

APPLICATION NOTE

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Subject: REMOTE CONTROL OF THE TRP 8000 SERIES

The microprocessor control of the TRP 8000 series of HF Radio Communication Equipment makes it very well suited for remote control applications.

The equipment can be delivered with a special remote control option (denoted by an "R" in the type designation) allowing full control of all keyboard functions via the serial data interface terminals of the Control Unit. The equipment may be controlled from an additional Control Unit or a computer. A Communication Protocol manual is available, containing a detailed description of the software structure, intended for use by the designer of computer systems for supervision and control of TRP 8000 series equipment.

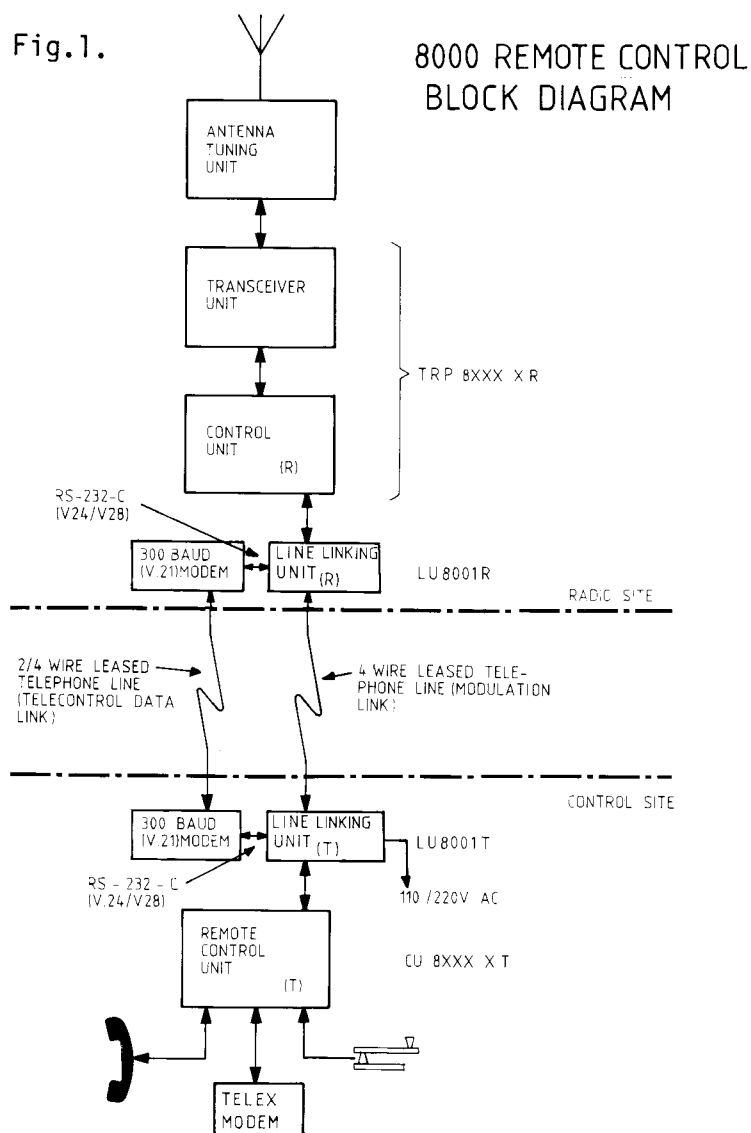
This Application Note describes remote control of the TRP 8000 equipment from an additional Control Unit making use of the Line Linking Units LU8001R and LU8001T.

General

The remote control system provides connection for audio signals as well as for keying signals and telecontrol data signals. The system supports all modes of operation of the radio equipment. Status signals including Signal Strength and Output Power information are transferred to the Remote Control Unit. The operator at the control site thus has a feeling of directly controlling the radio.

The Block Diagram in fig. 1 shows that the Control Units are interconnected by means of Line Linking Units: LU8001R at the radio site and LU8001T at the control site. The Line Linking Units in turn are connected to a set of 300 baud data modems which provide for the transfer of telecontrol data signals.

