

NAVSHIPS 0967-284-5010

**COMBINED
TECHNICAL MANUAL
FOR
TELETYPE MODIFICATION KITS (U)
TT-187A/UG AND TT-187B/UG
TT-176/UG SERIES
TT-47/48/69/70/UG SERIES
AN/UGC-20
AN/UGC-6/16/UG SERIES
SB-3176/UGQ**

**DEPARTMENT OF THE NAVY
NAVAL ELECTRONICS SYSTEM COMMAND**

NAVSHIPS 0967-284-5020

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TECHNICAL MANUAL

for

**NORMAL INPUT KEYING
TELETYPE MODIFICATION KITS (U)**

TT-187A/UG AND TT-187B/UG

**DEPARTMENT OF THE NAVY
NAVAL ELECTRONICS SYSTEM COMMAND**

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18 November 1967

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FOREWORD

This technical manual was prepared to MIL-M-15071E by PRC Technical Applications Inc. San Diego, California under contract N0022868C0118 for the San Francisco Bay Naval Shipyard, San Francisco, California.

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SECTION I
GENERAL DESCRIPTION

1.1 SCOPE

This technical manual provides a description of procedures for installing, operating, troubleshooting, and maintenance for the Normal Input Keying Teletype Modification Kit (NIK) for the TT-187A/UG and TT-187B/UG Transmitter-Distributors.

1.2 GENERAL INFORMATION

1. The Normal Input Keying Teletype Modification Kit was designed and manufactured by the San Francisco Bay Naval Shipyard, San Francisco, California.
2. It provides machine to machine interface between the TT-187A/UG and TT-187B/UG Transmitter-Distributor and the associated cryptographic system. The TT-187A/UG Transmitter-Distributor is shown in Figure 1.1. The NIK modification kit is shown in Figure 1.2.
3. The modifications are performed at the equipment site by field personnel. A list of tools required to perform the modification, a list of parts in the modification kit, and complete instructions for the installation of the kit are outlined in this manual.

1.3 ASSOCIATED EQUIPMENT REQUIREMENTS

The unit value of certain components in the NIK modification kit depends upon the system configuration. Read the instructions for the following configurations carefully before installing the NIK modification kit on the TT-187A/UG and TT-187B/UG Transmitter-Distributors.

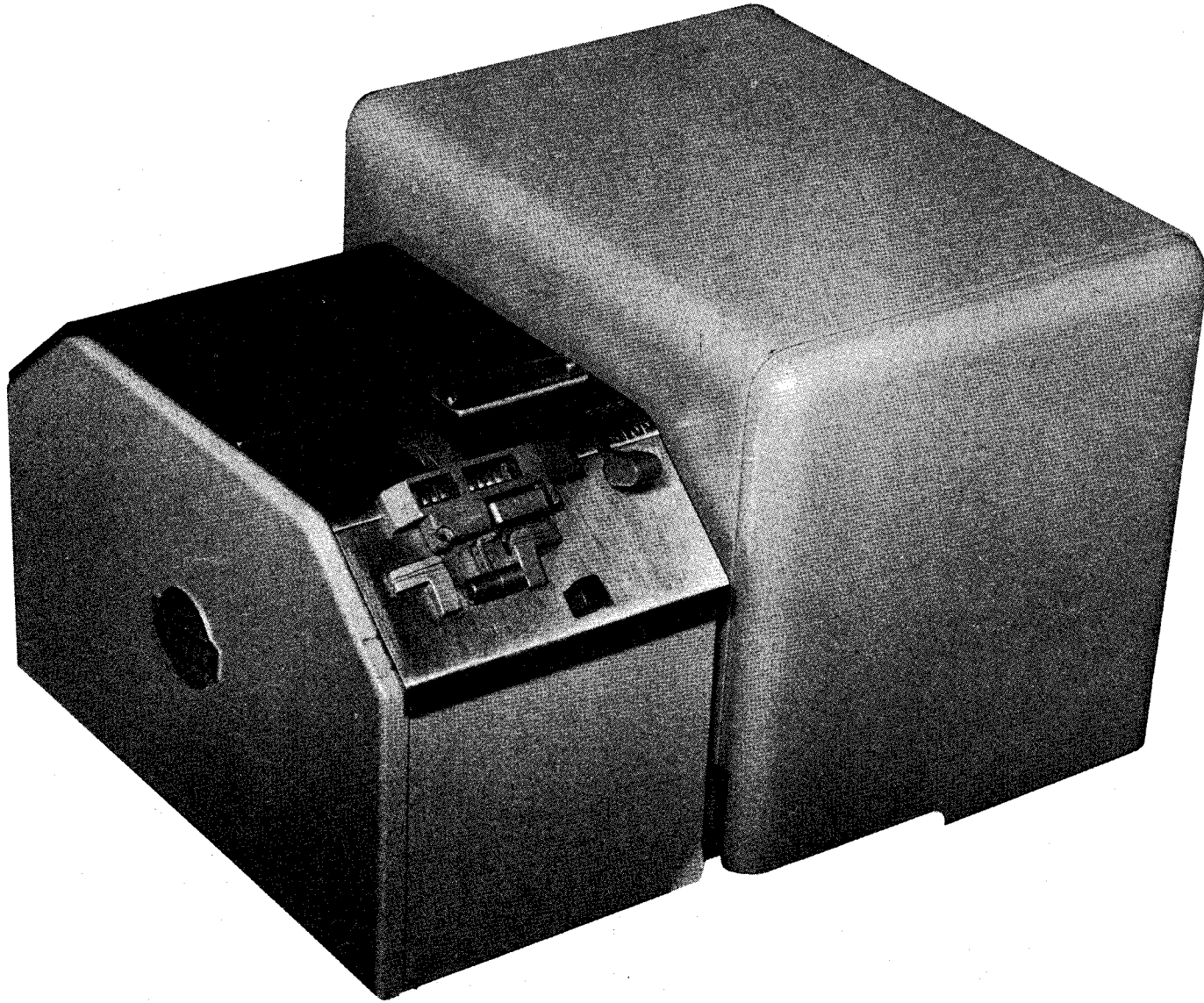


Figure 1.1 TT-187A/UG Transmitter-Distributor

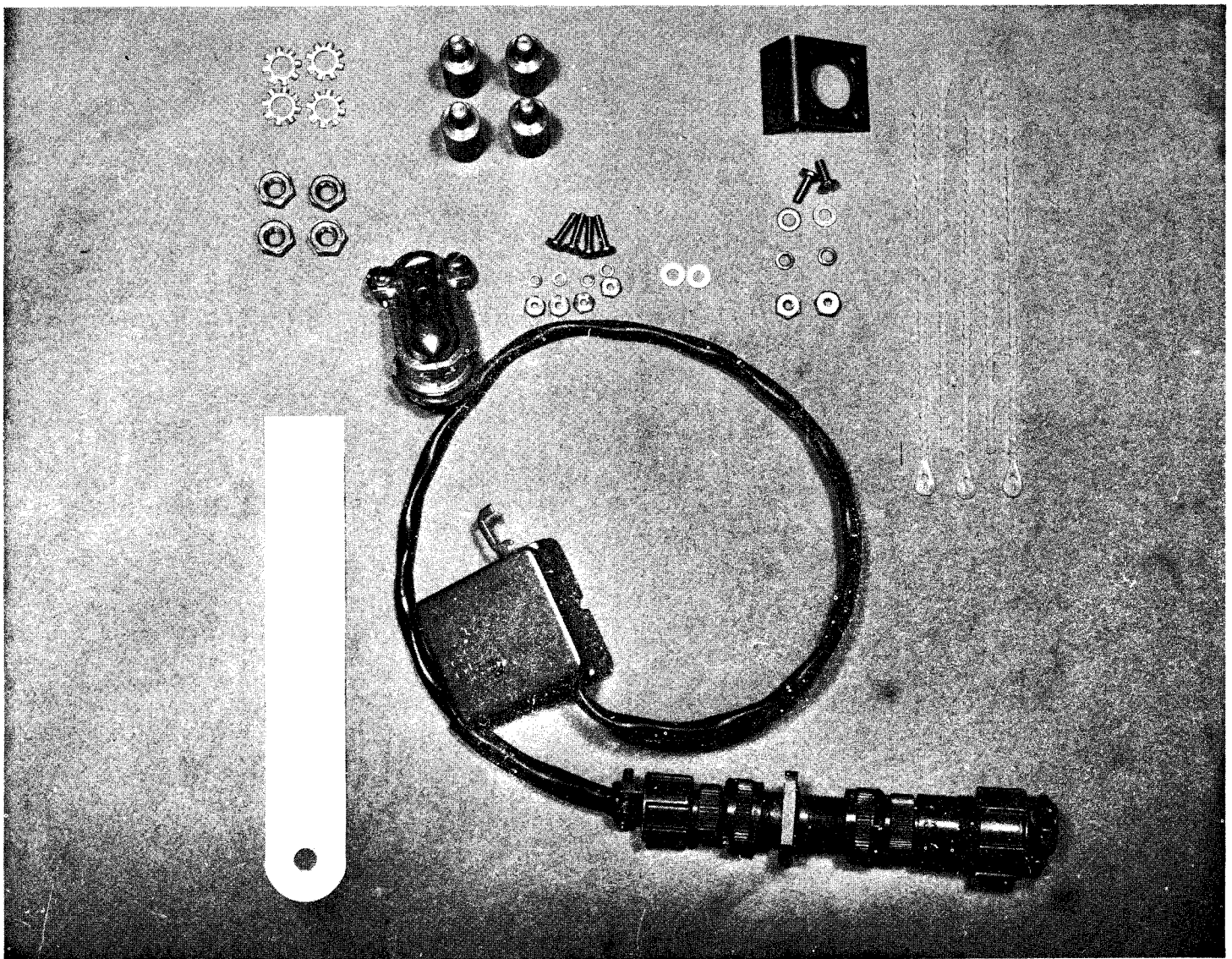


Figure 1.2 TT-187A/UG and TT-187B/UG NIK Modification Kit

1.3.1 System Configuration: TT-187A/UG and TT-187B/UG and KW-7/TSEC (MOD 13 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the two carbon 1K ohm resistors in the contact box supplied with the NIK modification kit and install two 4.7K ohm resistors (not furnished) in their place. Connect a 50V 0.01 uf capacitor across the input cable leads at the terminals where the two resistors are connected.

1.3.2 System Configuration: TT-187A/UG and TT-187B/UG and KW-26/TSEC (MOD 14 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the two carbon 1K ohm resistors in the contact box supplied with the NIK modification kit and install wire straps across the terminals where the resistors were installed. (Wire straps are not provided.)

1.3.3 System Configuration: TT-187A/UG and TT-187B/UG KW-7/TSEC (MOD 13 Installed), KW-26/TSEC (MOD 14 Installed), with SB-3176/UGQ Patch Panel

1. Remove the two carbon 1K ohm resistors in the contact box supplied with the NIK modification kit and install wire straps across the terminals where the resistors were installed. (Wire straps are not provided.)
2. Install the encapsulated filter network in the SB-3176/UGQ Patch Panel as directed in the SB-3176/UGQ Installation Manual.

NOTE

The encapsulated filter network must be installed in the SB-3176/UGQ Patch Panel whenever a KW-7/TSEC cryptographic device is used.

1.3.4 System Configuration: TT-187A/UG and TT-187B/UG and KW-7/TSEC (MOD 13 Installed), KW-26/TSEC (MOD 14 Not Installed), with SB-3176/UGQ Patch Panel.

Install the NIK modification kit as directed in the installation procedures, Section II.

1.3.5 All System Configurations Using the SB-3176/UGQ Patch Panel

1. Read the appropriate section of the KAM-85/TSEC for pre-conditions required prior to connecting the KW-26/TSEC to the (NIK) normal input keying system.
2. Read the appropriate section of the KAM-143/TSEC for pre-conditions required prior to connecting the KW-7/TSEC to the (NIK) normal input keying system.

NOTE

In all cases when using the SB-3176/UGQ Patch Panel, the encapsulated filter network must be installed at the SB-3176/UGQ Patch Panel where the KW-7/TSEC (J8 loop-in) cable connects.

1.4 PHYSICAL CHARACTERISTICS

Table 1.1 lists the major parts contained in the NIK modification kit.

1.5 ELECTRICAL CHARACTERISTICS

Refer to KAM-85/TSEC and KAM-143/TSEC for Electrical Characteristics of Normal Input Keying.

1.6 REFERENCE DATA

1.6.1 Weight Change Due To Modification

The modifications are estimated to have added less than one pound of weight to the TT-187A/UG and TT-187B/UG Transmitter-Distributors.

Table 1.1 TT-187A/UG and TT-187B/UG Modification Kits

Item	Quantity	Part
1	1	Contact box cable assembly with connectors MS3106A-10SL-3S, TBF-10SL-3PS, and MS3106A-10SL-3P
2	1	Bracket
3	1	90 ^o Box connector
4	4	1/4" x 1" Mounting studs
5	4	1/4" Star washers
6	4	1/4" x 20 Hex nuts
7	2	6-32 x 3/8" BH screws
8	2	6-32 Split lock washers
9	2	6-32 Hex nuts with flat washers
10	4	4-40 x 1/2" BH screws, hex nuts, and split lock washers
11	5	Plastic cable ties
12	1	Ground strap
13	1	Decal

1.6.2 Dimension Changes Due To Modifications

The modifications increased the depth of the chassis approximately one inch with the external cable disconnected, and increased the space required behind the chassis by approximately four inches with the external cable in place. The height was increased one inch due to the mounting studs.

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SECTION II
INSTALLATION

2.1 GENERAL

This section contains detailed steps for removal of components no longer used, and installation of new components to the TT-187A/UG and TT-187B/UG Transmitter-Distributors. Figures 2.1 through 2.6, shows a TT-187A/UG before and after the modification. Figure 2.7 and 2.8 shows the installation drawings.

2.2 REMOVAL OF REPLACED COMPONENTS

Perform the following steps in the order listed. The tools required for the modification are listed in Table 2.1.

1. Secure ac power and dc (signal) line current.
2. Lift the large cover and remove from chassis.
3. Remove the small cover by pulling in a forward direction.
4. Lift off the stainless steel cover plate.
5. Remove the plastic cable clamp at the back of the chassis next to the power ON-OFF switch.
6. Remove the 115 vac input wires from terminals 7 and 9 on the lower terminal board.
7. Remove the dc signal line cable from terminal 1 and 2 on the upper terminal board.
8. Remove unit if bolted to foundation.

2.3 REMOVAL OF OLD CONTACT BOX

1. Remove the cover from the contact box. Remove or cut the two wires and pull cable from contact box.

Table 2.1 Tools Required

Quantity	Item
1	1/4 inch electric drill
1	3/8 inch electric drill
4	Bits, 3/8 inch, 1/4 inch, 1/8 inch and No. 27
2	Screwdrivers, medium and small
3	Open end wrenches, 7/16 inch, 5/16 inch, 1/4 inch and 3/8 inch
1	6' Tape measure
1 roll	Plastic insulation tape
1	Side cutter
1	Wire stripper
1 roll	Resin core solder
1	Soldering iron
1	Wire brush, small
1	Center punch
1	Hammer
2	Chassis hole cutters, 1 inch and 7/8 inch
1	Round file, 3/16 inch
1 set	Wire feeler gauges

2. Tape the two wires so that there is no possibility of making an electrical contact with any other metal part.
3. Re-locate the end of the cable so that it will not interfere with normal operation of the equipment.
4. Disconnect the end of the link spring nearest the contact box. Do not discard the spring.
5. Remove the two screws holding the contact box. Remove the old contact box and retain the two screws.
6. Tape the eccentric adjusting screw in position.

2.4 INSTALLATION OF THE MODIFICATION KIT

Use caution during the installation of the modification kit, by not misaligning any mechanical assembly or stretching wire in the cable harness.

2.4.1 Installation of the Mounting Studs and Connector

1. Remove the three base screws holding the shock mounts and separate the chassis assembly from the bottom plate.
2. Remove the four rubber foot assemblies (36148) and replace with the four one-inch studs (item 36) and star washers (item 37) in the kit. Enlarge the mounting holes to 1/4 inch with the round file as required. Pass one of the supporting bolts through the 1/4 inch hole in the ground strap (if required). The other end of the ground strap (item 41) must be drilled and bolted to the metal supporting table or foundation.

2.4.2 Installation of Box Connector

1. Locate a point on the base plate 2 7/8 inches (see drawing Figure 2.7) toward the center and directly behind the (removed) plastic cable clamp. (Drill a pilot hole for the chassis hole cutter.)

2. Cut a 7/8 inch hole in the baseplate with the chassis hole cutter or hole saw.
3. Mount the 90⁰ box connector (item 40) so that the cable enters below the base plate and from the rear.
4. Locate the bracket (item 4) on the chassis, so that the vertical side (connector opening) faces the rear and is back 1/8 inch from the chassis edge. Center the bracket exactly over the spot where the plastic cable clamp was located. Mark the mounting holes for drilling.

NOTE

The connector (item 5), when mounted in the bracket, must fit into the cut-out slot in the rear of the cover. Elongated holes are provided for lateral adjustment of the bracket.

5. Drill the two mounting holes with a #27 drill bit. Temporarily move the terminal board if necessary to obtain clearance for the drill motor.
6. Mount the bracket in position with two 6-32 screws, split lock, and flat washers and nuts (items 42, 43, 52, and 53). Do not fully secure screws.
7. Position the chassis over the base plate and re-fasten the screws on the three rubber shock mounts.

2.4.3 Installation of Cable Connectors

1. Insert the connector TBF-10SL-3PS (item 5) into the bracket from the outside with the key way up and with the female end facing the outside.
2. Bolt the TBF connector in the bracket using four 4-40 x 1/2 inch screws (item 14), with split lock washers (item 16) under the nuts (item 15). Place nuts on the inside position.

3. Temporarily place the cover in position. Align the bracket (side-to-side) so that the connector is centered in the slot in the cover. Remove the cover and secure the two-screws holding the bracket to the chassis.

2.4.4 Installation of the New Contact Box

1. Remove the tape holding the eccentric screw in position. Place the new contact box (item 10) and link into position and using the mounting screws retained from the old contact box, secure friction tight.
2. Re-install the link-spring (86304) on the link (156644) (item 34) near the contact box.
3. Place the cable (item 21) in position as shown on the drawing (Figure 2.7) and mate the connector (item 3) with the TBF connector on the bracket. Tye the cable to the metal strap using the plastic cable ties (item 44) in the modification kit.
4. Install power cable in the box connector and connect to appropriate terminals on lower terminal board. Ground third wire or shield in power cable.

CAUTION

Dress all cables away from the motor gears and moving parts.

5. Use a vacuum cleaner to remove chips, filings, et cetera before turning on power.
6. Using standard procedures, make up a two-wire shielded cable to carry the signal from the connector just installed to the SB-3176/UGQ Patch Panel, in accordance with NAVSHIPS 0967-284-5070.

NOTE

The alignment procedures in Section V, (Maintenance) must be performed before the equipment can be operated.

7. Install all covers that were removed for the installation of the modification kit.
8. Install decal where visible to operator.

2.5 ADDITIONAL REQUIREMENTS

The modification of the TT-187A/UG and TT-187B/UG Transmitter-Distributors with the NIK modification kit, requires that the equipment listed below be modified before being used with the NIK modified equipment.

2.5.1 KW-7/TSEC

MOD 13 must be installed prior to NIK installation.

2.5.2 KW-26/TSEC

MOD 14 must be installed prior to NIK installation.

2.5.3 SB-1210/UGQ Patch Panel

The SB-1210/UGQ must be strapped for remote battery prior to NIK installation. See NAVSHIPS 95718.

2.5.4 Removal of KWL-4/TSEC Unit and Installation of Dummy Connector

The KWL-4 unit and its associated cables must be removed, prior to NIK installation. Proceed as follows.

1. Remove the KWL-4 unit and its associated cables.
2. Using standard procedures, make up two dummy connectors for J~~4~~3 and J7 on the KWF-1/TSEC rack. Wire strap pins B and C together on each of the connectors and install.

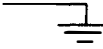
3. Using standard procedures, make up a shielded two-wire cable and connect from the SB-3176/UGQ Patch Panel to J8 on KWF-1. See Table 2.2 for cable connections. Use connector type MS3116E-14-5S (connector not furnished).

Table 2.2 J8 of KWF-1 to SB-3176/UGQ Cable Connections

KWF-1 J8 Pins	SB-3176/UGQ Patch Panel Conn. Pins
B	B
C	C
A	D

4. Using standard procedures, make up a shielded two-wire cable and connect from the SB-1210/UGQ Patch Panel to J4 on KWF-1. See Table 2.3 for cable connections. Use connector type MS3116E-14-5PW (connector not furnished).

Table 2.3 J3 of KWF-1 to SB-1210/UGQ Cable Connections

KWF-1 J4 Pins	SB-1210/UGQ Patch Panel Conn. Pins
C	1 (3) (5) etc.
D	2 (4) (6) etc.
A	

2.5.5 Typical Cryptographic System

Figure 2.9 shows a typical cryptographic system using the TT-187A/UG and TT-187B/UG transmitter-distributors.

