13C1 ONE-WAY
SPLIT LOOP TELEGRAPH REPEATER

1. GENERAL

1.01 This section describes the 13C1 one-way telegraph repeater for providing service to subscribers on a split loop basis and for any other uses for which such a repeater would be suitable. It is reissued to include information concerning the use of a single 13C1 repeater to send polar signals to a group of subscriber station loops connected in parallel. Marginal arrows indicate changes from the previous issue of the section.

2. GENERAL DESCRIPTION

2.01 The 13C1 repeater consists essentially of a telegraph relay with the necessary auxiliary equipment arranged so that it may be operated by either neutral or polar signals and may transmit either neutral or polar signals as may be required in order to meet various circuit conditions.

2.02 This repeater was designed for providing split loop operation to subscribers. To obtain maximum economy in loop conductors with this method of operation one wire of a pair is generally used for receiving and the other wire for sending, both wires being grounded at the subscriber's station.

2.03 Parallel polar loops to receiving-only stations can be operated from a 13C1 repeater. A maximum of 10 such station loops may be connected to a repeater. Each loop operates polar-to-ground on either a metallic or ground return basis with an operating current of ±10 ma produced by the application of ±130-volt battery.

2.04 The repeater may also be used as a simple one-way repeater for repeating between dummy circuits in the central office. It is not suitable for use as a main line repeater however, because its noise killer does not give sufficient reduction in noise influence.

3. CIRCUIT DESCRIPTION AND APPLICATION

3.01 The detailed circuit of the 13C1 repeater and the cross-connections for the various alternative circuit arrangements of the repeater are shown on SD-64054-01. The 255A polar relay employed should be adjusted and maintained according to the Bell System practices covering the relay and testing equipment.

3.02 The neutral or polar arrangement for the armature or winding circuit of the relay is obtained by strapping and cross-connecting at the terminal strips associated with each repeater and mounted on the repeater unit. Fig. 1 indicates in schematic form the combinations which may be obtained. Fig. 1A shows the repeater arranged for neutral-to-polar operation. Fig. 1B shows the arrangement for neutral-to-neutral operation, Fig. 1C the arrangement for polar-to-polar and Fig. 1D for polar-to-neutral operation. The repeater as sent out by the manufacturer is not ready for use until the strapping for the desired condition as covered on the SD drawing has been applied in the field.

3.03 Fig. 2 shows a typical circuit arrangement of four 13C1 repeaters when used to provide split loop operation on a full-duplex service at an intermediate point involving two sending and receiving subscriber sets and two receiving-only subscriber sets. Repeater No. 1 will repeat from the "S" leg associated with set A to the loop which transmits signals to Line E. Repeater No. 2 associated with the "R" leg and set B will repeat signals from Line W. Repeater No. 3 will repeat from the "S" leg associated with set C to the loop which transmits signals to Line W. Repeater No. 4 associated with the "R" leg and set D will repeat signals from Line E. As shown in Fig. 2, repeaters No. 1 and 3 will operate neutral-to-neutral and repeaters No. 2 and 4 will operate neutral-to-polar.

