

SAN/BAR CORPORATION

TECHNICAL BULLETIN

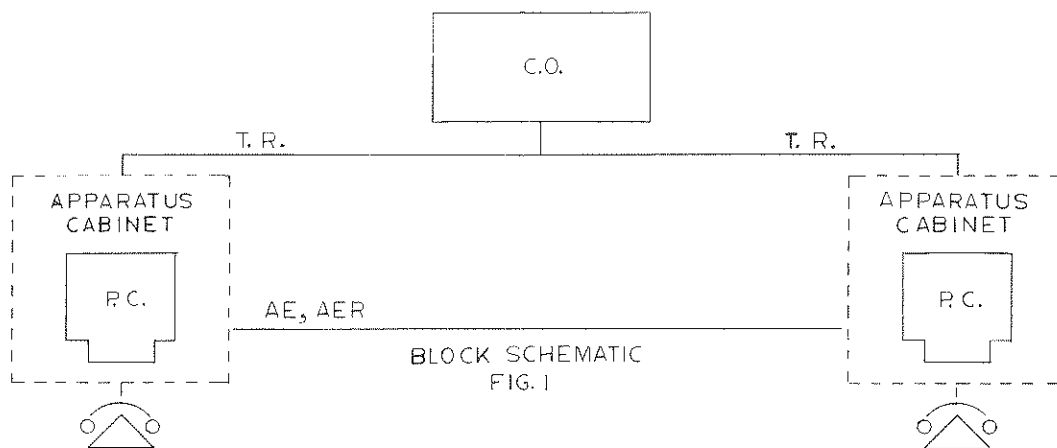
**MODEL 4100A
TWO STATION CONTROL
K.T.U. LINE CARD**

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TECHNICAL DESCRIPTION
MODEL 4100A TWO STATION CONTROL LINE CARD

GENERAL

The San/Bar Model 4100A Two Station Line Card is a simplified KTU line circuit designed for full compatibility with all types of key systems working in conjunction with central office or PBX/PABX equipment. In addition, as indicated in the title, the 4100A enables two (or more) subscriber stations to completely control a telephone circuit from any connected station. Operation of the line buttons at any companion station will concurrently provide line status at all other stations. See Fig. 1.

DESCRIPTION

The item comprises a single sided (double sided to the "E" unit) 3-1/2" x 4-3/4" x 1/16" printed circuit board for the mounting of the circuit components consisting of relays, reed and telephone type, transistors, capacitors, switch, lamp, resistors, handle and "U" link socket.

For longer life and greater reliability, the contact fingers of the p.c. board are rhodium plated. As an aid to servicing, each circuit component is identified by the silk screening on the p.c. board.

FEATURES

The basic specifications and features are as follows:

1. Voltage D.C.

Operates 20 thru 25 volts D.C. Voltage transients on the 24 volt power supply will not cause false ringing-in.

2. Current Consumption

There is no idle current consumption.

In talk or ringing, 30 milli-amps (K1 or K2 relay).

In hold, 60 milli-amps (K1 or K2 relay).

Check lamp, 40 milli-amps additional via the momentary switch as required. K4 and K5 current depend on loop conditions.

3. Ringing Sensitivity

Guaranteed 200 milli-seconds of ringing signal will trigger the ring-in

4. Parallel Dialing

A remote two wire telephone instrument dial (on the central office side) will not cause false ringing-in.

5. False Ringing

Line induced AC voltages will not cause false ringing-in.

6. Response Time

Guaranteed 200 milli-seconds of ringing signal will trigger the ring-in circuitry.

7. Line Reversal

Unit operation is independent of line polarity.

8. Ringing Time-out

Ringing time out is approximately 6 seconds.

9. Busy Light

A 24 volt lamp with series momentary switch is furnished to indicate, on demand, a busy or idle line condition.

10. Bridged Ringing

The unit operates the bridged ringing only.

11. Hold Function

Hold function switching time 30 ± 10 milli-seconds.

12. Mutually Distant Key Telephone Sets

Each instrument will command full supervisory control, will simultaneously detect ringing signal, can accept a call, originate a call, place a call into and retrieve it from a hold condition and simultaneously provide presentation of visual status as displayed.

APPLICATION

The 4100A Line Card can be used on any existing KTU system as a replacement unit or for additional lines/extensions as required. In areas where AC line induction is a problem, the 4100A Line Card has application.

If an existing 24 volt KTU power supply is creating operating problems with loading transients, the 4100A Line Card has application. On PBX use by key operation, the 4100A Line Card has instantaneous ring-in response.

On PBX and/or Centrex use where transfer and hold problems with KTU operation can arise, the 4100A Line Card has application because of its fast response into hold.

MOUNTING

The 4100A will mount in any standard 300 series mounting shelf. For those installations where only two units are required, the SB302A apparatus box may be used.

CIRCUIT DESCRIPTION

The 4100A, designed to provide dual station control, is schematically illustrated by SB drawing #4100001B. As shown, the line card circuit includes five relays. Three relays perform primarily operational functions in the line card while the remaining two contribute to dual station control.