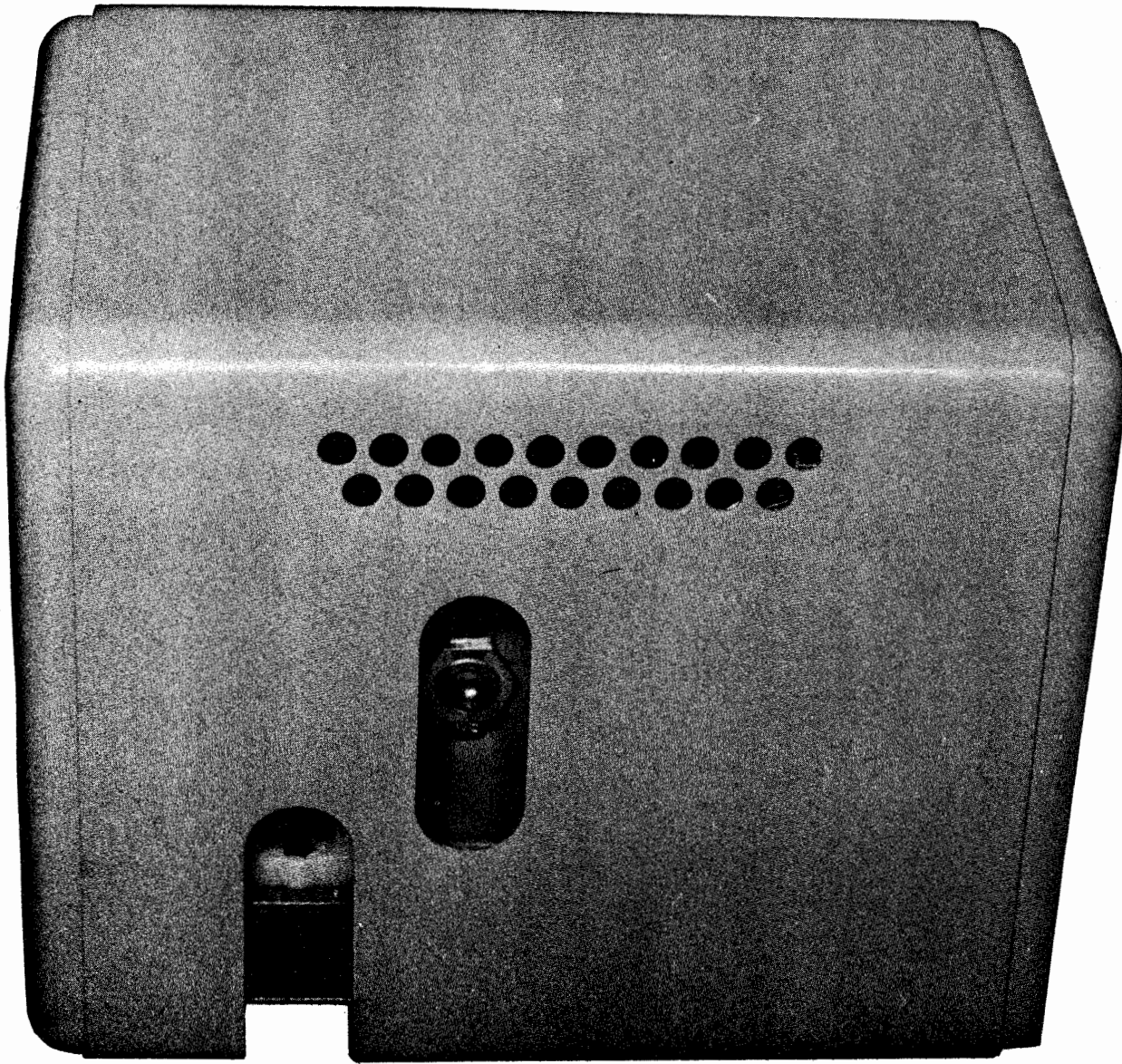


Figure 2.1 Rear View of TT-187A/UG Before Modification



Figure 2.2 Rear View of TT-187A/UG After Modification

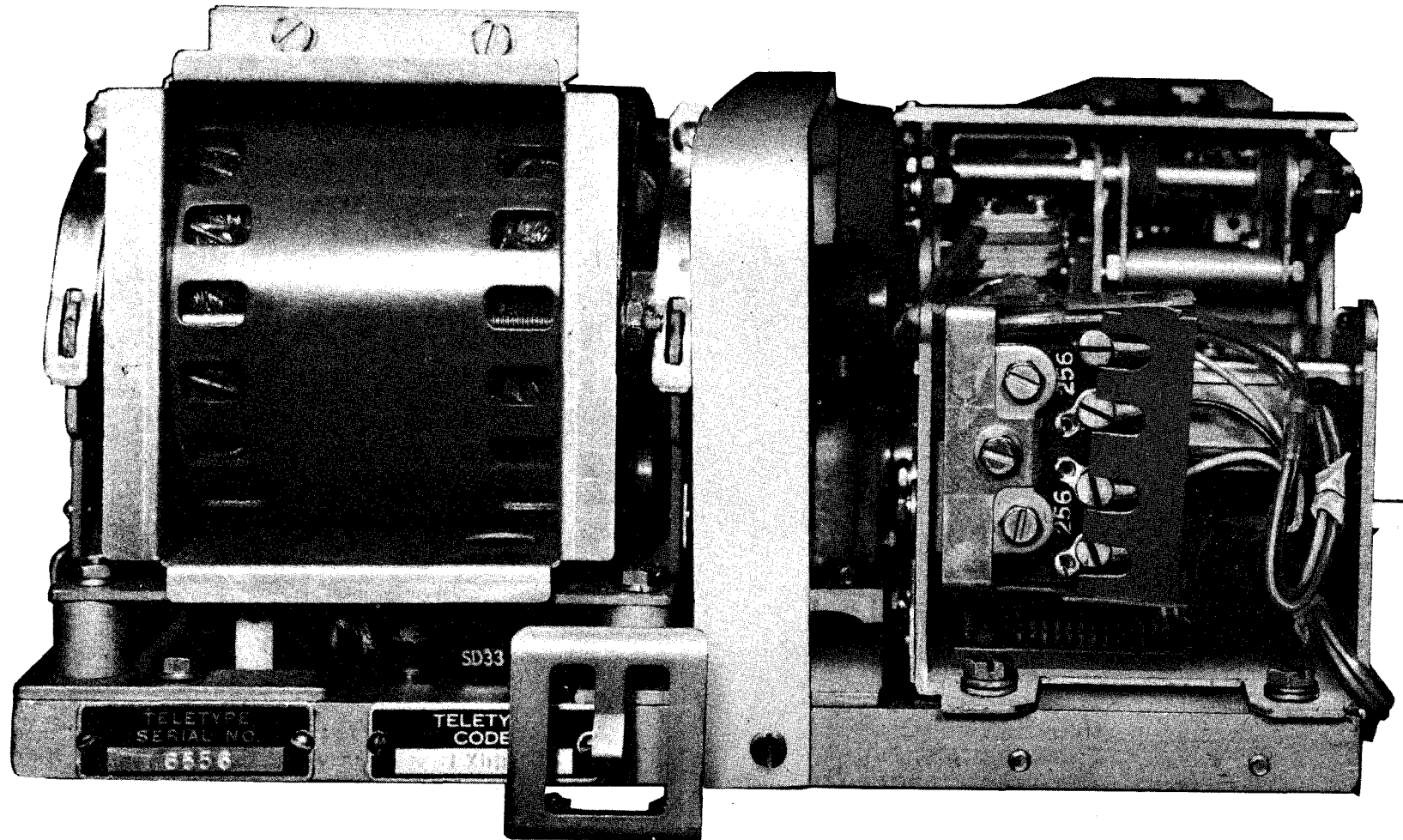


Figure 2.3 Side View of TT-187A/UG Before Modification

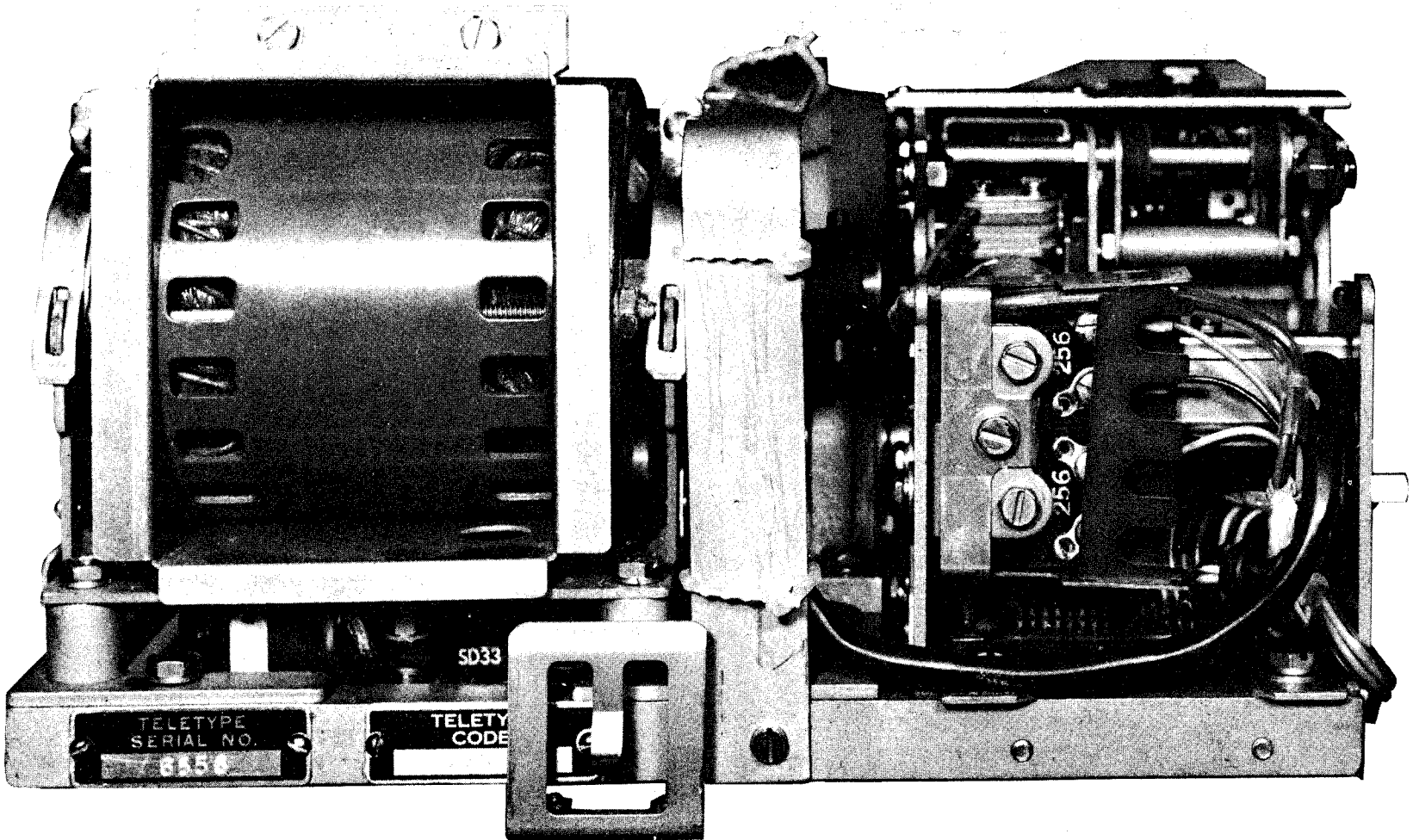


Figure 2.4 Side View of TT-187A/UG After Modification

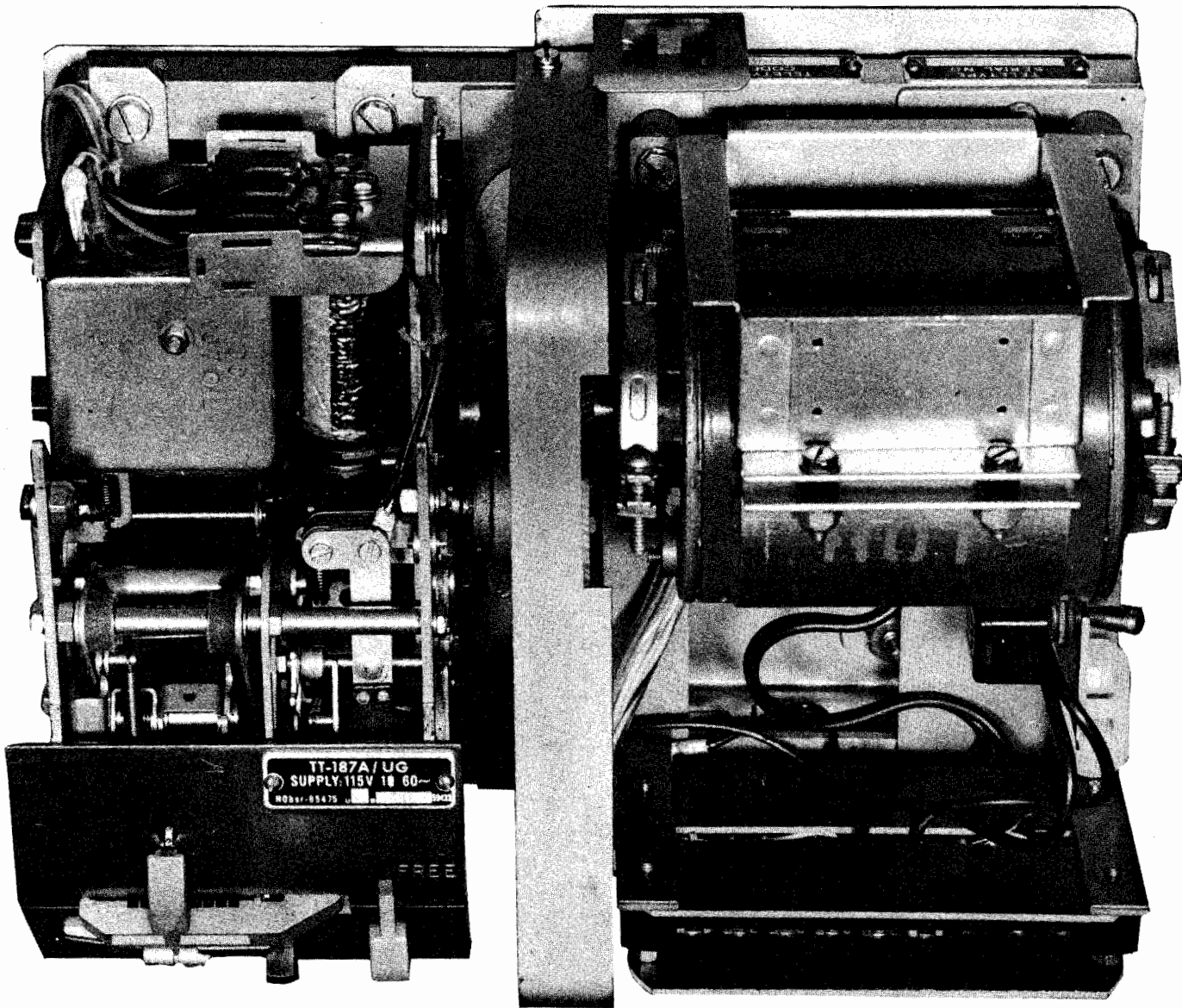


Figure 2.5 Top View of TT-187A/UG Before Modification

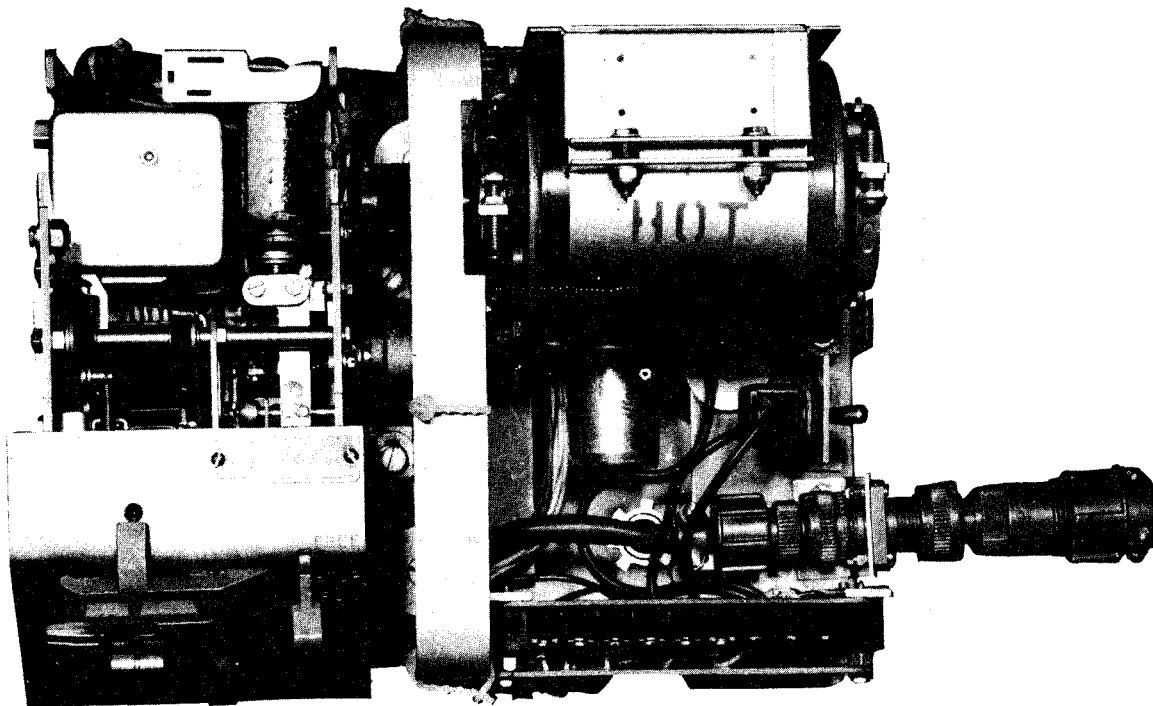


Figure 2.6 Top View of TT-187A/UG After Modification

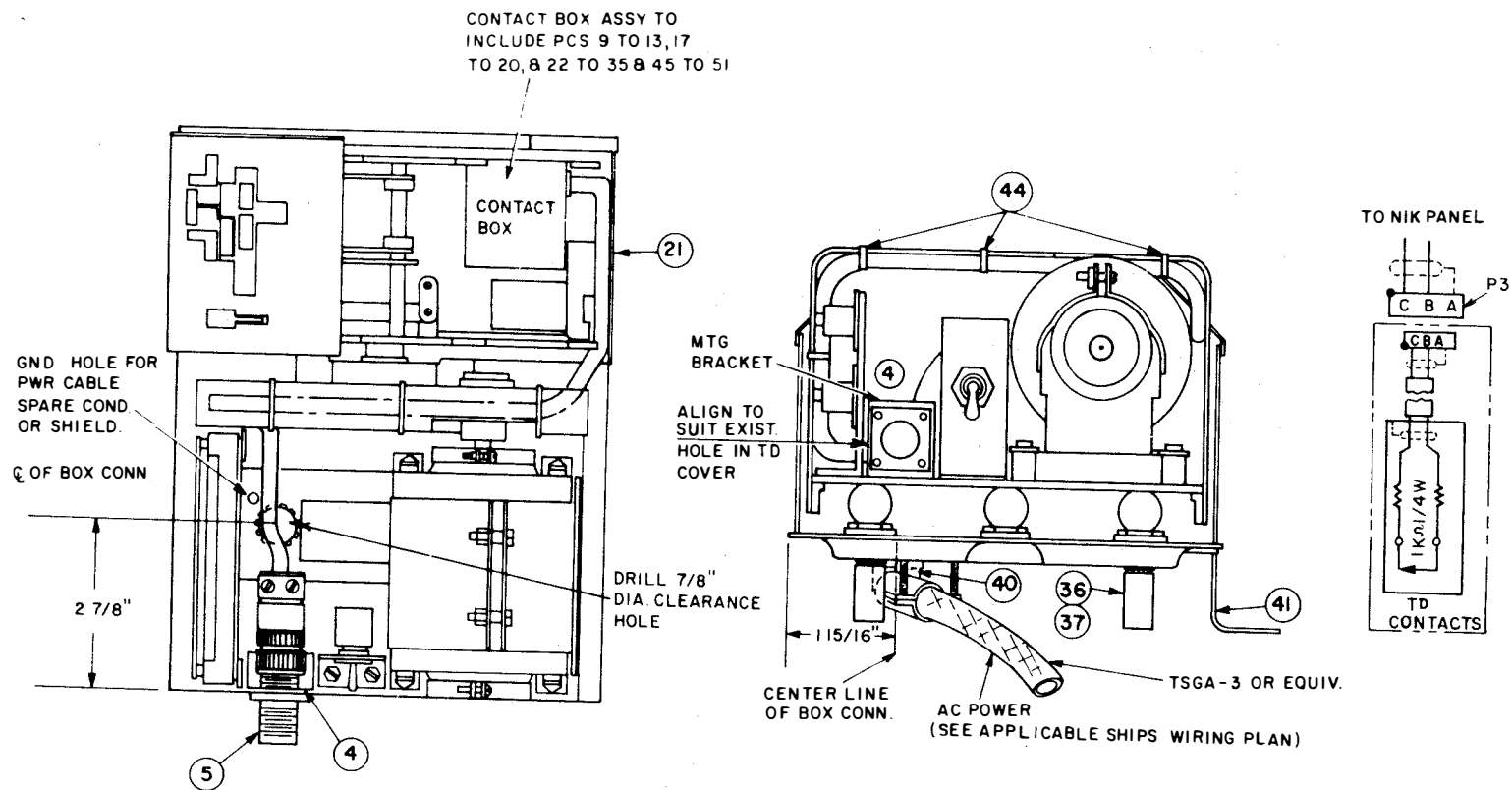


Figure 2.7 TT-187A/UG and TT-187B/UG Installation Drawing (Part 1)

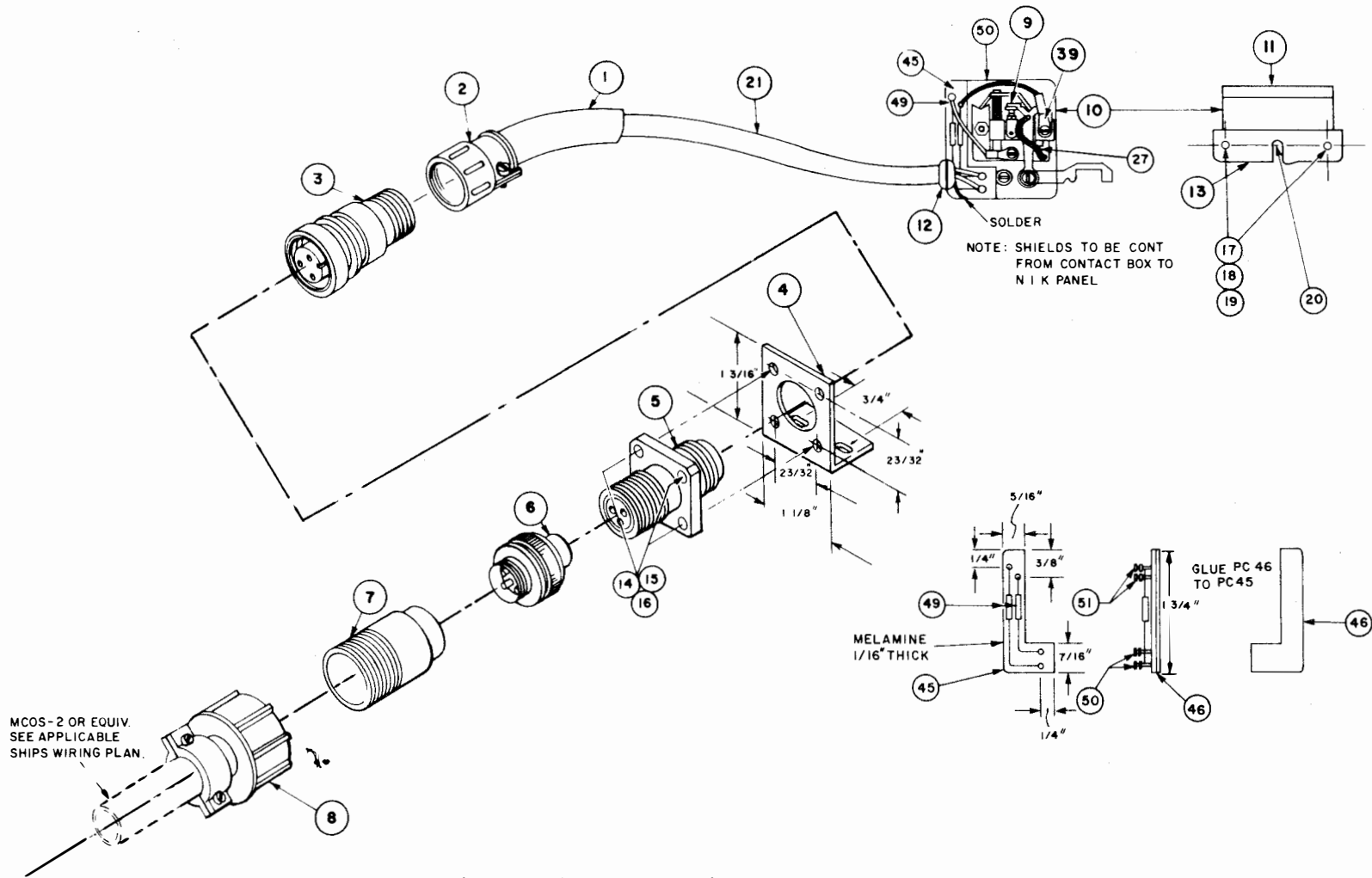


Figure 2.8 TT-187A/UG and TT-187B/UG Installation Drawing (Part 2)

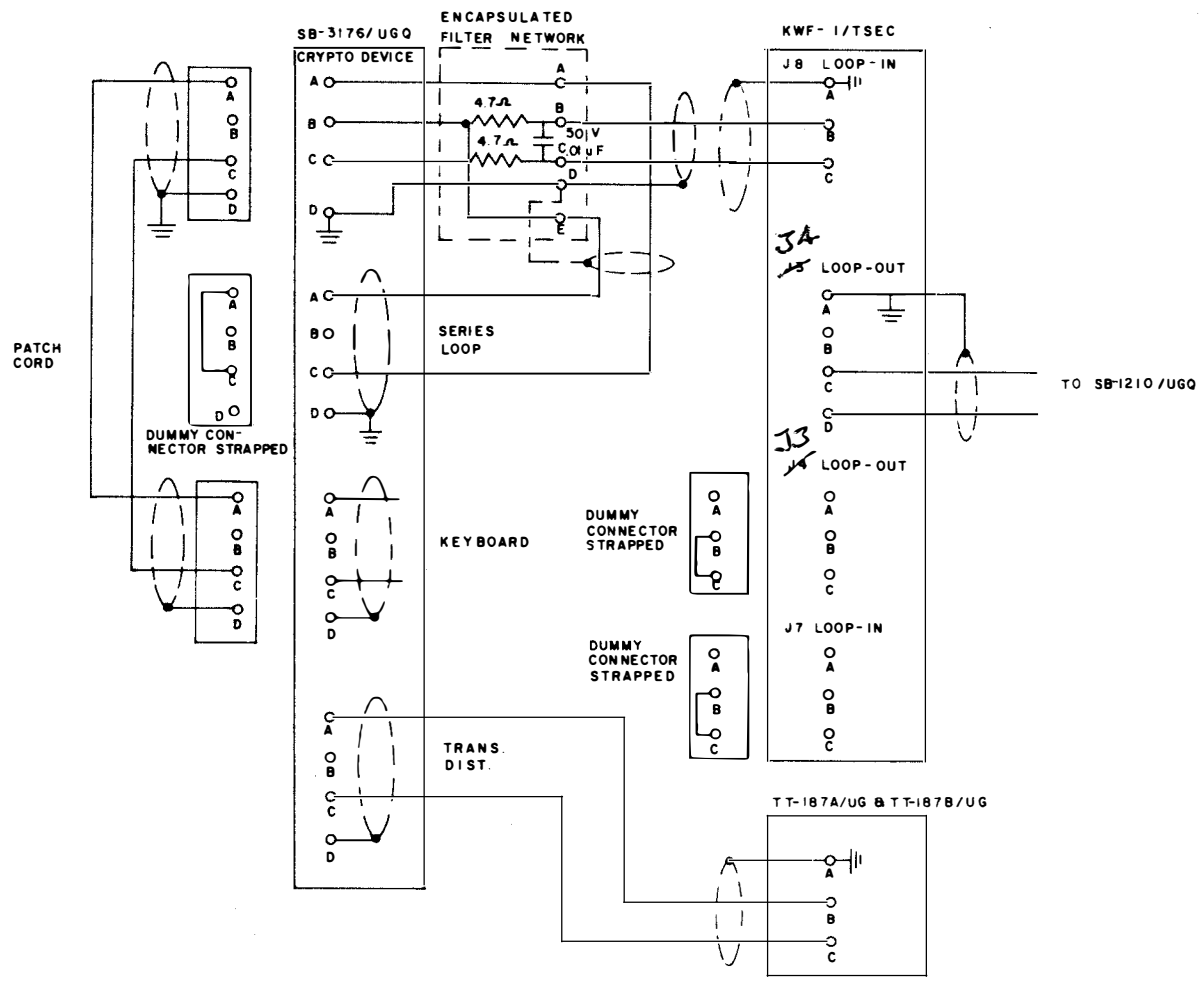


Figure 2.9 Typical Cryptographic System Using the TT-187A/UG and TT-187B/UG Series Transmitter-Distributor

SECTION III

OPERATION

3.1 OPERATIONAL CAPABILITIES

The installation of the NIK modification kit does not change the operation of the TT-187A/UG and TT-187B/UG Transmitter-Distributor. See NAVSHIP 92733A for theory of operation.

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SECTION IV
TROUBLESHOOTING

4.1 INSPECTION

Perform periodic inspection on all mechanical assemblies, connectors, etc.

1. Ensure that all terminals are tight and clean.
2. Ensure that all connector contacts are clean and straight.
3. Ensure that all connectors are run up tight to provide firm contact with the mating connector.
4. Ensure that all cables are in proper place and do not interfere with equipment operating.

4.2 CHECKOUT

NOTE

The following tests should be limited to volt-ohmmeter with an internal resistance of at least 20,000 ohms per volt, using minimum current.

1. A suspected "open" cable may be checked by using an ohmmeter (low ohms range) connected from pin A on one end of the disconnected cable to pin A on the other end of the cable and etc.
2. A suspected "short" in the disconnected cable may be determined by setting the ohmmeter to a higher scale and checking from pin A to pin B, from pin B to pin C etc. Any resistance reading would indicate a shorted cable.

4.3 DISTORTION OR GARBLED MESSAGE

Distortion or intermittent garble may be caused by dirty contact points. Refer to paragraph 5.2 for cleaning procedures.