13-C-1 ONE WAY SPLIT LOOP TELEGRAPH REPEATER

WINDING AND ARMATURE CIRCUIT CONNECTIONS OF THE POLAR RELAY

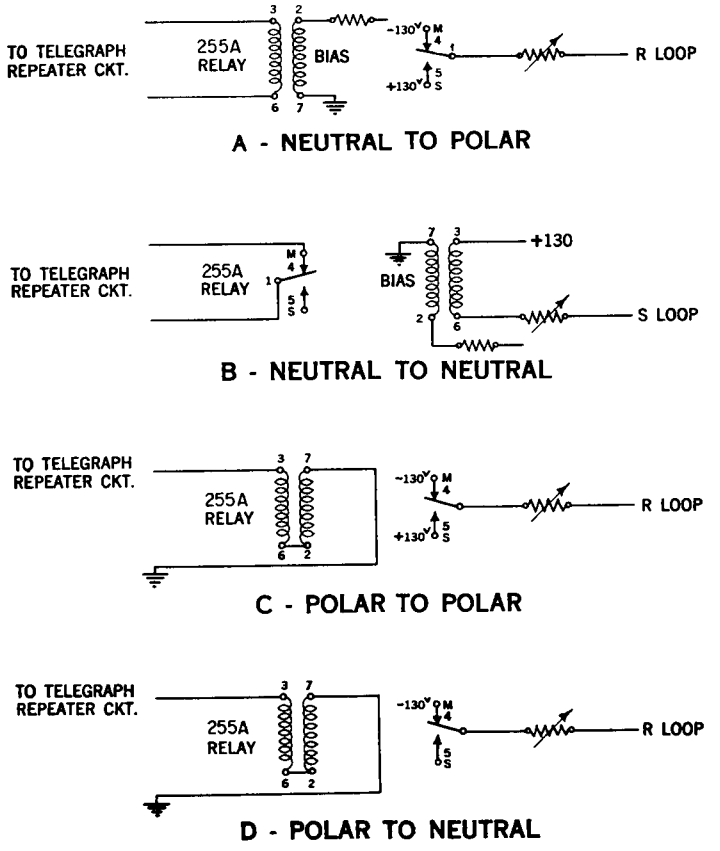


Fig. 1

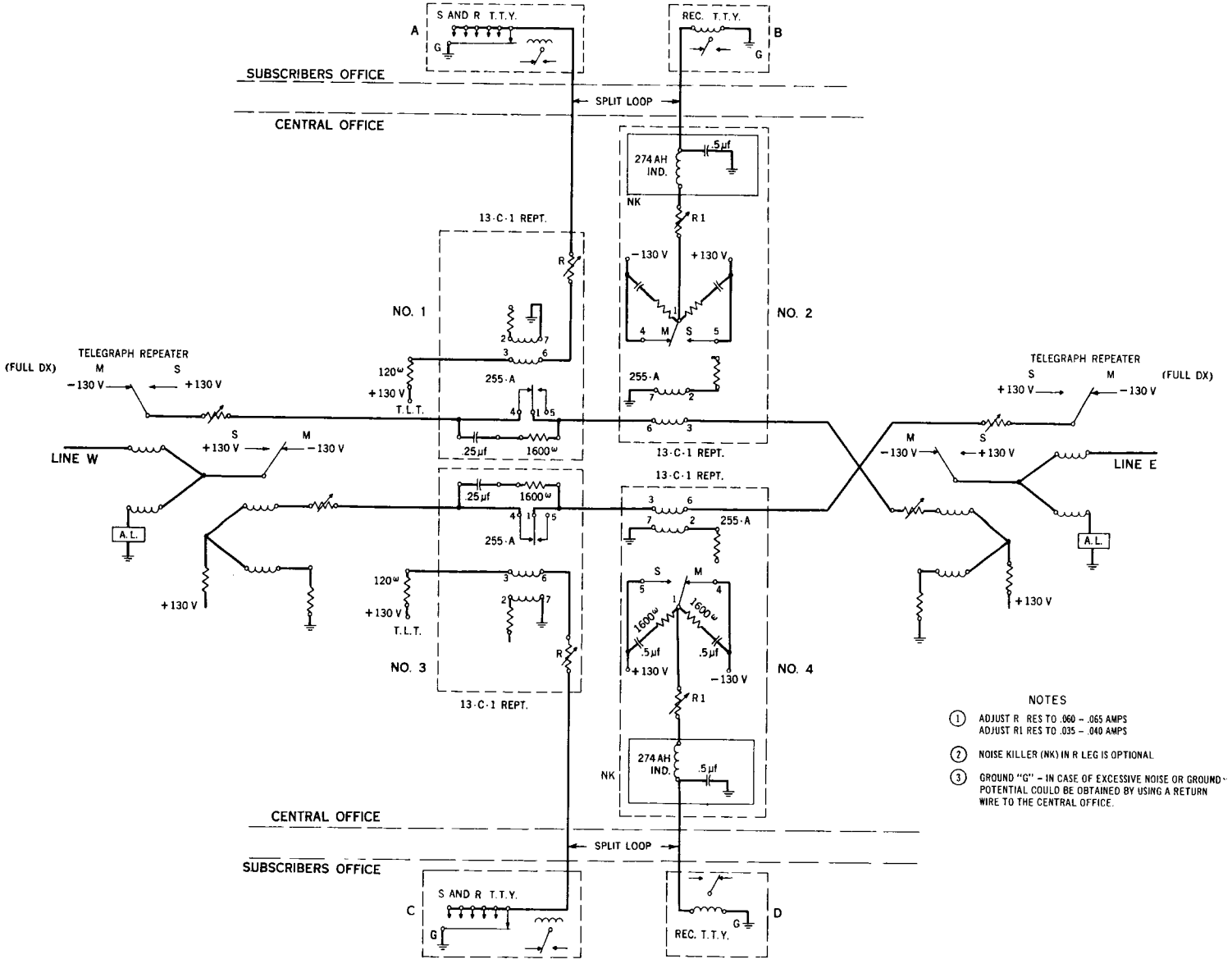
3.04 A current regulating group of resistors designated B, C, D, E, and F in Fig. 3 is supplied with each repeater and by cross-connecting at the repeater terminal strip this resistor group may be put in the armature circuit or the winding circuit. When connected into the armature circuit as is required for polar operation on an "R" leg circuit, these resistors are adjusted by soldering iron connections to allow a current of .035 to .040 ampere to flow. When the resistors are connected into the winding circuit for neutral operation from a station, the current should be adjusted to be between .060 to .065 ampere. The resistors in the biasing winding will result in about .030 ampere with normal battery voltages. A suitable spark killer is furnished for the contacts of the repeater relay (PC).