Relay K1 generally enables ringing and associated lamp control at a subscriber station in response to ringing signal transmitted from a central office for incoming calls. K1 also operates to prepare the telephone circuit for a hold condition. Relay K2 essentially operates in response to a subscriber being "on-line", and also serves to prepare the line card circuit to have the telephone circuit placed in a hold condition when the relay K1 is energized. Relay K3 is a switching relay and energizes the line card circuit in response of line current attendant to a subscriber being "on-line". K3 also detects ringing. Relays K4 and K5 serve to enable the dual control of the telephone circuit by two or more subscriber stations. Specifically, K4 and K5 allow the simultaneous presentation of ringing signals and control of lamp indicators at each subscriber station. Relays K4 and K5 also permit the respective key telephone units at the subscriber stations to place the telephone circuit in a hold condition or retrieve it.

OPERATION (Incoming Call)

See schematic drawing #4100001B.

An incoming call will apply ringing voltage to T and R and this is rectified in the bridge CR1-CR4 to operate K3 relay through coil R. C1 blocks DC current flow into the bridge network when the telephone circuit is completed for a conversation. Resistor R9 and capacitor C1 provide a high impedance to voice frequencies. R1 and C4 filters the rectified ringing voltage to prevent relay chattering. Contact K3A closes and energizes relay K5.

Closure of K3A also energizes the K5 in the companion line card. In fact, closure of K3A in either line card will energize like K5 relay in both line card units.

Closure of K5A (of both line cards) applies negative potential to the base of Q1 through R5 and R8 and Q1 conducts to energize K1 and C3 and R10 acting as a time constant circuit. Contacts K1-A through K1-E operate to afford the following functions:

- K1-A connects line card pins 5 and 6. (ST & LG) to start the interrupter.
- K1-B connects lamp flash line card pin 7 to lamp line card pin 8 and line button on teletest flashes.
- K1-C connects ring control voltage line card pin 1 via pin 11 to bell/buzzer in teletest.
- K1-D no function.
- K1-E prepares Q1 for switching to non-conductive state.
- K1-F prepares for hold condition when K2-B closes through resistor R2 120 ohms across T and R of line card unit.

OPERATION (Abandoned call)

If the incoming ringing ceases due to the caller hanging up, resistor R3 determines the time out charge of C3 and the holdover time before relay K1 releases.

OPERATION (Call answered)

When the telephone receiver is off hook and the calling line button is depressed, a ground is applied to AE and A line card pin 16. Relay K4 is energized and K4A is closed.

Removal of the receiver also loops the T and R leads and the resulting CO or PBX line circuit current flow will trip the incoming ringing.

Since AE and A line card 16 is linked to a companion card AE and A terminal, the K4 relay there is also energized and its K4A contact closes. The resulting controls and indicating display are duplicated.

The closure of K4-A contact renders Q1 non-conductive to comply with the RC time constant of R3, R10 and C3. Relay K1 releases and lamp flashing and ringing ceases. Contact K4A also energizes Relay K2. Relay contacts K2A through K2F operate and afford the functions indicated below.

- K2A applies an alternate ground to the K2 relay to hold it if K4 is released (K4-A) when the A lead is opened in the HOLD CONDITION.
- K2B connects R2 to tip line to prime for HOLD CONDITION if and when K1F closes later.
- K2C contact removes short condition from K3 L winding and ring circuit current energizes L winding.

K2D breaks ringing control voltage from bell/buzzer circuit.

K2-E determines lamp steady/wink conditions.

K2-F at both local and companions teletests. (The contact K2-E operates to close a connection to the winking signal sources LW terminal 2 or \pm 10V terminal 4. K1-B controls the steady or wink state.)

The telephone circuit is now established and a telephone conversation effected.

The line button lamp will be steadily illuminated until the subscriber at both companion stations go off the line. Summarizing the functions of the release of K1 relay and the operation of the K2 relay follows:

The Function of K1 relay:

1. Open the prepared hold circuit by disconnecting the R2 resistor from the T and R leads at contact K1-F.
2. Stop the interrupter motor at contact K1-A.
3. Disconnect the ringing audible signal at contact K1-C.
4. Change the flashing lamp signal to a steady light at contact K1-B, K1 via relay K2-E operated.

The Operation of K2 relay:

1. Prepare the hold path for resistor R2 to be connected across the T and R leads at contact K2-B.
2. Disconnects and prevents reconnection of the audible signal at contact K2-D should relay K2 reoperate in the hold condition.
3. Disconnects the lamp flashing signal at contact K2-E and prepares a circuit for the LW (wink) or the 10 AC volt steady option on the hold feature if required.
4. Connects the lamp to the 10 volt steady state at contact K2-F as the answer signal and busy condition.

HOLD CONDITION

In a hold condition, the ground potential from the "A" lead is removed. The relay K4 is thus de-energized and the contact K4-A is opened to remove the ground potential from the base terminal of the transistor Q1. The transistor Q1 is as a result again rendered conductive by the negative potential applied to the base terminal thereof through the closed contact K5-A and the relay K1 is energized.

Re-operation of the relay K1 will:

1. Loop the T and R leads into the hold condition at contact K1-F via the resistor R2 which will hold the relay K3 to the Central Office or PBX line current.
2. Re-operate the interrupter motor at contact K1-A.
3. Does not reconnect the audible signal at contact K1-C because the circuit is now open at the relay K2 contact K1-D (operated).
4. Connects the "L" lead at contact K1-E to the "X" or "Y" option to give the steady or winking lamp indication that the circuit is on hold.
The "L" winding of the relay K3 is now held in series with the line via the resistor R2 (120 ohms) which simulates the telephone instrument to hold any connected circuit which may have been dialed into the Central Office or PBX.