Fig.1.



The CU 8xxx xT Remote Control Unit is basically identical to the Control Unit of the radio equipment but contains special software.

The LU8001R Line Linking Unit at the radio site is powered from the radio equipment and may thus be operated from all supply voltages for which the radio equipment is designed. At the control site the Remote Control Unit is powered from the LU8001T which in turn is supplied from AC mains.

Fig. 2 and Fig. 3 show the mechanical outline of the Line Linking Units. They may be installed in standard 19 inch racks or used free-standing. All connections are made at the front.

The data modems are not supplied by SKANTI. The RS-232-C (V.24) compatible data interface in the Control Units allows any standard CCITT V.21 modem to be used. If connected to a leased telephone line, however, the modem must be type approved by the telephone company.

Operation

Operation of the Remote Control Unit is virtually identical to the operation of the local Control Unit. Errors in the data transmission are corrected by automatic retransmission. Failures on the data link are indicated by flashing of all display segments and annunciators.

When the Remote Control Unit is ON and in connection with the radio equipment, local operation is inhibited. When the Remote Control Unit is OFF, however, the equipment may be operated from the local Control Unit.

Installation

The Installation Wiring Diagrams in fig. 4 and fig. 5 shows the necessary interconnections between Control Unit, Line Linking Unit and data modem at

the radio site and the control site respectively. All connectors listed in the tables are supplied with the units. Cable is not supplied.

After the installation each Line Linking Unit should be adjusted for Line Loss Compensation. A 0 dBm, 1 kHz tone is applied to the Test Input terminals and Line Loss Compensation is adjusted in the opposite end of the Link for an AC voltage of 0.775 V at the Test Output terminals there.

Radiotelex

The TRP 8000 series radio equipment is designed for telex operation based on an external radiotelex modem. The frequency shift keying normally used in HF radiotelex operation is effected by applying audio signals to the input of the single sideband transmitter from the radiotelex modulator and by applying the receiver signals as audio signals to the demodulator.

In the remote control system the radiotelex modem is intended to be connected to the Control Unit situated at the control site. The audio signals are transferred over the modulation link via the Line Linking Units.

The serial interface in CU 8xxx xT may be utilized for remote frequency control from the radiotelex equipment in the same way as with the standard equipment. In this case the configuration PROM must be preprogrammed to enable MARITEX or AUTO-TELEX.

In TELEX mode the keying signal for the transmitter is transferred either via the data link or via the modulation link dependent on the setting of the "second function" PRESET bit 0 (280) in the Control Units:

- 0: Data Link Keying
- 1: Modulation Link Keying.

Data Link Keying allows the full modulation frequency range to be transferred via the Line Linking Units, but the keying delay is approx. 70 ms.

