issued. A successful initial CPD bus diagnosis results in the status word for that bus being updated to indicate a good CPD and CPD bus. A message is also printed indicating a successful diagnosis.

5.24 The unavailability of one of the buses at the time of diagnosis results in the processing of diagnostic results program generating two trouble numbers for the unavailable bus. The first generated trouble number is identical to the test results from the available bus and the other trouble number corresponds to an ATP result. This procedure will in most cases generate a valid trouble number regardless of whether or not the trouble is bus sensitive.

EXERCISE PROGRAMS

5.25 The CPD exercise programs can be initiated either on demand or scheduled basis.

A. Scheduled Exercise

5.26 The scheduled exercises are performed on an hourly and daily basis. The hourly exercise switches the active CPDs and the CPD buses and checks the maintenance circuits of the CPD that it is making active to ensure that they are functioning properly and can detect trouble. If the CPD fails any of these checks, then it is marked for diagnosis in addition to any CPD already marked in trouble. The hourly exercise will also reset the hourly peripheral error counter and reinitialize the error print counter.

B. Demand Exercise

5.27 The demand exercise programs are mainly initiated by manual action from the TTY where an attendant can request that a CPD be removed from service or diagnosed with either a raw data or a trouble number printout. A CPD that successfully passes diagnosis is restored to service. A TTY request for diagnosis will be denied if the mate CPD or either PUB is marked in trouble.

CPD DIAGNOSTIC TESTS

5.28 The CPD diagnostic program will use the INHIBIT INTERRUPT mode since the diagnostic program may be using a bad CPD bus which would give rise to maintenance interrupts if call programs were to interrupt the diagnosis. In

this mode no call program interrupts can occur during the course of the diagnosis; hence, the diagnosis must be segmented so that all the normal system J-level work can be done between segments.

5.29 The CPD diagnosis is performed in two identical phases; the first phase uses CPD bus 0, the second uses CPD bus 1. The following is a breakdown of the eight individual diagnostic tests:

- Test 1—addresses the CPD test lead (simulating an output load) in conjunction with each of the 64 possible combinations of valid group address codes.

- Test 2—tests the parity checking and all-seems-well CPD circuits to ensure that they are properly responding by sending out a blank code and an excess 1 code to the CPD.

- Test 3—sends all 64 valid group address combinations to the CPD while in the inhibit mode to cause the CPD to respond with an all-seems-well CPD and a Matrix Current Excessive (MCE) pulse if there is a shorted isolation diode in the output row corresponding to the received address.

- Test 4—sends all 16 valid Z address codes to the CPD while in the inhibit mode to test the response of both the first and second stage Z address group registers.

- Test 5—causes the CPD to send 1s out on all 24 verify answer bus leads by addressing the CPD test lead while the CPD is in the inhibit state and access to the CPD is checked by way of the test lead.

- Test 6—this test is done in two stages, both with the CPD in the normal mode: the first stage addresses a point with a shorted output transformer secondary winding and records the MCE data to verify that the matrix current detector will detect excess current.

- Test 7—sends out all eight register group address codes to ensure that the parity circuits respond to valid addresses.

Note: The following test is not used in No. 1A ESS.

- Test 8—checks the ability of the CPD to send WRMI pulses to the CCs, the call stores, and the program stores via subroutine CPWRMI.

HOURLY SCHEDULED EXERCISE TESTS

5.30 The hourly scheduled exercise program switches active CPD buses and active CPDs. This causes the CPDs to be switched for all peripheral orders that use the status word as a means of CPD selection (this does not imply that the system will not use the nonactive CPD). The CPDs made active from this switch are tested as follows:

- Test 1—sends a blank address code to the CPD and verifies that all parity checks fail.

- Test 2—addresses a shorted output pin and verifies that all parity checks pass.

- Test 3—sends one excess bit to each address group and verifies that the parity checks fail.

- Test 4—addresses the test lead while the CPD is in the inhibit state and checks that the CC enable verify register becomes all 1s.

- Test 5—addresses a Z register with the CPD in the inhibit mode and verifies that the CPD responds with ASWCP and MCE pulses.

- Test 6—repeats Test 5 with the CPD in the normal mode and an ASWCP or MCE pulse indicates that the CPD is still inhibited.

Note: The following test is not used in No. 1A ESS.

