

4200 LINE CARD

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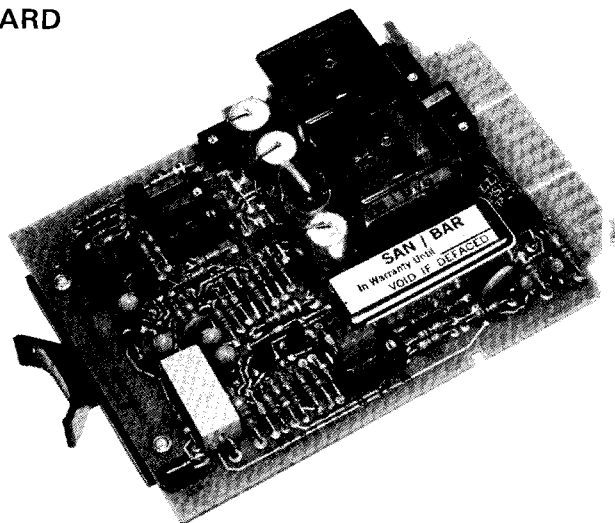


Fig. 1. SB4200 Line Card

1.0 GENERAL

1.1 This section provides circuit description, installation and basic testing information for the SAN/BAR 4200 Line Card.

1.2 The SAN/BAR 4200 Line Card (Fig. 1) is a simplified KTU line circuit designed for full compatibility with all types of key telephone systems working in conjunction with central office or EPBX/PABX equipment. In addition, the 4200 enables the caller to provide music on T and R to the party called when in the hold condition. Also, the 4200 can be optionally used with STC type interface connecting arrangements.

The issue 7 SB4200 Line Card has been issued to add the option of withstanding 50MS/500MS open loop prior to dropping the call. This is important since ESS offices may under some circumstances open the loop in a test made for 500MS.

2.0 SPECIFICATIONS

2.1 List of Applicable Drawings

Equipment Drawing: ED-4200-000 (Fig. 5)
(Issue 7)

Schematic Drawing: SD-4200-000 (Fig. 4)
(Issue 7)

2.2 Electrical Characteristics

- a) Source voltage operates at 18V to 28V DC.
- b) Operating environment temperature from 0°C to 50°C. Humidity to 90%.
- c) Current Consumption: there is no idle current consumption. Maximum current consumption is 60 MA.

- d) Loop Current: 20MA (minimum)
- e) Ringing Voltage: Operates at 57V ringing signal; will not
- f) Response Time: Guaranteed 200msec of ringing signal will trigger the ring-in circuitry.
- g) Ringing Time Out: Two options are furnished either 5 to 9 or 12 to 20. (See schematic and option chart)
- h) False Ringing: Line induced AC voltages will not cause false ringing-in.
- i) Ringing Option: The unit includes an "STC signaling ringing" option by the use of "U" link and socket furnished. The unit is factory set for bridged ringing. (See schematic and option chart).
- j) Parallel dialing: A remote two wire telephone instrument dialing (on the central office side) will not cause false ringing-in.
- k) Line Reversal: Unit operation is independent of line polarity.
- l) Busy Light: A light emitting diode is provided to indicate a busy line condition.
- m) Music on Hold: A band pass filter "H" pad is used to provide music on hold from either a low impedance source (4 to 16 ohms) or a 70.7 VAC music distribution source.

2.3 Physical Characteristics

- a) Dimensions: 3.5"W x 4.75"L x 1.3"H
Conforming to standard line card dimensions.
- b) Weight: 7 oz. approximately
- c) Key Location: Card must be keyed with slots between pin 5 and 6, and between

d) Pin spacing: 0.150 inches between centers

3.1 Inspect the unit thoroughly, as soon as possible after delivery. If any part of the unit has been damaged in transit, report the extent of damage to the transportation company immediately. If the unit is to be stored for some time before installation, make an operational check at once. The purpose of this check is to make sure that the unit is in proper working order as received from the factory. If the check indicates satisfactory performance, the unit may be stored for future installation. If the system is to be installed at once, make an operational check after the installation is completed.

