

RETRIEVAL FROM HOLD CONDITION

This is effected by a release of the hold button which applies ground to the "A" lead to make Q1 non-conductive. Relay K1 de-energizes. In the majority of telephone exchange areas, when an outgoing call is placed into the hold condition, it will so remain until released by the re-operation of the associated line button in the keyset. However, in those telephone office areas where "Forced Release" or "Called Party Release" equipment is installed, a line disconnect condition may be given to the circuit which will release the K3 relay from the "L" winding and return the unit to the idle state.

CALLER ABANDONS CALL 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 line current ceases. The relay K3 is accordingly de-energized and the consequent opening of the contact K3-A causes the subsequent de-energization of the relay K5 which is followed by de-energization of the relays K2 and K1 due to the opened contact K5-A. This series of events is duplicated in the companion line card circuit since the opening of the contact K3-A also removes the negative potential applied over the conductor AER to the companion circuit.

OUTGOING CALLS

A subscriber can place an outgoing call by depressing the appropriate line button and removing his telephone receiver to an off hook condition. Line current will flow through the loop formed by the interconnected tip and ring conductors and through the coil L of the relay K3 which is energized. Consequent closure of the contact K3-A energizes the relay K5 of both companion line card circuits.

The relay K4 will also be energized by the application of ground potential to the "A" leads of both the companion line card circuits. The closed contacts K5-A and K4-A energize relay K2 which is evidenced by the steady illumination of the line button lamp on the key telephone unit. No ringing occurs at the telephone unit.

The closed contact K4-A prevents triggering of the transistor Q1 to conduction but also primes a transistor Q3 to be rendered conductive in the event that the contact K5-A is opened while the contact K4-A remains closed. This combination can occur when the central office is replaced by a private branch exchange (PBX) for which calls are initiated through an operator with whom an outside telephone number is requested. The operator may typically place the telephone circuit in a "PBX Hold" condition while the request is executed.

This "PBX Hold" condition may totally disconnect the subscriber tip and ring conductors from the PBX. The flow of line current would cease and the relay K3 would be de-energized to have the contact K3-A opened and followed by de-energization of the relay K5 and opening of the contact K5-A. If the relay K2 were also permitted to become de-energized, the steady illumination of the line button lamp would cease even while the party placing the call remains on-line. The calling party may then get the impression that he has "lost" the operator.

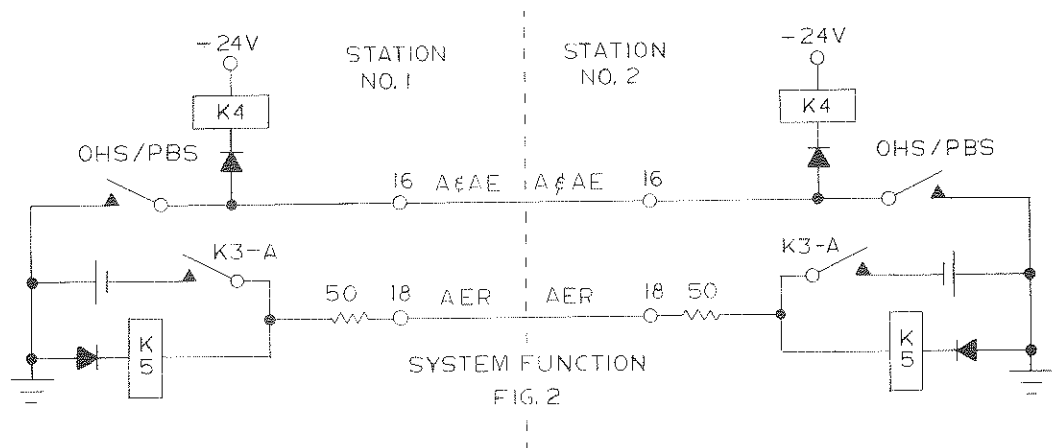
To prevent any such difficulty, the relay K2 is maintained energized by the transistor Q3 which, when conductive, provides an alternate path to the negative terminal 17. A pair of resistors R6 and R7 serve to properly bias the terminals of the transistor Q3, so that it conducts whenever contact K5-A is opened and contact K4-A remains closed. The line button lamp will therefore remain properly lit until the PBX operator reconnects the subscriber.

The telephone circuit may, once seized, be placed in a hold condition from either station in the manner earlier described. If only one subscriber station is in use, then the hold operation is as earlier described. If, however, both stations are simultaneously on-line, then either both hold buttons must be depressed or one station must be returned to an on-hook condition while the hold button of the on-line station is depressed. This is necessary due to the need for removing ground potential from the "A" leads to permit a hold condition. Clearly, if either station is on-line, a ground potential would be applied to the "A" leads of both companion stations and a hold condition would be impossible. For outgoing calls, as with incoming calls, the line button lamps at the companion stations will be controlled simultaneously and will both go off when both the subscribers are off-line and the line card circuits are permitted to be restored to an idle condition.

