

144B1 COUPLING UNIT

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1. GENERAL

1.01 The 144B1 Coupling Unit is a demountable electronic two-path connecting link that serves to interconnect one-way sending and one-way receiving repeaters to receive and send electronic hub circuits, respectively. It is also arranged to interconnect send electronic hubs to short 62.5 mil loops serving receiving only stations or to testing equipment. The send and receive hubs, to which the coupling unit connects, operate on voltages of +60 mark and -30 space. This form of hub operation is employed in the No. 2 and No. 9B Telegraph Service Boards and in testboard offices using electronic regeneration. The 143A2 Regenerative Repeater is connected between the send and receive hubs when regeneration is required.

1.02 As the 144B1 Coupling Unit is arranged for two-path operation, it will not operate half duplex between a two-way facility and an electronic hub circuit. However, the inward and outward transmission circuits of the same coupling unit may be operated simultaneously in the two-path manner.

1.03 The coupling unit includes a circuit element for actuating hit indicating devices at the service board.

1.04 The coupling unit is arranged for bench testing by means of a 165B1 Test Set.

2. PRINCIPLES OF OPERATION

2.01 Inward Transmission

Signals incoming from a repeater pass through the coupling unit from lead T1 to lead RL and to the receive hub (see second 144B1 Coupling Unit from the top in Fig. 1). The repeater connects +130-volt battery to lead T1 for the marking and -130-volt battery for the spacing condition. The receive hub is normally held at +60 volts, which is the marking potential, by the hub potentiometer. A varistor network, interposed in the coupling unit between leads T1 and RL, is poled so that current can not flow from the repeater to the hub when the repeater sends a mark. Current is permitted to flow from the hub to the repeater, however, when the repeater sends a space. The hub marking potential thus remains unchanged for a mark but is reduced to -30 volts for an incoming space. From the receive hub the signals pass to the send hub either directly via the hub link or indirectly via a regenerative repeater.

2.02 Outward Transmission

Signals on the send hub pass outward via the SL and T leads of a 144B1 Coupling Unit to either a one-way repeater or a loop (see upper 144B1 Coupling Unit in Fig. 1). The outward transmission circuit includes two beam power tubes which are connected in parallel with their grids connected to lead SL. With their plates connected to lead T and their cathodes connected to ground these tubes function as relays, closing the loop for a mark and opening it for a space.

2.03 Hit Indications

Incoming signal potentials are converted by means of a potentiometer circuit to suitable voltages for flashing a cold cathode tube in the service board. The tube is made to