SAN/BAR 4200 circuit card is the same physical size and has the same tap key and lock capability as the standard WE 400 line card or the SAN/BAR 4000 line card and will mount in any standard key service panel such as the SB319A. For mounting techniques see the SAN/BAR equipment mounting shelf brochure.



1. Disconnect shelf wiring at the line card connector Pin 12 (T Station) and resolder to pin 14 of the line card connector.
2. Establish a new wire from pin 12 of the Line Card connector to a spare pin on the feature block.
3. Install "U" link per paragraph 5.4
4. Crossconnect S.T.C. signaling leads to the KS-20721 Station Coupler (S.T.C.) pins 7 and 3 as shown above.

Fig. 3 S.T.C. Signaling Ringing Installation

5.1 The installer should be cautioned to be sure that the music-on-hold music source has a volume control independent of the volume control for the P.A. microphone and music system. An ideal music-on-hold music source is the SB4201A FM receiver on a KTU size circuit and that easily installs into the Key Service Panel. (See separate CD-4201-000).

For a pre-wired 584 Type Key Service Panel pin 3 of each line card connector will be wired together and connected to talk battery ground; pin 18 of each line card connector will be wired together and connected to talk battery. (See Fig.2) To wire in music-on-hold the installer needs only to disconnect the talk battery connections, sleeve them, and connect the music source to any pair of pins 3 and 18. However, if a SB319A Key Service Panel is used no internal wiring changes are required because pins 3 & 18 of each card position appear as a strap option on the rear of the 319A (See separate CD-0319-000).

Crosstalk may be encountered in some systems if wires carrying the music are tightly wrapped with other cabling in the system. It is, therefore most important to run all music carrying wiring loosely and separate from other wiring in the Key Service Panel.

Strap option J2 is provided to allow the use of a low impedance source in the "B" position of J2 and a high impedance 70.7 VAC music source in the "A" position.

5.2 The 4200 would ordinarily replace standard type line card.

5.3 In areas of high thunderstorm activity, the following information is offered:

Continued and extensive tests of line card failures due to lightning damage indicates that the best protection is to have a separate earth ground (water pipe) for the KTU power supply and not to use an adjacent or easily available AC circuit ground for this purpose.

5.4 S.T.C. Signaling Ringing

Use the strap of socket J1 at RR for DC voltage ringing. Take the strap of socket J1 out (not use) for AC voltage ringing and see the wiring harness as shown in Fig. 3 for additional card cage wiring changes to accommodate S.T.C. signaling.

5.5 Open Loop Time Constant

J8 strap options provide the user with the option of a fast or slow loop release. Normally a line card will drop the loop within 50MS for all but cases where the card is associated with

a ESS office. In this case, J8 should be strapped to maintain a connection through a 500MS open loop, which a ESS office will do when testing loops.

6.0 CIRCUIT DESCRIPTION

Please refer to Figure 4 for this description.

6.1 Idle Condition

All transistors are off, and all relays are released and in the position indicated in the schematic. No current is drawn in this mode.

6.2 Incoming Call

An incoming call will apply ringing voltage to T (C.O.) and R (C.O.) and this is rectified in the bridge CR 1 - CR 4 to operate K 3 relay through coil R. Contact K 3 closes and applies positive potential through R 32 to the base of Q3. Q3 applies negative potential to the base of Q1 through R5 and R8 and Q1 conducts to energize K1. Contacts K1-A through K1-F operate to afford the following functions:

- K1-F connects line card pin 5 and 6 (ST and LG) to start the interrupter.
- K1-E connects lamp flash (pin 7) to lamp (pin 8) and line button on teletest flashes.
- K1-D connects ring control voltage (pin 1) via pin 11 to bell/buzzer in teletest.
- K1-C prepares Q1 for switching to the non-conductive state.
- K1-B prepares for the hold condition in coincidence with the K1-A and K2-E contacts.
- K1-A assures complete isolation of the music system during the talk condition of the card.

