DATA TESTBOARD AND ASSOCIATED CIRCUITS A1 DIGITAL DATA SIGNALING SYSTEM PRIVATE SERVICE SYSTEMS

CONTENTS

1. GENERAL

1.01 This section covers general descriptive information for the Data Testboard and Associated Circuits of the A1 Digital Data Signaling System.

1.02 This testboard is designed primarily for making over-all tests on the A1 digital data transmission system, and sectionalizing tests for locating the elements of the system which may be in trouble.

1.03 This section also describes the jack arrangements for the provision of suitable access points for testing the various circuit elements and for patching and substituting spare elements for faulty ones.

1.04 While the size of the data testboard may vary according to the type of installation with which it is associated, the basic testboard features remain the same. Standard jack arrangements for the data circuits are provided for all installations.

1.05 The transmitting and receiving facilities may be provided in duplicate with transmission over separate routes for protection purposes. A switching arrangement at the receiving end permits the use of either route. The data testboard is designed to test both dually operated as well as singly operated data circuits.

1.06 The equipment and circuit sketches included in this section are for the purpose of illustrating the text and may or may not agree with a particular installation. For exact wiring or equipment information, reference should be made to the drawings for the installation involved.

A. Descriptive Information

1.07 The data testboard is the main point of access for testing and maintaining A1 digital data transmitting and receiving circuits.

1.08 It serves to centralize the over-all maintenance of data transmitting and receiving circuits, facilitates the segregation of trouble, and expedites the restoration of service when failures occur.

1.09 Each testboard position consists primarily of jacks for testing access to the transmitting and receiving circuits. The testboard also contains jacks for miscellaneous circuits such as communication trunks, transmission measuring circuits, and other test circuits of a specialized nature.

1.10 Bridging pads, for use at the transmitting end of the data circuit for providing dual circuit operation when required, are provided above the jack field in the data patch and test jack bays.

1.11 In a telephone company building, the testboard and test equipment are mounted in bays. These buildings are normally associated with large sites such as Direction Centers (DC), Combat Centers (CC), and heavy radar sites. The term "small sites" refers to installations other than the above, such as Gap-Filler Radars and missile installations. At these small sites, the test equipment is mounted with the Digital Data Transmitter (DDT), Digital Data Receiver (DDR), etc, in a cabinet located in a building on the customer's premises.

B. Equipment Layout

1.12 The equipment is mounted on standard 23-inch relay racks on frames 11-1/2 (or 9) feet high according to the height of the office or in 7-foot steel cabinets at small sites. This equipment consists of jack units furnished in accordance with the requirements of the individual offices or sites.

1.13 The jack field consists of the required number of testing, patching, and monitoring jacks, keys, and lamps for DDRs and DDTs, and miscellaneous jacks and lamps.

2. DATA CIRCUIT LAYOUT

2.01 The A1 digital data signaling system uses a DDT at one terminal near the source of the data to be transmitted and a DDR at the other terminal near the data using equipment. A dually operated circuit arrangement is shown on Fig. 1 and a singly operated circuit arrangement is shown on Fig. 2.

2.02 Dipulse signals are received from the source over three separate pairs (start, data, and timing) which are connected to the three respective inputs of the transmitter. Each component is sent into the DDT separately. The start and data signals are each separately combined with the timing signal to insure synchronization and to produce the proper signals to be used in modulation. These two resultant signals modulate a 2000-cycle carrier to form a single complex line signal at the output of the DDT

which is connected to the line. The timing signal as such is neither transmitted nor used in modulation.

2.03 At the receiving end, the DDR reconstructs the start and data signals in dipulse form. The timing sine wave is regenerated in the receiver; the exact frequency is controlled by the start signal. The start and data signals and the timing sine wave are transmitted from the three outputs of the receiver to the data using equipment over three separate pairs.

2.04 For each data circuit, a one-way transmission path is employed between the data transmitting and data receiving installations.

2.05 For dual circuit operation (see Fig. 1), two transmitters at the originating end supply identical complex line signals simultaneously over two separate routes to two receivers at the far terminal. A switching arrangement in the receiving equipment permits the data using equipment to be connected to the output of the receiver associated with either the regular or alternate route.

2.06 A single circuit arrangement, as shown in Fig. 2, may be used for less critical transmission service in which case the switching arrangement at the receiving end is omitted and the trouble detector functions only to provide an alarm in case of circuit failure.

2.07 For dual facility operation, the testing and patching jacks for the digital data transmitters are arranged as shown in Fig. 1. The three pairs carrying the start, data, and timing signals incoming from the data source include jacks for testing and patching and for monitoring on the incoming pairs. Each of the three incoming pairs is carried through a bridging pad where it is divided for connection to each of two digital data transmitters to provide dual operation.

2.08 Each of the three inputs to each transmitter also includes jacks for testing and patching the transmitter. The output of each transmitter is connected to its associated outgoing line through jacks for testing and patching and for monitoring the outgoing signals.

2.09 For services which do not require dual circuit operation at the time of installation, but which may require such service at a later date, the second digital data transmitter is omitted and the output of the bridging pad is terminated with a 600-ohm resistor.

2.10 Where dual facility transmission is not required or anticipated, the bridging pads are omitted and the jacks for the transmitter are arranged as shown in Fig. 2.

2.11 The jacks, keys, and lamps for the digital data receivers are shown in Fig. 1. The incoming line is carried through line, drop, and monitoring jacks for testing and patching, and for monitoring incoming signals.

2.12 When dual circuit operation is employed, the outputs of the two assigned data receivers are fed through a transfer and control circuit to the data using equipment.

2.13 Battery from the transfer and control circuit over leads "SW" lights the "in use" lamp, SW, associated with the jack circuits to indicate at the data testboard which one of the dual circuits is in use.

2.14 A trouble detector at the receiving end functions automatically to detect abnormal noise conditions on the line from the transmitter to the receiver and to detect the loss of the start signal from trouble either on the line or in the receiver. When either trouble condition occurs, an alarm circuit is actuated, battery is connected to leads ST and A lighting the status (ST) and alarm (ALM) lamps at the data testboard to indicate the defective circuit, and an audible alarm is given. When the audible alarm and associated aisle pilots are retired by the operation of the nonlocking alarm cut-off (ACO) key, the GUARD lamp lights. When the trouble disappears, the alarm circuit restores to normal and lamps ST, ALM, and GUARD are retired.

2.15 In case of failure on the "in use" route of a dually operated circuit, the trouble detector, through its sensing circuit, also transfers the data using equipment to the DDR associated with the alternate route and causes the lamp SW associated with the route in trouble to be retired and lamp SW of the alternate route to be lighted. However, if the alternate route is not satisfactory, as indicated by its trouble detector, an automatic switch will not be made.

3. DATA TESTBOARD

A. Physical Appearance (See Fig. 3, 4, 5, 6, and 7)

3.01 The data testboard may consist of one or more testing and patching bays and a test frame for in-service testing or a test frame for combined in-service testing and adjusting of data equipment units according to the size and type of the installation.

3.02 For data testboards associated with heavy radar sites, see Fig. 3, the center bay holds the test frame for combined in-service testing of the data circuits and for testing and adjusting of data equipment units. The test frame includes a fixture for plugging in DDTs, DDRs, trouble detectors, and transfer and control units.