Fig.2. ELECTRICAL INSTALLATION OF LU 8001 R

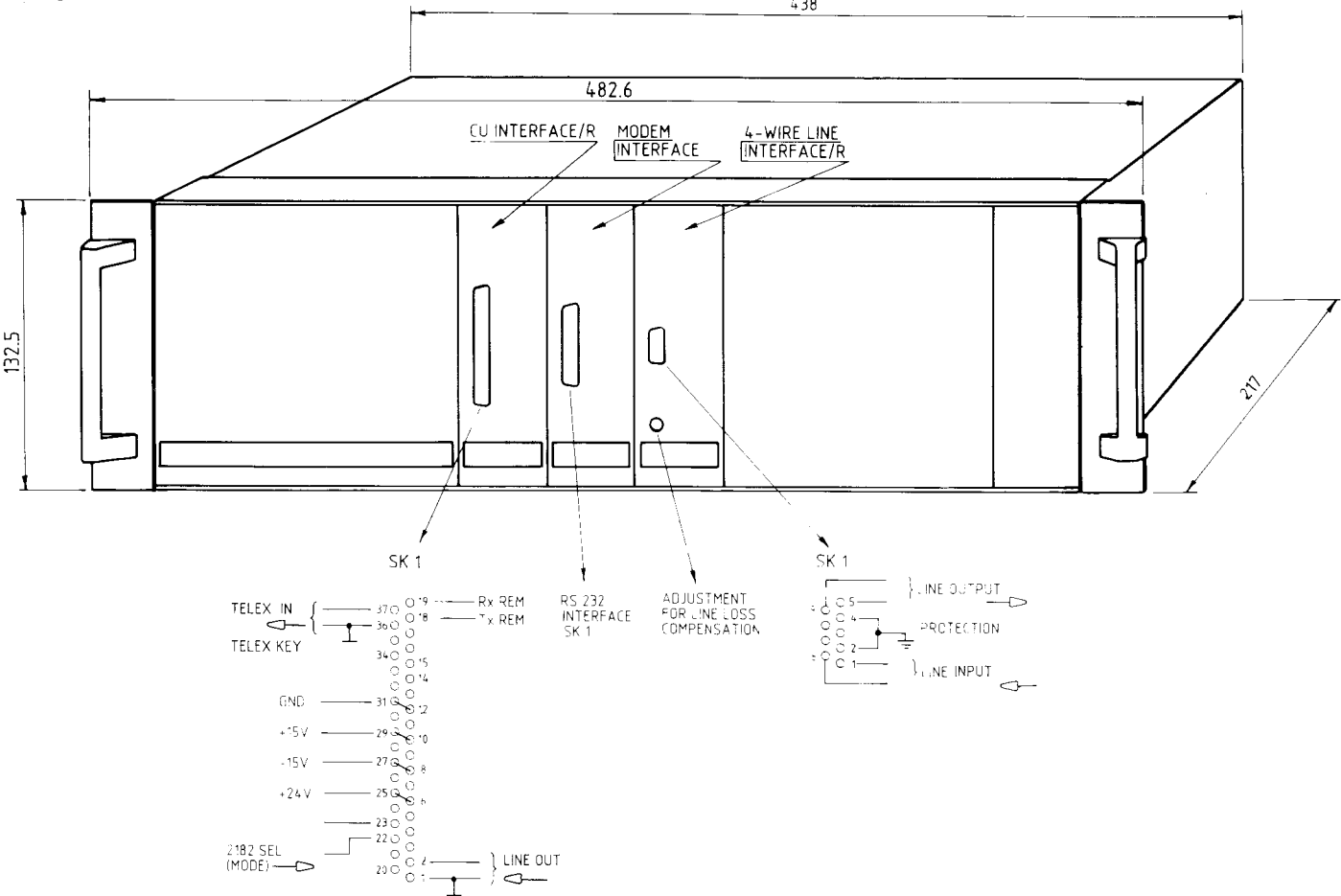