SECTION V
MAINTENANCE

5.1 ALIGNMENT PROCEDURES

Proper operation of the TT-187A/UG and TT-187B/UG is dependent upon the signal generator contact adjustment. Three methods of adjustment are provided. Method I or Method II is preferred. It is recommended that a 6 volt battery be used when making Method I or Method II adjustments. Battery should be connected across pins B and C of input connector.

5.1.1 Contact Adjustment, Method I

1. Connect the input leads of an oscilloscope directly across the contacts in the contact box. The input leads may be connected to the mark contact terminal and the fixed terminal, to which the jumper or pigtail is soldered.
2. Insert a test tape in the TD. The tape should contain a repetitive character such as an R. Start the TD and adjust the scope sweep controls to obtain a stationary pattern including several marks and spaces. A pattern similar to that shown in Figure 5.1 should be obtained. The marking and spacing levels should be symmetrical with respect to the scope base line.

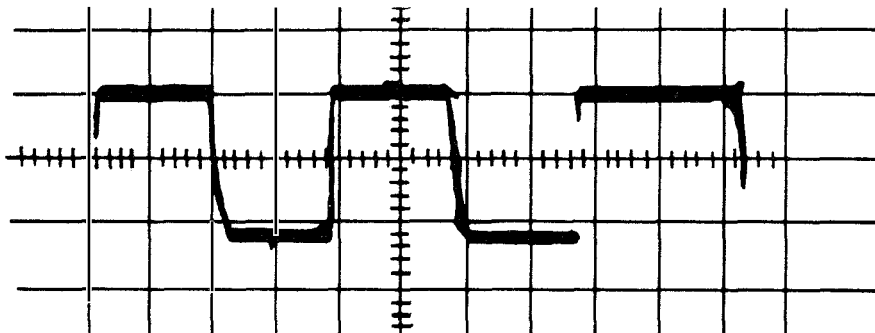


Figure 5.1 Waveform Method 1

3. Loosen the contact box mounting screws until they are friction tight.
4. Adjust the eccentric contact adjusting screw to make the marking and spacing elements displayed on the oscilloscope base line of equal length.

CAUTION

Do not use the stop baud as a marking element. It is of a longer time duration than the other elements of the signal. The stop baud appears at the right hand side of the trace shown by Figure 5.1.

5. Tighten the contact box mounting screws and re-check the oscilloscope display to verify the presence of equal marking and spacing signal elements.

5.1.2 Contact Adjustment, Method II

This method of adjusting the contacts can be used to obtain a precise contact adjustment more easily than by use of Method I.

1. Connect the oscilloscope as in sub-paragraph of Method I. In addition, provide a connection from the signal input lead at the contact assembly, to the external sync or trigger input on the oscilloscope.
2. Insert a test tape containing alternate R's and Y's in the TD. Start the TD and adjust the oscilloscope controls to obtain a stationary display including a complete character having marking and spacing levels arranged symmetrically with respect to its base line. A sweep rate of approximately 5 ms per cm will display one character. A display similar to that shown by Figure 5.2 should be obtained.

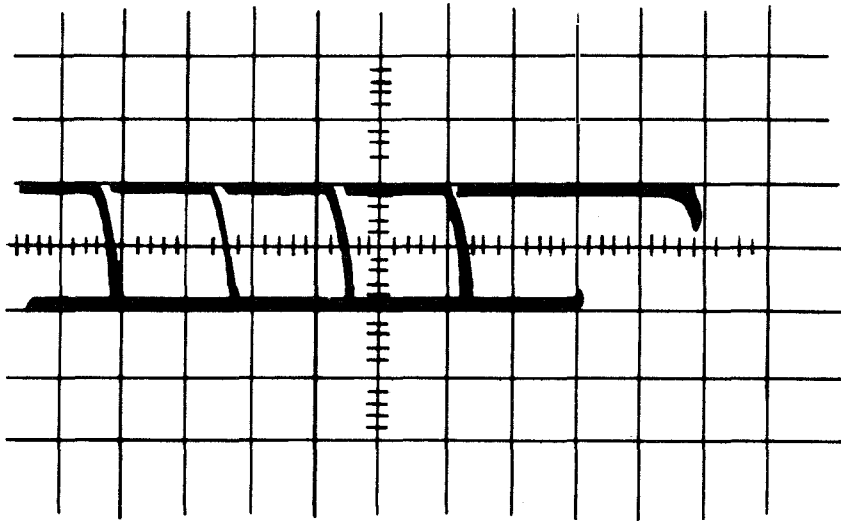


Figure 5.2 Waveform Method II

3. Adjust the contacts in the manner set forth in Method I, to obtain equal marking and spacing elements as indicated on the scope base line at the crossover points on the scope trace. The use of alternate R's and Y's, will result in an overlap of the alternate marks and spaces due to scope persistence, which results in the rise and fall portions of the traces crossing at the scope base line.

5.1.3 Contact Adjustment, Method III

Use only when an oscilloscope is not available.

1. Remove the contact box cover. See Figure 5.3.
2. Loosen the two contact box mounting screws until friction tight.
3. Engage the clutch and rotate the main shaft slowly until one set of points are at maximum clearance.
4. Check the clearance with a clean (no oil) wire feeler gauge. If the clearance is less than 0.010 inches, adjust the eccentric screw until a clearance of approximately 0.009 inches is obtained.
5. Remove the feeler gauge and slowly rotate the main shaft until the other set of points are at maximum clearance. Check with the feeler gauge.

The two sets of points must open at least 0.008 inches and not more than 0.010 inches. The difference between the two readings must be held to less than 0.002 inches.

6. Tighten the mounting screws and verify with the feeler guage that the readings have not changed.
7. Replace the contact box cover.

5.2 CLEANING PROCEDURES

The gold contacts require that no abrasives be used for cleaning purposes. If cleaning is required use a dry, clean, lint free cloth.

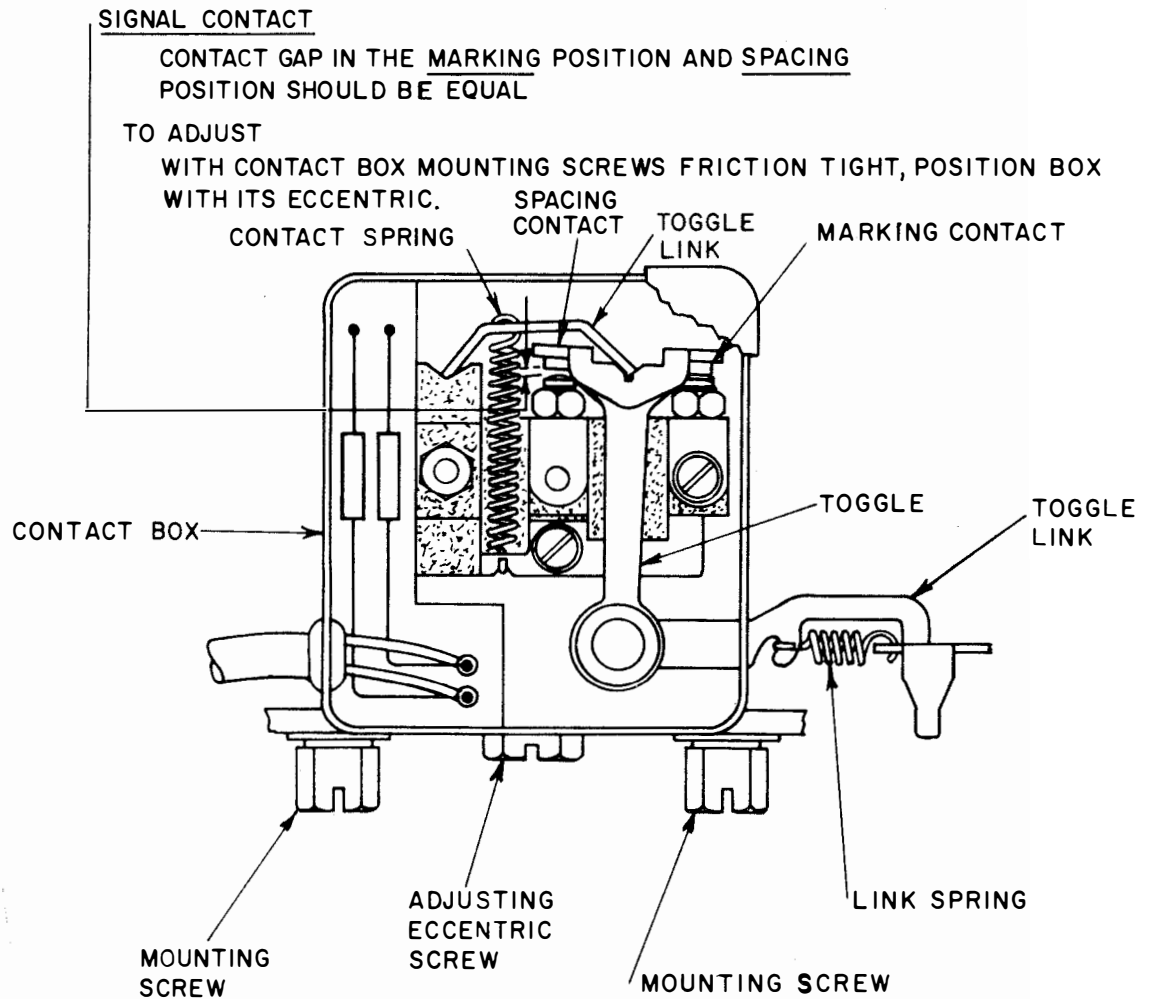


Figure 5.3 Contact Point Adjustment

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SECTION VI

PARTS LIST

6.1 PARTS LIST

Table 6.1 contains a detailed parts list for the TT-187A/UG and TT-187B/UG NIK Modification Kit.

Table 6.1 Parts List

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
1	Bushing AN3420-4	1	Amphenol or Equal	
2	Clamp, Cable AN3057-4	1	Amphenol or Equal	
3	Connector, MS3106A-10SL-3S	1	Amphenol or Equal	
4	Bracket, 1/16" THK CRS	1	Local Fabrication	
5	Connector, TBF 10SL-3PS	1	Amphenol or Equal	
6	Connector, MS3106A-10SL-3P	1	Amphenol or Equal	
7	Clamp, Cable AN3057-8	1	Amphenol or Equal	
8	Connector, G530-1228C-1.0	1	Glenair Inc. Glendale California	
9	Assembly, Gold Contact	1	9N5935-878-1051	179639
10	Box, Contact	1	IN5815-676-6992	154130
11	Cover, Contact Box	1	IN5815-676-6993	154131
12	Grommet	1	Teletype Corp. Skokie, Illinois	154156
13	Bracket, Contact Box	1	IN5815-767-5644	156643
14	Screw 4-40 x 1/2 B.H.S.S.	4		
15	Nut 4-40 S.S.	4		
16	Washer, Split Lock CRS	4		
21	Cable RG-108/U	20"	9Z6145-553-7823	
22	Screw	2	9Z5305-285-5575	1293
23	Nut	2	9Z5305-285-5575	3599
24	Washer	4	9Z5310-194-1478	3640
25	Washer	1	9Z5310-209-0929	90791
26	Washer	2	9Z5310-209-3861	110743
27	Screw	1	Teletype Corp. Skokie, Illinois	125126
28	Screw	1	9Z5305-370-0809	151152

Table 6.1 Parts List (Continued)

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
29	Washer	1	9Z5330-599-8282	151182
30	Screw	1	IN5815-738-4518	151686
31	Screw	1	9Z5305-514-7391	151731
32	Nut	1	9Z5310-514-7394	151880
33	Insulator	1	9G5970-691-2733	154189
34	Link	1	IN5815-652-1569	156644
35	Insulator	1	9G5970-691-2343	156663
36	Stud 1/4" x 1" LG 7-H	4		
37	Washer, Star 1/4" S.S.	4		
38	Wire, Green	1	Teletype Corp. Skokie, Illinois	195648
39	Lug, Amp 323914	2	9G5940-819-2960	
40	Connector Box 3/8" 90°	1		
41	Strap Bonding 1" x 6" Cad. Plt. Copper	1		
42	Screw, 6-32 x 3/8" B.H.S.S.	2		
43	Washer, #6 CRS Split Lock	2		
44	Strap, Nylon	5	Panduit Corp. Tinley Park, Illinois	
45	Board, Melamine 1/16" x 2" x 1" per MIL-P- 78A	1		
46	Insulator, Fishpaper 2" x 1"	1		
47	Wire, 22 AWG, Type E, Red, MIL-16878D	3"		
48	Wire, 22 AWG, Type E, Yellow, MIL-16878D	3"		
49	Resistor, Carbon 1K 1/4 W	2	9N5905-883-9198	
50	Terminal, Turret #2035-B1	2	USECO Div. of Litton Industries	
51	Terminal, Turret #2520-B1	2	USECO Div. of Litton Industries	
52	Nut 6-32	2		
53	Washer Flat #6	2		
54	Nut 1/4 x 20	4		
	Assembly (Complete) Part No. GO-1353. Consists of pc. # 1, 2, 3, 5, 6, 7, 8	1	Glenair Inc. Glendale, Calif.	

MAKE THE FOLLOWING PEN AND INK CORRECTIONS AS INDICATED BELOW.

Page ix, LIST OF TABLES, 5th Line, Change J3 to READ J4.

Page 2-6, Para 2.5.4(2), 2nd Line, Change J4 to READ J3.

Page 2-7, Para 2.5.4(4), 3rd Line, Change J3 to READ J4.

TABLE 2.3, Change J3 to READ J4 where appearing.

Page 2-16, Figure 2.9, under KWF-1/TSEC, Change J3 Loop-out to READ J4 Loop-out. Change J4 Loop-out to READ J3 Loop-out.

DONE 9/23/10



★
NAVSHIPS 0967-284-5030

TECHNICAL MANUAL

for

NORMAL INPUT KEYING TELETYPE MODIFICATION KITS (U)

TT-176/UG SERIES

DEPARTMENT OF THE NAVY
NAVAL ELECTRONICS SYSTEM COMMAND

★
18 November 1967

LIST OF EFFECTIVE PAGES

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6-1 thru 6-3	Original

FOREWORD

This technical manual was prepared to MIL-M-15071E by PRC Technical Applications Inc. San Diego, California under contract N0022868C0118 for the San Francisco Bay Naval Shipyard, San Francisco, California.

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SECTION I

GENERAL DESCRIPTION

1.1 SCOPE

This technical manual provides a description of procedures for installing, operating, troubleshooting, and maintenance for the Normal Input Keying Teletype Modification Kit (NIK) for the TT-176/UG Series Teletypewriters.

1.2 GENERAL INFORMATION

1. The Normal Input Keying Teletype Modification Kit was designed and manufactured by the San Francisco Bay Naval Shipyard, San Francisco, California.
2. It provides machine to machine interface between the TT-176/UG Teletypewriters and the associated cryptographic system. The TT-176/UG Teletypewriter is shown in Figure 1.1.
3. The NIK modification kit is shown in Figure 1.2. The modifications are performed at the equipment site by field personnel. A list of tools required to perform the modification, a list of parts in the modification kit, and complete instructions for the installation of the kit are outlined in this manual.

1.3 PRELIMINARY REQUIREMENTS

The TT-176/UG and the TT-176A/UG teletypewriters must have Field Change No. 2 installed before the NIK modification kit can be installed. This field change modifies 7.42 unit code keyboard to 7.00 unit code keyboard. However, the unit code change will not affect operation. Field change No. 2 is required to accommodate the larger signal contact box used for NIK operation.



Figure 1.1 TT-176/UG Teletypewriter

1.4 ASSOCIATED EQUIPMENT REQUIREMENTS

The unit value of certain components in the NIK modification kit depends upon the system configuration. Read the instructions for the following configurations carefully before installing the NIK modification kit on the TT-176/UG series Teletypewriters.

1.4.1 System Configuration: TT-176/UG Series and KW-7/TSEC (MOD 13 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the two carbon 1K ohm resistors from the contact box supplied with the NIK modification kit and install two 4.7K ohm resistors (not furnished) in their place. Connect a 50V 0.01 uf capacitor across the input cable leads at the terminals where the two resistors are connected.

1.4.2 System Configuration: TT-176/UG Series and KW-26/TSEC (MOD 14 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the two carbon 1K ohm resistors from the contact box supplied with the NIK modification kit, and install wire straps across the terminals where the resistors were installed. (Wire straps are not provided.)

1.4.3 System Configuration: TT-176/UG Series, KW-7/TSEC (MOD 13 Installed) and KW-26/TSEC (MOD 14 Installed), with SB-3176/UGQ Patch Panel

1. Remove the two carbon 1K ohm resistors in the contact box supplied with the NIK modification kit and install wire straps across the terminals where the resistors were installed. (Wire straps are not provided.)
2. Install the encapsulated filter network in the SB-3176/UGQ Patch Panel as directed in the SB-3176/UGQ Installation Manual.

NOTE

The encapsulated filter network must be installed in the SB-3176/UGQ Patch Panel whenever a KW-7/TSEC cryptographic device is used.

- 1.4.4 System Configuration: TT-176/UG Series, KW-7/TSEC (MOD 13 Installed) and KW-26/TSEC (MOD 14 Not Installed), with SB-3176/UGQ Patch Panel

Install the NIK modification kit as directed in the installation procedures, Section II.

- 1.4.5 For all System Configurations Using the SB-3176/UGQ Patch Panel

1. Read the appropriate section of the KAM-85/TSEC for pre-conditions required prior to connecting the KW-26/TSEC to the (NIK) normal input keying system.
2. Read the appropriate section of the KAM-143/TSEC for pre-conditions required prior to connecting the KW-7/TSEC to the (NIK) normal input keying system.

NOTE

In all cases when using the SB-3176/UGQ Patch Panel, the encapsulated filter network must be installed at the SB-3176/UGQ Patch Panel where the KW-7/TSEC (J8 loop-in) cable connects.

1.5 PHYSICAL CHARACTERISTICS

Table 1.1 lists the major parts contained in the NIK modification kit.

1.6 ELECTRICAL CHARACTERISTICS

Refer to KAM-85/TSEC and KAM-143/TSEC for the electrical characteristics of normal input keying.

1.7 REFERENCE DATA

1.7.1 Weight Change Due To Modifications

The modifications are estimated to have added less than one pound of weight to the TT-176/UG teletypewriter.

Table 1.1 TT-176/UG Modification Kit

Item	Quantity	Part
1	1	Cable assembly (two piece) with contact box connected to one end and MS3100A-16S-6S connector on the other end. The intermediate connectors are Winchester type M4SLRH14 and M4PLSH14.
1	1	Cable assembly (two piece) with a AN-3100A-16-6P connector on one end and terminal lugs on the other end. The intermediate connectors are Winchester type M4SLRH14 and M4PLSH14.
2	8	4-40 Screws, hex nuts and split lock washers.
3	1	90° Box connector
4	1	6-40 x 1 inch screw
	1	6-40 x 3/8 inch screw
	1	No. 6 Flat washer
	1	No. 6 Split lock washer
5	1	Ground Strap
6	2	Straps with lugs, two inch and three inch
7	1	Plastic cable clamp
8	1	Decal

1.7.2 Dimension Changes Due To Modifications

The modifications increased the depth of the chassis approximately one inch with the external cable disconnected, and increased the space required behind the chassis by approximately four inches with the external cable in place.

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SECTION II
INSTALLATION

2.1 GENERAL

This section contains detailed steps for removal of components no longer used, and installation of new components to the TT-176/UG Teletypewriter. Figures 2.1 through 2.10 at the end of this section, show the TT-176/UG before and after the modification. Figure 2.11 and 2.12 show the installation drawings.

2.2 REMOVAL OF REPLACED COMPONENTS

Perform the following steps in the order listed. The tools required for the modification are listed in Table 2.1.

2.2.1 Removal of Page Printer Assembly

1. Secure ac power and dc (signal) line current.
2. Remove light plug from cabinet
3. Remove covers from the teletypewriter and power distribution chassis.
4. Remove keyboard connector and page printer connectors.
5. Remove the four screws holding the page printer and remove from baseplate.
6. Remove the bolts holding the ends of the power distribution chassis to the baseplate.
7. Disconnect the power and signal line cables.
8. Remove the metal plate between the line shunt assembly and power switch on the power distribution chassis.

Table 2.1 Tools Required

Quantity	Item
1	1/4 inch electric drill
2	Bits, 1/8 inch and No. 27 Drill
2	Screw drivers, medium and small
4	Open end wrenches 7/16 inch, 5/16 inch 1/4 inch and 3/8 inch
1	6' Tape measure
1 roll	Plastic insulation tape
1	Side cutter
1	Wire stripper
1 roll	Resin core solder
1	Soldering iron
1	Wire brush, small
1	Center punch
1	Hammer
2	Chassis hole cutters, 1 inch and 7/8 inch
1	Round file, 3/16 inch
1	File, flat
1 set	Wire feeler gauges

2.2.2 Removal of Old Contact Box

1. On the keyboard assembly remove the cover from the contact box. Remove or cut the two wires and pull cable from contact box.
2. Tape the two wires so that there is no possibility of making an electrical contact with another metal part.
3. Re-locate the end of the cable so that it will not interfere with normal operation of the equipment.
4. Remove the end of the link spring nearest the contact box. Do not discard the spring.
5. Remove the two mounting screws holding the contact box. Remove the contact box and tape the eccentric adjusting screw in position. Retain the mounting screws.
6. On the page printer remove the cover from the selector magnet terminal board and disconnect the wires.
7. Tape the wires so that there is no possibility of making electrical contact with another metal part.
8. Re-locate the end of the cable so that it will not interfere with normal operation of the equipment.

2.3 INSTALLATION OF THE MODIFICATION KIT

Use caution during the installation of the modification kit, by not misaligning any mechanical assembly or stretching wire in the cable harness.

2.3.1 Installation of Box Connector

1. Drill a pilot hole in the base plate (under the power distribution chassis) four inches in from the rear and 4 inches left of the right side (looking at the front).

2. Using the 7/8 inch chassis hole cutter, or hole saw, cut a hole in the baseplate using the pilot hole as a guide.
3. Mount the 90° Box Connector (item 46) so that the cable enters below the base plate and from the rear.

2.3.2 Installation of Cable Connectors

1. Draw a horizontal line 1 5/8 inches up from the bottom on the rear side of the power distribution chassis.
2. Draw two intersecting lines 3 5/8 inches and 5 1/8 inches in from the left side.
3. Drill 1/4 inch holes where the above two lines intersect the horizontal line.
4. Use the one inch chassis hole cutter or a hole saw, to enlarge the two pilot holes to one inch in diameter.
5. Hold connector AN3100A-16-6P (item 6) in the mounting holes with the key up. Scribe the location of the four small hole on the chassis for each position.
6. Drill out the eight holes using a No. 27 drill bit.
7. Mount the connector (item 6) on the left side (from the rear). Bolt in position with the flange on the inside and key up using four 4-40 x 1/2 inch bolts (item 15), split lock washers (item 17) and hex nuts (item 16). Disconnect the Winchester connectors (item 1).
8. Mount the connector MS3100A-16S-6S (item 7) on the right side (from the rear). Bolt in position with the flange on the inside and key up using four 4-40 x 1/2 inch screws (item 15), split lock washers (item 17) and hex nuts (item 16). Disconnect the Winchester connectors (item 2).

2.3.3 Installation of the New Contact Box

1. Remove the tape holding the eccentric screw in position. Place the new contact box (item 19) and link in position, using the mounting screws retained from the old contact box, secure friction tight.
2. Re-install the link-spring (86304) on the link (156644) near the contact box.
3. Route the contact box cable (item 12) down through the baseplate towards the rear. Bring the cable up through the baseplate and clamp the Winchester connector M4SLRH14 (item 1) on the base plate with the plastic clamp HP-9N (item 27). See installation drawing, Figure 2.11.

2.3.4 Installation of Cables

1. On the page printer selector magnet terminal board, connect the two outside terminals together using the three inch wire strap (item 54).
2. On the same board, connect the two inside terminals together, using the two inch wire strap (item 55).
3. Connect one lead of the selector magnet cable to one of the outside terminals on the terminal board.
4. Connect the other lead of the selector magnet cable to one of the inside terminals.
5. Utilize a screw on the frame of the page printer to ground the cable shield to the frame.
6. Clamp the cable to the frame just behind the terminal board with the plastic cable clamp that held the original cable in place. See Figure 2.10.
7. Install the 115 vac power cable through the box connector and connect in the power distribution chassis.
8. Clean the equipment with a vacuum cleaner to pick up chips, filings, etc.

9. Re-fasten the steel plate on the power distribution chassis.
10. Bolt the power distribution chassis to the base plate. Install ground strap (item 45) if required.
11. Re-install the printer on the baseplate.
12. Insert connectors for the keyboard and printer, into the proper receptacles.
13. Mate the Winchester connectors on the contact box with the selector magnet cables.

CAUTION

Dress all cables away from the motor flywheel and moving parts.

14. Using standard procedures, make up a two-wire shielded cable assembly using a MS3106A-16S-6P (item 9) connector, and connect to the SB-3176/UGQ Patch Panel in accordance with NAVSHIPS 0967-284-5070. Pins B and C are signal lines, pin A is the shield. At the SB-3176/UGQ panel, pins A and C are signal lines, pin D is ground and pin B is not used. See Figure 2.13.
15. Using standard procedures, make up a two wire shielded cable assembly using a MS3106A-16S-6S (item 8) connector and connect to the SP-1210/UGQ Patch Panel. Pins B and C are signal lines. Pin A is the shield. At the SB-1210/UGQ Patch Panel install terminal lugs on the signal lines. The shield is ground, See Figure 2.13. Connect the signal lines to SET JACK terminals on the SB-1210/UGQ Patch Panel.

2.3.5 Modification of the Power Distribution Chassis Cover

1. On the back face of the power distribution chassis cover, draw a horizontal line three inches above the base. Draw two intersecting lines, $2 \frac{3}{4}$ and 6 inches in from the left side of the cover.

2. Cut out the rectangular section 3 x 3 1/4 inches with power shears or by drilling a series of holes just inside the lines and filing to the required size. Remove all burrs and sharp edges.
3. Install the cover on the power distribution chassis.