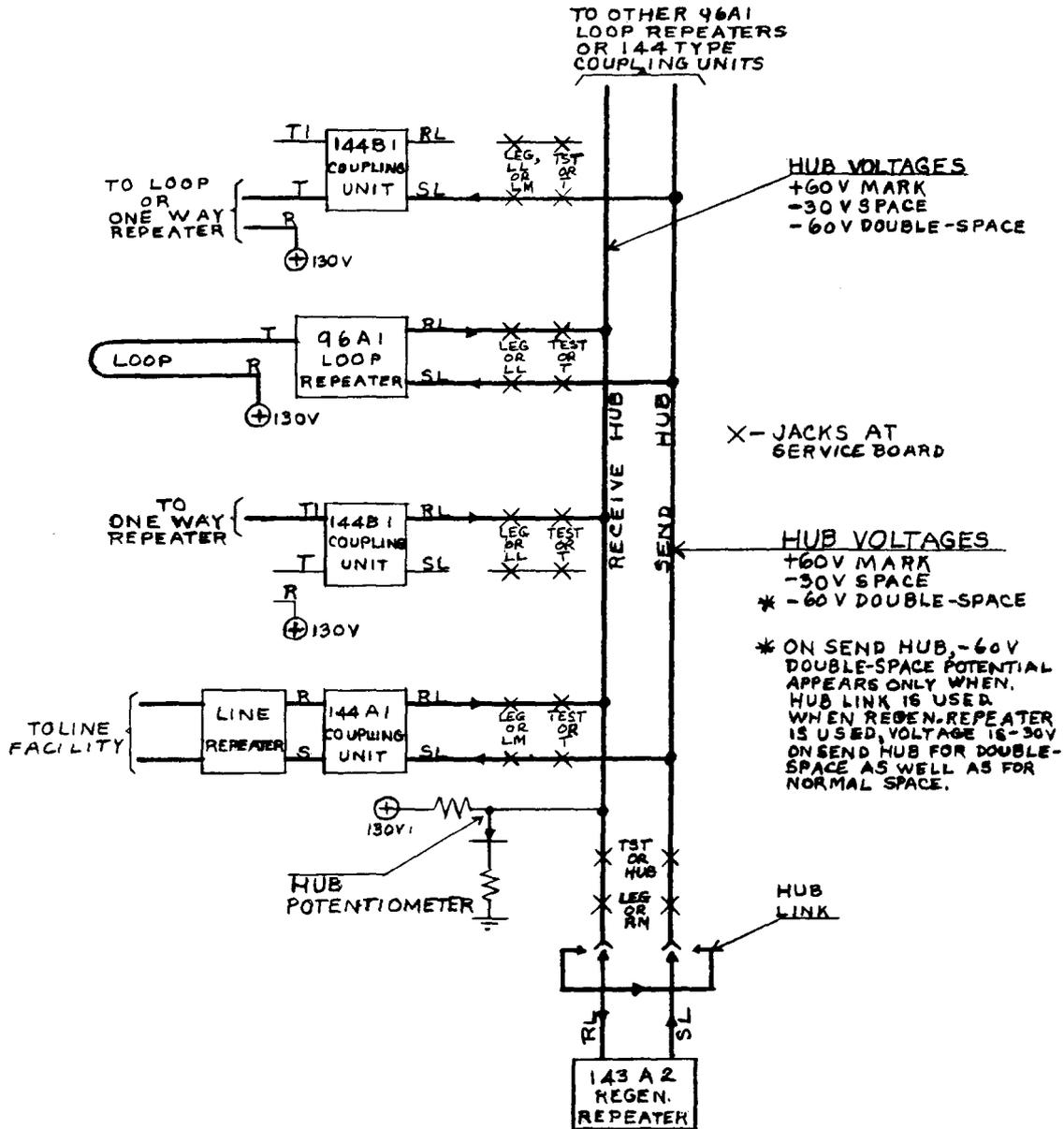


Fig. 1

light in response to reception of spacing pulses by a lead designated TL which extends from the coupling unit to the service board.

3. DESCRIPTION OF OPERATION

3.01 Inward Transmission

The inward transmission circuit of the coupling unit is shown schematically in the upper portion of Fig. 2. The one-way repeater which is connected to lead TL applies +130-volt

battery for the marking and -130-volt battery for the spacing condition. Lead RL connects to the receive hub which for the marking or idle condition is held at +60 volts by connection to a hub potentiometer. When the repeater connects +130-volt battery to lead TL for a mark, the left side of the varistor chain consisting of varistors CR1 to CR5, inclusive, assumes a potential of approximately +65 volts. The varistors are poled so as to prevent current flow from the repeater to the receive hub and the voltage of the hub remains unchanged.