OPERATIONAL COMMENTS

1. The C2 capacitor, 65 mf 10 volt NP, is a speech by-pass capacitor for the transmission purposes.
2. The C4, 15 mf 100 volt, capacitor prevents false operation by parallel dialing of the K3 relay.
3. The "L" winding of the relay K3 is normally short circuited to prevent false operation.
4. The zener diode CR7 protects Q1 against voltage transients in excess of 30 volts caused by the intercom dialing.
5. System function drawing **FIG2** gives the basic details regarding the operation of two station control. The circuit diodes prevent relay malfunctioning due to reverse voltages.

NOTE: Power switch "on" or initial line card insertion will cause a "ring-up" transient due to capacitor charge of the circuitry. This is a "one time only" transient and is not a fault condition.



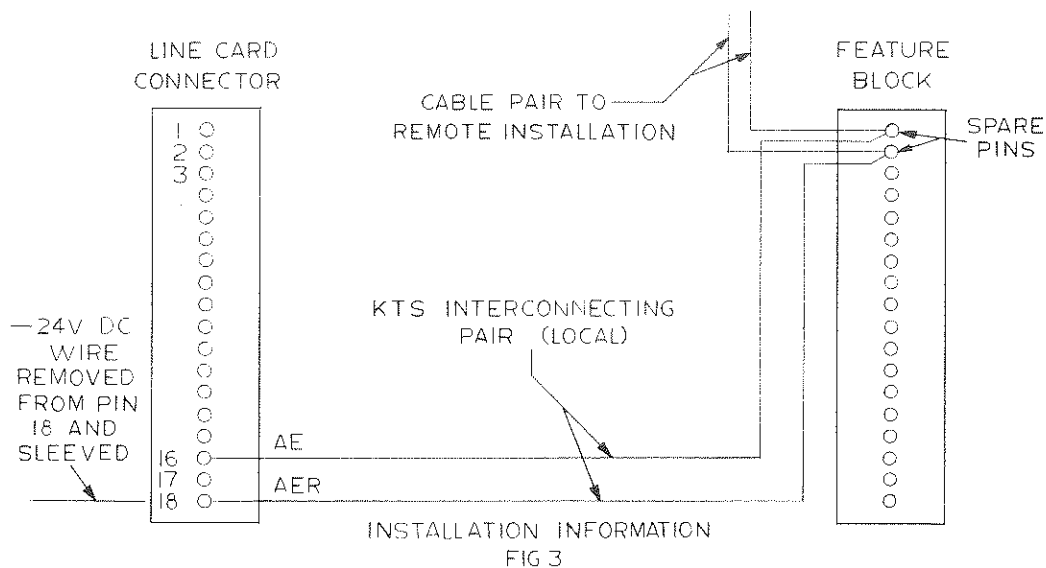
INSTALLATION

The 4100A line card requires one cable pair in addition to the CO/PABX pair interconnected between itself and the companion line card remotely located. The card would ordinarily be inserted into a key telephone system at each location and would probably replace standard type cards. The cable pair is to be terminated at AE (connects AE) and AER (connects #18) of the 4100A associated with the CO or PABX line to be used.

Since, however, AE of the card is wired to the feature block as the "A" lead, the tip side of the cable pairs should be connected at this point.

Point AER (18) is not wired out and the existing wire on pin #18 of the card connector block should be removed and sleeved and a wire run from point #18 to the feature block where the AER side of the cable should also be connected. See Fig. 3.

Duplicate key features and supervision is now available if both the remote and local KTU systems have been wired as indicated above.



MAINTENANCE

The only maintenance feature is the operation of the line light switch. This can be used as a busy condition interrogator by pressing same. The absence or presence of light will indicate the idle or busy state of the line.

The light switch can also be used as a ring-up indicator to check the ringing in and line functions. If the circuit to be tested is dialed via another line or the test handset and the switch button of the line to be tested is held pressed, the lamp will indicate the receipt of incoming ringing because the operation of K3 relay contact will apply negative to the lamp which will light to the ringing cycle timing.

As long as the switch is held pressed, operation K1 relay is prevented and test calls do not ring in until release of the switch button. This action will also effectively prevent service call interference to customer operation.