- Test 7—tests that the CPD can send WRMI pulses to the CCs and call stores (CPWRMI subroutine).

Note: A failure in any of the above tests will result in the CPD being marked for diagnosis and again made inactive.

5.31 An exercise program marking a CPD out-of-service results in a memory action ***only*** and the entire system load will not normally be transferred to its mate unless the CPD is

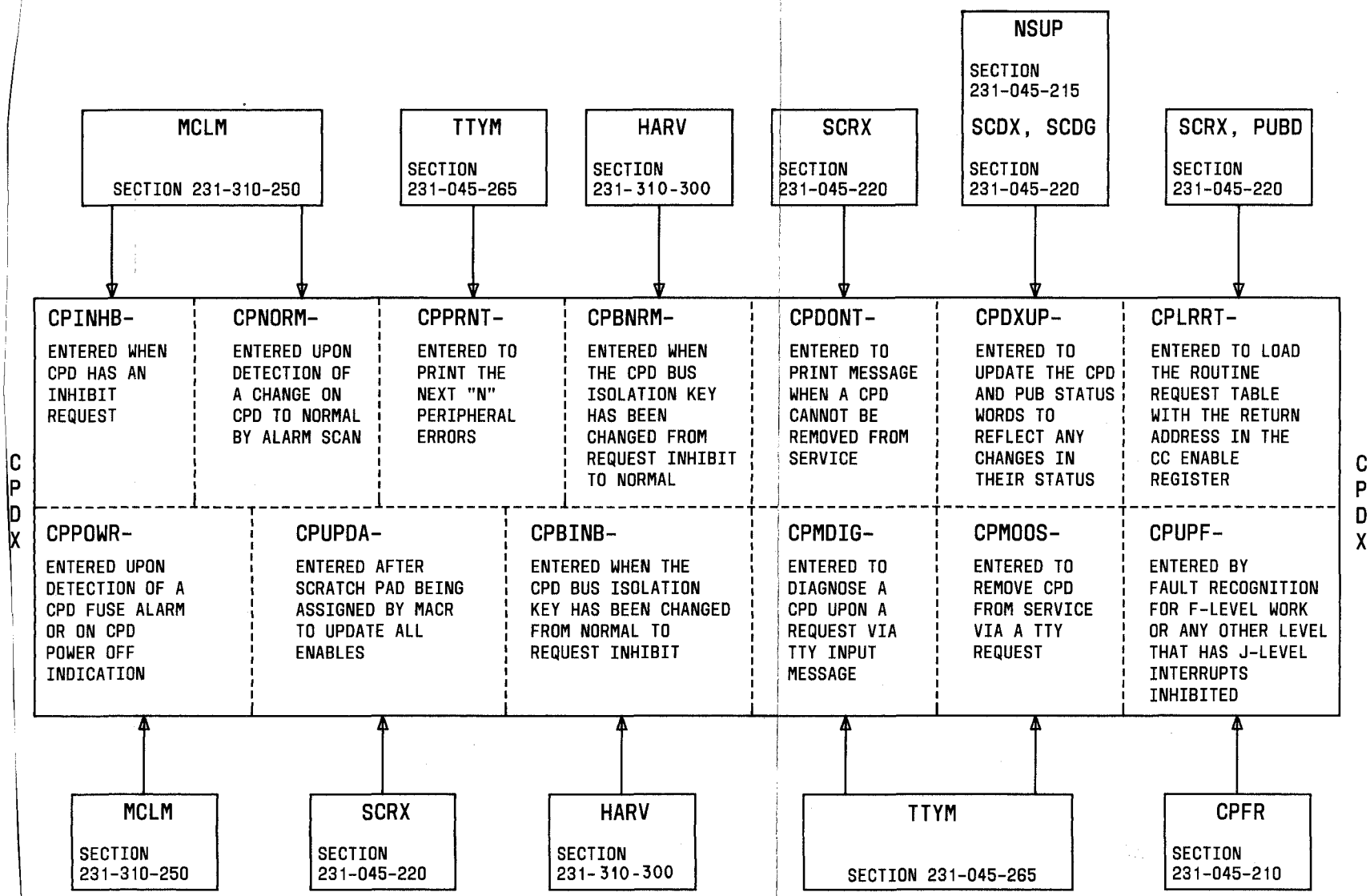


Fig. 7—Entries to Central Pulse Distributor Exercises (CPDX)