Fig.3. ELECTRICAL INSTALLATION OF LU 8001 T

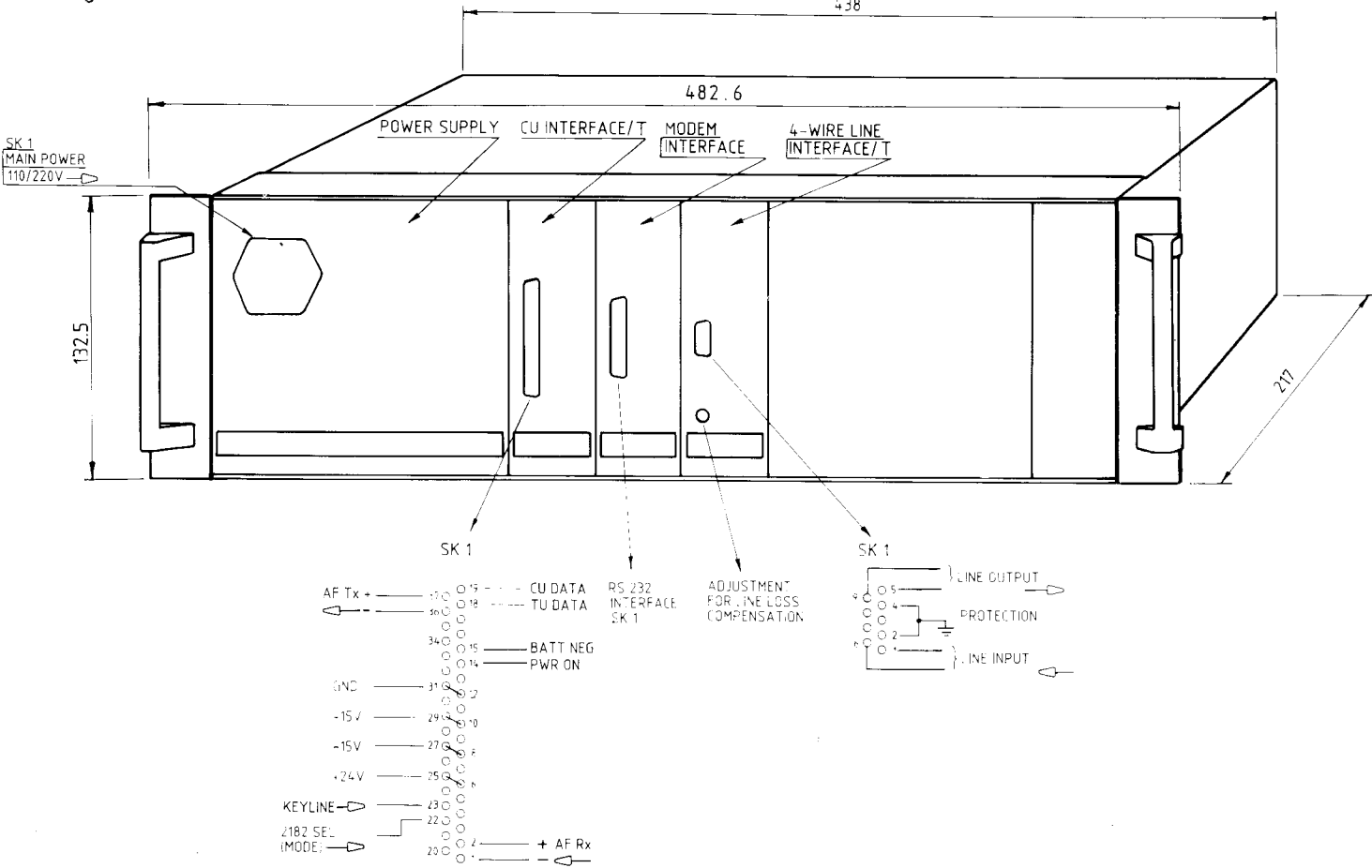
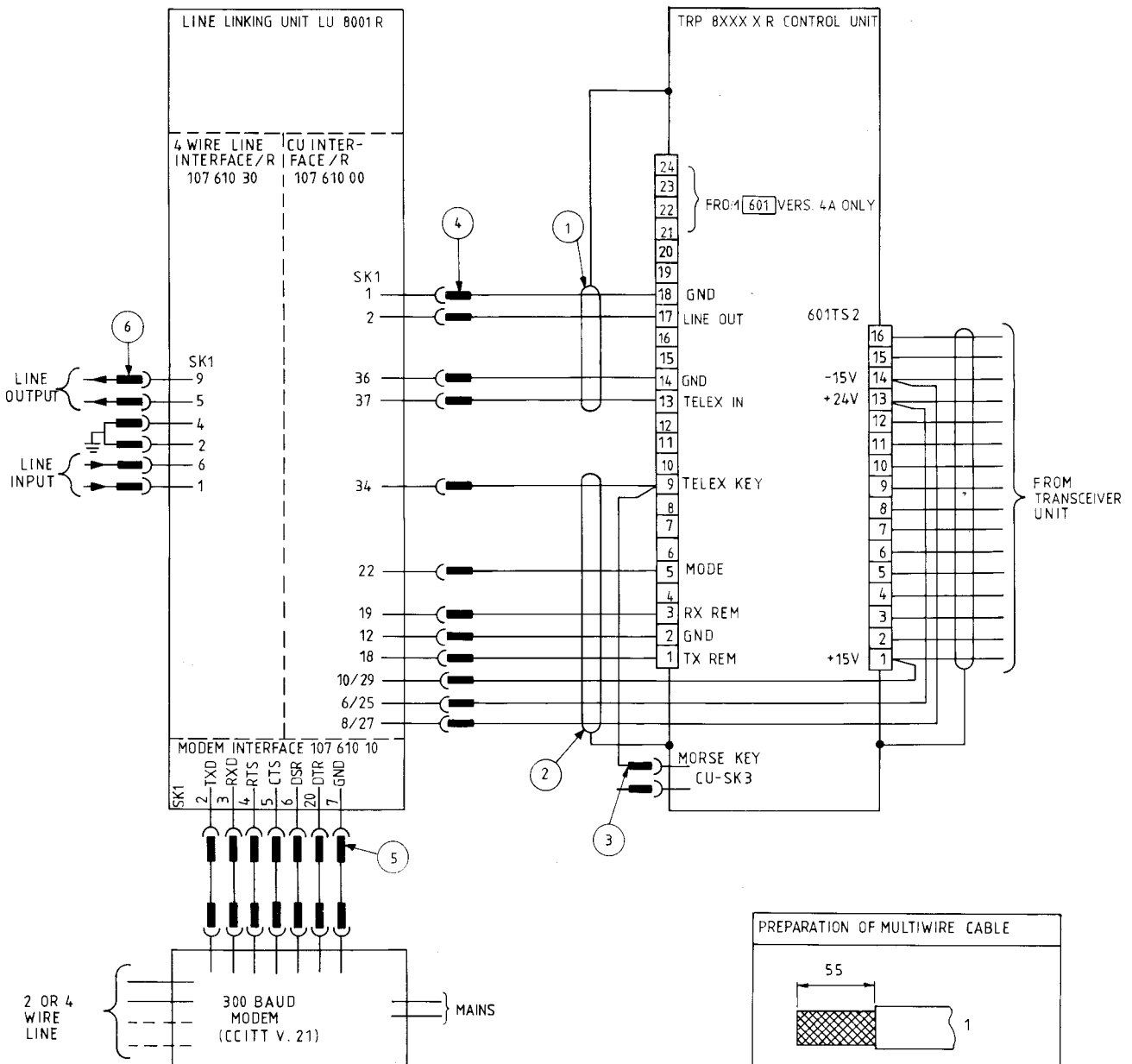