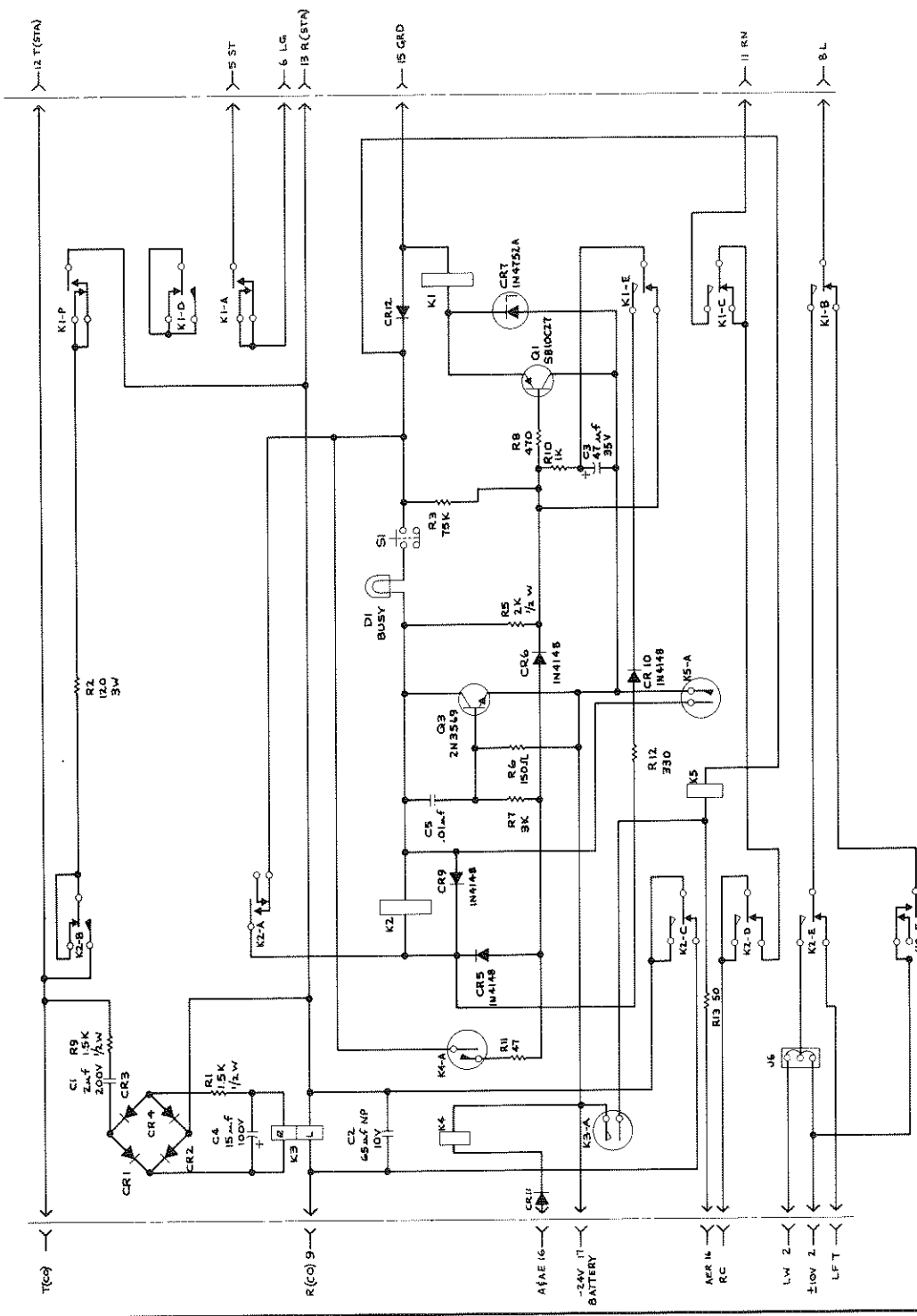
LIGHTNING

Installation

As a matter of interest to Special Service Groups and to installers of KTU systems 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.

REVISIONS	DESCRIPTION	DATE	APPROVED
1	A	ADDED CR11 & CR12	
1	B	CHANGED REF DESIGNATION & CONNECTORS	



FACTORY WAIRED	OPTION	SOCKET REF	FUNCTION
YES	X	J6	STEADY HOLD LAMP
	Y	J6	WINKING HOLD LAMP

SANIBAR CORPORATION
 SCHEMATIC -
 2. STATION CONTROL KTU
 LINE CARD SB 4100A
 SHEET NO. 410001
 SHEET OF 8

NOTES: UNLESS OTHERWISE SPECIFIED
 1. ALL RESISTOR VALUES ARE IN OHMS ±5% AND
 ARE RATED 1/4 WATT
 2. ALL DIODES ARE IN 4-002