NOTE

The alignment procedures in Section V (Maintenance) must be performed before the equipment can be operated.

4. Install cover on equipment and insert light cable into paper receptacles.
5. Install decal adjacent to name plate.

CAUTION

Before applying power to the TT-176/UG teletypewriter, SB-1210/UGQ Patch Panel, and the associated KW-7 cryptographic equipment, ensure that the loop-out cable (J4) from the KWF-1/TSEC to the SB-1210/UGQ, and to the selector magnets of the page printer, are free of all grounds. Check with an ohmmeter from each side of the line to ground. A grounded receive signal line will cause damage to the KW-7/TSEC.

2.4 ADDITIONAL REQUIREMENTS

The modification of the TT-176/UG Series Teletypewriters with the NIK modification kit, requires that the equipment listed below be modified before being used with the NIK modified equipment.

2.4.1 KW-7/TSEC

MOD 13 must be installed prior to NIK installation.

2.4.2 KW-26/TSEC

MOD 14 must be installed prior to NIK installation.

2.4.3 SB-1210/UGQ PATCH PANEL

The SB-1210/UGQ must be wire strapped for remote battery prior to NIK installation. See NAVSHIPS 95718.

2.4.4 Removal of KWL-4/TSEC Unit and Installation of Dummy Connectors

The KWL-4 unit and its associated cables must be removed prior to NIK installation. Proceed as follows.

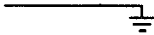
1. Remove the KWL-4 unit and its associated cables.
2. Using standard procedures, make up two dummy connectors for J4 and J7 on the KWF-1/TSEC rack. Wire strap pins B and C together on each of the connectors and install.
3. Using standard procedures, make up a shielded two-wire cable and connect from the SB-3176/UGQ Patch Panel to J8 on KWF-1. See Table 2.2 for cable connections. Use connector type MS3116E-14-5S. (Connector not furnished.)

Table 2.2 J8 of KWF-1 to SB-3176/UGQ Patch Panel Cable Connections

KWF-1 J8 Pins	SB-3176/UGQ Patch Panel Conn. Pins
B	B
C	C
A	D

4. Using standard procedures, make up a shielded two-wire cable and connect from the SB-1210/UGQ Patch Panel to J4 on KWF-1. See Table 2.3 for cable connections. Use connector type MS3116E-14-5PW (Connector not furnished).

Table 2.3 JA of KWF-1 to SB-1210/UGQ Cable Connections

KWF-1 JA Pins	SB-1210/UGQ Patch Panel Conn. Pins
C	1 (3) (5) etc.
D	2 (4) (6) etc.
A	

2.4.5 Typical Cryptographic System

Figure 2.13 shows a typical cryptographic system using the TT-176/UG Series Teletypewriter.

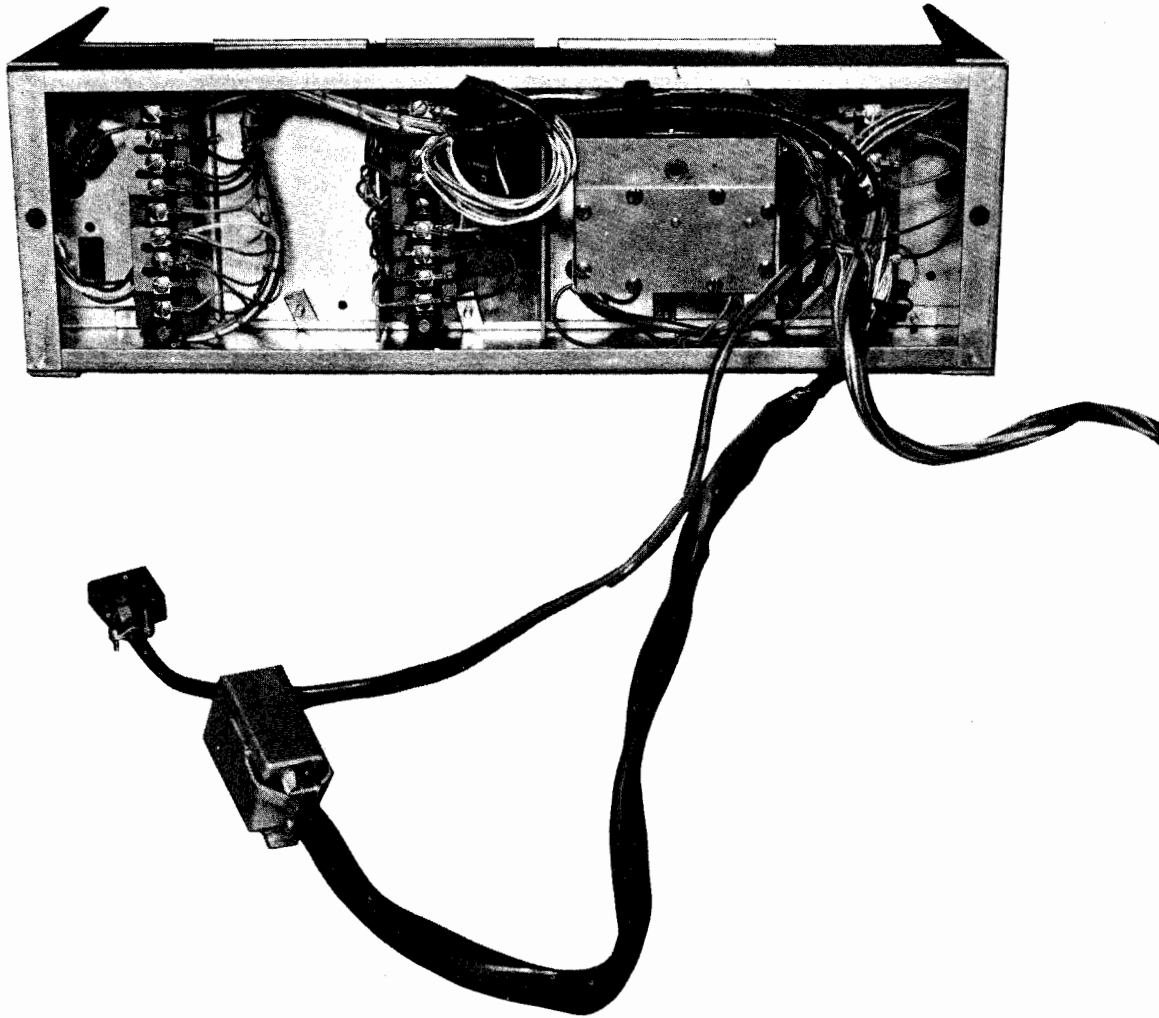


Figure 2.1 Bottom View of TT-176/UG Power Distribution Chassis before Modification

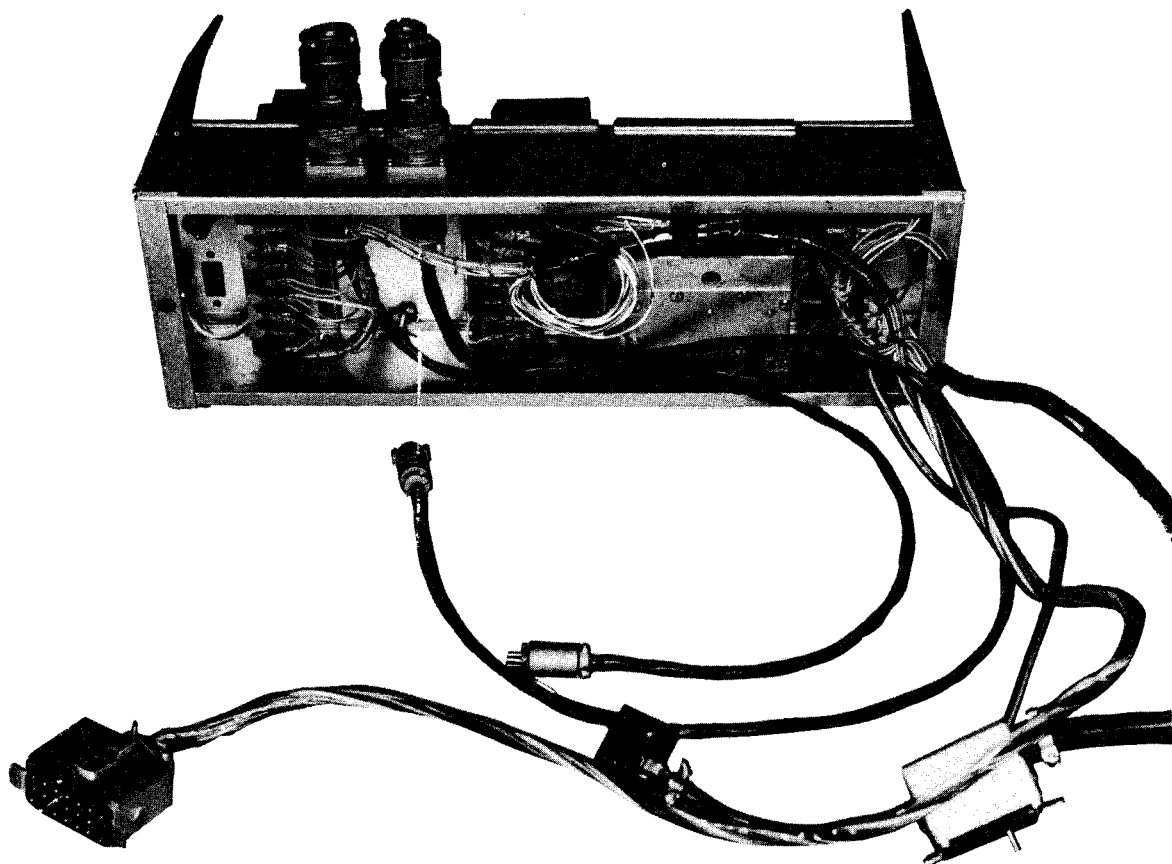


Figure 2.2 Bottom View of TT-176/UG Power Distribution Chassis after Modification