Fig.4. INSTALLATION WIRING DIAGRAM FOR LINE LINKING UNIT LU 8001R



POS.	CONNECTORS AND CABLE TYPES
1	SCREENED MULTIWIRED CABLE 4x0.25mm Sq
2	SCREENED MULTIWIRED CABLE 8x0.25mm Sq
3	2-POLE JACK PLUG ø 6.35mm
4	37-POLE D-TYPE CONNECTOR
5	25-POLE D-TYPE CONNECTOR
6	9-POLE D-TYPE CONNECTOR

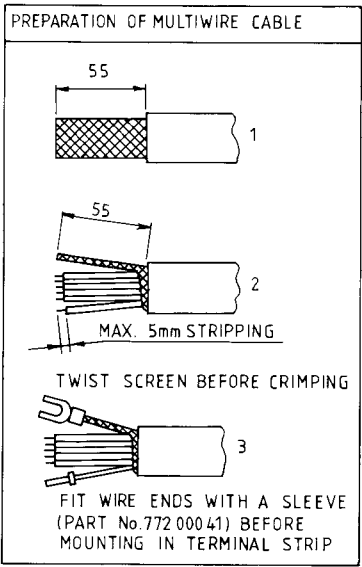
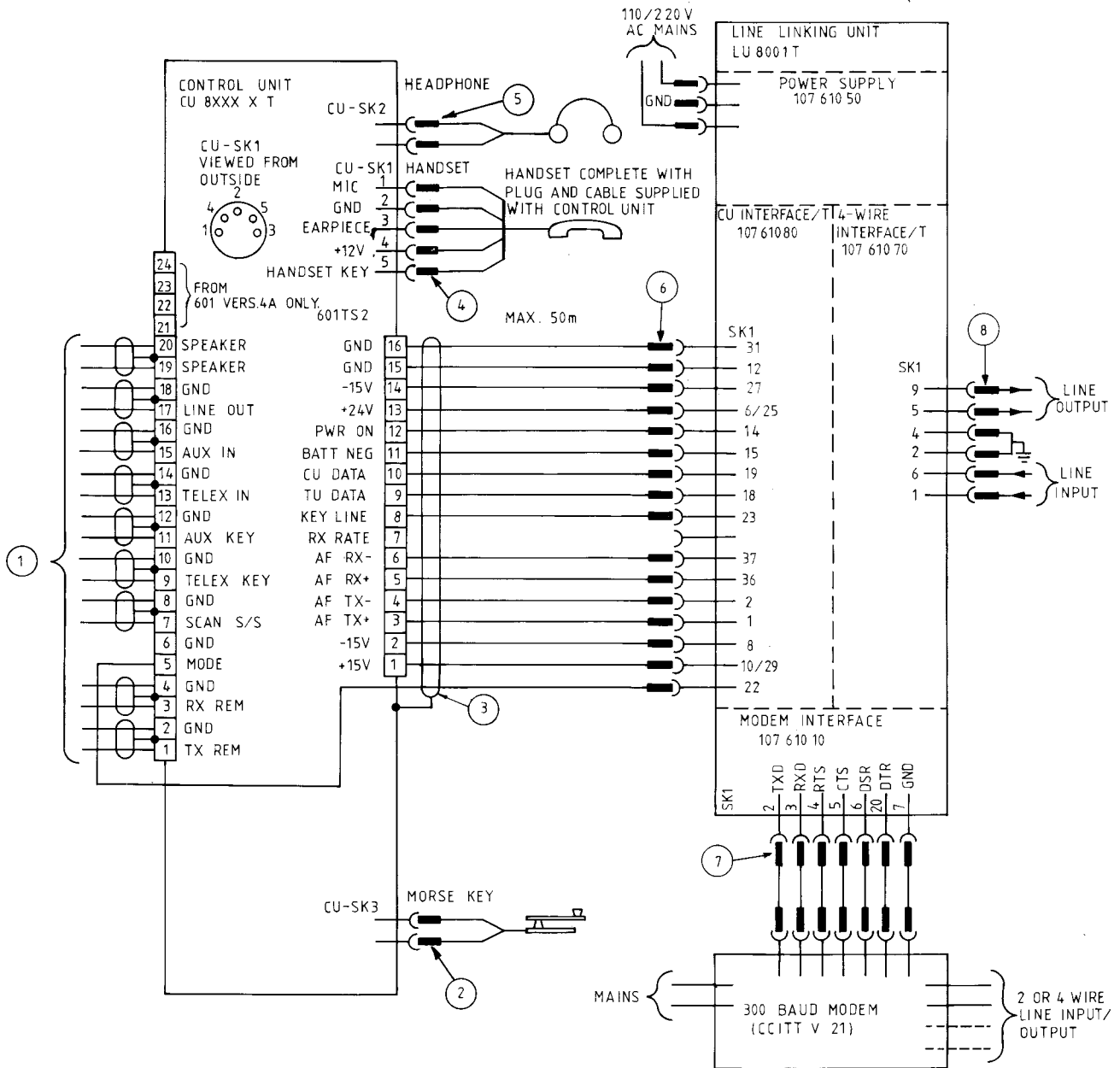
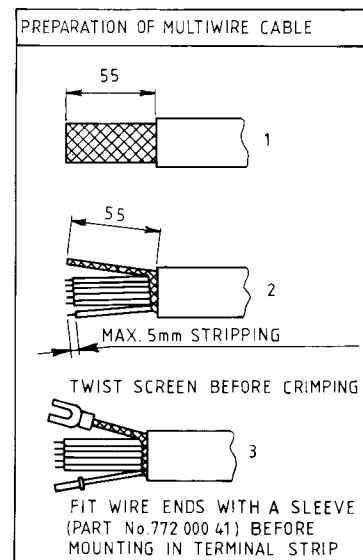


