STATION SYSTEMS
516A KEY SERVICE UNIT
(433A KTU) INTERCONNECTING CIRCUIT
AND 105A INTERCONNECTING UNIT
FOR USE BETWEEN BELL SYSTEM CO AND
CUSTOMER-PROVIDED MANUAL SWITCHBOARD
OR AUTOMATIC PBX

TABLE OF CONTENTS

SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.01 This circuit provides a means to connect a customer-provided PBX cord switchboard to Bell System 2-wire CO lines. The circuit is intended to be used for voice frequency coupling. An associated console provides the PBX attendant with a means to dial out on the CO lines.

2. GENERAL DESCRIPTION OF OPERATION

2.01 The 516A key service unit is used to house a 28A1 power unit and up to six (433A key telephone units) interconnecting units. The 433A key telephone unit provides for interconnection of a customer-provided PBX cord switchboard with a 2-wire CO line. The circuit provides for dc isolation between Bell System and customer equipment. In the event of excessive signals from the customer equipment, a clipping circuit limits the signal in order to prevent crosstalk and overload of the Bell System network. Supervision is controlled by a customer-provided off-hook contact; the CO ringing signal is passed on to the customer by means of a relay contact closure.

2.02 The console associated with the 516A key service unit and located within the reach of the switchboard operator provides her with a means to dial over a maximum of 17 CO lines.

SECTION II - DETAILED DESCRIPTION

1. INCOMING CALL

1.01 CO line ringing current passes through the S relay break contact, C3 capacitor, and R2 resistor to the R relay after being rectified by the 460A diode bridge. The R relay follows the ringing interval and is protected from false operations by transient currents by the CR2 regulator diode. A make contact of the R relay closes through a connection to the customer on the C1 and C2 leads. This connection can be used to control customer audible and visual signals.

1.02 A contact provided by the customer whenever he goes off-hook (controlled by customer connection to leads T and R via the customer-provided switchboard) operates the S relay and charges capacitor C4 through resistor R3. The operated S relay disconnects the ringup circuit from, and connects the transformer T1 to, the CO line. A dc path is now provided between the CO T and R leads through the transformer and R1 resistor to provide supervision on the CO line. A talking path has now been established. If the signal levels from the customer equipment become

excessive, varistors RV1 and RV2 will conduct causing severe distortion.

1.03 When the customer goes on-hook (disconnects from T and R), capacitor C4 discharges through resistor R3 and relay S to slow-release relay S in from 0.2 to 0.6 second. Relay S is slow release to prevent false dialing from the customer's off-hook contact.

2. OUTGOING CALL

2.01 The switchboard attendant seizes the circuit causing the off-hook contact to close, thereby operating the S relay. Dialing takes place at a console which is located within reach of the switchboard operator. The console comes equipped with a dial, 11 locking pickup buttons, and a mechanical release button (six more locking pickup buttons can be added by the installer). Depressing a pickup button applies a ground to its associated D lead operating the D relay of the associated 433A key telephone unit. The D relay connects the dial pulse contact into the CO line for dialing and dial off-normal contact across the customer transmission path to prevent dial clicks from reaching the customer equipment. After dialing is completed, the release button, when operated, will release the operated pickup button. A talking path has now been established.

3. INTERFACE REFERENCE DATA FOR CUSTOMER-PROVIDED EQUIPMENT

PHYSICAL

3.01 Electrical connection between the customer-provided equipment and the interconnecting unit is from an installer-provided connecting block. The customer is provided with two terminals for a talking pair, two terminals to connect an off-hook contact, and two terminals for ringing contact connections for each line connection.

INSERTION LOSS

3.02 The insertion loss of the 433A key telephone unit is a nominal 1 dB over the frequency range of 300 to 3000 Hz.

IMPEDANCE LEVEL

3.03 The input impedance of the 433A key telephone unit is essentially a 900-to-900 transformation of the impedance of the telephone line which varies from line to line and is frequency-dependent.