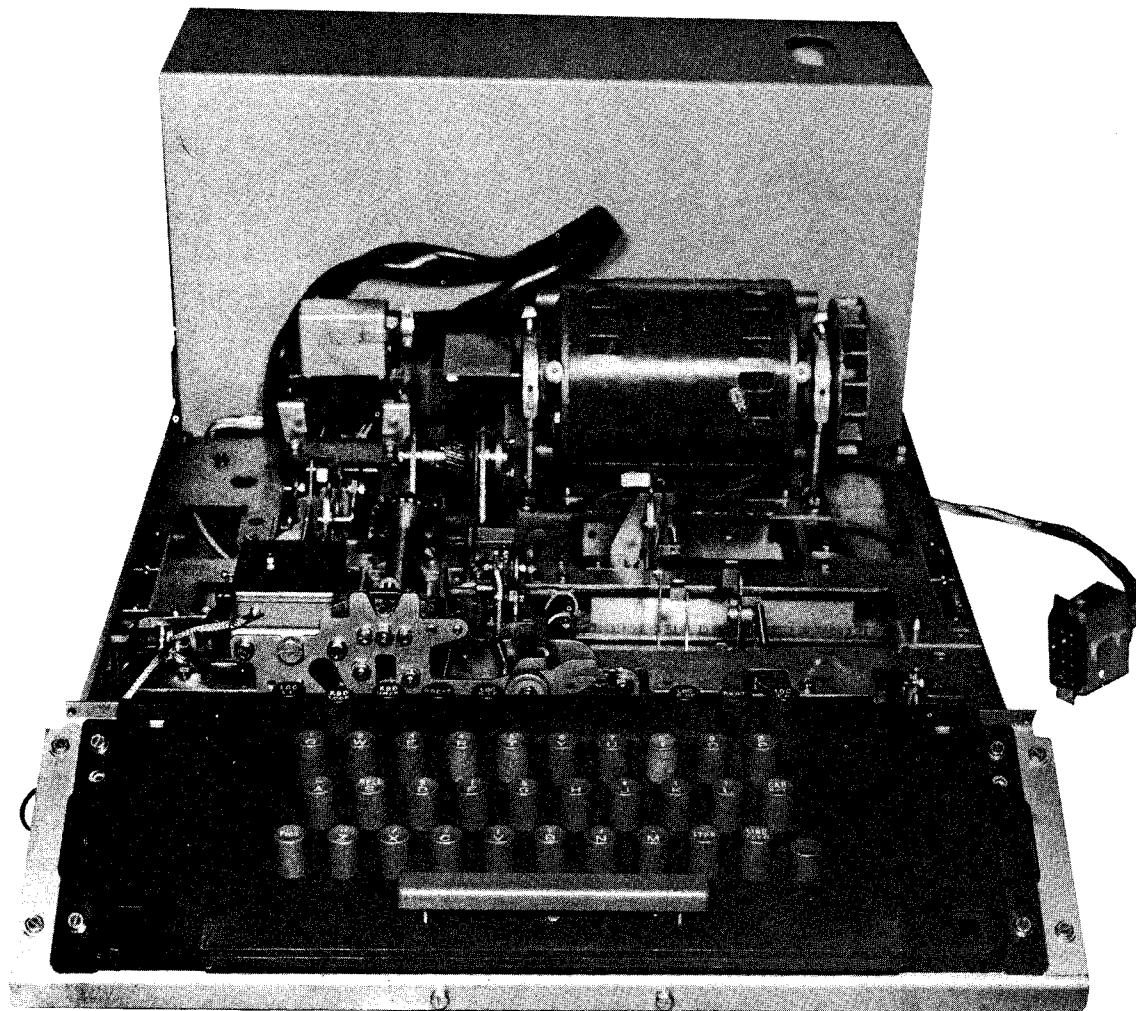


Figure 2.3 Front View of TT-176/UG Printer Removed, before Modification

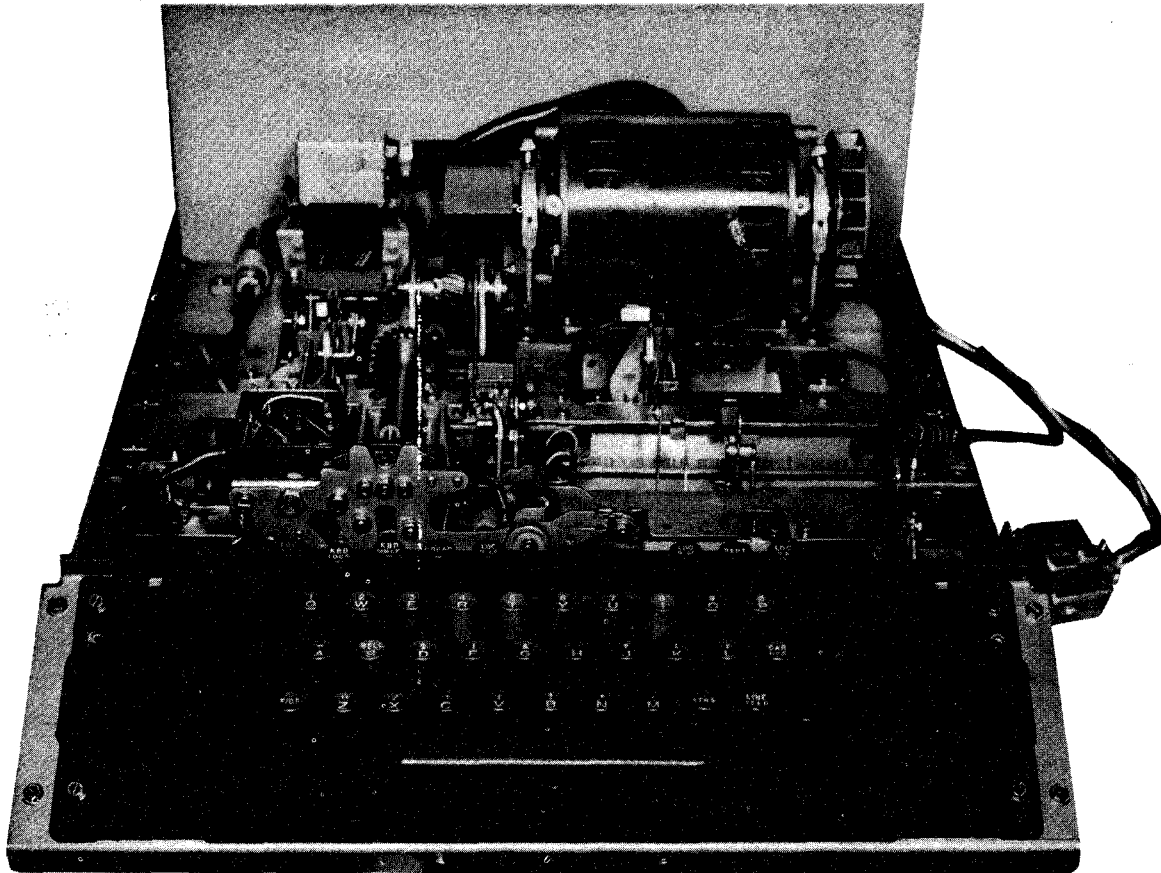


Figure 2.4 Front View of TT-176/UG Printer Removed, after Modification

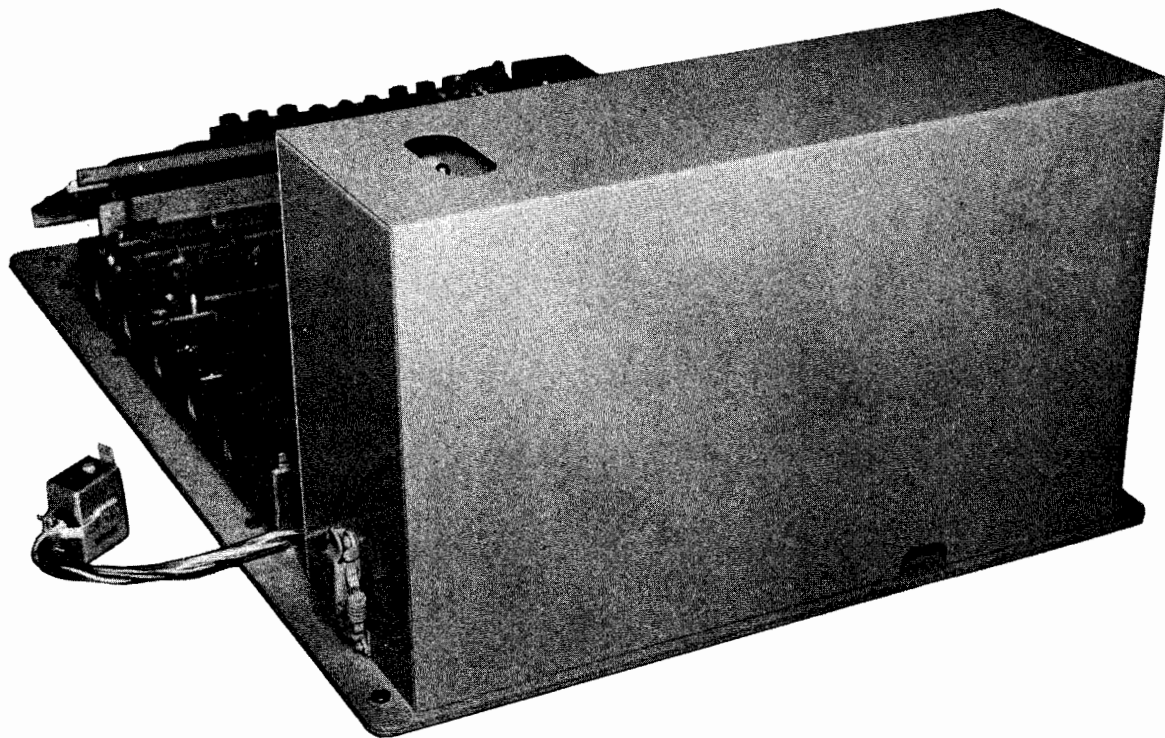


Figure 2.5 Rear View of TT-176/UG before Modification

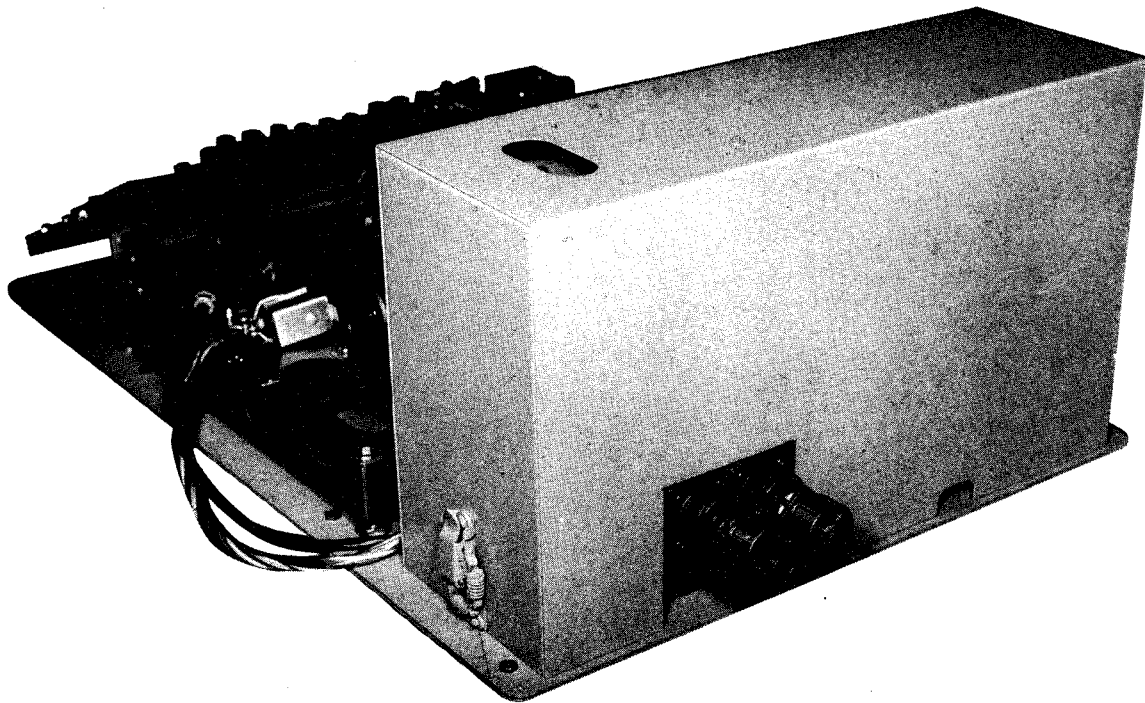


Figure 2.6 Rear View of TT-176/UG after Modification

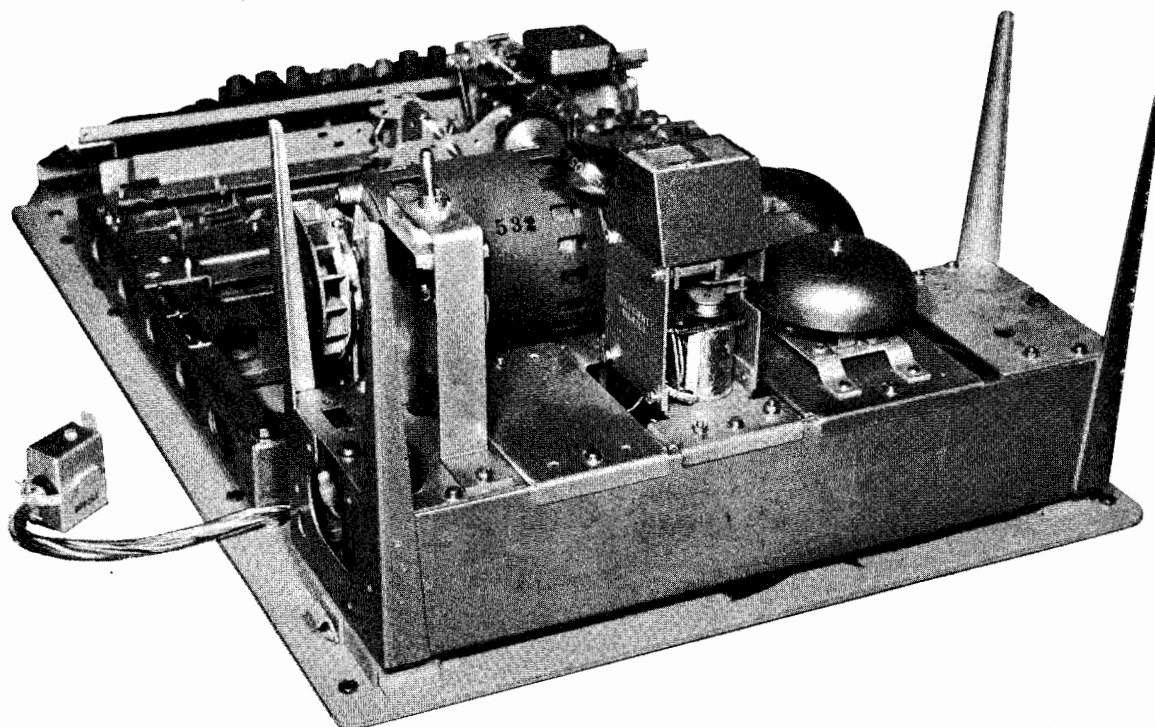


Figure 2.7 Power Distribution Chassis of TT-176/UG before Modification

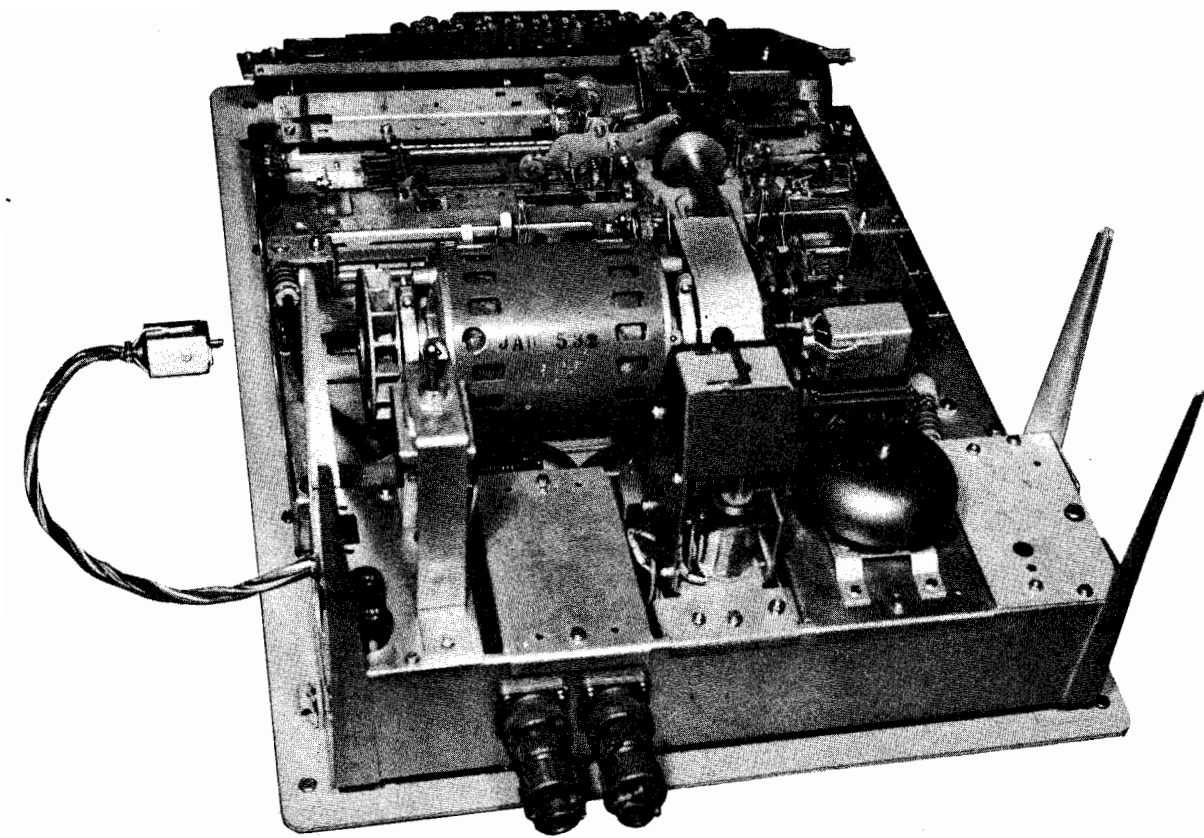


Figure 2.8 Power Distribution Chassis of TT-176/UG after Modification

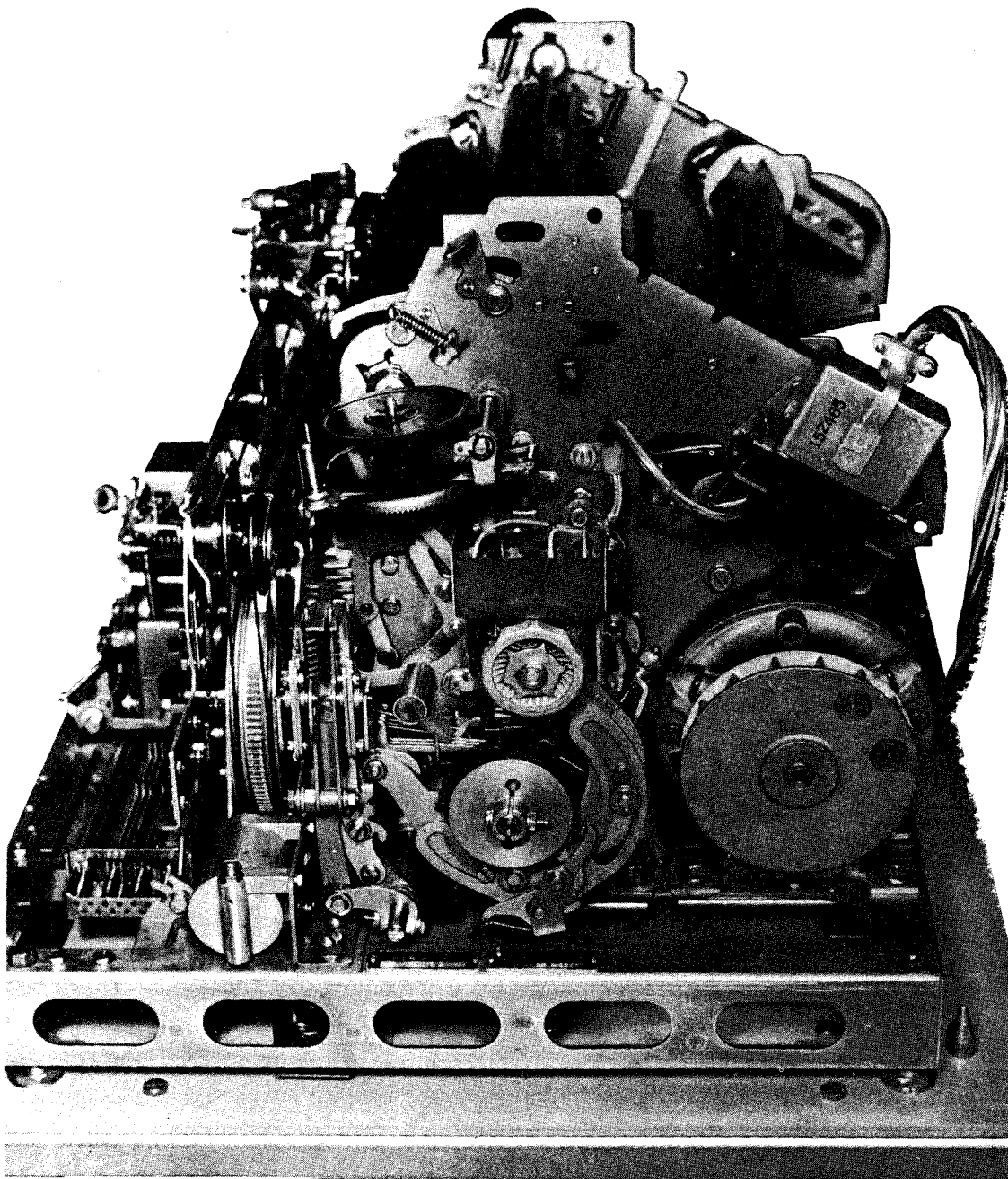


Figure 2.9 Side View of TT-176/UG before Modification

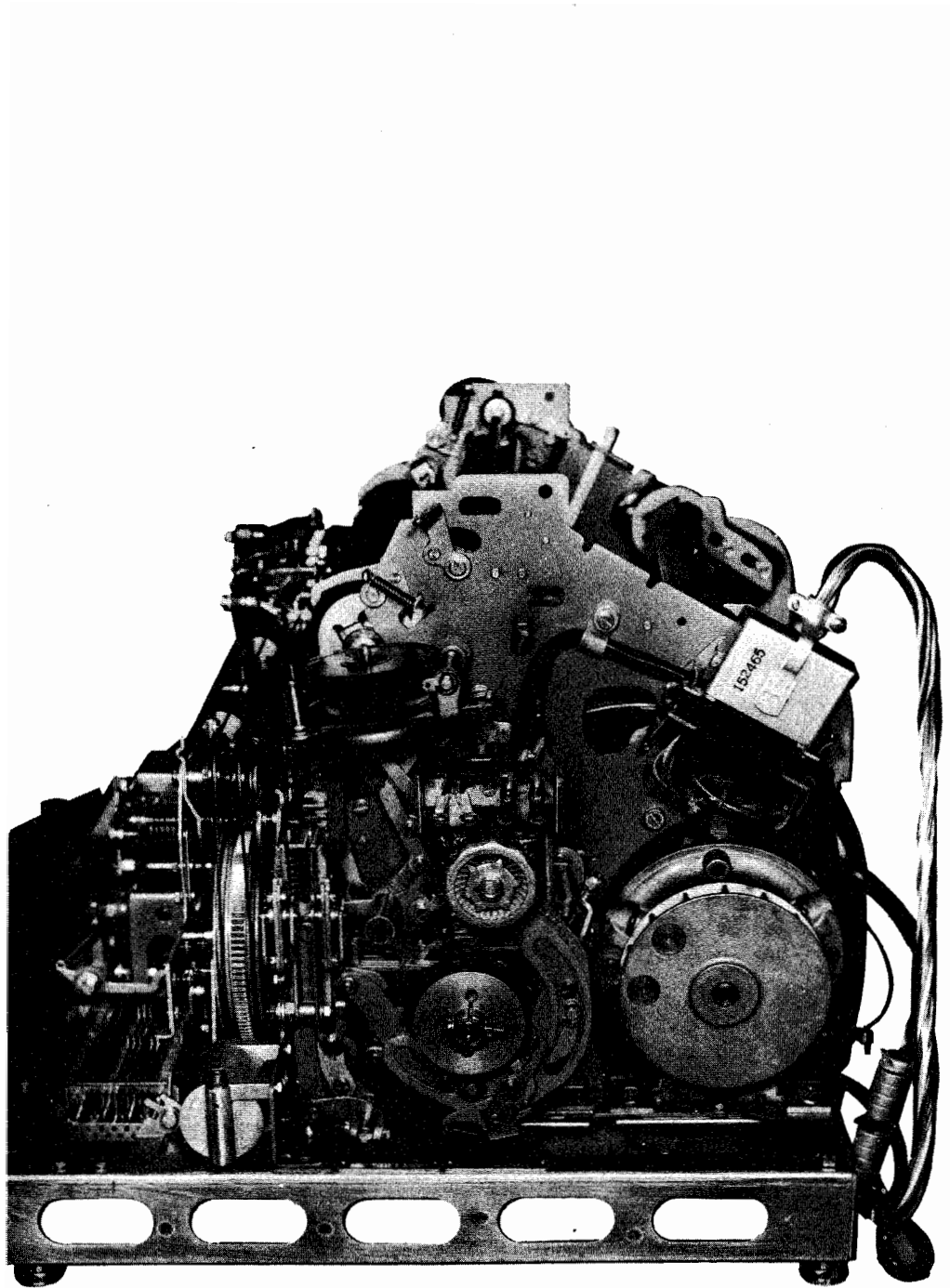


Figure 2.10 Side View of TT-176/UG after Modification

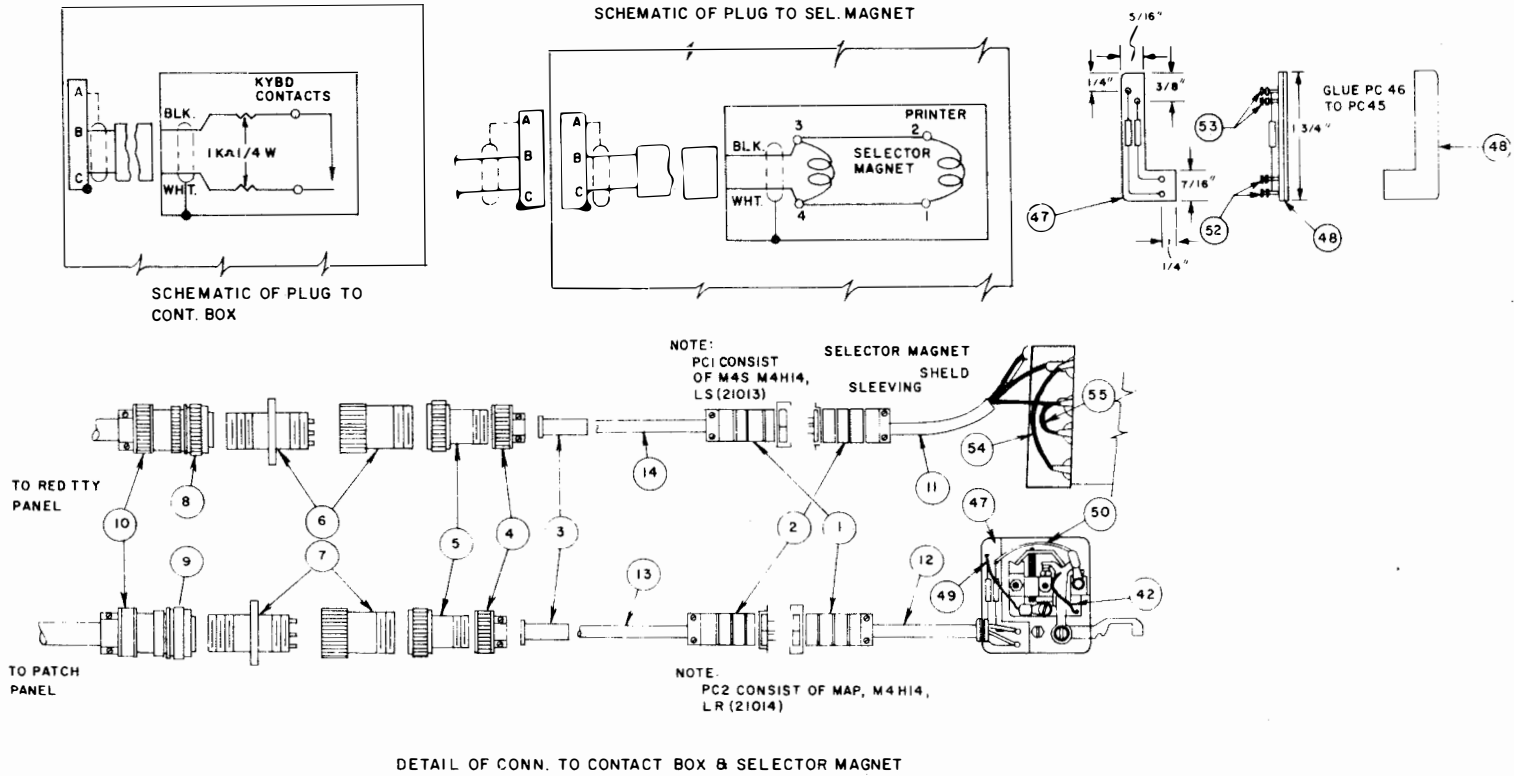


Figure 2.11 TT-176/UG Installation Drawing (Part 1)

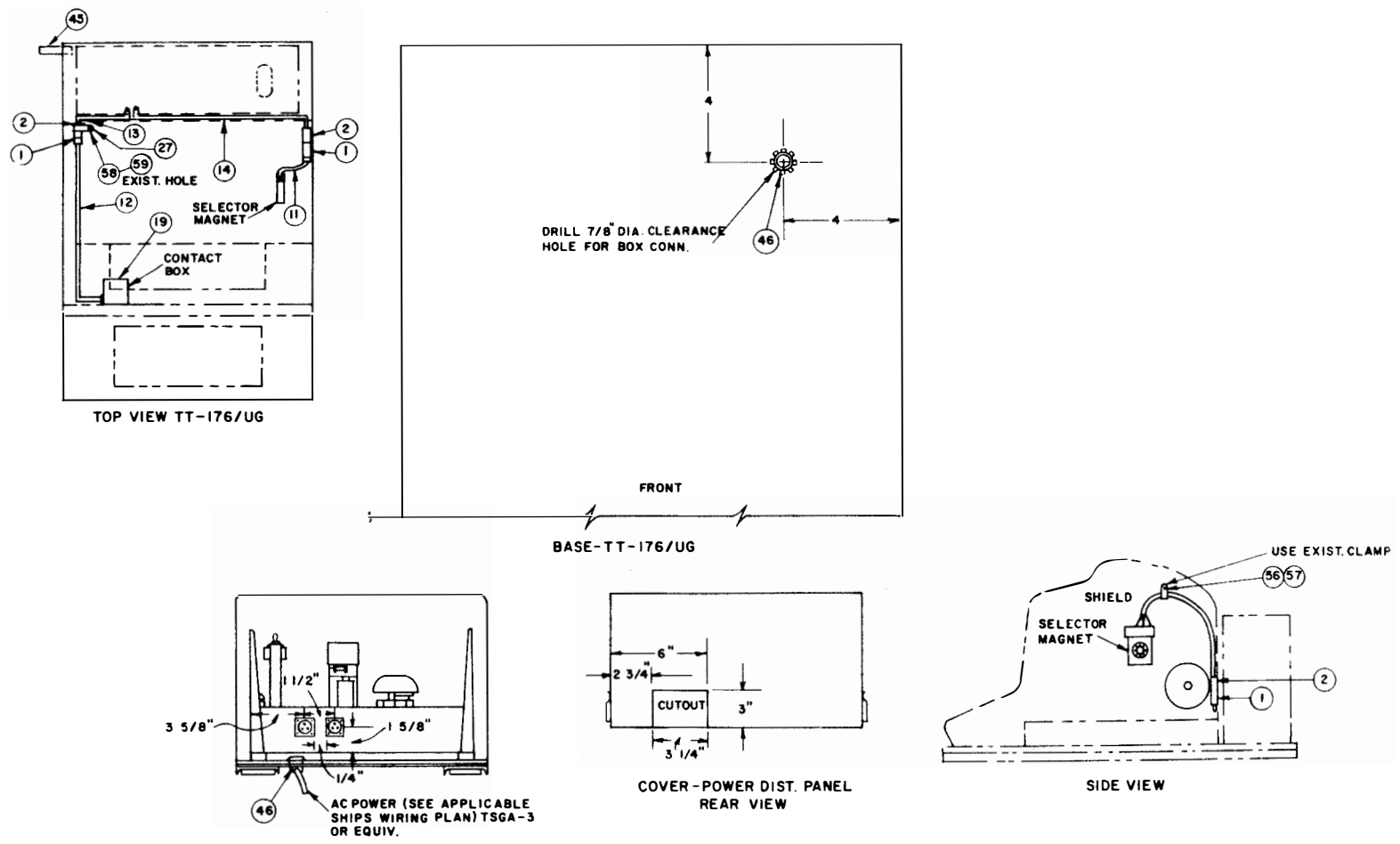


Figure 2.12 TT-176/UG Installation Drawing (Part 2)

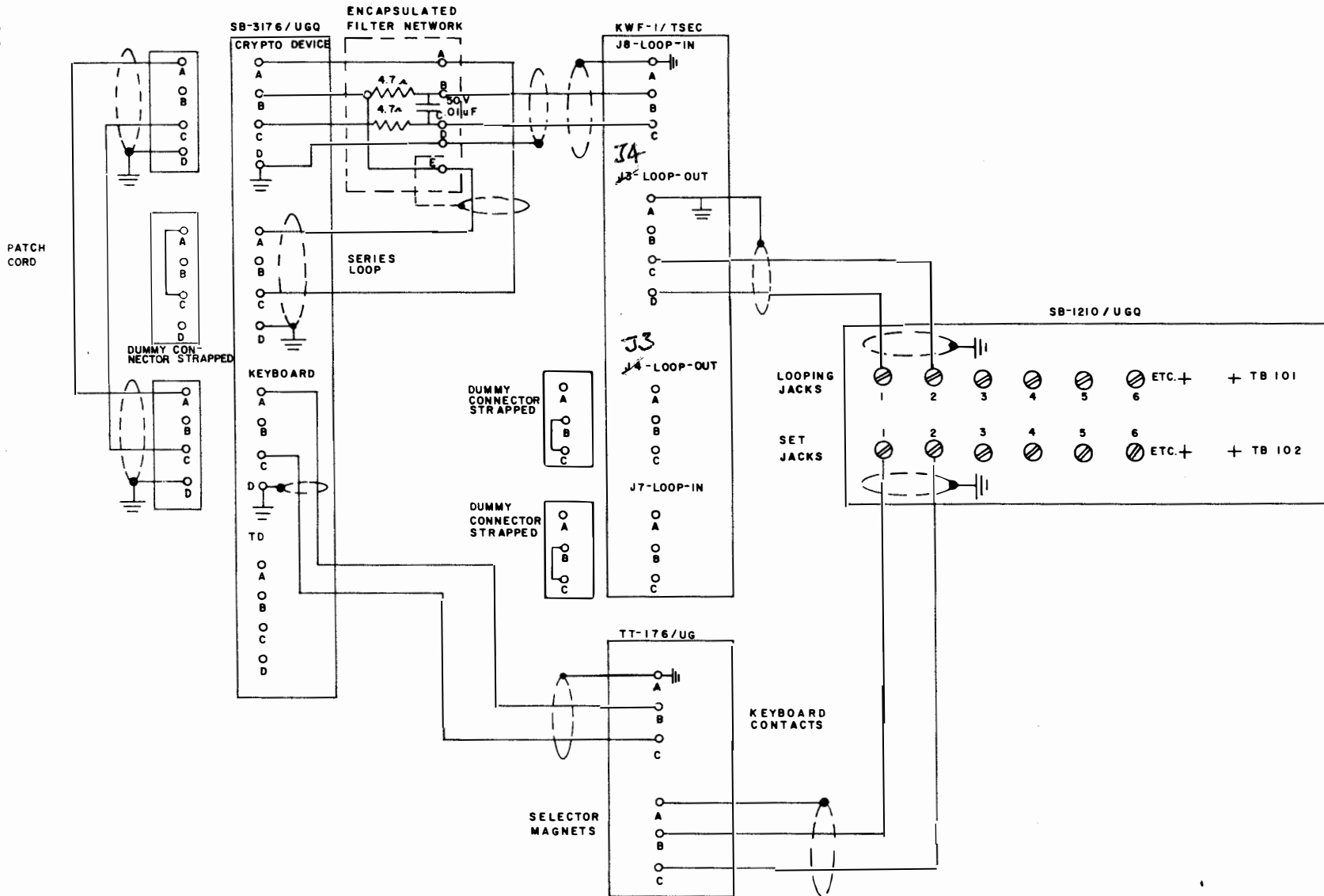


Figure 2.13 Typical Cryptographic System Using the TT-176/UG Series Teletypewriters

SECTION III

OPERATION

3.1 OPERATIONAL CAPABILITIES

The TT-176/UG Series Teletypewriters is affected by the NIK modification kit as follows:

1. Keyboard and page printer are not in series.
2. Signal line shunt relay is inoperative.
3. The electrical portion of the break key is inoperative.

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SECTION IV
TROUBLESHOOTING

4.1 INSPECTION

Perform periodic inspection on all mechanical assemblies, connectors, etc.

1. Ensure that all terminals are tight and clean.
2. Ensure that all connector contacts are clean and straight.
3. Ensure that all connectors are run up tight to provide firm contact with the other connector.
4. Ensure that all cables are in proper place and do not interfere with equipment operation.

4.2 CHECKOUT

NOTE

The following tests should be limited to a volt-ohmmeter with an internal resistance of 20,000 ohms per volt, using minimum current application.

1. A suspected "open" cable may be checked by using an ohmmeter (low ohms range) connected from pin A on one end of the disconnected cable, to pin A on the other end of the cable and etc.
2. A suspected "short" in the disconnected cable may be determined by setting the ohmmeter to a higher scale and checking from pin A to pin B, from pin B to pin C and etc. Any resistance reading would indicate a shorted cable.

4.3 DISTORTION OR GARBLED MESSAGE

Distortion or intermittent garble may be caused by dirty contact points. Refer to paragraph 5.2 for cleaning procedures.

SECTION V
MAINTENANCE

5.1 ALIGNMENT PROCEDURES

The proper operation of the keyboard is dependent upon the signal generator contact adjustment. Three methods of adjustment are provided. Method I or Method II is preferred. It is recommended that a 6 volt battery be used when making Method I or Method II adjustments. Battery should be connected across pins B and C of keyboard input connector.

5.1.1 Contact Adjustment, Method I

1. Connect the input leads of an oscilloscope directly across the contacts in the signal generator box. The input leads may be connected to the mark contact terminal and the fixed terminal, to which the jumper or pigtail is soldered.
2. Insert a test tape in the TD. The tape should contain a repetitive character such as an R. Start the TD and adjust the scope sweep controls to obtain a stationary pattern including several marks and spaces. A pattern similar to that shown by Figure 5.1 should be obtained. The marking and spacing levels should be symmetrical with respect to the scope base line.

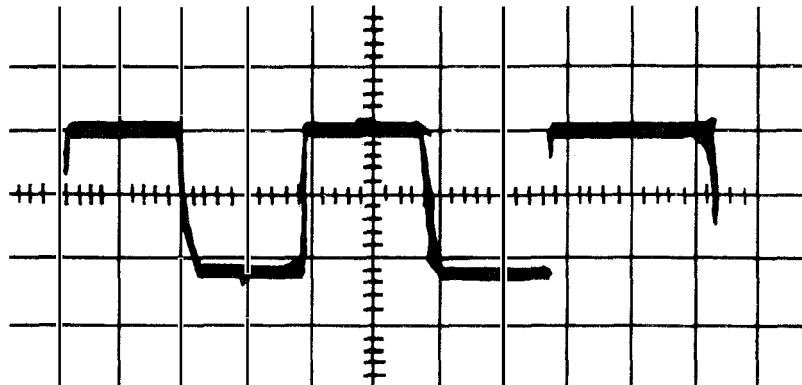


Figure 5.1 Waveform, Method I

3. Loosen the contact box mounting screws until they are friction tight.
4. Adjust the eccentric contact adjusting screw to make the marking and spacing elements displayed on the oscilloscope base line of equal length.

CAUTION

Do not use the stop baud as a marking element. It is of a longer time duration than the other elements of the signal. The stop baud appears at the right hand side of the trace shown by Figure 5.1.

5. Tighten the contact box mounting screws and recheck the oscilloscope display to verify the presence of equal marking and spacing signal elements.

5.1.2 Contact Adjustment, Method II

This method of adjusting the contacts can be used to obtain a precise contact adjustment more easily than by the use of Method I.

1. Connect the oscilloscope as in sub-paragraph 1 of Method I. In addition, provide a connection from the signal input lead at the contact assembly, to the external sync or trigger input on the oscilloscope.
2. Insert a test tape containing alternate R's and Y's in the TD. Start the TD and adjust the oscilloscope controls to obtain a stationary display, including a complete character having marking and spacing levels arranged symmetrically with respect to its base line. A sweep rate of approximately 5 ms per cm will display one character. A display similar to that shown by Figure 5.2 should be obtained.