Transistor Q6 provides an additional relay contact to apply the timeout capacitor, C14, to maintain a hold condition for open loops of 50 or 500 milliseconds. Zener CR13 assures that Q6 turns off before K1 drops out.

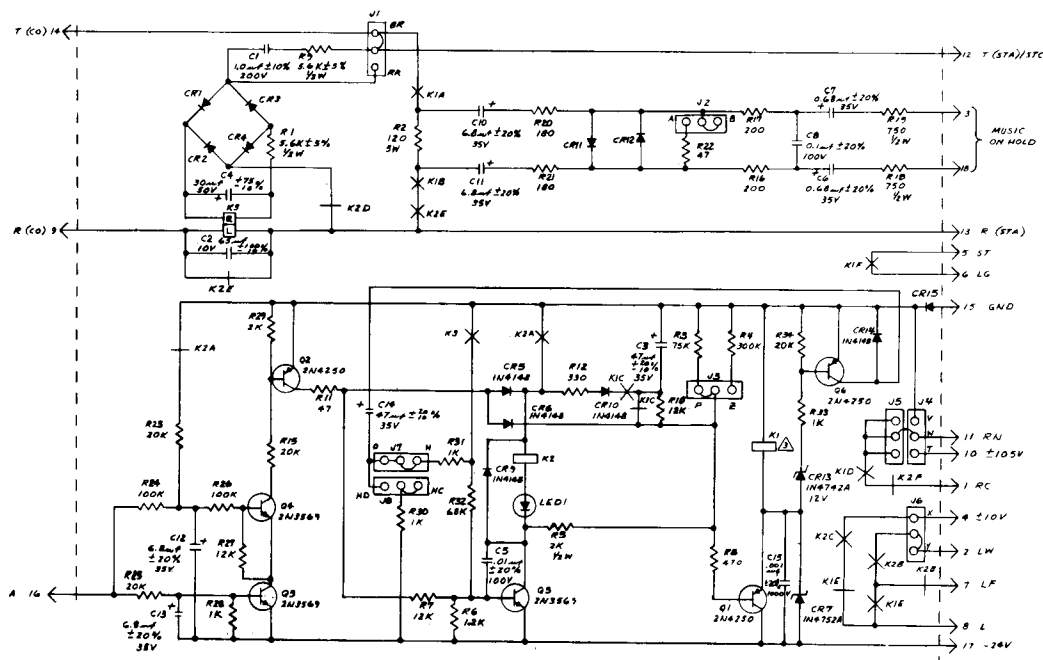
6.3 Abandoned Call:

If the incoming ringing ceases, due to the caller hanging up, resistor R3 or R4 determines the timeout charge of C3 and the hold-over time before relay K1 releases.

6.4 Call Answered

When the line button has been depressed and the handset goes off-hook a ground is applied to pin 16. Transistor Q5 turns on after a short timeout determined by R25, R28 and C13. Transistor Q4 is pre-biased through the normally closed (N.C.) K2-A contact and R23 so that Q4 turns on as soon as Q5 supplies bias to the emitter of Q4. With Q4 and Q5 on, Q2 turns on and supplies a ground to the anodes of CR5 and CR6. In addition, the ground through R7 operates Q3, the ground through CR5 operates the K2 relay, and the ground through CR6 forces off Q8 which releases the K1 relay. Relay contacts K2-A through K2-F operate and afford the functions indicated below:

- K2-A applies an alternate ground to the K2 relay to hold it if Q2 is released when the A lead is opened in the hold condition.
- K2-E connects R2 to ring line to prime for hold condition if and when K1-B and K1-A close later. K2-E contact removes short condition from K3 (L winding) and loop current energizes L winding.



- c) K2-D removes the ring detect circuit.
- d) K2-F breaks ringing control voltage from the bell/buzzer circuit.
- e) K2-B breaks lamp flash.
- f) K2-C gives lamp steady state.

The telephone circuit is now established and a telephone conversation effected. The line button lamp will be steadily illuminated until the subscriber goes off the line.