3.03 For installations associated with large sites other than heavy radar sites, such as Direction Centers and Combat Centers, see Fig. 4, the test frame located in the center of the testboard line-up is used for in-service testing only and a separate test frame is located away from the testboard in a separate testing center for testing and adjusting data equipment.

3.04 Description of the test frame for testing and adjusting data equipment units is given in Section 986.100.06.

3.05 The same type of equipment is provided at small sites. The testing and adjusting equipment is available, as needed, in small portable units which are designed for stacking. The in-service testing equipment and testboard jacks are provided in fixed metal cabinets together with the DDRs, DDTs, the power equipment etc. Fig. 5 shows the testboard arrangement at sites equipped with one DDR. Fig. 6 shows the testboard arrangement at sites equipped with one DDT. Fig. 7 shows the testboard arrangement at sites equipped with four DDRs, two DDRs and two DDTs, or four DDRs and two DDTs.

B. Face Equipment

3.06 In telephone company buildings, the jack units, each containing the jacks, keys, and lamps for ten dually operated circuits are arranged vertically. This arrangement will accommodate three jack units or 30 dually operated circuits per bay. Normally, the DDR and DDT jack units will be in separate bays. A jack unit for transmitters is shown on Fig. 8 and one for receivers on Fig. 9.

3.07 At small sites where the provision of a jack unit for ten jack circuits for transmitting and receiving circuits is not justified, the jack unit is arranged horizontally so that each pair of a dually operated circuit will go across the strip. At these small sites, the test jacks, etc, usually are located in a cabinet containing the data equipment and power supply. Typical mounting units for the jacks, etc, for a dually operated circuit are shown on Fig. 10 and 11 for receivers and transmitters, respectively, and for a singly operated circuit on Fig. 12 and 13 for transmitters and receivers, respectively.

3.08 In telephone company buildings, jacks, keys, and lamps associated with talking trunks, the transmission and noise measuring systems and testing equipment are mounted in the miscellaneous jack strip located below the transmitter and receiver jacks as indicated on Fig. 14 and 15, while in small sites, these jacks, etc, are located on the same strip as the data circuit jacks and to the right of them.

C. Patching Cords and Plugs

3.09 Single patching cords are equipped with 310-type plugs at each end as shown in Fig. 16.

3.10 For easy and rapid patching of facilities in digital data trunks, triple patching cords are equipped with three plugs similar to the 310 type housed in a single shell (406A plug) at each end as shown in Fig. 16.

3.11 An out-of-service plug, also shown in Fig. 16, is provided for use with the OS jack of a circuit in trouble.

4. ASSOCIATED CIRCUITS

A. Jack, Key, and Lamp Circuit for Data Transmitting and Receiving Circuits

4.01 This circuit provides jacks, lamps, and alarm control keys for testing, patching, and maintaining digital data transmitting and receiving circuits (see Fig. 9, 10, and 13) and jacks and lamps for terminating miscellaneous trunks in the data testboard. (See Fig. 14.)

4.02 Indicating and alarm lamps are provided to designate which section of a dually operated circuit is in use as well as to indicate data circuit failures. A guard lamp is also provided

adjacent to each circuit alarm lamp. This lamp, which is lighted by momentary operation of the ACO key, indicates that the alarm condition has been noted and the audible alarm has been retired. Both the alarm and guard lamps remain lighted as long as the trouble condition remains.

4.03 Alarm indications are given by the trouble detector on any established data circuit if data is not being received. Thus, on new layouts awaiting use by the customer, or on spare layouts, or when temporary discontinuance of signals by the customer is expected to extend over an appreciable period, it may be undesirable, from a testboard operations standpoint, to have the alarm and guard lamps and trouble lamp lighted. The OS jack provides such control. An out-of-service plug in the OS jack will cause the alarm and guard lamps to be extinguished during the out-of-service period, and will cause an alarm indication to be received when data transmission is resumed on the circuit at which time removal of the plug will retire the alarm.

4.04 This circuit also provides the following jack and lamp circuits at data testboards.

(a) Jacks (and their associated calling-in lamps) for terminating communication trunks and miscellaneous test trunks (see Fig. 14).

(b) Test, patch, and monitor jacks for the V3 repeater.

(c) Test, patch, and monitor jacks for the bridge circuit.

(d) LINE and MON-DROP jacks for use with data trunks or telemetering (automatic fault finding) equipment.

(e) An emergency telephone jack for use with a 107A test set for emergency telephone use.

(f) Multiple test jacks for use in testing various circuits appearing in the data testboard.

(g) LINE and DROP jacks for miscellaneous line and drop equipments.

B. Connector Circuits

4.05 The connector circuits are used to interconnect the various test circuits which are used to test A1 digital data signaling equipments. Associated test circuits are interconnected for testing digital data transmitters and receivers, trouble detectors, and transfer and control circuits.

4.06 This circuit is used with bay-mounted test equipment for

(a) Testing and adjusting data equipment units.

(b) "In-service" testing at data testboard.

(c) Combined "in-service" testing and testing and adjusting data equipment units at data testboard.

(d) Offices arranged for portable test sets and a bay-mounted parity checker.

4.07 To facilitate testing, switching relays are employed to arrange the testing circuit for DDT, DDR, or trouble detector testing. The relays are controlled by a key designated TEST mounted in the jack field. Two keys designated TRA and TRB are used for testing the transfer and control circuit.

4.08 The connector circuits can also be used with portable test equipment in installations arranged for portable test sets as well as with fixed test sets.

4.09 The application block diagram, shown on Fig. 17, of a jack and connector circuit and a terminal strip and connector circuit indicates the interconnection between the various testing circuits for testing a DDT or DDR, trouble detector, and transfer and control circuit.

C. Word Generator Circuit

4.10 A word generator is available to provide typical repetitive data patterns consisting of start dipulses, data dipulses, and a timing sine wave from a tuning fork oscillator. These patterns may be fed to the input of a DDT to provide known signals for use in testing various components or the entire transmitting and receiving circuit.

4.11 When a word generator is used in this way, that is, through a DDT, the DDT-DDR switch is in the DDT position and the tuning fork oscillator is in operation.

4.12 A word generator operating on this No. 1 or transmitting function may be used for comparison testing in conjunction with another word generator connected to a DDR and oper-

ating on the No. 2 or receiving function. This second word generator has the DDT-DDR switch in the DDR position, the tuning fork is inoperative and may be removed, and the generator produces only square wave data signals.

4.13 For comparison tests, the word generator operating on the No. 2 function must be started and kept running in synchronization with the word generator operating on the No. 1 function. To accomplish this, the start and timing signals from the DDR are fed to the No. 2 generator. These start and timing signals, which are under the control of the No. 1 (transmitting) word generator, thus synchronize the data output of the DDR (transmitted signal from the No. 1 word generator) and the data output of the No. 2 word generator.

4.14 The data outputs of both the word generator operating on the No. 2 function and the DDR (the transmitted signals from the word generator operating on the No. 1 function) are fed to the matching and error counting circuit. When the switches which determine the word produced by each generator are in agreement, that is, the same signals are coming from both generators, the matching and error counting circuit will detect mismatches caused by a defective system.