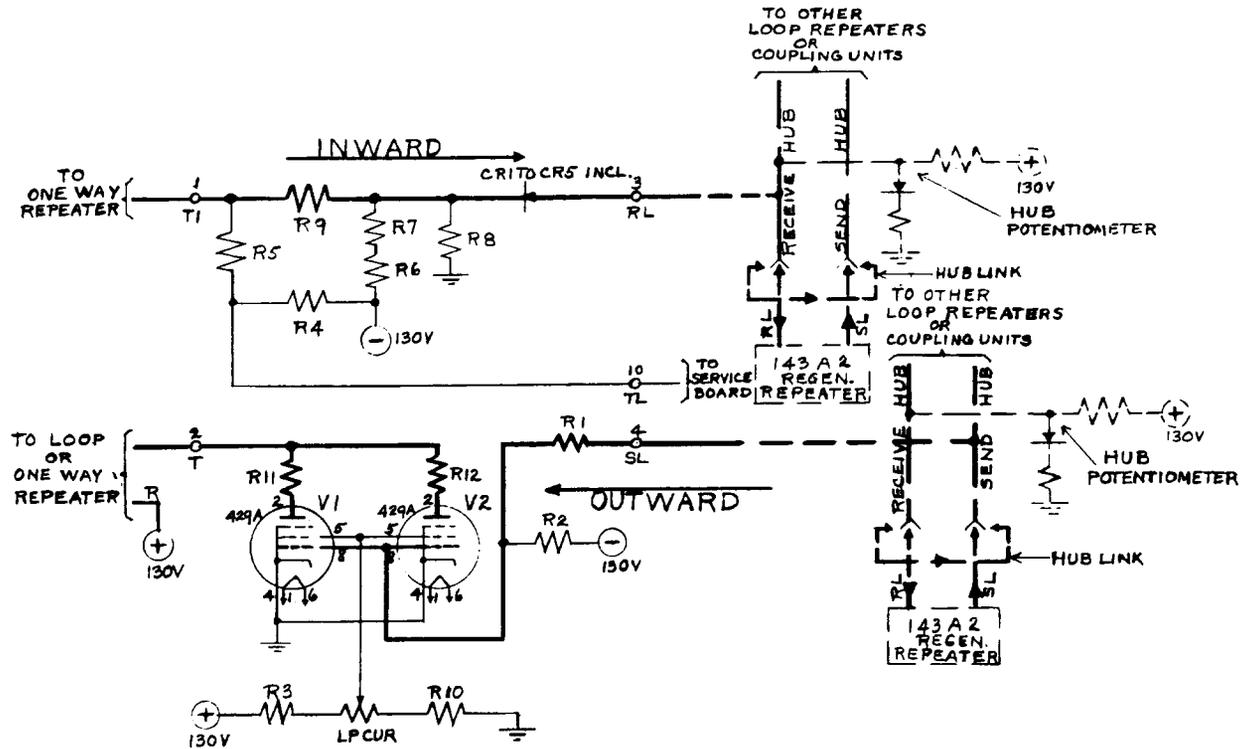


Fig. 2

For the marking condition, the repeater is isolated from the receive hub. The marking potential (+60V) on the receive hub reaches the send hub via either a hub link or a regenerative repeater and causes a mark to be transmitted outward over the facilities which are connected to the send hub. When the repeater connects -130-volt battery to lead T1 for a space, the left side of the varistor chain becomes negative with respect to the right side and a current of approximately 30 mils flows from the receive hub through the varistors to the repeater. The current flow in the hub potentiometer causes the potential of the receive hub to fall from the marking (+60V) to the spacing (-30V) potential. The -30-volt potential reaches the send hub via either the hub link or the regenerative repeater and causes a space to be transmitted outward over the interconnected legs.

3.02 Outward Transmission

The outward transmission circuit of the coupling unit is shown in the lower portion of Fig. 2. A marking signal on the send hub (+60V) will be applied to grids 8 of tubes V1 and V2 via lead SL and resistance R1 in combination with the negative voltage applied through R2. The grid voltages are positive with respect to

the cathodes and the tubes will conduct in parallel. Current will flow from positive 130-volt battery through the loop or via the send relay winding of a one-way repeater and through resistances R11 and R12 and the plate circuits of the tubes in parallel to ground. This current is adjustable to 62.5 mils by means of potentiometer LP CUR. Flow of 62.5 mil current at the station or in the winding of the send relay of a one-way repeater will cause a marking signal to be transmitted outward. A spacing signal on the send hub (-30V) will be applied to grids 8 of tubes V1 and V2 via lead SL and resistance R1 in combination with the negative voltage applied through R2. The grids will be lowered to a negative potential and the tubes will be cut off thereby interrupting the flow of current to send a space toward the loop or one-way repeater.