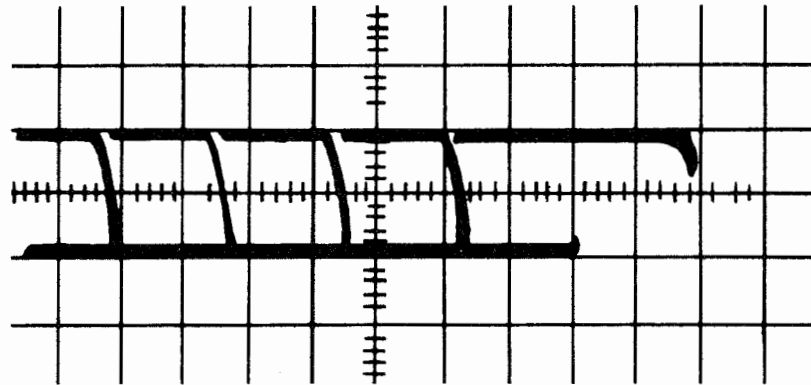


Figure 5.2 Waveform, Method II

3. Adjust the contacts in the manner set forth in Method I, to obtain equal marking and spacing elements as indicated on the scope base line at the crossover points on the scope trace. The use of alternate R's and Y's, will result in an overlap of the alternate marks and spaces due to scope persistence, which results in the rise and fall portions of the traces crossing at the scope base line.

5.1.3 Contact Adjustment, Method III

Use only when an oscilloscope is not available.

1. Remove the contact box cover. See Figure 5.3.
2. Loosen the two contact box mounting screws until friction tight.
3. Engage the clutch and rotate the main shaft slowly until one set of points are at maximum clearance.
4. Check the clearance with a clean (no oil) wire feeler gauge. If the clearance is less than 0.008 inches or more than 0.010 inches, adjust the eccentric screw until a clearance of approximately 0.009 inches is obtained.
5. Remove the feeler gauge and slowly rotate the main shaft until the other set of points are at maximum clearance. Check with the feeler gauge. The two sets of points must open at least

0.008 inches and not more than 0.010 inches. The difference between the two readings must be held to less than 0.002 inches.

6. Tighten the mounting screws and verify with the feeler gauge that the readings have not changed.
7. Replace the contact box cover.

5.2 CLEANING PROCEDURES

The gold contacts require that no abrasives be used for cleaning purposes. If cleaning is required use a dry, clean, lint free cloth.

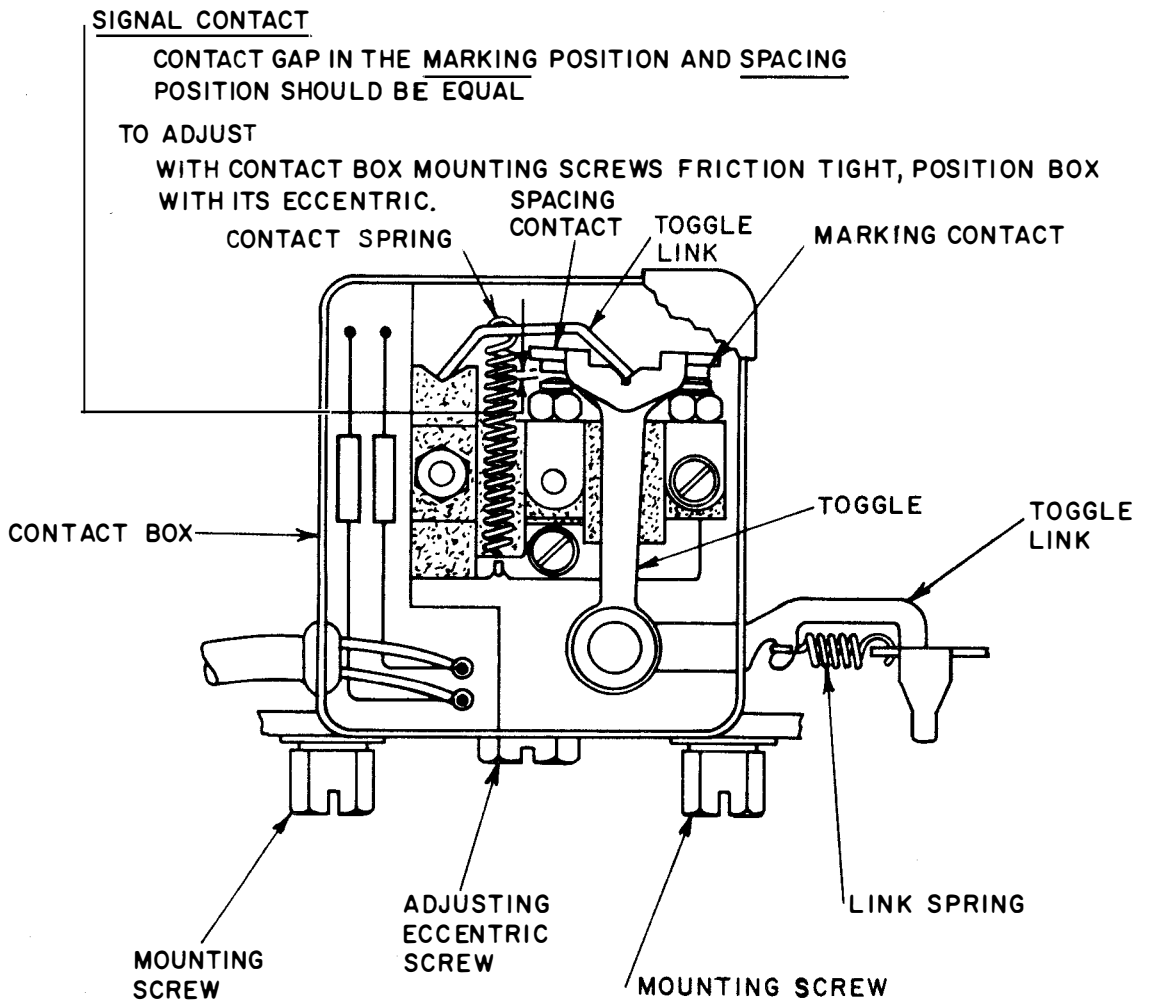


Figure 5.3 Contact Point Adjustment

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SECTION VI

PARTS LIST

6.1 PARTS LIST

Table 6.1 contains the detailed parts list for the TT-176/UG Series Teletypewriters NIK Modification Kit.

Table 6.1 Parts List

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
1	Connector, Winchester M4SLRH14	2	Winchester Div. of Litton Industries	
2	Connector, Winchester M4PLSH14	2	Winchester Div. of Litton Industries	
3	Bushing, Rubber AN3420-4	2	Cannon or Equal	
4	Clamp, Cable AN-3057-4	2	Cannon or Equal	
5	Reducer, Adapter AN-3055-16-4		Amphenol or Equal	
6	Connector AN3100A-16-6P Male	1	Cannon or Equal	
7	Connector MS3100A-16S- 6S Female	1	Cannon or Equal	
8	Connector MS3106A-16S- 6S Female	1	Cannon or Equal	
9	Connector MS3106A-16S 6P Male	1	Cannon or Equal	
10	Clamp, Cable AN3057-8	2	Cannon or Equal	
11	Cable RG-108/U	15"	9Z6145-553-7823	
12	Cable RG-108/U	20"	9Z6145-553-7823	
13	Cable RG-108/U	22"	9Z6145-553-7823	
14	Cable RG-108/U	35"	9Z6145-553-7823	
15	Screw 4-40 x 1/2 S.S.	8		
16	Nut 4-40 S.S.	8		
17	Washer, Split Lock #4	8		

Table 6.1 Parts List (Continued)

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
18	Assembly, Gold, Contact	1	9N5935-878-1051	179639
19	Box, Contact	1	IN5815-676-6992	154130
20	Cover, Contact Box	1	IN5815-676-6993	154131
21	Grommet	1	Teletype Corp. Skokie Illinois	154156
22	Bracket, Contact Box	1	IN5815-676-6971	154056
27	Clamp, Nylon Bundy HP-9N	1	2R5340-811-8387	
28	Lug, AMP #323914	2	9G5940-819-2960	
29	Nut	1	9Z5305-285-5575	3599
30	Washer	4	9Z5310-194-1478	3640
31	Washer	1	9Z5310-209-0929	90791
32	Washer	1	9Z5310-209-3861	110743
33	Screw	1	IN5815-738-4518	151686
34	Screw	1	9Z5303-514-7391	151731
35	Nut	1	9G5310-514-7394	151880
36	Insulator	1	9G5970-691-2733	154189
37	Washer	1	9Z5330-599-8282	151182
38	Screw	1	Teletype Corp. Skokie, Illinois	125126
39	Screw	1	9Z5305-370-0809	151152
40	Link	1	IN5815-652-1569	156644
41	Insulator	1	9G5970-691-2343	156663
42	Wire, 20G, Green	1 3/4"	Teletype Corp. Skokie, Illinois	195648
43	Screw	2	9Z5305-285-5575	1293
45	Strap, Bonding 1"x6" Cad.Plt.Copper			
46	Connector, Box 3/8" 90°	1		
47	Board, Melamine, 1/16" THK 2"x1" MIL-P-78A	1		
48	Insulator, Fishpaper 2" x 1"	1		
49	Wire, 22G, 600V, MIL-W- 16878D Teflon, Red	3"		
50	Wire, 22G, 600V Teflon Yellow MIL-W-16878D	3"		
51	Resistor, Carbon 1K, 1/4W	2	9N5905-883-9198	
52	Terminal, Turret USECO #2035-B1	2	USECO Div. of Litton Ind.	
53	Terminal, Turret USECO #2520-B1	2	USECO Div. of Litton Ind.	
54	Strap, Tye (long)	1	5815-325-1902	156880
55	Strap, Tye (short)	1	5815-325-1903	156881

Table 6.1 Parts List (Continued)

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
56	Screw	1		151657
57	Washer #6	1		2191
58	Screw	1		151642
59	Washer (Flat)	1		125015
	Assembly (Complete) Part No. GO-1352; Consist of pc. # 3, 4, 5, 6, 7, 8, 9, 10.	2		



MAKE THE FOLLOWING PEN AND INK CORRECTIONS AS INDICATED BELOW.

- Page ix, LIST OF TABLES, 5th line, Change J3 to Read J4.
- Page 2-7, Para 2.3.5(5), Under "Caution", 5th Line, Change (J3) to Read (J4).
- Page 2-8, Para 2.4.4(2), 2nd Line, Change J4 to Read J3.
- Para 2.4.4(4), 3rd Line, Change J3 to Read J4.
- Page 2-9, Table 2.3, Change J3 to Read J4 where appearing.
- Page 2-22, Figure 2.13, under KWF-1/TSEC Change J3 Loop-out to Read J4 Loop-out. Change J4 Loop-out to Read J3 Loop-out.

DONE 9/23/66



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NAVSHIPS 0967-284-5040

TECHNICAL MANUAL

for

NORMAL INPUT KEYING TELETYPE MODIFICATION KITS (U)

TT-47/48/69/70/UG SERIES

DEPARTMENT OF THE NAVY
NAVAL ELECTRONICS SYSTEM COMMAND

★
18 November 1967

LIST OF EFFECTIVE PAGES

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vii (RB)	Original
ix (RB)	Original
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3-1 (RB)	Original
4-1 and 4-2	Original
5-1 thru 5-5 (RB)	Original
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FOREWORD

This technical manual was prepared to MIL-M-15071E by PRC Technical Applications Inc. San Diego, California under contract N0022868C0118 for the San Francisco Bay Naval Shipyard, San Francisco, California.

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SECTION I

GENERAL DESCRIPTION

1.1 SCOPE

This technical manual provides a description of procedures for installing, operating, troubleshooting, and maintenance for the Normal Input Keying Teletype Modification Kit (NIK) for the TT-47/48/69/70/UG series Teletypewriters.

1.2 GENERAL INFORMATION

1. The Normal Input Keying Teletype Modification Kit was designed and manufactured by the San Francisco Bay Naval Shipyard, San Francisco, California.
2. It provides machine to machine interface between the TT-47/48/69/70/UG series teletypewriters and the associated cryptographic system. The TT-47/UG teletypewriter is shown in Figure 1.1. The NIK modification kit is shown in Figure 1.2.
3. The modifications are performed at the equipment site by field personnel. A list of tools required to perform the modification, a list of parts in the modification kit, and complete instructions for the installation of the kit are outlined in this manual.

1.3 PRELIMINARY REQUIREMENTS

Some of the TT-47/48/69/70/UG series teletypewriters must have field change modifications installed before the NIK modification kit can be installed. Table 1.1 contains a list of the teletypewriters and the number of the field change that must be installed. The field change modifies the 7.42 unit code keyboard to 7.00 unit code keyboard. However, the unit code change will not affect operation. The field changes are required to accommodate the larger signal contact box used for NIK operation.



Figure 1.1 TT-47/UG Teletypewriter

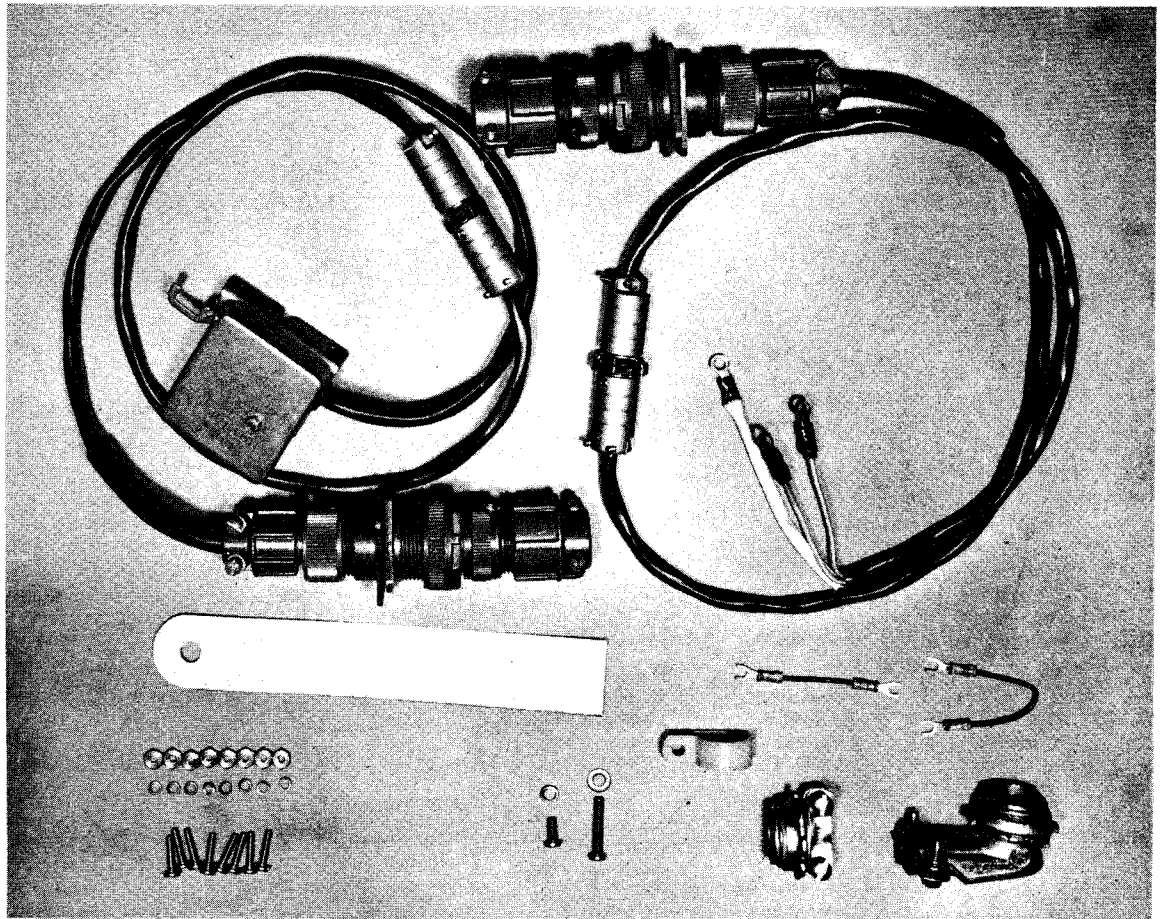


Figure 1.2 TT-47/UG NIK Modification Kit

Table 1.1 Field Changes Required

Teletypewriter	Field Change No.
TT-47	3
TT-47A	3
TT-47B	1
TT-47C	2
TT-47D	2
TT-47E	2
TT-48	3
TT-48A	3
TT-48B	2
TT-48C	2
TT-69	3
TT-69A	3
TT-69B	2
TT-69C	2
TT-70	3
TT-70A	3
TT-70B	1
TT-70C	2
TT-70D	2

1.4 ASSOCIATED EQUIPMENT REQUIREMENTS

The unit value of certain components in the NIK modification kit depends upon the system configuration. Read the instructions for the following configurations carefully before installing the NIK modification kit on the TT-47/48/69/70/UG series Teletypewriter.

1.4.1 System Configuration: TT-47/48/69/70/UG Series and KW-7/TSEC (MOD 13 Installed) Wired Direct

This configuration does not use SB-3176/UGQ Patch Panel. Remove the two carbon 1K ohm resistors in the contact box supplied with the NIK modification kit and install two 4.7K ohm resistors in their place. Connect a 50V 0.01 uf capacitor across the input cable leads at the terminals where the two resistors are connected.

1.4.2 System Configuration: TT-47/48/69/70/UG Series and KW-26/TSEC (MOD 14 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the two carbon 1K ohm resistors in the contact box supplied with the NIK modification kit and install wire straps across the terminals, where the resistors were installed (wire straps are not provided).

1.4.3 System Configuration: TT-47/48/69/70/UG Series, KW-7/TSEC (MOD 13 Installed), KW-26/TSEC (MOD 14 Installed), with SB-3176/UGQ Patch Panel

1. Remove the two carbon 1K ohm resistors in the contact box supplied with the NIK modification kit and install wire straps across the terminals, where the resistors were installed (wire straps are not provided).
2. Install the encapsulated filter network in the SB-3176/UGQ Patch Panel as directed in the SB-3176/UGQ installation manual.

NOTE

The encapsulated filter network must be installed in the SB-3176/UGQ Patch Panel whenever the KW-7/TSEC cryptographic device is used.

- 1.4.4 System Configuration: TT-47/48/69/70/UG Series, KW-7/TSEC (MOD 13 Installed), KW-26/TSEC (MOD 14 Not Installed), with SB-3176/UGQ Patch Panel

Install the NIK modification kit as directed in the installation procedures, Section II.

- 1.4.5 All System Configurations Using the SB-3176/UGQ Patch Panel

1. Read the appropriate section of the KAM-85/TSEC for pre-conditions required prior to connecting the KW-26/TSEC to the (NIK) Normal Input Keying System.
2. Read the appropriate section of the KAM-143/TSEC for pre-conditions required prior to connecting the KW-7/TSEC to the (NIK) Normal Input Keying System.

NOTE

In all cases when using the SB-3176/UGQ Patch Panel, the encapsulated filter network must be installed at the SB-3176/UGQ Patch Panel where the KW-7/TSEC (J8 Loop-in) cable connects.

1.5 PHYSICAL CHARACTERISTICS

Table 1.2 lists the major parts contained in the NIK modification kit.

1.6 ELECTRICAL CHARACTERISTICS

Refer to KAM-85/TSEC and KAM-143/TSEC for the electrical characteristics of Normal Input Keying.

1.7 REFERENCE DATA

1.7.1 Weight Change Due To Modification

1. The modifications are estimated to have added less than one pound of weight to the TT-47/UG tele-typewriter.

Table 1.2 TT-47/UG Modification Kit

Item	Quantity	Part
1	1	Cable assembly (two piece), wired to contact box and MS3100A-16S-6S connector. The intermediate connectors are Winchester type M4SLRH14 and M4PLSH14.
2	1	Cable assembly (two piece), with a AN3100A-16-6P connector on one end and terminal lugs on the other end. The intermediate connectors are Winchester type M4SLRH14 and M4PLSH14.
3	8	4-40 Screws, hex nuts and split lock washer.
	1	No. Six flat washer.
	1	No. 6 Split lock washer.
4	1	90 ^o Box connector
5	1	Straight Box connector
6	1	6-40 x 1 inch screw
	1	6-40 x 3/8 inch screw
7	1	Bonding strap
8	2	Wire straps with lugs, two inch and three inch.
9	1	Plastic cable clamp
10	1	Decal

1.7.2 Dimension Changes Due To Modifications

1. The modifications increased the depth of the chassis approximately one inch with the external cable disconnected, and increased the space required behind the chassis by approximately four inches with the external cable in place.

SECTION II

INSTALLATION

2.1 GENERAL

This section contains detailed steps for removal of components no longer used and installation of new components to the TT-47/48/69/70/UG Series Teletypewriters. Figures 2.1 through 2.6 in the back of this section, show the TT-47/UG before and after the modification. Figures 2.7 and 2.8 show the installation drawings.

2.2 REMOVAL OF REPLACED COMPONENTS

Perform the following steps in the order listed. The tools required for the modification are listed in Table 2.1.

2.2.1 Page Printer Assembly and Removal of Keyboard

1. Secure the ac power and the dc (signal) line current.
2. Raise the cover on the teletypewriter and lock in the open position.
3. Remove keyboard connector and page printer connector.
4. Loosen two thumb screws and remove cross bar.
5. Remove four screws holding page printer and remove from baseplate.
6. Remove the keyboard.
7. Remove the existing external dc signal line cable.

2.2.2 Removal of Contact Box

1. With the keyboard in a suitable work area, remove the cover from the contact box. Remove

Table 2.1 Tools Required

Quantity	Item
1	1/4 inch electric drill
3	Bits, 1/4 inch, 1/8 inch and No. 27
2	Screwdrivers, medium and small
4	Open end wrenches 7/16 inch, 5/16 inch, 1/4 inch and 3/8 inch
1	6' Tape measure
1 roll	Plastic insulation tape
1	Side cutter
1	Wire stripper
1 roll	Resin core solder
1	Soldering iron
1	Wire brush, small
1	Center punch
1	Hammer
2	Chassis hole cutters, 1 inch and 7/8 inch
1	Round file, 3/16 inch
1 set	Wire feeler gauges

or cut the two wires and pull cable from contact box.

2. Tape the two wires and the shield so that there is no possibility of making an electrical contact with another metal part.
3. Re-position the end of the cable so that it will not interfere with normal operation of the equipment.
4. Remove the end of the link spring nearest the contact box. Do not discard the spring.
5. Remove the two screws holding the contact box.
6. Remove the contact box and retain the two screws. Tape the eccentric adjusting screw in position.
7. Remove the cover from the selector magnet terminal board on the page printer and disconnect the incoming wires.
8. Tape the wires so that there is no possibility of making electrical contact with another metal part.
9. Re-position the end of the cable so that it will not interfere with normal operation of the equipment.

2.3 INSTALLATION OF THE MODIFICATION KIT

Use caution during the installation of the modification kit, by not misaligning any mechanical assembly or stretching wire in the cable harness.

2.3.1 Installation of Box Connectors

1. Install the 90° box connector (item 40) as required so that the power cable enters below the baseplate and from the rear.
2. Install a straight box connector (item 39) in the back side of the cabinet (console) if required.

2.3.2 Installation of Cable Connectors

1. Draw a horizontal line across the back of the cabinet 5 1/4 inches above the bottom of the cabinet. Draw intersecting lines 6 1/2 and 8 1/2 inches from the left side (facing the back panel).
2. Drill a pilot hole at each of the above line intersections.
3. Use a one inch chassis hole cutter or hole saw to enlarge the above pilot holes to one inch diameter.
4. Insert the connectors AN3100A-16-6P and MS3100A-16S-6S (items 6, 7) in the above holes, and adjust until the four sides are true vertically and horizontally. Scribe the four mounting holes for each connector.
5. Drill out the eight holes using a No. 27 drill bit.
6. Mount the connector (page printer, item 6) on the left side (from the rear). Bolt in position with the key up using four 4-40 x 1/2 inch screws (item 11), split lock washers (item 13) and hex nuts (item 12).

2.3.3 Installation of the New Contact Box

1. On the keyboard assembly, remove the tape holding the eccentric screw in position. Place the new contact box (item 24) and link in position and using the mounting screws retained from the old contact box, secure friction tight.
2. Re-position the link-spring (86304) to connect to the link (156644) near the contact box.

2.3.4 Installation of Cables

1. Run the cable (item 17) from the contact box down and back along the edge of the base plate. Clamp the front half of the Winchester connector M4SLRH14 (item 1) near the rear edge on top of the base plate if necessary.

2. On the page printer selector magnet terminal board, connect the two outside terminals together using the three inch wire strap.
3. On the same board, connect the two inside terminals together using the two inch wire strap.
4. Connect one line in the new selector magnet cable (item 16) to either outside terminal on the selector magnet terminal board. Connect the other line to either inside terminal.
5. Use an existing screw on the frame of the page printer to ground the cable shield.
6. Replace the terminal board cover and clamp the cable (item 16) in position just behind the terminal board with the plastic cable clamp, obtained from the original cable going to the terminal board.
7. Install bonding strap (item 55) as required.
8. Use a vacuum cleaner to remove chips and filings from the cabinet.
9. Re-install the keyboard, page printer and cross bar in the cabinet.
10. Insert connectors for the printer, and keyboard into the proper receptacles.
11. Mate the back half of the Winchester connector, M4PLSH14 (item 2, connected to MS3100A-16S-6S in the back panel) to the front half (clamped to the base plate) which goes to the contact box.
12. Run the cables (items 15, 16) from the selector magnet terminal board down to the base plate and back to connector AN3100A-16-6P (item 6) in the back panel.

CAUTION

Dress cable away from motor flywheel and other moving parts.

13. Using standard procedures, make up a two-wire shielded cable assembly with a MS3106A-16S-6P (item 9) connector and connect to the SB-3176/UGQ Patch Panel in accordance with NAVSHIPS 0967-284-5070. Pins B and C are signal lines and pin A is the shield. At the SB-3176/UGQ panel, pins A and C are signal lines, pin D is ground and pin B is not used. See Figure 2.9.
14. Using standard procedures, make up a two wire shielded cable assembly with a MS3106A-16S-6S (item 8) connector and connect to the SB-1210/UGQ Patch Panel. Pins B and C are signal lines. Pin A is the shield. At the SB-1210/UGQ Patch Panel, install terminal lugs on the signal lines. The shield is ground. See Figure 2.9. Connect the signal lines to SET JACK terminals on the SB-1210/UGQ Patch Panel.