D. Matching and Error Counting Circuit

4.15 The matching and error counting circuit receives data (originally produced by a No. 1 word generator) from a DDR and compares these data bits to the same data bits generated locally (by a No. 2 word generator) for the purpose of detecting all added or deleted bits due to a trouble or noise condition.

4.16 This circuit displays, on the neon lamps (numbered 1, 2, 4, 8, 16, 32, 64) of a seven stage binary counter, the number of mismatches up to 127 of similar data from two sources. A message register that indicates once for every 128 mismatches is also provided to the right of the neon lamps.

4.17 A stop key is provided to stop the counting and a reset key is provided to extinguish the neon display lamps. The messages register is reset mechanically with a small lever located directly below the display area.

E. Parity Check Circuit

4.18 The parity check circuit receives data from a DDR and determines, due to a trouble or a noise condition, the number of times an odd number of bits or pulses per word or signal group are either added to, or deleted from, the data transmitted over the system.

4.19 The parity checker is arranged for high impedance monitoring or for terminating a line on a 600-ohm basis by means of the jack and connector circuit.

4.20 The parity checker is arranged to display the number of parity errors up to ten on a counter tube and to operate a register once for every ten errors, that is, once for each firing cycle of the counter tube. A key is provided to manually reset the counter tube to zero. In addition, the parity checker can be set to check for either an odd or even number of bits per word.

4.21 In large sites, the parity check circuit is located at the in-service patching bay.

F. Telephone, Dial, and Connecting Jack Circuit

4.22 This circuit provides the telephone and dial circuits required in the data testboard by patching from either the TEL A or TEL B jack (Fig. 14) to the desired trunk.

4.23 Selection of the A and/or B circuit out of the testboard is accomplished by operating the corresponding TEL keys.

4.24 Headset access is provided through the TEL T and R jacks to permit monitoring or talking on the local trunks or the order wire circuits.

4.25 Order wire signaling is provided through the jack circuit by operating the TEL key of the jack used and the OW key. This circuit is also arranged for monitoring by operating the MON key.

4.26 This circuit is also arranged for dial pulsing by operating the TEL key of the connecting jack used and the DIAL key.

G. Trouble Detector Circuit

4.27 The trouble detector detects abnormal noise conditions on the line and detects a predetermined loss in level of the start signal output of the digital data receiver.

4.28 Reduction in level or a complete loss of the start signal indicates trouble in the DDR, the toll facilities, or the transmitting equipment.

H. Transfer and Control Circuit

4.29 The major function of this circuit is to switch transmission lines in a dually operated circuit during periods of high line noise or the loss of the transmitted signal itself on the circuit in use.

4.30 When an associated trouble detector functions, one of two relays in this circuit releases causing associated lamps to indicate a trouble condition and an alarm circuit to sound an alarm.

4.31 Visual indication of the status of each circuit is provided at the testboard and at the data using equipment. Fig. 18 shows the switching and status lamp indications for the various circuit conditions.

4.32 A key is provided at the data using equipment location to permit the circuit to be switched manually. However, once the circuit is switched to a particular line it will remain associated with that line until it is switched to the other line or to automatic control.

4.33 For single circuit operation the alarm features are retained but no provision is made for switching transmission lines.

I. Alarm Circuit

4.34 This circuit is used at the receiving end of an A1 digital data signaling circuit to provide an audible and visual alarm in case of data circuit failure.

4.35 This circuit will light indicating lamps at the data testboard associated with the circuit in trouble when a circuit failure occurs.

4.36 A minor alarm will sound and the associated aisle pilot lamps will light when a data circuit failure occurs. The alarm will lock in until retired by the data testboard attendant by the operation of the ACO key.

4.37 After the audible alarm is retired, and the aisle pilot lamps are extinguished by operation of the ACO key, this circuit maintains the alarm and guard lamps lighted at the testboard until the alarm condition disappears.

J. Miscellaneous Test Circuit

4.38 The miscellaneous testing circuit provides a grouping of a noise source, amplifier, attenuators, etc, for testing components of the A1 digital data signaling system.

4.39 This circuit provides the system with a means for mixing noise with digital data signals.

4.40 The following elements of the miscellaneous test circuit are available by means of patching cords for use in testing operations:

(a) A 200-3000-cycle noise source with or without attenuation and amplification.

(b) Two attenuators with 30 steps of 2 db.

(c) A 6 db mixing pad.

(d) A V3 amplifier.

K. Transmission Measuring Circuit

4.41 The transmission measuring circuit is terminated in a group of jacks and keys in the miscellaneous jack strip. A jack designated SEND 1MW is provided which may be patched to any desired circuit for the purpose of sending testing power of 1MW at 1000 cycles. For measuring received testing power, a jack designated REC B is provided. The measuring range covered is from 15db above 1MW to 35db below 1MW and is controlled by the operation of keys designated A, B +10, or B +20. The loss of any circuit at 1000 cycles or at other frequencies may be measured with this device. The readings are made with a bracket mounted db meter located on the testboard bay upright or with a projection-type db meter.

4.42 Detailed description of the transmission measuring circuit is given in other sections of the E40 series of BSP's.

Noise Measuring Circuit

4.43 This equipment is capable of measuring noise and crosstalk volume between 10 to 40 db above a reference power of −85dbm, or +10 to +40dba. The jack and keys associated with this circuit are terminated in the miscellaneous jack field. The jack for connection to the noise measuring circuit is designated NOISE A +25. The same db meter used in connection with the transmission measuring circuit may be

used for noise and crosstalk measurements. Sensitivity control keys A +10, A +15, and A +20 are provided for obtaining a suitable meter deflection.

4.44 Detailed description of the noise measuring circuit is given in other sections of the E40 series of BSP's.

L. Oscilloscope

4.45 A relay-rack mounted general purpose oscilloscope is provided in the data testboard lineup.

4.46 This oscilloscope is intended for use in the observation of signals, for testing and adjusting work, and for trouble analysis in connection with the maintenance of data transmitters and data receivers for the A1 digital data signaling system.

4.47 The oscilloscope provides a balanced or unbalanced input for the measurement of ac or dc signals through the use of the jacks and a seven position rotary switch on the front panel of the oscilloscope. In addition, two jacks on the rear panel of the oscilloscope, are connected to two jacks on the jack and connector strip. Jack (V1) on the jack strip is used for making unbalanced measurements (grounded) while jack (V2) on the jack strip is for balanced measurements (metallic). Measurements on the transmission circuits of the DDT and DDR require the balanced arrangement provided in jack (V2). Measurements at certain pin jacks in the data units require an unbalanced connection provided in jack (V1).

4.48 The oscilloscope has a self-contained reference voltage and a dc voltmeter for calibrating the vertical deflection.

4.49 An attenuator probe with a built-in switch for 10:1 attenuation is available for use with this oscilloscope. Within the body of the probe is an adjustable capacitor which compensates for slight variations in the input capacitance. An adjustment of the capacitor is necessary after the oscilloscope is installed or after any major repair to insure a square wave presentation on the scope.

4.50 An optional preamplifier probe with an ac signal gain of 10 db can also be used to extend the sensitivity of the vertical channel to five millivolts (rms) per inch.

4.51 A 4-foot cord equipped with a coaxial (BNC type) connector at one end for connecting to the oscilloscope and a pin plug at the other end for connecting to the circuit under test is provided.