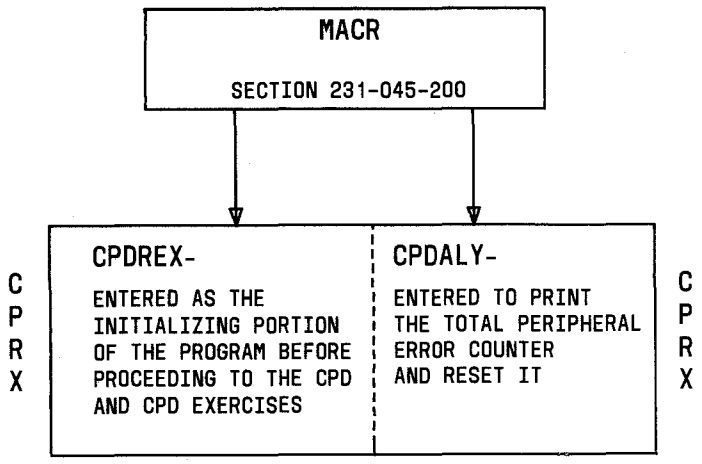


Fig. 8—Entries to Central Pulse Distributor Routine Exercises (CPRX)

powered down. In this case the CPD fault recognition program (Reference F) will update all routes to use the other CPD.

> ***Note:*** The CPD diagnostic programs are not able to detect certain faults that affect only one of its output points and an interpretation of the output message is necessary to locate these faults (see OM-6A001).

6. SCANNER DIAGNOSTIC AND EXERCISE PROGRAMS (PR-6A027)

6.01 The scanner diagnostic and exercise set of programs (PR-6A027) (Fig. 9 through 11) are made up of the following:

(a) Scanner Diagnostics

(b) Answer Bus Diagnostics

(c) Scanner Exercises.

SCANNER DIAGNOSTICS

6.02 Scanner diagnostics are initiated by MACR when it finds a request for scanner diagnostics. This request may be entered by any of the following:

(a) Scanner Fault Recognition Program

(b) Answer Bus Diagnostic Program

(c) Scanner Exercise Program

(d) Central Pulse Distributor Fault Recognition Program.

6.03 Upon entering the scanner diagnostic program, the following preliminary checks are made before proceeding with the diagnosis:

(a) The scanner is free of a fuse alarm condition

(b) The CPD and PU are not both in trouble

(c) The scanner enable data is valid.

A failure in any one of these checks will cause the diagnosis to be aborted except in the case for raw data output which does not check for accessibility of the CPD and PU bus. An aborted diagnosis will result in a message identifying the scanner being printed on the maintenance TTY.

6.04 The actual scanner diagnostic tests are normally done in four phases, each utilizing a different configuration of PU bus and scanner controller. If a particular PU bus or CPD is in trouble at the time of diagnosis, the two phases that would use that PU bus or CPD are omitted. The selection of the answer bus will always be determined by which PU bus is being used; for example, phases that send addresses via PU 0 will get answers from answer bus 0.