6.5 Call Placed On Hold

Depressing the red hold button removes the ground at pin 16. Q5 turns off, turning off Q2, which removes the ground at the anodes of CR5 and CR6. Relay K2 is held operated by contact K2-A and Q3. Transistor Q3 remains on because loop current through the K3-L winding keeps contact K3 closed, which maintains Q3 through R32. With the ground removed from the anode of CR6, Q1 is turned on through R5 and R8, which operates K1 to apply R2 across the tip and ring. Any music impressed across R2 may now be heard by the distant party. With R2 bridged across the tip and ring, loop current will continue to flow through K3-L after the pickup key is released. The time constant formed by R24, R26, and C12 assure that a momentary grounding of pin 16 while the hold button is released will not force the line card out of hold. It also assures that a pulse will not be generated across the tip and ring (dial-one pulse) when retrieving the call from hold. Should the Central Office open the loop intermittently, the line card will remain in hold for 10,50 or 500 milliseconds, depending on the strap option selected. The time constant is determined by C14, R31 and R32 or R30.

6.6 Call Abandoned on Hold.

In the event that the calling or distant party hangs up or otherwise abandons a call when the telephone circuit is in a hold condition, the flow of loop current ceases. The relay K3 is accordingly de-energized and the consequent opening of the contact K3 starts the timeout of C14, R31 and R32. At the end of the timeout, Q3 turns off and releases K2 and K1.

6.7 Music on Hold Circuit

R18, R19, C6, C7 and C8 form a low pass filter. R20, R21, R2, C10 and C11 form a high pass filter. Together they form a band pass filter with a pass band of from 300 to 3000 Hz. Diodes CR11 and CR12 provide amplitude limiting and R22 is used to provide additional attenuation when the music source is 70.7VAC rather than the usual 8 ohm source.

7.0 TESTING

7.1 If trouble is encountered with the operation of the 4200 line card, check that all installer connections and strappings have been properly made. Make certain that the 4200 unit is making good connection with the mounting assembly card connector, snap the 4200 out and in several times.

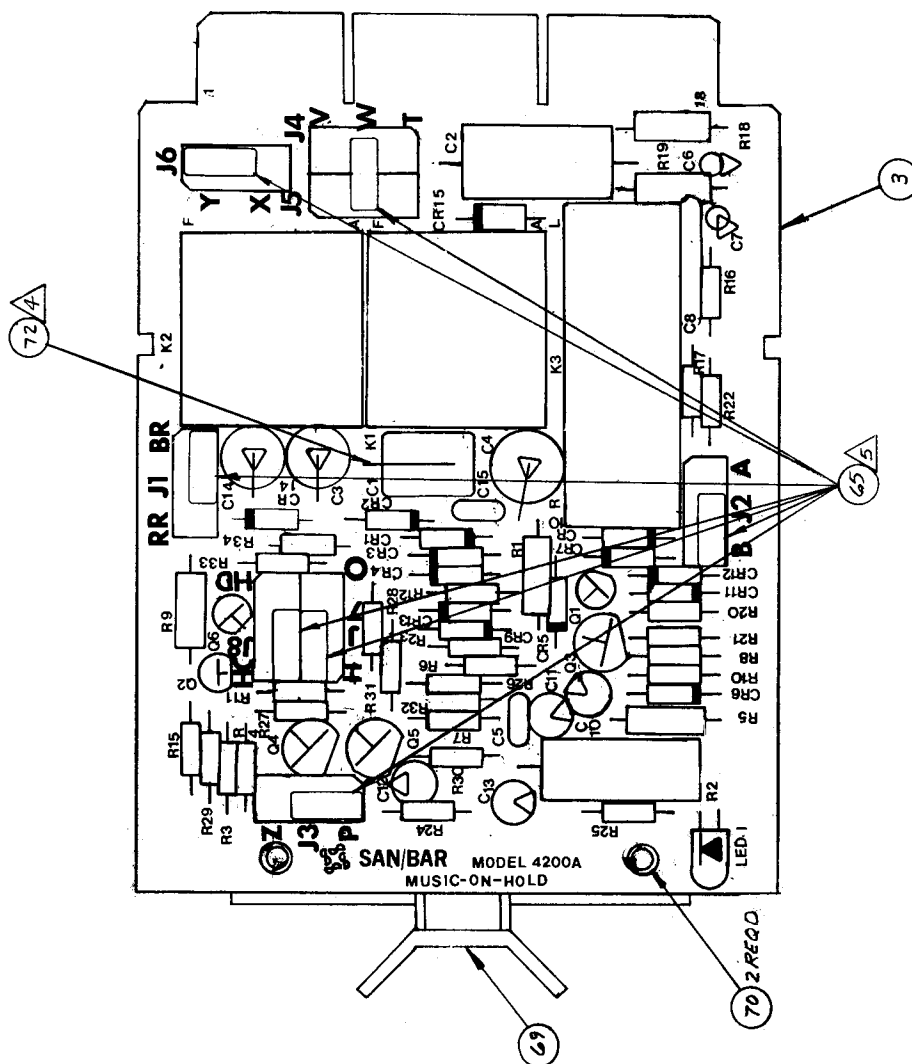
7.2 If the trouble persists use the procedure in 7.3 to determine a bad line card or a bad system.