→3.05 A noise killer consisting of an 274AH inductor and a .5 mf capacitor has been made available for use at the central office when transmitting into outside plant conductors. The circuit of the noise killer is shown in Fig. 3. Also shown is the arrangement employing the 54R or 274R inductor which is now rated M.D.

3.06 When the 13C1 repeater is used to operate parallel polar loops to receiving-only stations, it is desirable to reduce to a minimum any resistance between the send relay armature of the repeater and the signal bus to which the loops are connected. Resistors (B) to (F) should be strapped out as indicated in Fig. 3. The current in each loop is adjusted individually by means of a 10,000-ohm pad which supplements the 3,500-ohm pad generally used.

13-C-1 ONE WAY SPLIT LOOP TELEGRAPH REPEATER

TYPICAL FULL DUPLEX ARRANGEMENT AT AN INTERMEDIATE POINT
WITH TWO SEND AND REC. SUBSCRIBERS
AND TWO REC. ONLY SUBSCRIBERS

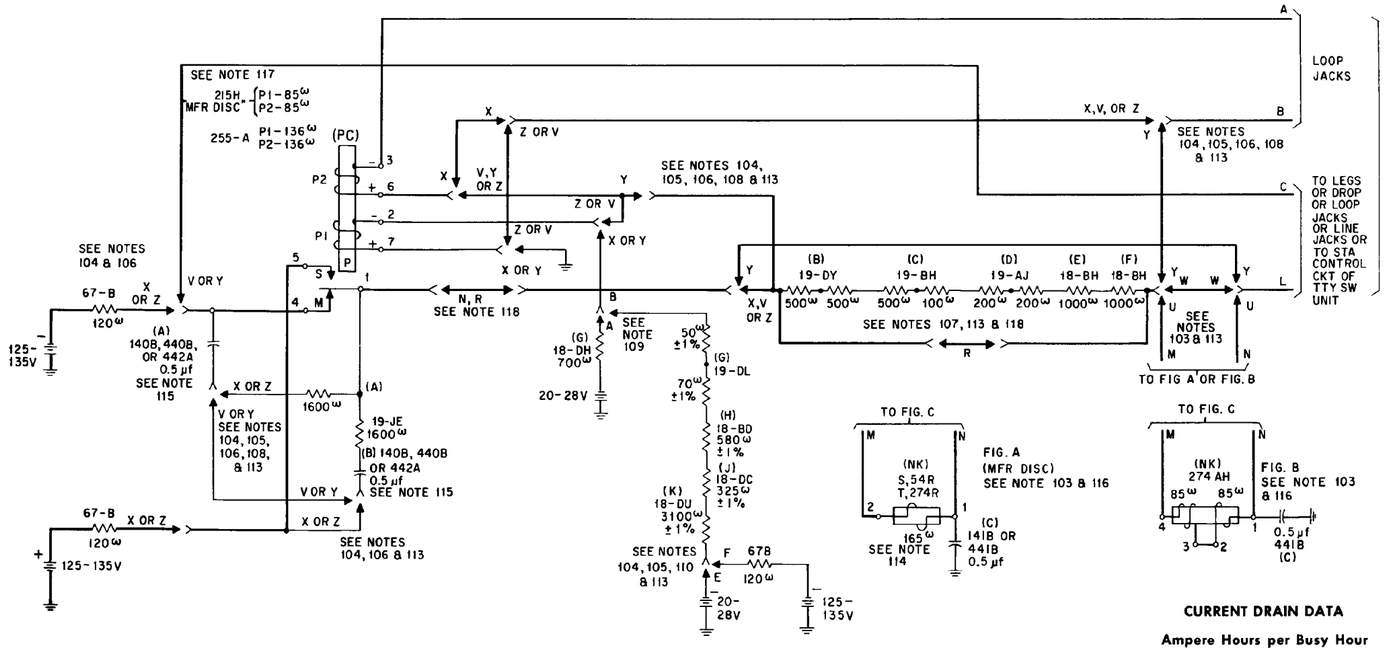


NOTES

1. ADJUST R RES TO .060 – .065 AMPS
   ADJUST R1 RES TO .035 – .040 AMPS
2. NOISE KILLER (NK) IN R LEG IS OPTIONAL
3. GROUND "G" – IN CASE OF EXCESSIVE NOISE OR GROUND POTENTIAL COULD BE OBTAINED BY USING A RETURN WIRE TO THE CENTRAL OFFICE.

Fig. 2

FIG. C



CURRENT DRAIN DATA

Ampere Hours per Busy Hour

WIRING	24V SIG. BAT.	24V R.R. GRD	130V +BAT.	130V −BAT.
X & E	.03	.03	.021	.014
X & F	—	.03	.021	.044
Y & E	.03	.03	—	—
Y & F	—	.03	—	.030
Z	—	—	.021	.014
10 ma Parallel Polar Loops (10)				
X & E	.03	.03	.06	.03
X & F	—	.03	.06	.06
Z	—	—	.06	.03

Fig. 3 – Schematic Drawing of 13C1 Repeater

3.07 Fig. 4 shows a relay-type line repeater associated with a 13C1 repeater for sending polar signals to a group of subscriber station loops connected in parallel. A maximum of 10 such loops may be connected to a repeater. The maximum relay contact current of 100 ma establishes this limit. Because polar transmission over long loops is susceptible to characteristic distortion, 50 miles of 19-gauge cable or equivalent has been established as a maximum loop length for 60-speed operation.

4. EQUIPMENT ARRANGEMENTS

4.01 The equipment mounting arrangement for this repeater is shown on ED-61302-01. Four of the repeaters are arranged in a unit on four mounting plates for mounting on a standard 19-inch relay rack. Each repeater is arranged vertically. The polar relays are mounted on the lower plate and the associated capacitors and resistors on the two plates just above. The top mounting plate is drilled and wired for the inductor of the noise killer, which is supplied only when specified. The capacitor of the noise killer is located on the mounting plate just above the relays. Two terminal strips are associated with each repeater and these are mounted on the rear of the top mounting plate.