4.52 An adapter connector is available to connect a single wire lead to the oscilloscope. The adapter has a connector on each end. On one end is a male BNC-type connector for connecting to the scope; on the other end is a push-type binding post for connecting a lead or a connection pin.

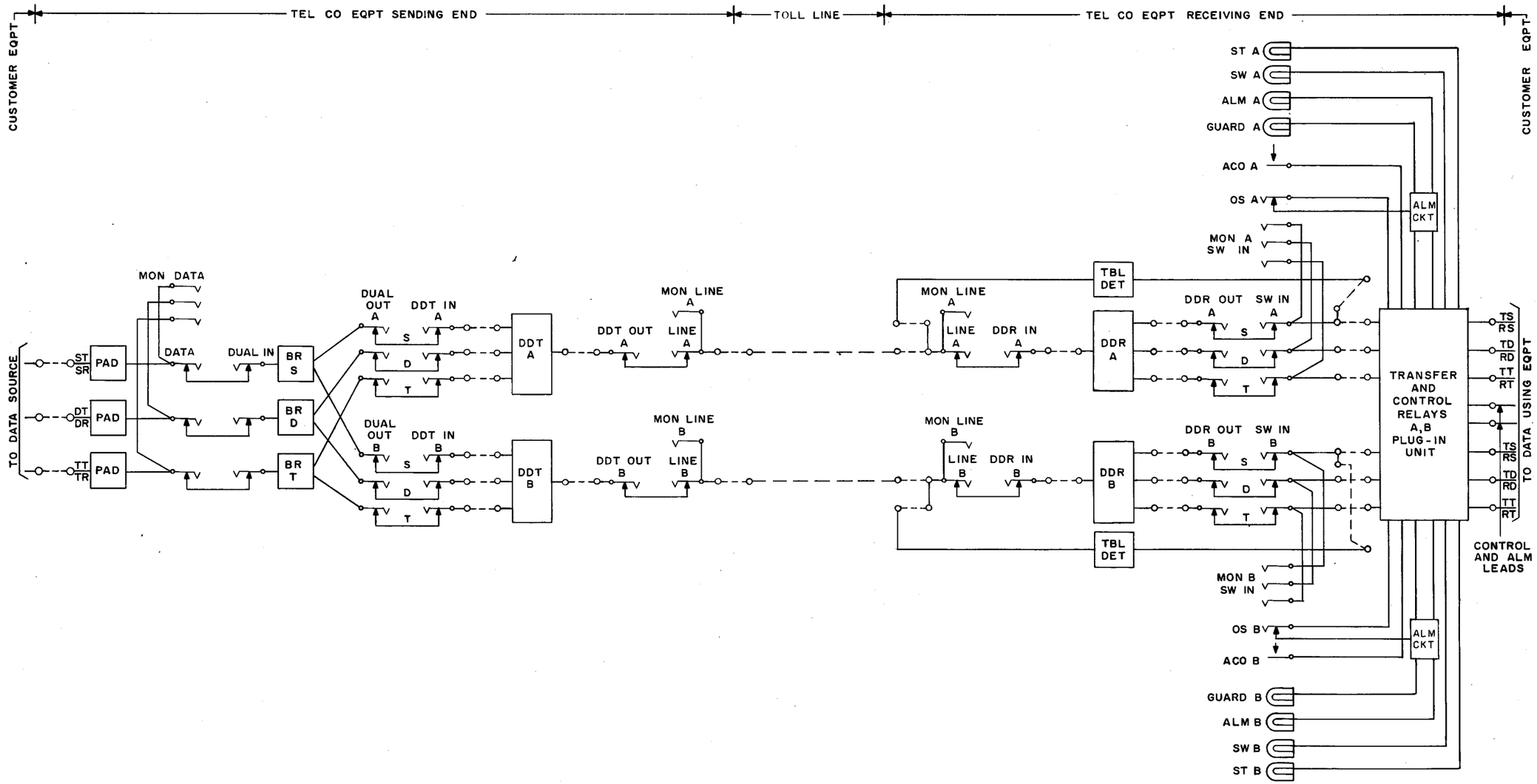


Fig. 1 — A1 Digital Data Signaling System — Patch and Test Jack and Alarm Circuit Arrangements — Dual Circuit Operation Only

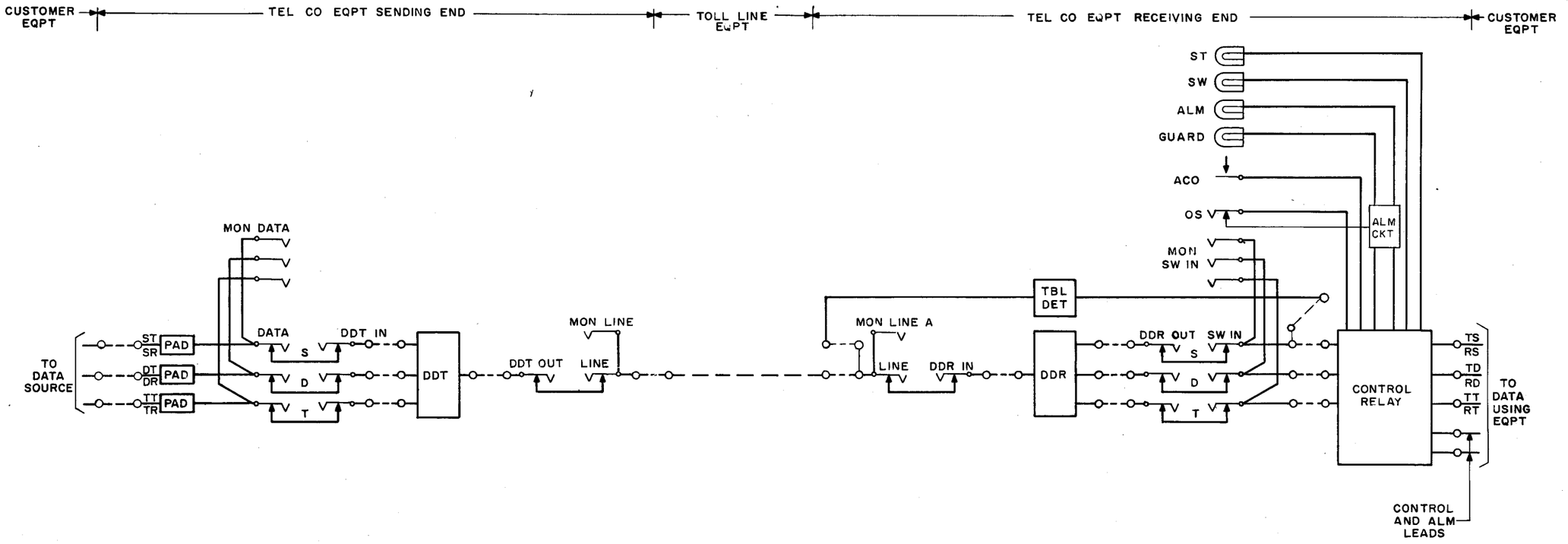


Fig. 2 — A1 Digital Data Signaling System — Patch and Test Jack and Alarm Circuit Arrangements — Single Circuit Operation Only