NOTE

The alignment procedures in Section V (Maintenance) must be performed before the equipment can be operated.

15. Close the front cover on the equipment.
16. Install the decal adjacent to the name plate.

CAUTION

Before applying power to the TT-47/48/69/70/UG series, SB-1210/UGQ Patch Panel and the associated KW-7 cryptographic equipment, ensure that the loop-out cable (J4) from the KWF-1/TSEC to the SB-1210/UGQ Patch Panel, and to the selector magnets of the page printer are free of all grounds. Check with an ohmmeter from each side of the line to ground. A grounded receive signal line will cause damage to the KW-7/TSEC.

2.4 ADDITIONAL REQUIREMENTS

The modification of the TT-47/48/69/70/UG Teletype-writers with the NIK modification kit, requires that the equipment listed below be modified before being used with the NIK modified equipment.

2.4.1 KW-7/TSEC

MOD 13 must be installed prior to NIK installation.

2.4.2 KW-26/TSEC

MOD 14 must be installed prior to NIK installation.

2.4.3 SB-1210/UGQ Patch Panel

The SB-1210/UGQ Patch Panel must be wire strapped for remote battery prior to NIK installation. See NAVSHIPS 95718.

2.4.4 Removal of KWL-4/TSEC Unit and Installation of Dummy Connector

The KWL-4 unit and its associated cables must be removed prior to NIK installation. Proceed as follows.

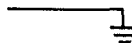
1. Remove the KWL-4 unit and its associated cables.
2. Using standard procedures make up two dummy connectors for J~~3~~ and J7 on the KWF-1/TSEC rack. Wire strap pins B and C together on each of the plugs and install.
3. Using standard procedures make up a shielded two-wire cable and connect from the SB-3176/UGQ Patch Panel to J8 on KWF-1. See Table 2.2 for cable connections. Use connector type MS3116E-14-5S (connector not furnished).

Table 2.2 J8 of KWF-1 to SB-3176/UGQ Cable Connections

KWF-1 J8 Pins	SB-3176/UGQ Patch Panel Conn. Pins
B	B
C	C
A	D

- Using standard procedures make up a shielded two-wire cable and connect from the SB-1210/UGQ Patch Panel to J4 on KWF-1. See Table 2.3 for cable connections. Use connector type MS3116E-14-5PW (connector not furnished).

Table 2.3 J3 of KWF-1 to SB-1210/UGQ Cable Connections

KWF-1 J4 Pins	SB-1210/UGQ Panel Conn.
C	1 (3) (5) etc.
D	2 (4) (6) etc.
A	

2.4.5 Typical Cryptographic System

Figure 2.10 shows a typical cryptographic system using the TT-47/48/69/70/UG Series Teletypewriter.

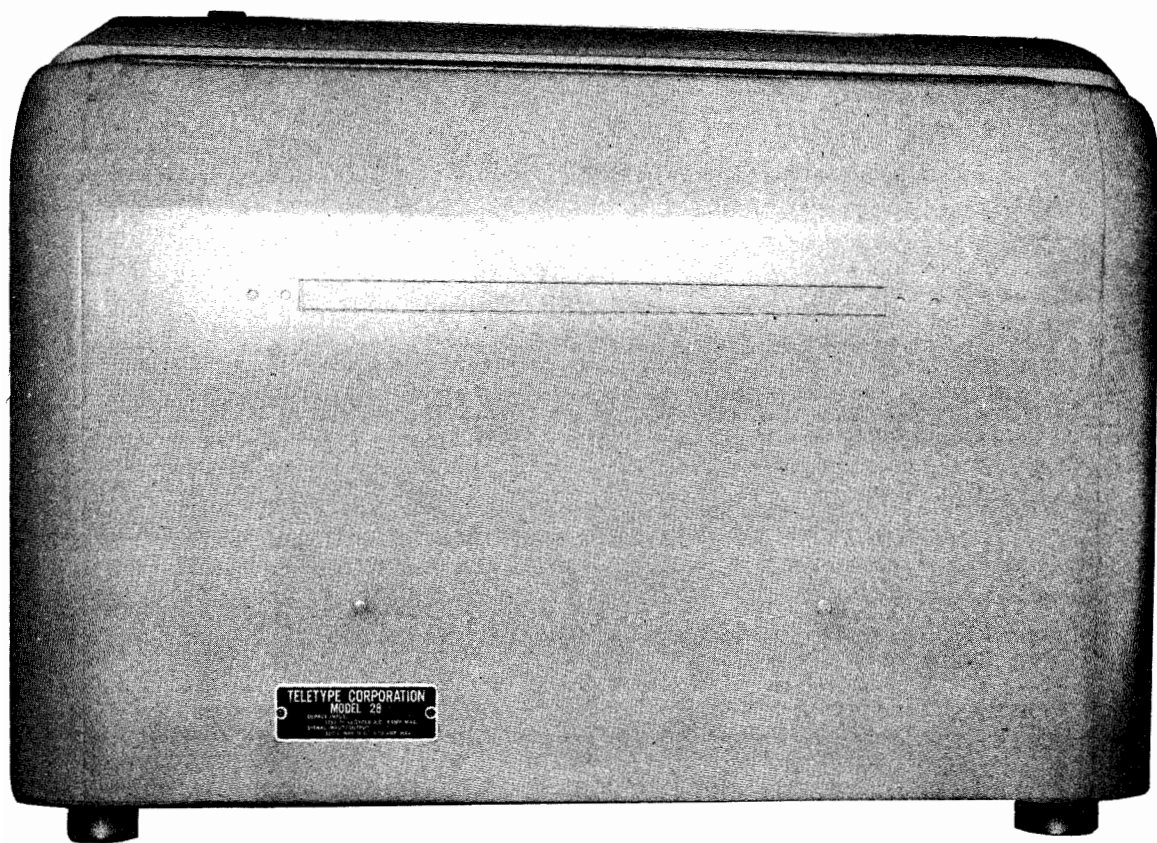


Figure 2.1 Rear View of TT-47/UG Before Modification



Figure 2.2 Rear View of TT-47/UG After Modification

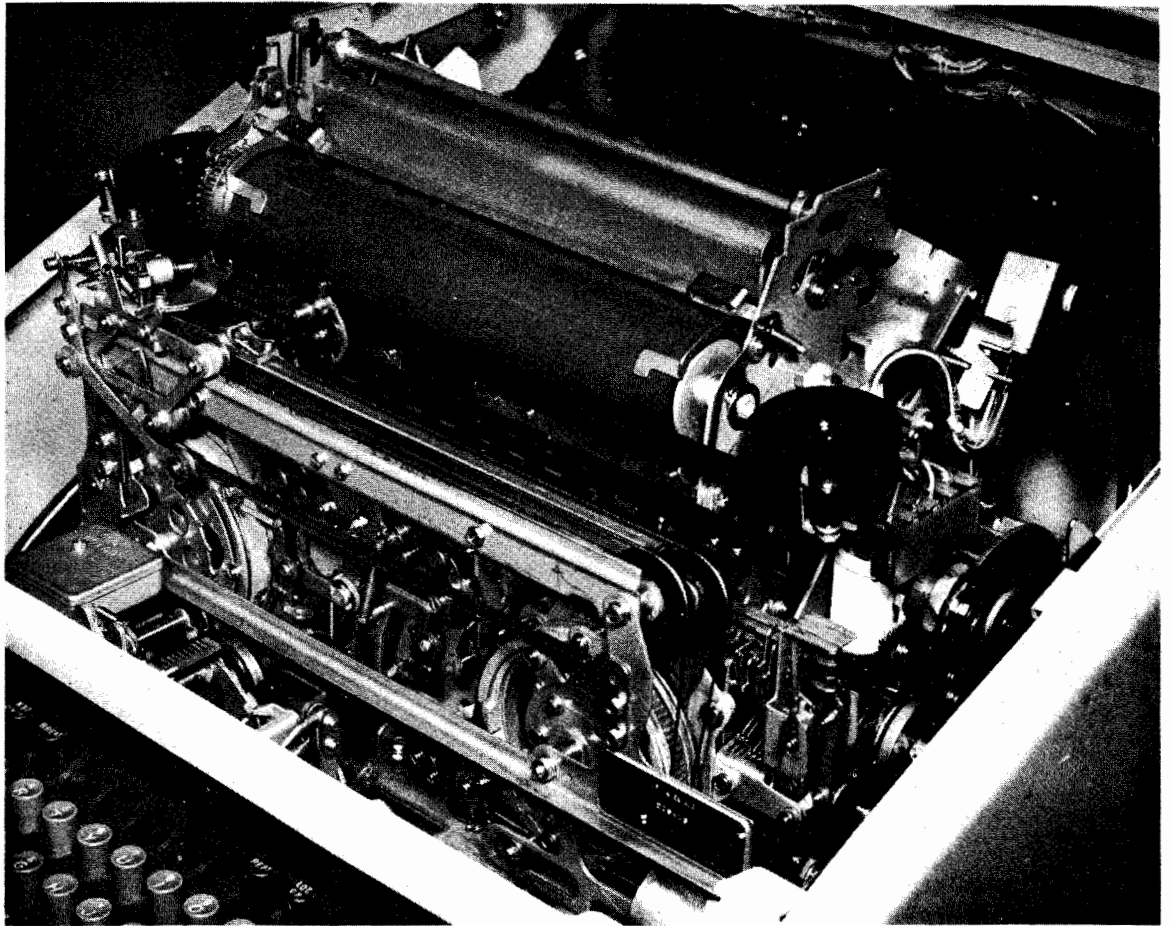


Figure 2.3 Internal View of TT-47/UG Showing Selector Magnet Assembly Before Modification

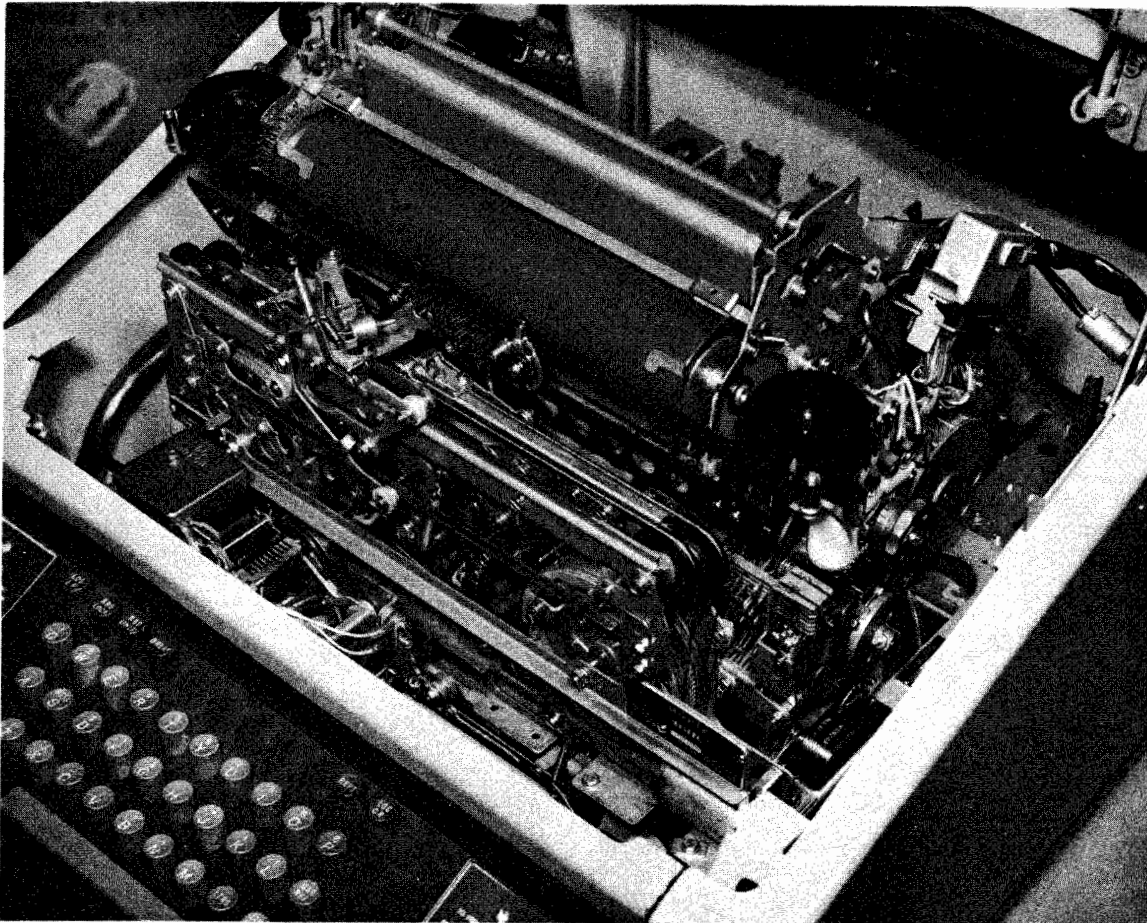


Figure 2.4 Internal View of TT-47/UG Showing Selector Magnet Assembly After Modification

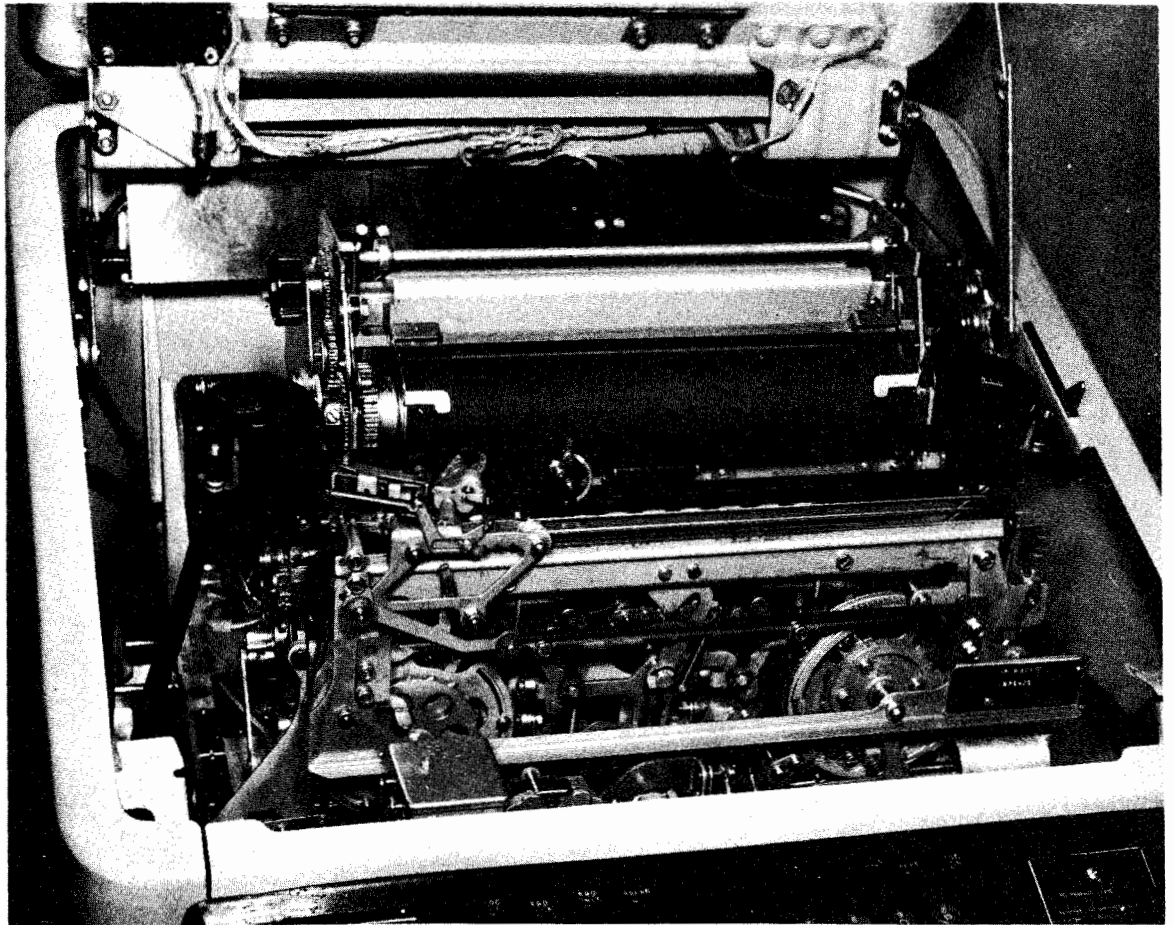


Figure 2.5 Internal View of TT-47/UG Showing Contact Box and Cables Before Modification

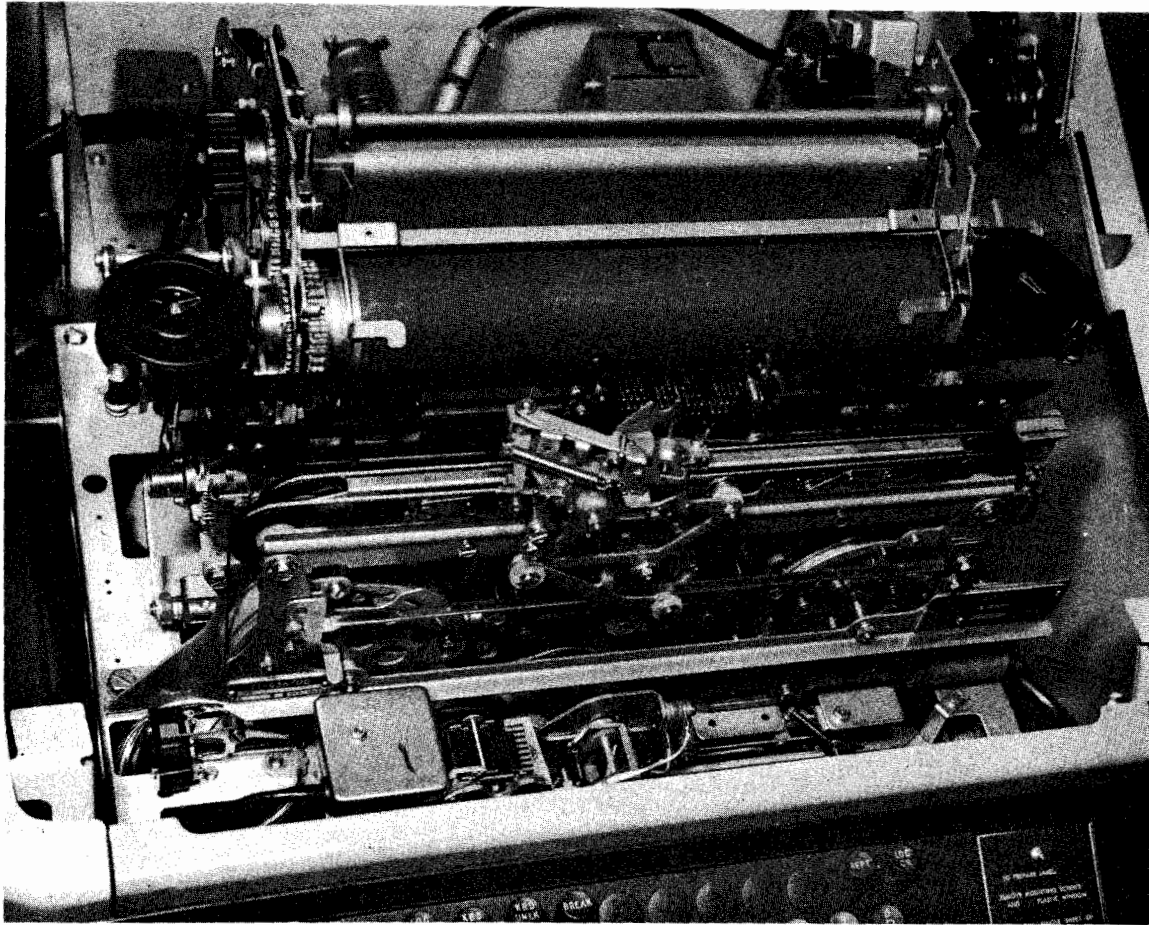


Figure 2.6 Internal View of TT-47/UG Showing Contact Box and Cables After Modification

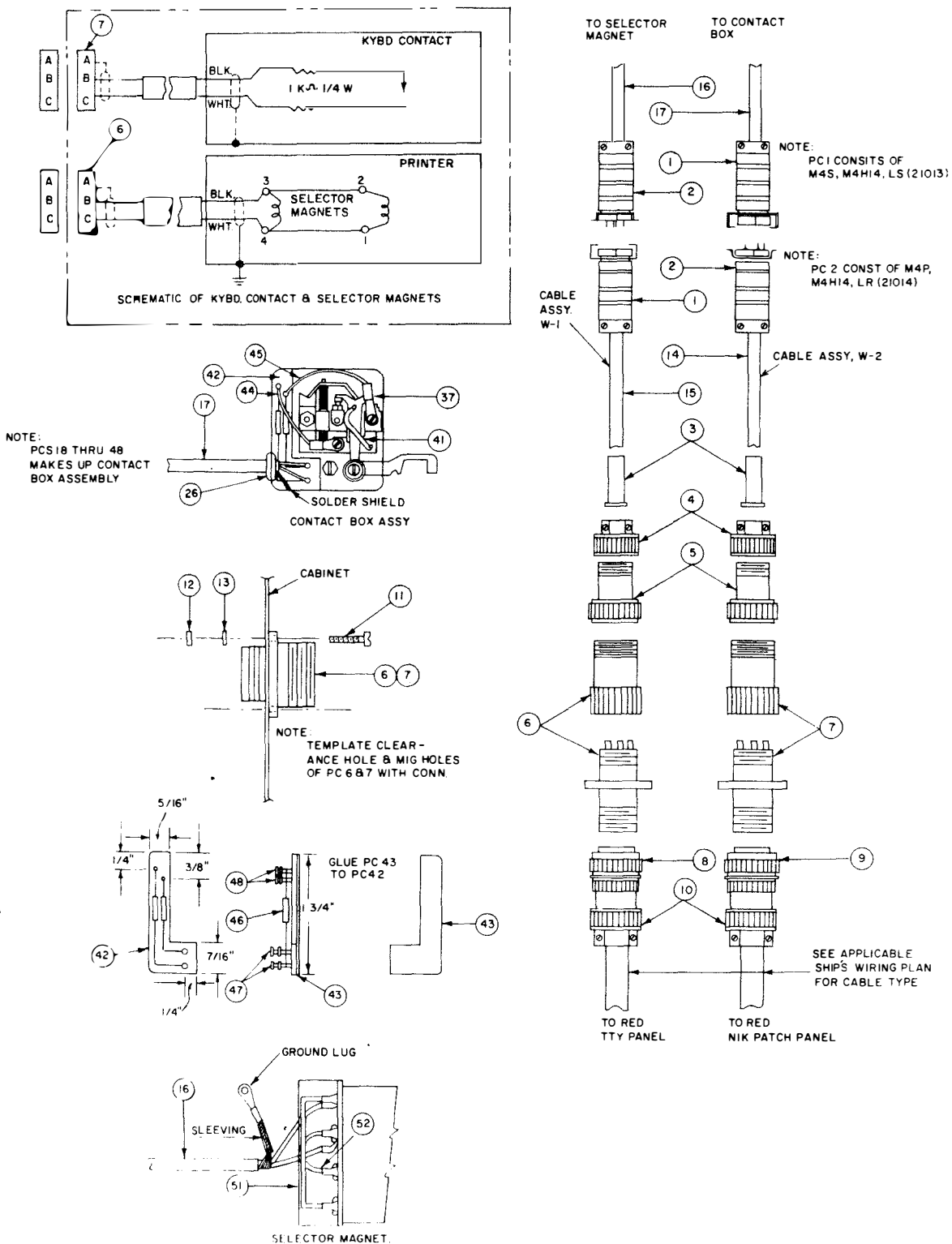


Figure 2.7 TT-47/UG Installation Drawing (Part 1)

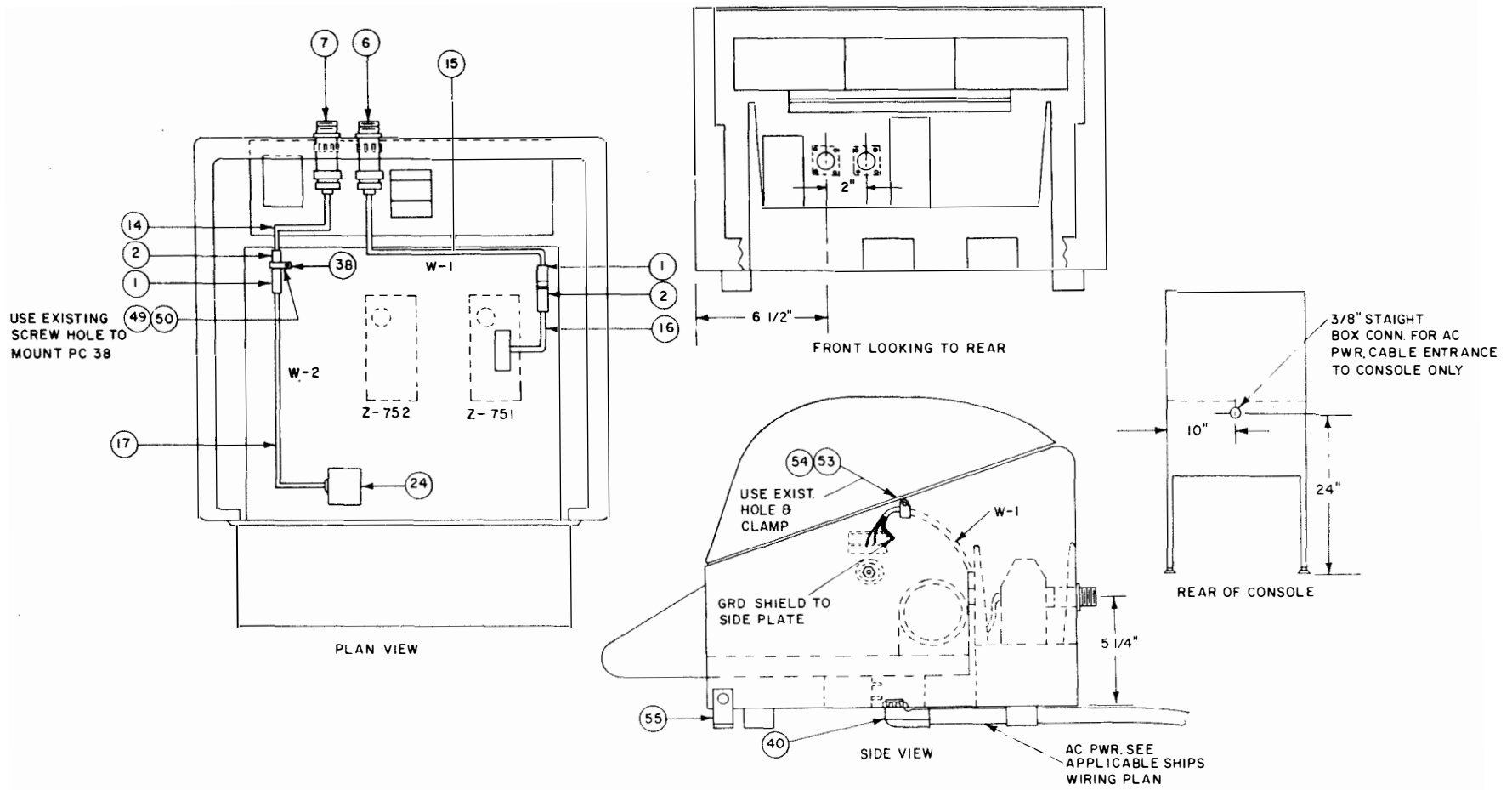


Figure 2.8 TT-47/UG Installation Drawing (Part 2)