7.3 Using a multimeter (Simpson 262 or equiv.) test the 4200 as follows:

- a) Connect the multimeter (set to the 60V DC scale) across pin 15 (GRD) and pin 17 (-24V) of the card connector. The multimeter should indicate $+ 24 \pm 4$ VDC.
- b) Connect the multimeter (set to the 60V DC scale) across pin 16 (GRD) and pin 17 (-24V) of the card connector, in the answer mode. The multimeter should indicate $+ 24 \pm 4$ V DC.
- c) Connect the multimeter (set to the 15V AC scale) across pin 4 (± 10 V) and pin 6 (LG) of the card connector. The multimeter should indicate 10 ± 2 V AC.
- d) Take the 4200 off the card connector, set the multimeter to the R x 100 ohm scale and measure across pin 12T (STA) and pin 13R (STA) of the 4200 line card. The multimeter should indicate infinity (00).
- e) Measure the coil resistance of K1, K2 and K3 on the 4200 line card, (set the multimeter to the R x 100 ohm scale). The resistance of K1 K2 winding should measure 750 ohms $\pm 10\%$, R winding of K3 should measure 1600 ohms $\pm 10\%$ and L winding of K3 should measure 70 ohms $\pm 10\%$ on the meter.
- f) Check the Music Source:
Connect the multimeter (select the VAC scales: from 150V AC to 25V AC) across pin 3 (MOH) and pin 18 (MOH) of the card connector. The multimeter should kick at the 2.5V AC scale.

7.4 Field repairs involving replacement of components within a module are not recommended. All San/Bar products are warranted for 2 years from the date of purchase. Return to San/Bar Corporation, 17422 Pullman Street, Irvine, California, 92714. For technical assistance, call (714) 546-6500.

REVISIONS		
LTR	DESCRIPTION	DATE
M	SEE DCN 0458	9m 7/74
		APPROVED



- 5 ASSY TO BE SHIPPED WITH ITEM 65 IN POSITIONS SHOWN
- 4 SLEEVE TOP LEAD OF C1 (MAX HT AFTER SLEEVING=1.30)
3. Δ DENOTES POSITIVE END OF CAPACITORS
2. COMPONENTS MAY BE FLOW SOLDERED
1. K1, K2 & K3 TO BE HAND SOLDERED AFTER FLOW SOLDERING

NOTES: UNLESS OTHERWISE SPECIFIED

SEE SEPARATE BM-4200-000

CONTR. NO.		SAN/BAR CORP.	
DR. MILLER		17422 PULLMAN STREET SANTA ANA, CA 92711	
CHK #5		EQUIPMENT DWG-LINE CARD	
DSGN		WITH MUSIC-ON-HOLD (SS-T)	
APPD		MODEL 4200A	
SIZE	C	CODE	27412
UNIT NO.	ED-4200-000	DATE	2/1
LTR	M	SHEET	1 OF 1

FIGURE 5