Fig.5. INSTALLATION WIRING DIAGRAM FOR CU 8XXX X T AND LU 8001 T



POS.	CONNECTORS AND CABLE TYPES
1	SCREENED CABLE 2x0.25-2x1.5mm Sq *
2	2-POLE JACK PLUG \varnothing 6.35
3	SCREENED MULTIWIRE CABLE 15x0.25mm Sq
4	5-POLE CONNECTOR (DIN 41524)
5	2 OR 3-POLE JACK PLUG \varnothing 6.35
6	37-POLE D-TYPE CONNECTOR
7	25-POLE D-TYPE CONNECTOR
8	9-POLE D-TYPE CONNECTOR
	* MULTIWIRE CABLE MAY BE USED IF CONVENIENT



Modulation Link Keying is faster and is used in case of ARQ telex operation. The modulation frequencies in this case must be above 1400 Hz.

ARQ telex operation is possible in remote configuration, but dependent on the delay of the interconnecting media. In ARQ systems designed in accordance with CCIR Rec. 476 (SITOR) the acknowledge signal must be received within a fixed time frame, which limits the total propagation delay, including the delays of radio link and the system delays in both ends of the link.

Radio distances of up to 21000 km are possible, allowing world wide communication, provided system delays in both ends are kept below 12 ms. The insertion of a telephone line in one end of the link increases the system delay, whereby the maximum possible radio distance decreases. The maximum radio distance in ARQ operation may be estimated roughly as

$$(70 - tg) \times 300 \text{ km,}$$

where tg signifies the group delay in milliseconds of the interconnecting link between the Line Linking Units.

Link Requirements

The equipment at the radio site and the control site may be connected via leased telephone lines or by similar quality interconnecting means. It should be noted that in case of leased telephone lines, use of the Line Linking Units must be approved by the local telephone company just as the data modems must be type approved.

The Line Linking Units are interconnected by a 4-wire connection and the modems by a 2 or 4-wire connection, determined by the modems used.