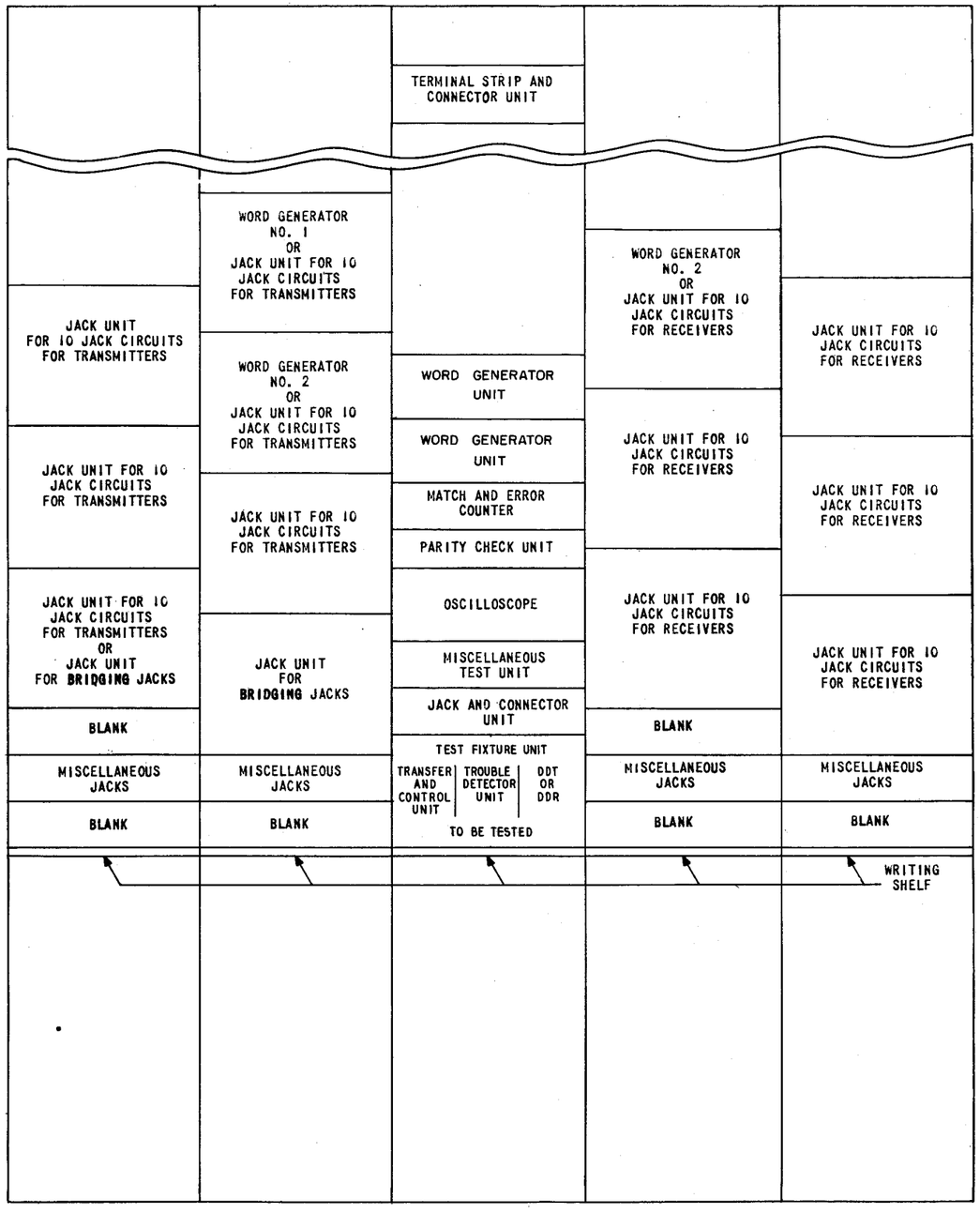


Fig. 3 — Testboard Layout at Heavy Radar Sites

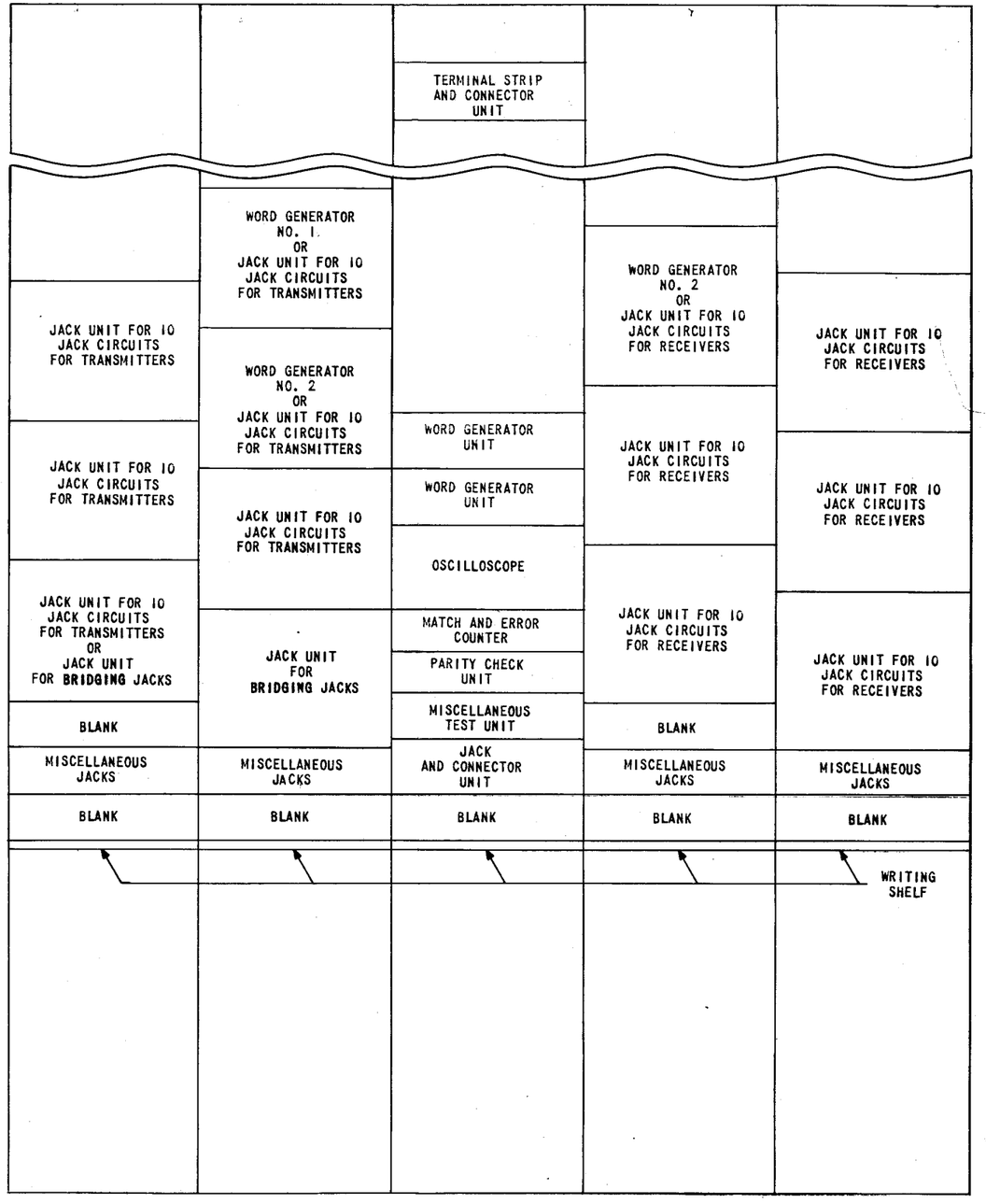


Fig. 4 — Testboard Layout at Direction Centers and Combat Centers

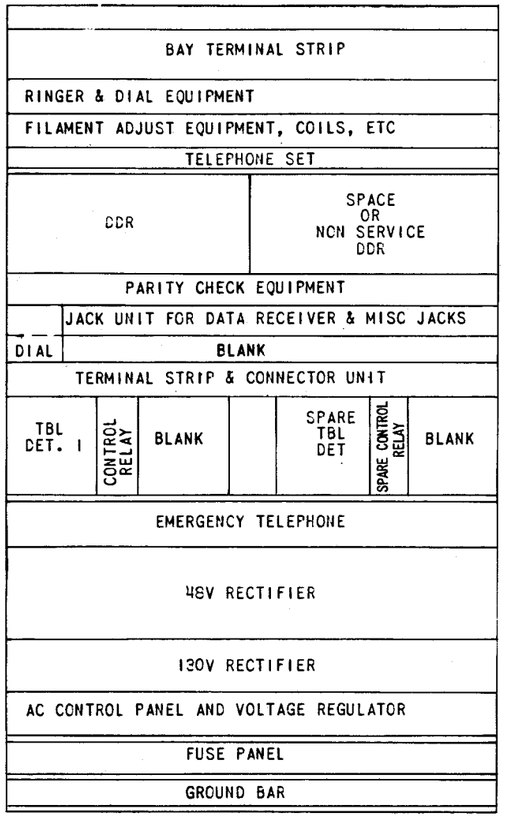


Fig. 5 — Testing and Equipment Features for Small Sites Employing 1DDR — All Equipment in a 7-foot Metal Cabinet