3.03 Hit Indications

Lead TL extends from the junction of resistances R4 and R5 to the service board where it serves to flash a cold cathode tube in response to incoming spacing pulses. Lead TL assumes potentials of approximately -50 and -125 volts in response to the reception of mark and space signals, respectively, from the repeater. Since one side of the cold cathode

tube at the service board is permanently connected to -24 volts, the tube flashes only in response to spacing pulses (-125V on lead TL).

3.04 Outward Transmission Characteristics

Tubes V1 and V2 are beam power tubes of the 429A type which have a high dynamic plate resistance. The plate resistance characteristic of these tubes is shown in Fig. 3 which holds for approximately zero grid potential. This curve shows that for the conditions under which the tubes are operated, the plate current increases only slightly with plate voltage between 80 and 130 volts. The high resistance characteristic plays an important part in producing a symmetrical wave shape at the station particularly when there is appreciable loop capacity. This is accomplished by the fact that the initial surge current for a space-to-mark transition is limited by the tubes to approximately 106% of the steady state value. This, together with the fact that current flow is abruptly interrupted for a mark-to-space transition, produces what is equivalent to a square wave at the central office. Outward transmission is at its best when there is an 80-volt drop across tubes V1 and V2. This limits the voltage drop to 50 volts in the loop with a corresponding maximum loop resistance of 800 ohms external to the coupling unit, including the battery tap. It is desirable that all loops be built out to 800 ohms by means of loop pads or battery tap resistances. In the case of one-way repeaters receiving from coupling units, resistance in the repeater serves to build out the impedance to a suitable value without the use of external pads.

4. DESCRIPTION OF EQUIPMENT

4.01 The 144B1 Coupling Unit is a plug-in type unit arranged to mount on a shelf type mounting plate equipped with a receptacle

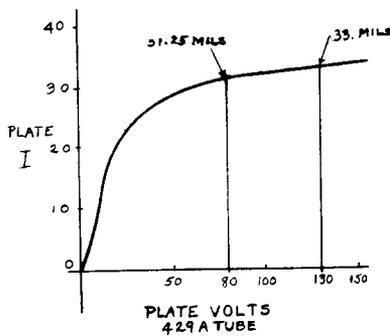


Fig. 3

through which external connections are made. The plug-in feature permits rapid removal and replacement of units for maintenance. The unit is 5-3/32" high, 2-25/32" wide and 7-5/32" deep over-all with vacuum tubes inserted. It consists of an aluminum chassis, open at top and bottom for ventilation, with vacuum tubes and operating controls on the front, and other apparatus components inside. The varistors, which are particularly sensitive to temperature rise, are located on a standoff fibre panel on the rear of the chassis. A plug, located on the rear, provides for mounting and making external connections.

4.02 Five coupling units, occupying the space of three 1-3/4" by 19" mounting plates, are arranged to mount side by side on a shelf type mounting plate. Due to the high heat dissipation per unit, a maximum of 45 coupling units together with a filament supply panel and bay fuse panel may be located in an 11'-6" bay. The coupling units and associated filament supply and fuse panels should be located in the upper portion of the bay and the lower portion used for equipment having low heat dissipation. The filament supply and fuse panels should be located above the coupling units. In installations where only a few coupling units are required, the common filament supply panel may be omitted and an individual filament adjusting resistance provided for each coupling unit.

5. REFERENCE INFORMATION

5.01 The following is a record of the specifications and drawings for the 144B1 Coupling Unit and associated equipments.

144B1 Coupling Unit

Equipment Specification	J70102
Circuit	SD-70638-01
Unit Equipment	ED-71024-01
Bay Equipment	ED-70816-01

Filament Supply

Equipment Specification	J70092
Circuit	SD-70626-01
Supply Panel Equipment	ED-70814-01
Filament Adjusting Resistance Equipment	ED-70815-01

165B1 Test Set

Equipment Specification	J70098
Circuit	SD-70635-01
Equipment Assembly	ED-71028-01