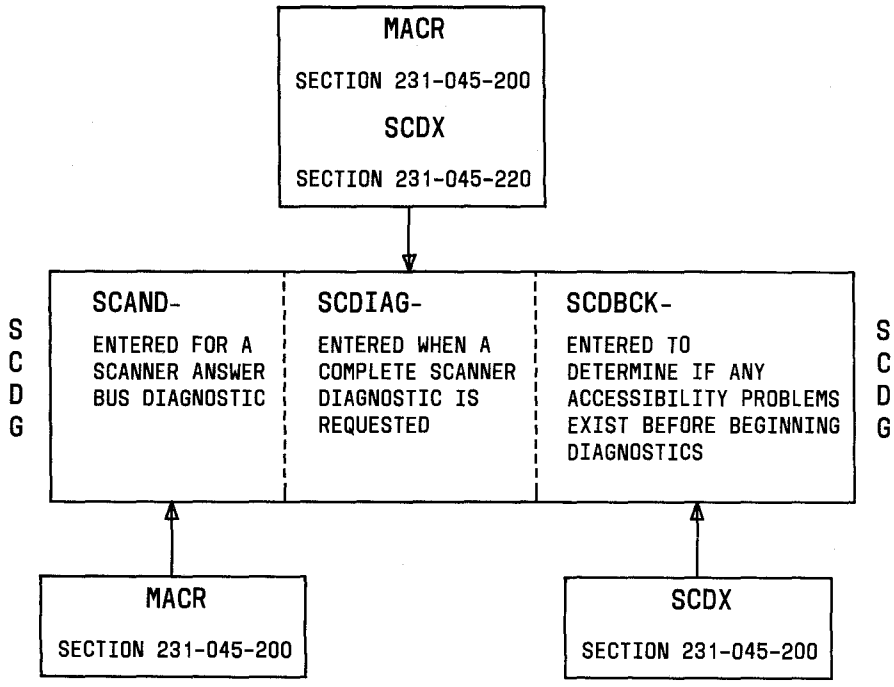


Fig. 9—Entries to Scanner And Answer Bus Diagnostics (SCDG)

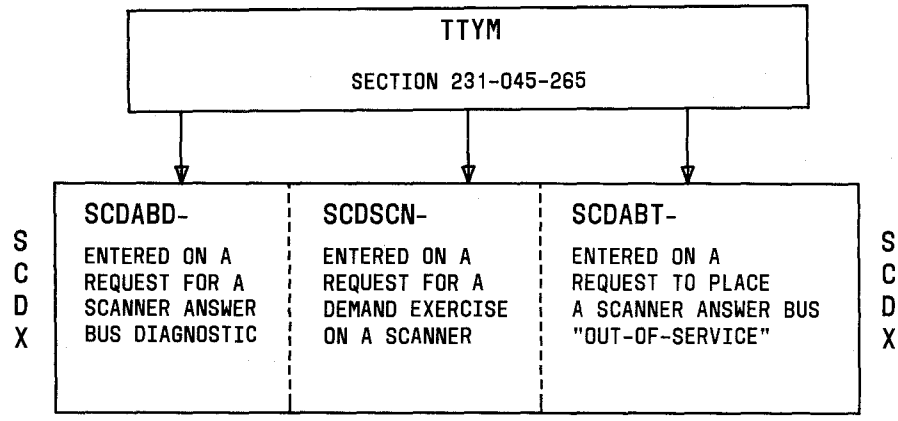


Fig. 10—Entries to Scanner Demand Exercises (SCDX)

6.05 Each diagnostic phase consists of the following four tests except for the PU bus, scanner controller, and CPD selection:

- Verifies that the scanner can send back 1s on all leads of the answer bus.
- Verifies that the scanner can send back 0s on all leads of the answer bus.
- Verifies the absence of an ASW indication from the scanner after it receives an invalid address.
- Verifies the presence of an ASW indication from the scanner for each equipped row that is addressed.

REPORTING OF DIAGNOSTIC RESULTS

6.06 The diagnostic results after being processed by the processing of diagnostic results programs (Reference D) are printed out on the maintenance TTY. If all of the diagnostic tests run successfully, a message indicating this fact will be printed. In the case of unsuccessful testing, the trouble number corresponding to the failure