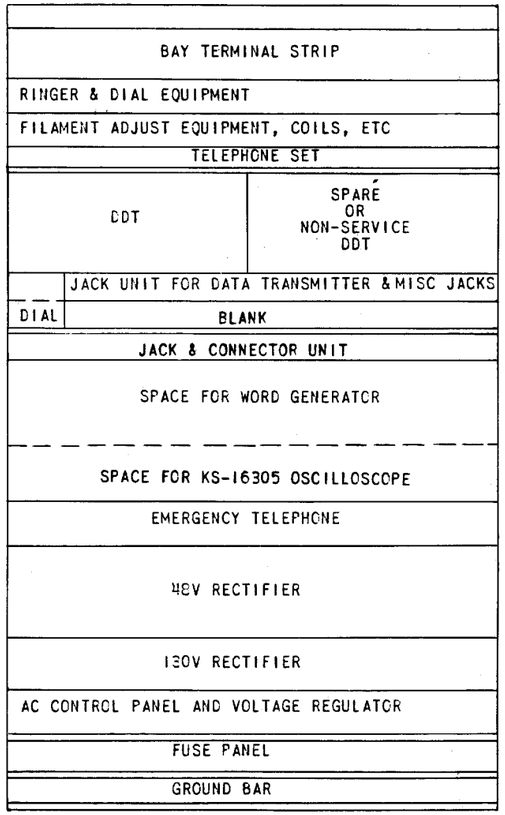


Fig. 6 — Testing and Equipment Features for Small Sites Employing 1DDT — All Equipment in a 7-foot Metal Cabinet

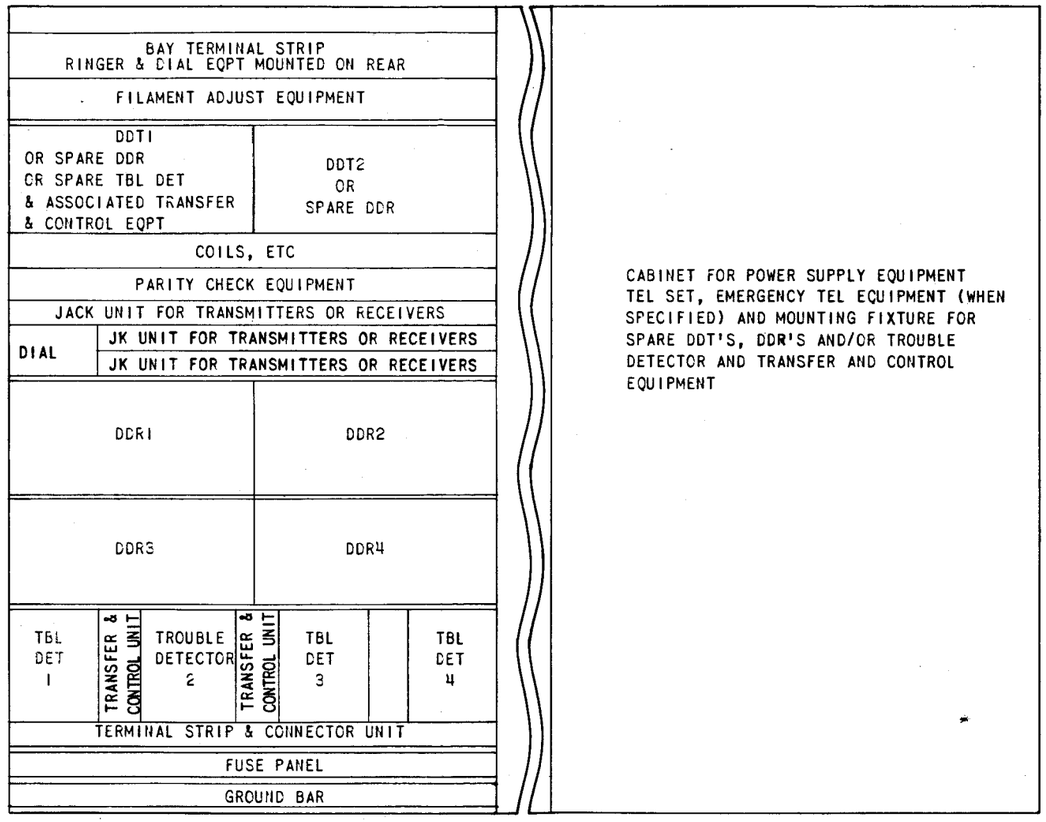


Fig. 7 — Testing and Equipment Features for Small Sites Employing 4DDRs, 2DDRs and 2DDTs, or 4 DDRs and 2DDTs