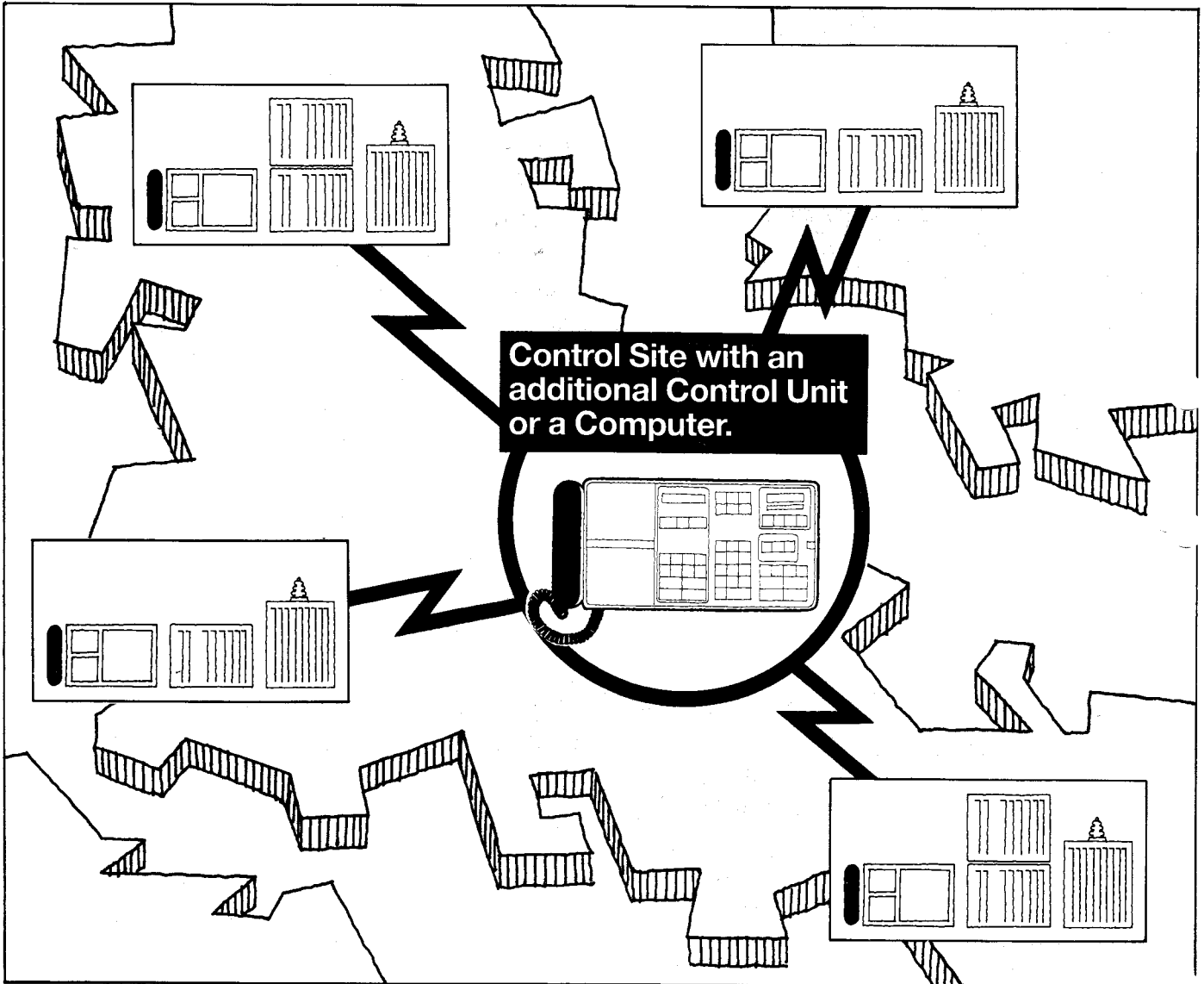
The connection between the Line Linking Units carries the modulation signals and the quality of the radio transmission and reception cannot be better than determined by this link.

Signal to noise ratio on the link should be better than 40 dB not to degrade the performance of the radio equipment appreciably.

In the telegraphy modes the keying signal is transferred via the modulation link as 605/725 Hz tone signals, generated and detected by the Line Linking Units. In systems comprising ARQ telex operation, delay of the keying signal relative to the modulation signal is critical, for which reason special quality lines with low group delay distortion are necessary (CCITT Rec. M.1020).

TRP 8000

REMOTE CONTROL SYSTEM



New Possibilities with SKANTI TRP 8000

If for topography, security, operational or environmental reasons the control system of your radio communications cannot be placed within 100 metres of the antenna site, the flexibility offered by the SKANTI TRP 8000 Remote Control System should be considered.

The system is based on the field proven, SKANTI TRP 8000 Series of Radio Communication Equipment with the standard operating functions intact, the additional facilities for remote operations being enabled by software modifications.

The Functions

In the remote system configuration the Control Units are interconnected via Line Linking Units and modems transmitting and receiving

both communication signals, and command and status messages, respectively.

Remote control is carried out via ordinary, leased telephone lines or similar quality interconnecting means.

The Line Linking Units can operate in both the Simplex and the Duplex Mode and may be used for telephony, telegraphy, and telex.

ARQ telex operation is possible in the remote configuration, although dependent on the delay of the interconnecting media.

As an additional Control Unit is supplied, a total radio system is available at the antenna site, and may function independently of the Remote Control Unit at the control site.

Both Control Units indicate the status of the equipment in real time.