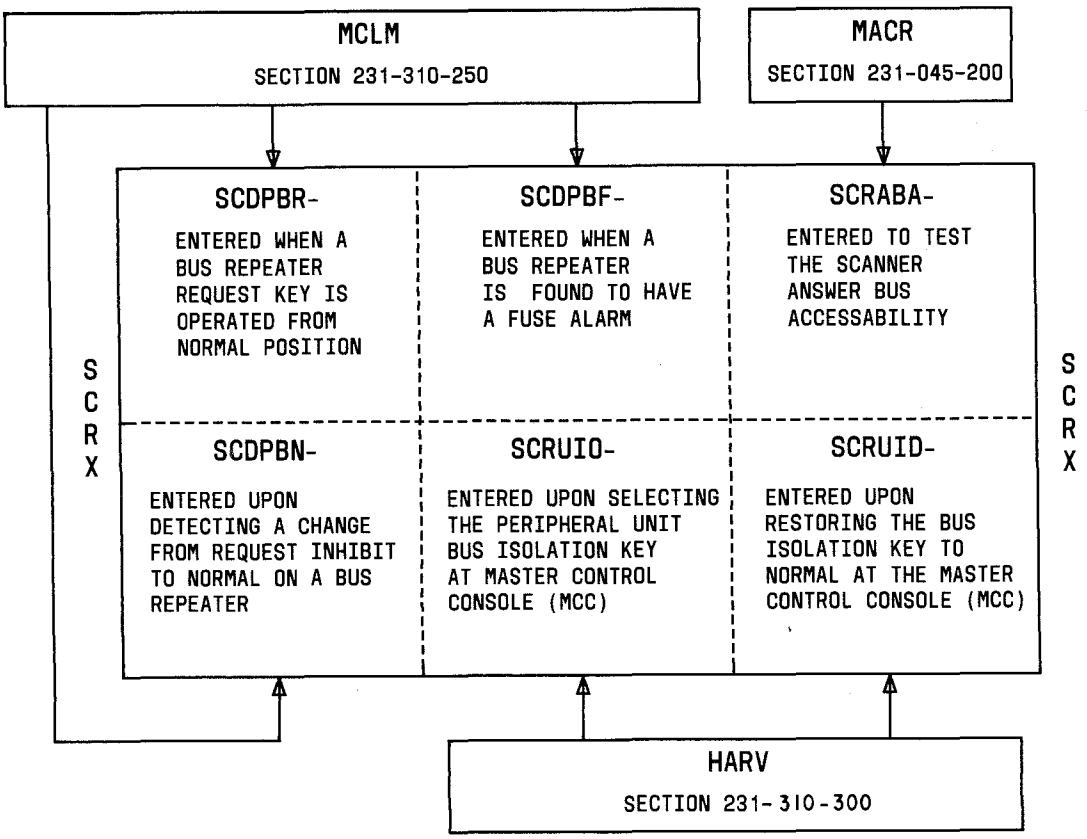


Fig. 11—Entries to Scanner Routine Exercises (SCRX)

pattern(s) will be printed in addition to raw data if requested. Two trouble numbers will be printed if a PU bus was not available for diagnosis, the first number being associated with an ATP pattern for the phases not run and the other coming from substituting a test result pattern identical to that obtained on the phases which were run. Three trouble numbers are printed when a CPD is not available for diagnosis. The scanner trouble bits, enable verify, and ASW scanner flags are all updated after each diagnosis.

ANSWER BUS DIAGNOSTICS

6.07 Answer bus diagnostics are initiated by MACR when it finds a request for answer bus diagnostics. The request may be entered by either of the following:

(a) TTY input message as a ROUTINE request

(b) Central Control (CC) Fault Recognition Programs.

6.08 The answer bus diagnostic tests are a subset of the full scanner diagnostics so that any scanner that fails on the answer bus diagnosis should also fail when it is fully diagnosed. The answer bus diagnostic program tests the ability of each scanner to send 1s and 0s over all pairs of the bus that is being diagnosed. It also tests that the scanners do not send back ASW scanner indications when they are invalidly addressed. The answer busy diagnostic program will request a complete diagnosis on any scanner that fails any of these tests.

6.09 If the answer bus diagnostic request is made as a routine exercise, then the diagnostic is terminated with the first scanner that fails and both CCs are put on the other answer bus. A TTY requested diagnostic that fails, however, will continue through all the scanners in the office, requesting complete diagnosis on all the scanners which fail. If all the scanners pass, the buses are configured so that the active CC receives on the bus that was diagnosed and the standby CC receives

on the other bus. Trouble numbers will again be printed for any tests that fail.

SCANNER EXERCISES

6.10 The scanner exercise program tests the scanners, the answer buses, and the PU buses. The exercises are initiated either on a routinely scheduled basis or on demand in response to a TTY request or a fuse alarm condition. The following requests can be made from the TTY:

- ***Scanner diagnosis*** with either raw data or trouble number output—an OK is returned if the request is accepted and NG if the scanner has a controller with its power removed or if access is limited to one route and raw data has not been requested.

- ***Answer bus diagnosis***—an OK is returned if none of the bus repeaters for this bus are off-normal in which case every scanner will be tested on the desired bus. This test should be used when a scanner diagnosis indicates an answer bus trouble to determine whether the trouble is common to many scanners.

- ***Remove a scanner controller from service*** which will update the scanner enable word to remove the requested controller from service if the scanner is not already in trouble—an OK is returned if the controller is removed from service; otherwise NG is returned meaning that the mate controller is in trouble.