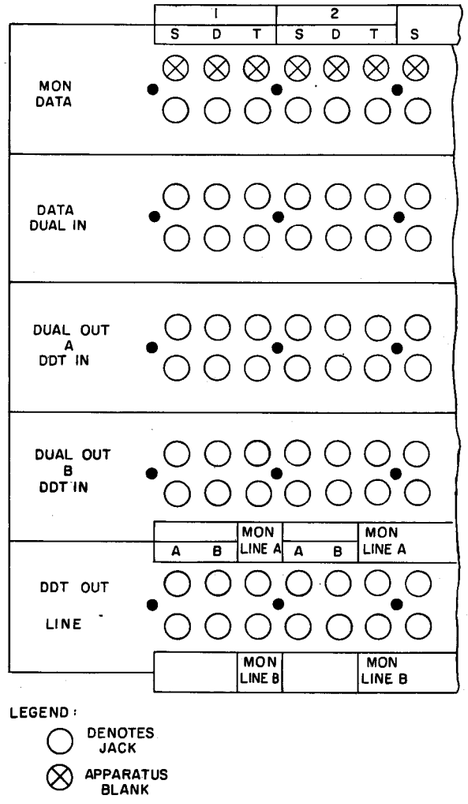


Fig. 8 — Jack Unit for Data Transmitters — in DC, CC, and Heavy Radar Sites

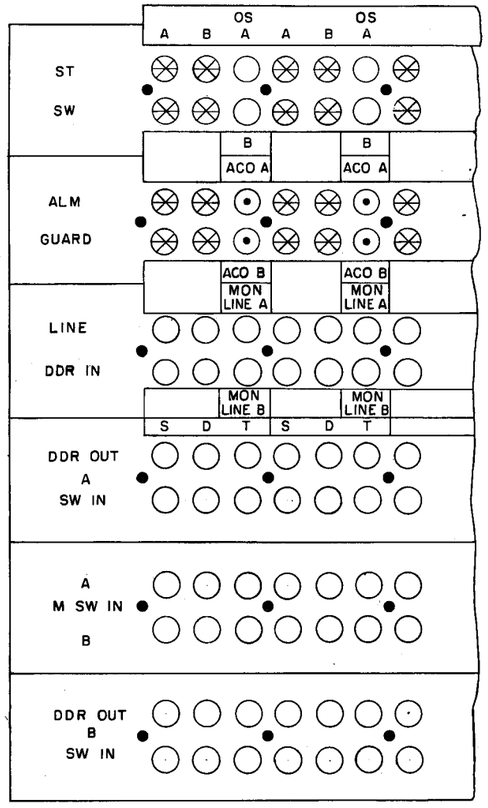
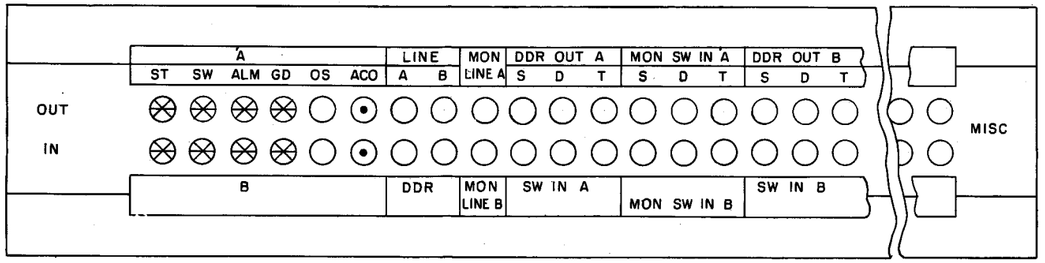


Fig. 9 — Jack Unit for Data Receivers — in DC, CC, and Heavy Radar Sites



LEGEND:
DENOTES JACK
LAMP
KEY

Fig. 10 — Jack Unit for Data Receivers — Dual Circuit Operation — For Cabinet Mounting at Small Sites — Space for 28 Miscellaneous Jacks

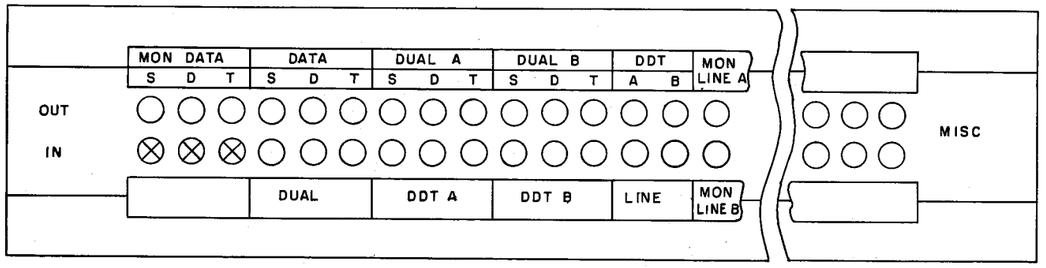


Fig. 11 — Jack Unit for Data Transmitters — Dual Circuit Operation — For Cabinet Mounting at Small Sites — Spaces for 34 Miscellaneous Jacks

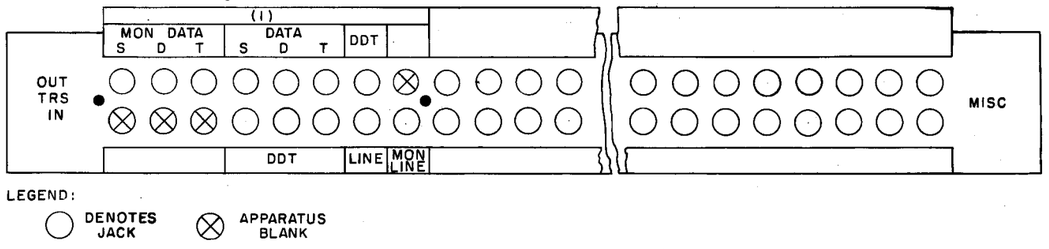


Fig. 12 — Jack Unit for Data Transmitters — Single Circuit Operation for Cabinet Mounting at Small Sites — Space for 48 Miscellaneous Jacks

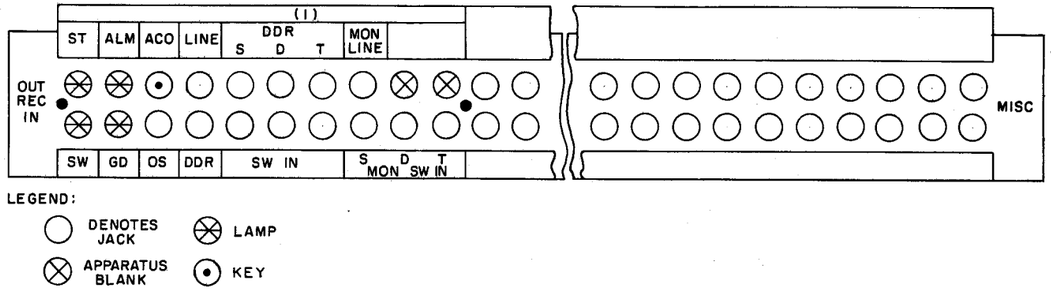


Fig. 13 — Jack Unit for Data Receivers — Single Circuit Operation — For Cabinet Mounting at Small Sites — Space for 44 Miscellaneous Jacks