4.02 An optional card holder is provided for use with the 13C1 repeater. It is about 19 inches long and 3 inches high and is held in place by the screws which normally attach the mounting plates of the 13C1 repeater to the relay rack. It is arranged to mount over the two center mounting plates.

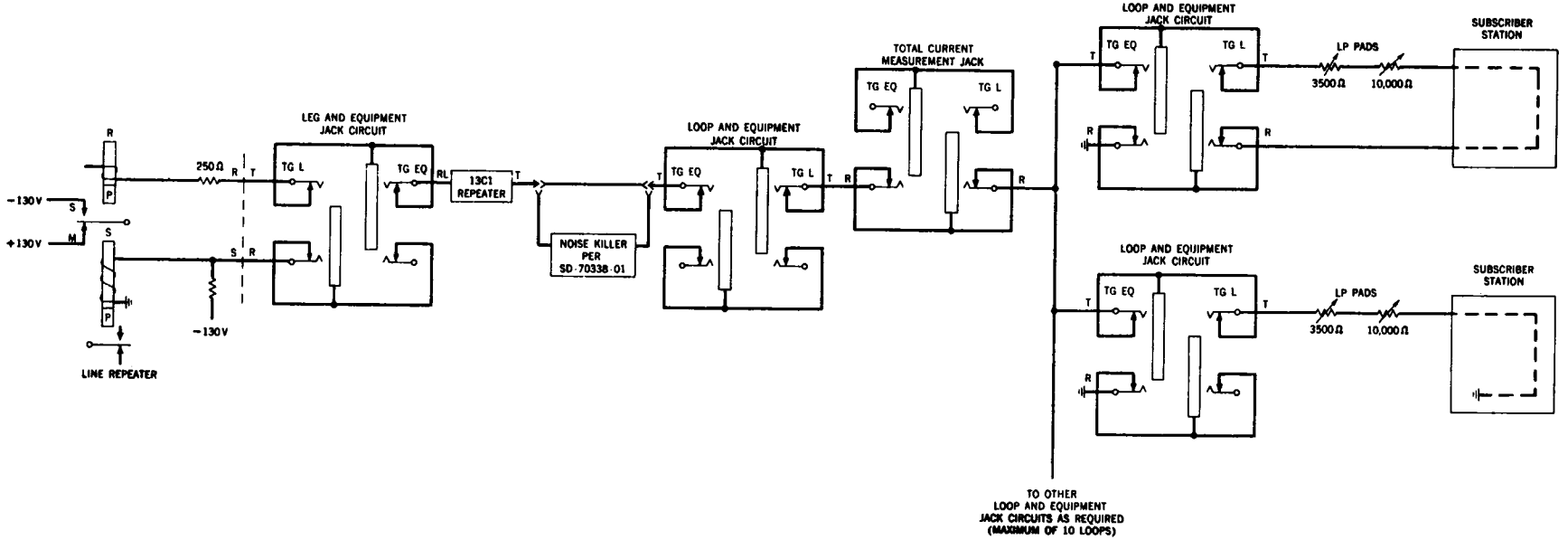

R
P
-130V
S
+130V
M
S
T
LINE REPEATER
250Ω
R
T
-130V
S
R
LEG AND EQUIPMENT
JACK CIRCUIT
TG L
TG EQ
RL
13C1
REPEATER
T
NOISE KILLER
PER
SD-70338-01
T
LOOP AND EQUIPMENT
JACK CIRCUIT
TG EQ
TG L
T
R
TOTAL CURRENT
MEASUREMENT JACK
TG EQ
TG L
R
LOOP AND EQUIPMENT
JACK CIRCUIT
TG EQ
TG L
T
T
R
R
LP PADS
3500Ω
10,000Ω
SUBSCRIBER
STATION
LOOP AND EQUIPMENT
JACK CIRCUIT
TG EQ
TG L
T
T
R
R
LP PADS
3500Ω
10,000Ω
SUBSCRIBER
STATION
TO OTHER
LOOP AND EQUIPMENT
JACK CIRCUITS AS REQUIRED
(MAXIMUM OF 10 LOOPS)

Fig. 4