- ***Remove an answer bus from service*** which will be done if the other answer bus is not marked in trouble in which case an OK acknowledgment is returned.

ANSWER BUS ACCESS TEST

6.11 The only routinely scheduled scanner exercise is the answer bus access test which requests a diagnosis of the answer bus on which the standby CC is receiving. If the diagnosis passes on all scanners, the answer buses are then split with the active CC receiving on the bus that had been diagnosed. This exercise will rotate the use of the answer buses between the CCs and also locate any defective answer bus leads.

SCANNER STATUS AND ENABLE TABLES

A. Scanner Status Tables

6.12 The scanner status table consists of the following words:

- PU Bus 0—symbolic address M4L
- PU Bus 1—symbolic address M4L+1
- Answer Bus 0—symbolic address M4R
- Answer Bus 1—symbolic address M4R+1
- Overall Scanner Status—symbolic address M4P

PU Bus 0 and 1 Status Words

6.13 A request for diagnosis is indicated in these status words by marking bit 0 in the appropriate bus status word. Bits 1 and 2 of each word are, respectively, the overall trouble and out-of-service flags. The repeater trouble flags and the address of the enable for the unit requesting the PU bus diagnosis are contained in the remaining portion of the word.

Answer Bus 0 and 1 Status Words

6.14 A request for diagnosis is indicated in these status words by marking bit 0 in the appropriate bus status word. Bit 1 is used as the trouble flag. The remaining portion of these words is used for repeater diagnostic request flags, raw data request flag, and a TTY-requested diagnostic flag.

Overall Scanner Status Word

6.15 Due to the large number of scanners in an office, the low order bits of each scanner ENABLE WORD are used for individual status information. The information contained in these low order bits are requests for overall junctor scanner, line scanner, master scanner, and universal scanner diagnostics in addition to a flag bit for raw data.

B. Scanner Enable Tables

6.16 There is an enable table for each of the four types of scanners: junctor, line, master,

and universal. Each table contains one word for every scanner of its type which contains the CPD address to be used by the system when enabling that scanner. The low order bits of these words are used for maintenance and status indications as previously stated.

7. GLOSSARY

SECTION	TITLE
AP	Apex Point gives the indication as to whether or not a proper path has been set up through the network.
ASW	All Seems Well is a circuit which returns an ASW pulse when it is satisfied that the data received is valid.
ATP	All Tests Pass is a flag set by the diagnostic and/or exercise programs when they are satisfied that individual tests are executed successfully.
BASE LEVEL	All programs that operate in a complex of loops without a beginning or an end which is controlled by the Executive Control Main Program (Reference D).
CC	Central Control is the center of the No. 1/1A ESS which performs the primary data processing functions.
COMBINED MODE	A mode of operation in which one controller has command of both halves of the actual system of links and switches through which paths are set up for talking or signaling
CPD	Central Pulse Distributor provides the CC fast access at electronic speeds to points within the system requiring action signals.
DIAGNOSTIC BUS	A private bus which may be gated onto a network or signal distributor controller to allow the CC to monitor certain test points within the unit.
F FLIP/FLOP	A master scanner point in the network and signal distributor controllers which indicates the busy/idle states of the units.
F-LEVEL INTERRUPT	A seizure of control by the central control for the purpose of giving control to the CPD fault recognition program when an improper peripheral unit response is detected.
FST	The three master scanner points in the network and signal distributor controllers which together indicate the state of the controller.
GC0	The "less than" controller group check point which indicates that an order is incomplete in that it will not operate at least one device in a particular group.
GC1	The "more than" controller group check point which indicates that an order requests the operation of more than one device in a particular group.
G1-G5,0G	Scan points which monitor the closure of selected wire spring relay contacts in the network frames.
IM-6A001	Input Message Manual for No. 1A ESS (IM-1A001 for No. 1 ESS) which lists all the teletypewriter messages that can be transmitted from the maintenance TTY to cause a system action or function.
J-LEVEL	An interrupt level which is activated by a 5-msec clock pulse which causes a transfer of control to the input-output main program.