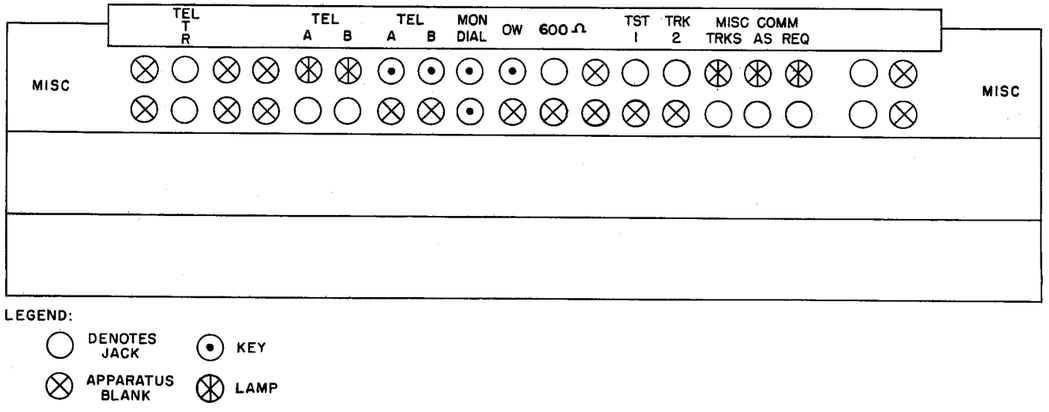


Fig. 14 — Typical Miscellaneous Jack Strip Located at Large Site Installations

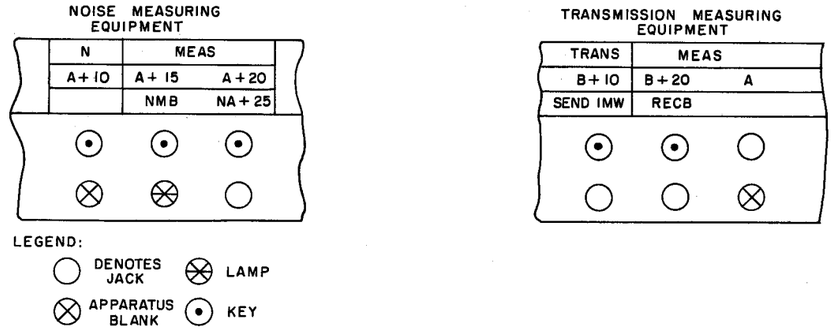


Fig. 15 — Transmission and Noise Measuring Jacks

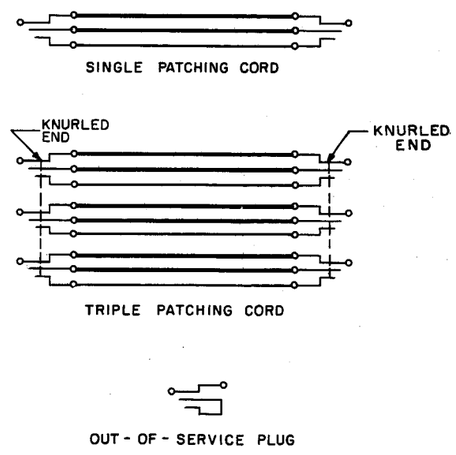
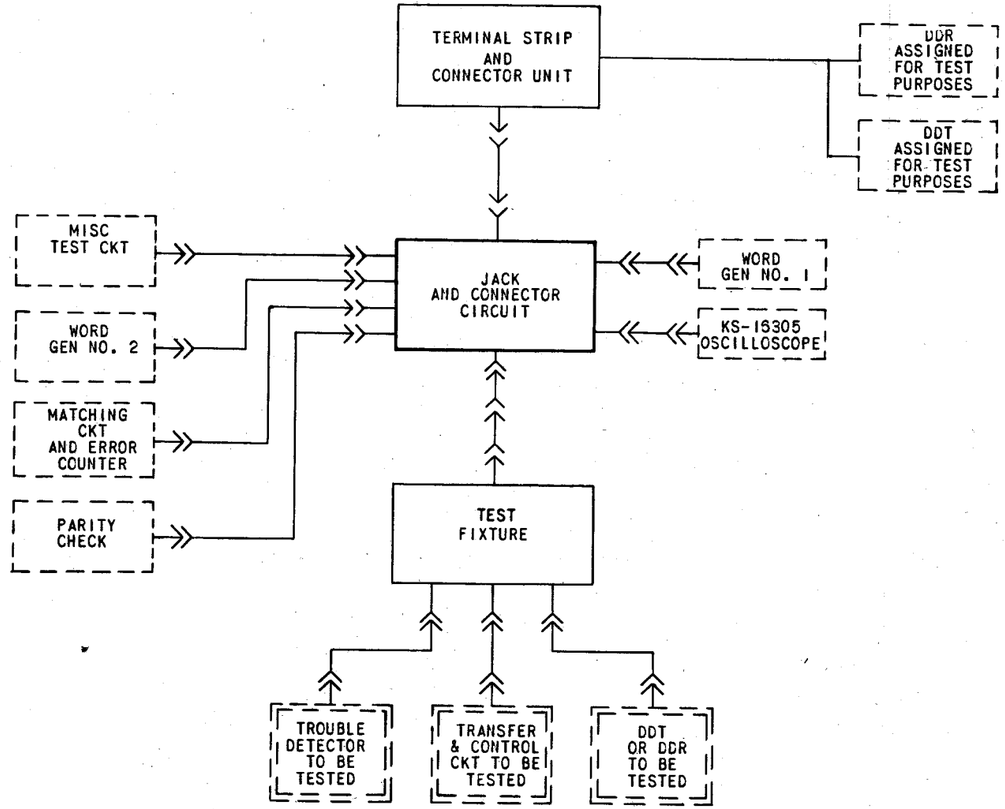


Fig. 16 — Patching Cords and Plugs



NOTE: DDT AND DDR ASSIGNED FOR TEST PURPOSES ARE LOCATED IN A BAY WITH THE OPERATING DDTs AND DDRs.

Fig. 17 — Block Diagram for Interconnection of Units Used With Jack and Connector Circuit for Data Equipment Out-of-Service Testing at Test Bay

TROUBLE DETECTOR AND STATUS LAMP INDICATIONS (SEE NOTE 1)				POSITION OF USER'S TRANSFER KEY	DATA EXTENDED TO CUSTOMER USING EQUIPMENT (SEE NOTE 2)			
CKT A	STA	CKT B	STB		CKT A	SWA	CKT B	SWB
GOOD	●	GOOD	●	NOR	YES	○	NO	●
BAD	○	GOOD	●	NOR	NO	●	YES	○
BAD	○	BAD	○	NOR	NO	●	YES	○
GOOD	●	BAD	○	NOR	YES	○	NO	●
GOOD	●	GOOD	●	A	YES	○	NO	●
BAD	○	GOOD	●	A	YES	○	NO	●
BAD	○	BAD	○	A	YES	○	NO	●
GOOD	●	BAD	○	A	YES	○	NO	●
GOOD	●	GOOD	●	B	NO	●	YES	○
BAD	○	GOOD	●	B	NO	●	YES	○
BAD	○	BAD	○	B	NO	●	YES	○
GOOD	●	BAD	○	B	NO	●	YES	○

NOTES:
1. STATUS LAMP INDICATIONS FOR DATA CIRCUITS A AND B ARE IDENTICAL AT THE CUSTOMER USING EQUIPMENT AND TESTBOARD.
2. SWITCHING LAMP INDICATIONS AT THE TESTBOARD ARE IDENTICAL TO THOSE AT THE CUSTOMER'S PRIMARY USING EQUIPMENT LOCATION AND OPPOSITE TO THOSE AT THE STANDBY EQUIPMENT LOCATION.

LEGEND:
○ LIGHTED LAMP ● UNLIGHTED LAMP

Fig. 18 — Switching and Status Lamp Indications for Various Circuit Conditions

Figs. 17 and 18