TRANSMISSION LEVELS

3.04 The 433A key telephone unit is designed to pass normal speech levels between customer-provided equipment and telephone company lines. The 433A key telephone unit contains a means to limit power levels. If the power into the coupler terminated in 900 ohms exceeds +3 dBm, a nonlinear limiting device is shunted across the line resulting in distortion of the voice signal.

DC SIGNALS

3.05 DC signals from the customer-provided equipment are blocked by a capacitor in the 433A key telephone unit.

3.06 The maximum dc voltage that can be applied across CT and CR is 100 volts measured at the customer connecting block.

CUSTOMER OFF-HOOK CONTACT

3.07 The maximum allowable loop resistance from the interconnecting service unit to the customer-provided off-hook contact is 200 ohms. The off-hook contact must be capable of switching a load at a maximum current of 0.5 ampere dc.

3.08 The maximum allowable leakage between the CS and CG leads and between each lead and ground is 20 kilohms when the customer-provided off-hook contact is open.

3.09 The CS lead, which is provided to the customer, will carry a maximum potential of 28 volts dc. When the customer-provided off-hook contact is closed, a ground applied on the CS lead operates a 915-ohm relay which is paralleled by a series-connected 150-mf capacitor and a 100-ohm resistor. The CG lead, which is provided to the customer, is at ground potential.

RINGING CONTACT AND LEAD LIMITS

3.10 The maximum current capacity of the R contact on the C1 and C2 leads is 0.5 ampere.

3.11 The R contact and associated telephone company wiring will have a nominal 5-ohm dc resistance when the contact is closed. This figure is based on not more than 100 feet of 24-gauge conductor loop between the interconnecting unit and the interface connecting block binding post.

3.12 The maximum peak voltage permissible across the C1 and C2 leads with the R contact open is 200 volts.

3.13 The R contact does not have a protection network associated with it.

4. TRAFFIC USAGE CIRCUIT CONTACT

4.01 The maximum current on the TU lead should not exceed 0.5 ampere.

4.02 The traffic usage circuit lead will have a nominal 5 ohms to power supply ground when the contact is closed. This figure is based on no more than 100 feet of 24-gauge conductor loop between the interconnecting unit and the interface connecting block binding post.

4.03 The traffic usage circuit contact does not have a protection network associated with it.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 The maximum dc current drain from the 28A1 power unit in a 516A key service unit at 26 volts is 265 mA.

1.02 The maximum allowable loop resistance from the interconnecting service unit to the console is 50 ohms.

1.03 The 516A key service unit, 433A key telephone unit, and console will operate over a temperature range of 0° to 55°C and a humidity range of from 5 to 95 percent.

1.04 This interconnection unit will operate over a temperature range from 0° to 55°C and a humidity range of from 5 to 95 percent.

2. FUNCTIONAL DESIGNATIONS

2.01 The functional meanings versus relay designation of the 433A key telephone unit are given in the following tabulation:

Relay	Functional Meaning
D	Dialing
S	Supervision
R	Ringing

3. FUNCTIONS

3.01 Provides voice frequency coupling to customer-provided equipment.

3.02 Provides a customer with a means to dial out on the CO lines.

3.03 Provides dc isolation to customer-provided equipment.

3.04 Limits excessive signals.

3.05 Provides a means to hold the Bell System line in the busy state.

4. CONNECTING CIRCUITS

4.01 The following are typical connecting circuits:

(a) Step-by-Step System, No. 1, 350A, 355A, and 366A Subscriber Line Circuit - SD-32133-01.

(b) Crossbar System No. 5 - Line , Link, and Marker Connector Control Circuit - SD-26030-01.

(c) Panel System Subscriber Line Circuit - SD-21712-01.

5. MANUFACTURING TESTING REQUIREMENTS

5.01 The manufacturing testing requirements are set forth in A-314077.

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