SECTION	TITLE
JSF	Junctor switch frame performs two stages of switching in interconnecting B-links and junctors (Reference C)
LSF	Line switch frame performs two stages of switching in interconnecting lines on their inputs to B-links on their outputs
MACR	Peripheral maintenance control is the pident which, among other functions, administers the requests for peripheral unit diagnostics
MCE	Matrix Current Excessive
MLR	Magnetic Latching Relay—test relays in the signal distributor which are operated during the "live orders" test to ensure that these maintenance relays as well as the pulse steering circuits in the logic path are functioning correctly.
NORMAL MODE	A mode of controller operation in which the controller is supporting call processing not in either the quarantine or test point access mode.
OM-6A001	Output Message Manual for No. 1A ESS (OM-1A001 for No. 1 ESS) which lists in alphanumerical order all the system output messages printed by the maintenance TTY.
PU	Peripheral unit is any unit which is connected to the peripheral unit bus.
PUAB	Peripheral Unit Address Bus is the bus used for addressing the peripheral units or for transferring to output equipment. It includes the WRMI lead.
PUB	Peripheral Unit Bus is the entire bus which interconnects all the peripheral units of the network.
QUARANTINE MODE	The mode into which a controller is placed when it is faulty or suspected of being faulty and is removed from service, no longer having access to the network.
S FLIP/FLOP	One of the three FST scan points in the network and signal distributor controllers which indicates the state or mode of the units.
STG	Short-to-Ground scan point which monitors the path across the pulser terminals in ferreed-type network frames.
TEST POINT ACCESS MODE	A mode of operation during which the CC is monitoring unit test points by way of the diagnostic bus.
TLM	Trouble Location Manual is a document which lists trouble numbers that are matched with numbers generated by the system from the raw diagnostic results along with information used in locating troubles within a system unit.
T SCAN POINT	One of the three FST scan points in the network and signal distributor controllers which indicates the state or mode of the units.
TSF	Trunk Switch Frame performs two stages of switching in interconnecting trunks and service circuits on the inputs with B-links on the output.
VCT FLIP/FLOP	The point which monitors the current flowing though the path selecting devices.

SECTION	TITLE
WRMI	We Really Mean It is a pulse sent out from the CPD when it is required to operate certain bipolar flip-flops.
Z-ADDRESS CODES	The sixteen valid codes which are sent to the CPD during CPD testing to test the response of both the first and second Z-address group registers.
Z-ADDRESS GROUPS	The sixteen CPD address groups which are specified by the Z-address codes.
0G	See G1-G5 in glossary.

8. ABBREVIATIONS AND ACRONYMS

AP	Apex Point
ASW	All Seems Well
ASWCPD	All-Seems-Well Central Pulse Distributor
ATP	All Tests Pass
CC	Central Control
CEB	Coded Enable Peripheral Unit Bus
CPD	Central Pulse Distributor
DOCT	Dictionary Output Control Program
FCG	False Cross and Ground
GC	Group Check
MACR	Maintenance Control Program (Peripheral)
MCC	Master Control Center
MCE	Matrix Current Excessive
MLR	Magnetic Latching Relay
PU	Peripheral Unit
PUAB	Peripheral Unit Address Bus
PUB	Peripheral Unit Bus
SCAB	Scanner Answer (Peripheral Reply) Bus
SD	Signal Distributor
STG	Short to Ground
TPAM	Test Point Access Mode
TTY	Teletypewriter
VCT	Voltage Cut-Through
WRMI	"We really mean it"

9. REFERENCES

A. Section 231-045-000—Introduction to No. 1/1A ESS Software

B. Section 231-045-100—Operational Software

C. Section 231-045-120—Peripheral Control Software Subsystem Document

D. Section 231-045-200—Maintenance Software

E. Section 231-310-300—Interrupt Recovery Software Control

F. Section 231-045-210—Fault Recognition Software Subsystem Document

G. Section 231-045-250—Master Control Center (Man-Machine Interfacing) Software Subsystem Document

H. Section 231-045-265—Teletypewriter Programs Software Subsystem Document

I. Section 231-045-270—Network Fabric Maintenance Software Subsystem Document

J. IM-1A001—No. 1 ESS Input Message Manual

SECTION	TITLE
K.	IM-6A001—No. 1A ESS Input Message Manual
L.	OM-1A001-—No. 1 ESS Output Message Manual
M.	OM-6A001—No. 1A ESS Output Message Manual
N.	No. 1A ESS Trouble Location Manual (TLM)