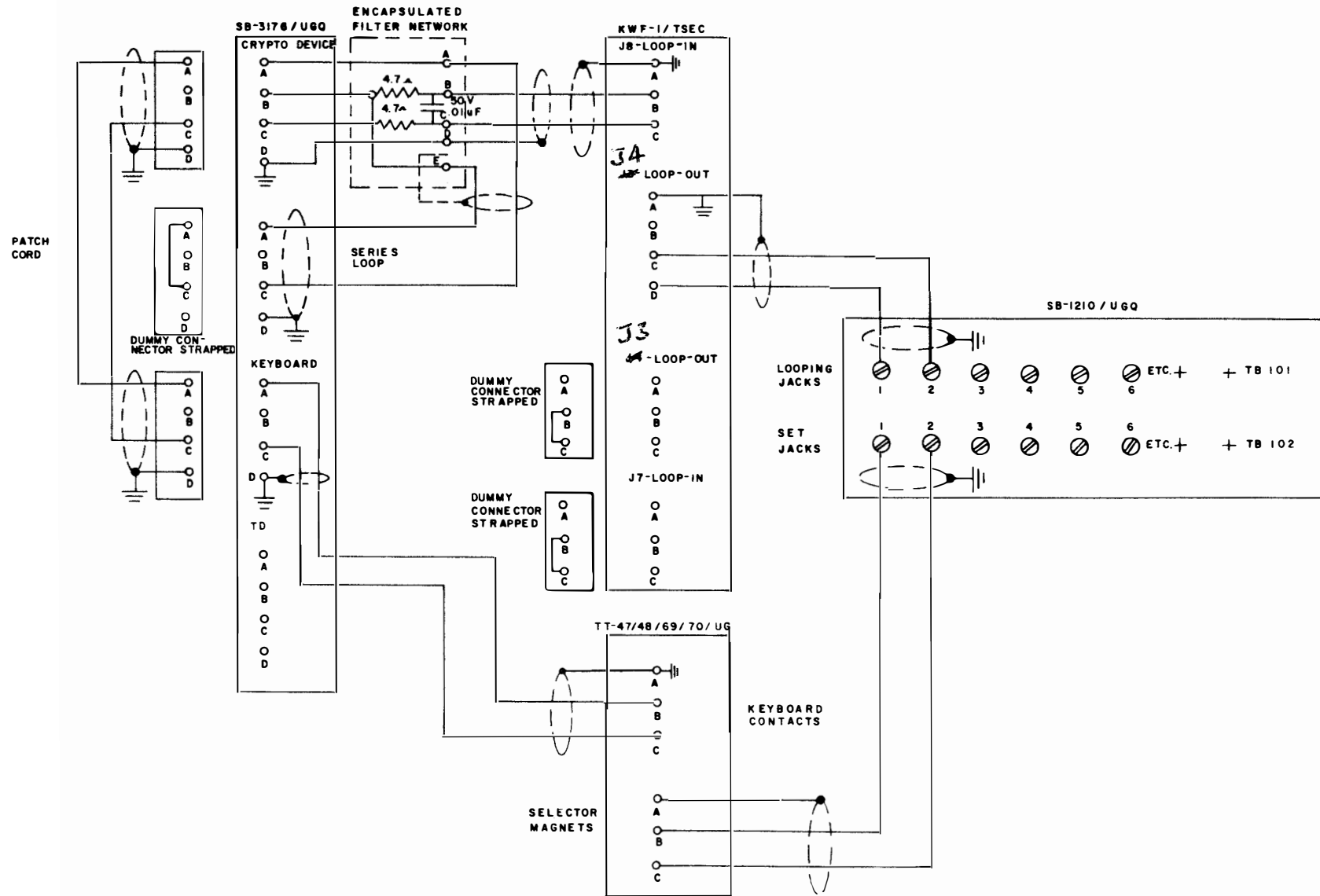


Figure 2.9 Typical Cryptographic System Using the TT-47/48/69/70/UG Teletypewriters

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SECTION III

OPERATION

3.1 OPERATIONAL CAPABILITIES

The TT-47/48/69/70/UG series teletypewriters is affected by the NIK modification kit as follows;

1. Keyboard and page printer are not in series.
2. Signal line shunt relay inoperative.
3. The electrical portion of the break key inoperative.

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SECTION IV
TROUBLESHOOTING

4.1 INSPECTION

Perform periodic inspection on all mechanical assemblies, connectors, etc.

1. Ensure that all terminals are tight and clean.
2. Ensure that all connector contacts are clean and straight.
3. Ensure that all connectors are run up tight to provide firm contact with the other connector.
4. Ensure that all cables are in proper place and do not interfere with equipment operation.

4.2 CHECKOUT

NOTE

The following tests should be limited to a volt-ohmmeter with an internal resistance of 20,000 ohms per volt, using minimum current application.

1. A suspected "open" cable may be checked by using an ohmmeter (low ohms range) connected from pin A on one end of the disconnected cable, to pin A on the other end of the cable and etc.
2. A suspected "short" in the disconnected cable may be determined by checking from pin A to pin B, from pin B to pin C and etc. Any resistance reading would indicate a shorted cable.

4.3 DISTORTION OR GARBLED MESSAGE

Distortion or intermittent garble may be caused by dirty contact points. Refer to paragraph 5.2 for cleaning procedures.

SECTION V
MAINTENANCE

5.1 ALIGNMENT PROCEDURES

The proper operation of the keyboard is dependent upon the signal generator contact adjustment. Three methods of adjustment are provided. Method I or Method II is preferred. It is recommended that a 6 volt battery be used when making Method I or Method II adjustments. Battery should be connected across pins B and C of keyboard input connector.

5.1.1 Contact Adjustment, Method I

1. Connect the input leads of an oscilloscope directly across the contacts in the signal generator box. The input leads may be connected to the mark contact terminal and the fixed terminal, to which the jumper or pigtail is soldered.
2. Insert a test tape in the TD. The tape should contain a repetitive character such as an R. Start the TD and adjust the scope sweep controls to obtain a stationary pattern including several marks and spaces. A pattern similar to that shown by Figure 5.1 should be obtained. The marking and spacing levels should be symmetrical with respect to the scope base line.

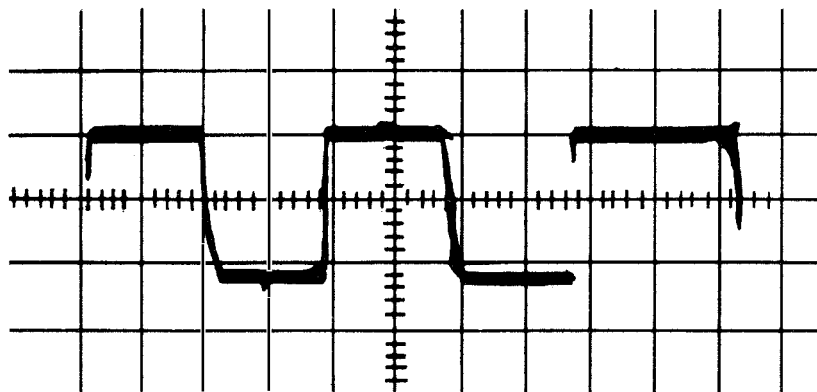


Figure 5.1 Waveform Method I

3. Loosen the contact box mounting screws until they are friction tight.
4. Adjust the eccentric contact adjusting screw to make the marking and spacing elements displayed on the oscilloscope base line of equal length.

CAUTION

Do not use the stop baud as a marking element. It is of a longer time duration than the other elements of the signal. The stop baud appears at the right hand side of the trace shown by Figure 5.1.

5. Tighten the contact box mounting screws and recheck the oscilloscope display to verify the presence of equal marking and spacing signal elements.

5.1.2 Contact Adjustment, Method II

This method of adjusting the contacts can be used to obtain a precise contact adjustment more easily than by the use of Method I.

1. Connect the oscilloscope as in sub-paragraph 1 of Method I. In addition, provide a connection from the signal input lead at the contact assembly, to the external sync or trigger input to the oscilloscope.
2. Insert a test tape containing alternate R's and Y's in the TD. Start the TD and adjust the oscilloscope controls to obtain a stationary display, including a complete character having marking and spacing levels arranged symmetrically with respect to its base line. A sweep rate of approximately 5 ms per cm will display one character. A display similar to that shown by Figure 5.2 should be obtained.

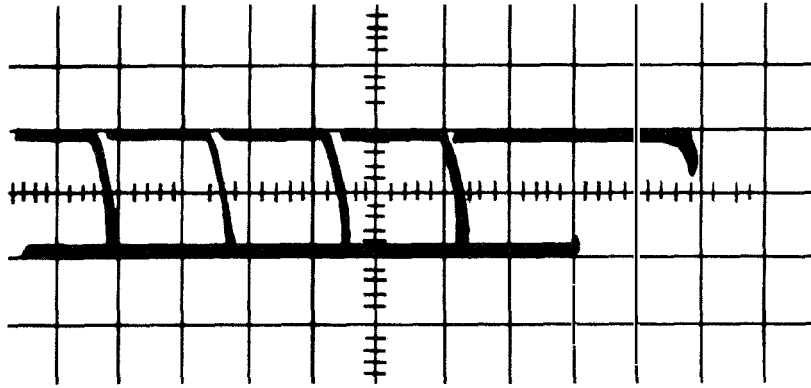


Figure 5.2 Waveform, Method II

3. Adjust the contacts in the manner set forth in Method I, to obtain equal marking and spacing elements as indicated on the scope base line at the crossover points on the scope trace. The use of alternate R's and Y's, will result in an overlap of the alternate marks and spaces due to scope persistence, which results in the rise and fall portions of the traces crossing at the scope base line.

5.1.3 Contact Adjustment, Method III

Use only when an oscilloscope is not available.

1. Remove the contact box cover. See Figure 5.3.
2. Loosen the two contact box mounting screws until friction tight.
3. Engage the clutch and rotate the main shaft slowly until one set of points are at maximum clearance.
4. Check the clearance with a clean (no oil) wire feeler gauge. If the clearance is less than 0.010 inches, adjust the eccentric screw until a clearance of approximately 0.009 inches is obtained.
5. Remove the feeler gauge and slowly rotate the main shaft until the other set of points are at maximum clearance. Check with the feeler gauge. The two sets of points must open at least

0.008 inches and not more than 0.010 inches.
The difference between the two readings must be held to less than 0.002 inches.

6. Tighten the mounting screws and verify with the feeler gauge that the readings have not changed.
7. Replace the contact box cover.

5.2 CLEANING PROCEDURES

The gold contacts require that no abrasives be used for cleaning purposes. If cleaning is required use a dry, clean, lint free cloth.

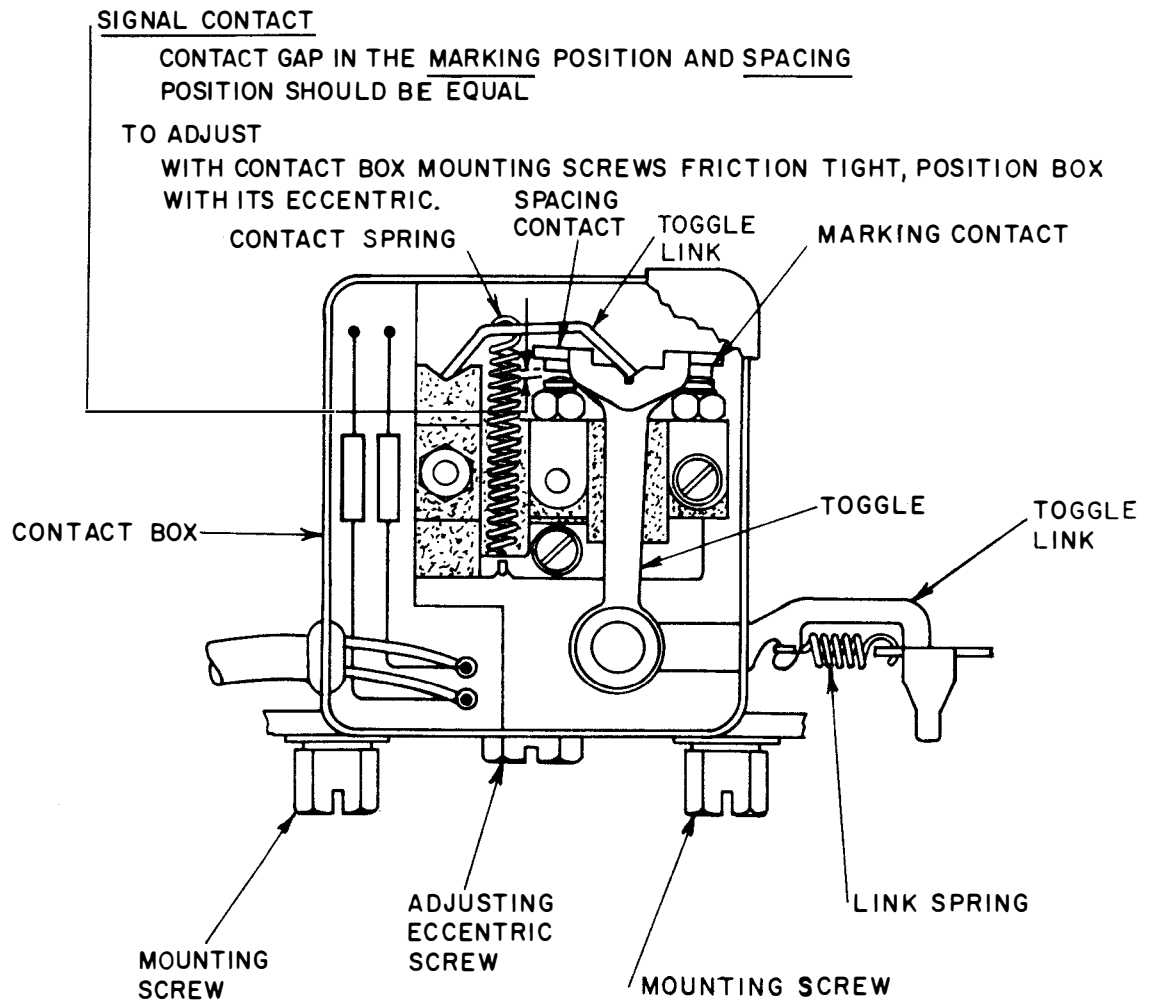


Figure 5.3 Contact Point Adjustment

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SECTION IV

PARTS LIST

6.1 PART LIST

Table 6.1 contains the detailed parts list for the TT-47/48/69/70/UG Series Teletypewriters NIK Modification Kit.

Table 6.1 Parts List

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
1	Connector, Winchester M4SLRH14	2	Winchester Div. of Litton Industries	
2	Connector, Winchester M4PLSH14	2	Winchester Div. of Litton Industries	
3	Bushing, Rubber AN3420-4	2	Cannon or Equal	
4	Clamp, Cable AN3057-4	2	Amphenol or Equal	
5	Adapter, Reducer AN3055- 16-4	2	Cannon or Equal	
6	Connector, Male AN3100A- 16-6P	1	Cannon or Equal	
7	Connector, Female MS3100A-16S-6S	1	Cannon or Equal	
8	Connector, Female MS3106A-16S-6S	1	Cannon or Equal	
9	Connector, Male MS3106A-16S-6P	1	Cannon or Equal	
10	Clamp, Cable AN3057-8	2	Cannon or Equal	
11	Screw, 4-40 x 1/2 B.H.S.S.	8		
12	Nut, Hex 4-40 S.S.	8		
13	Washer, Split Lock #4	8		
14	Cable, RG-108/U	12"	9Z6145-553-7823	
15	Cable, RG-108/U	15"	9Z6145-553-7823	
16	Cable, RG-108/U	15"	9Z6145-553-7823	
17	Cable, RG-108/U	20"	9Z6145-553-7823	
18	Assembly, Gold Contact	1	9N5935-878-1051	179639
19	Washer	1	9Z5330-599-8282	151182

Table 6.1 Parts List (Continued)

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
20	Screw	1	IN5815-738-4518	195186
21	Screw	1	9Z5305-514-7391	151731
22	Nut	1	9G5310-514-7394	151880
23	Bracket	1	IN5815-676-6971	154056
24	Box, Contact	1	IN5815-676-6992	154130
25	Cover, Contact Box	1	IN5815-676-6993	154131
26	Grommet		Teletype Corp. Skokie, Illinois	154156
27	Insulator	1	9G5970-691-2733	154189
28	Link	1	IN5815-652-1569	156644
29	Insulator	1	9G5970-691-2343	156663
30	Screw	2	9Z5315-285-5575	1293
31	Nut	1	9Z5310-194-8195	3599
32	Washer	4	9Z5310-194-1478	3640
33	Washer	1	9Z5310-209-0929	90791
34	Screw	2		125126
35	Screw	1		151152
36	Washer	2		110743
37	Lugs	2	AMP#323914	
38	Clamp, Nylon, Bundy HP-9N	1	2R5340-811-8387	
39	Connector, 3/8" Straight Box	1		
40	Connector, Box 3/8" 90°	1		
41	Wire, Green 20G	3/4"		195648
42	Melamine Board 1/16" THK 2" x 1"	1		
43	Insulator, Fish Paper 2" x 1"	1		
44	Wire, 22G, 600V. Teflon Red MIL-W-16878D	3"		
45	Wire, 22G, 600V. Teflon Yellow MIL-W-16878D	3"		
46	Resistor, Carbon 1K, 1/4W	2		
47	Terminal, Turret #2035-B1	2	USECO Div. of Litton, Ind.	
48	Terminal, Turret #2520-B1	2	USECO Div. of Litton, Ind.	
49	Screw	1		151642
50	Flat Washer	1		125015
51	Strap (Long)	1		156880
52	Strap (Short)	1		156881

Table 6.1 Parts List (Continued)

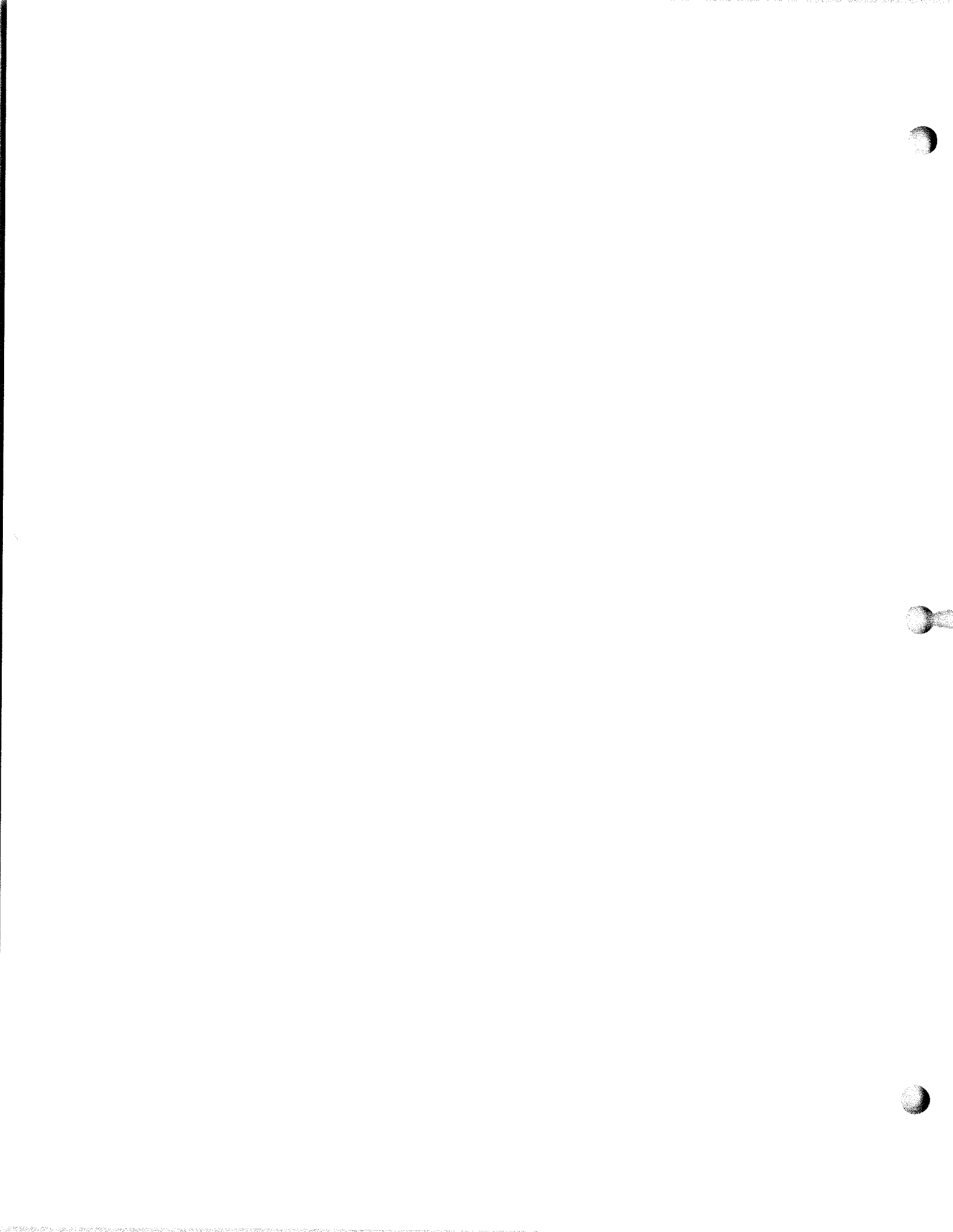
Pc. No.	Description	Qty	Mfg or FSN	TTY No.
53	Screw	1	Glenair Inc. Glendale, Calif.	151657
54	Washer, Split Lock #6	1		2191
55	Strap, bonding 1" wide x 6" long, Cad. Plt.	1		
	Copper Assembly (Complete) part No. GO-1369, consists of the above pc. # 5, 6, 7, 8, 9, and 10.	2		



MAKE THE FOLLOWING PEN AND INK CORRECTIONS AS INDICATED BELOW.

- Page ix, LIST OF TABLES, 6th Line, Change J3 to Read J4.
- Page 2-6, Para 2.3.4(16), under "Caution", 5th Line Change (J3) to Read (J4).
- Page 2-7, Para 2.4.4(2), 2nd Line, Change J4 to Read J3.
- Page 2-8, Para 2.4.4(4), 3rd Line, Change J3 to Read J4.
- TABLE 2.3, Change J3 to Read J4 where appearing.
- Page 2-17, Figure 2.9, under KWF-1/TSEC
Change J3 Loop-out to Read J4 Loop-out.
Change J4 Loop-out to Read J3 Loop-out.

DONE 9/23/16



★
NAVSHIPS 0967-284-5050

TECHNICAL MANUAL

for

**NORMAL INPUT KEYING
TELETYPE MODIFICATION KITS (U)**

AN/UGC-20

**DEPARTMENT OF THE NAVY
NAVAL ELECTRONICS SYSTEM COMMAND**

★
18 November 1967

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4-1 (RB)	Original
5-1 (RB)	Original
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FOREWORD

This technical manual was prepared to MIL-M-15071E by PRC Technical Applications Inc. San Diego, California under contract N0022868C)118 for the San Francisco Bay Naval Shipyard, San Francisco, California.

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SECTION I

GENERAL DESCRIPTION

1.1 SCOPE

This technical manual provides a description of procedures for installing, operating, troubleshooting, and maintenance for the Normal Input Keying Teletypewriter Modification Kit for the AN/UGC-20 Series Teletypewriter.

1.2 GENERAL INFORMATION

1. The Normal Input Keying Teletype Modification Kit was designed and manufactured by the San Francisco Bay Naval Shipyard, San Francisco, California.
2. It provides machine to machine interface between the AN/UGC-20 Teletypewriter and the associated cryptographic system. The AN/UGC-20 Teletypewriter is shown in Figure 1.1.
3. The NIK modification kit is shown in Figure 1.2. Modifications are performed at the equipment site by field personnel. A list of tools required to perform the modification, a list of parts in the modification kit, and complete instructions for the installation of the modification kit are outlined in this manual.

NOTE

It is recommended that, the AN/UGC-20 Teletypewriter be used in a "receive only" capacity, as much as possible, after the installation of the normal input keying kit (NIK). Due to the fact that gold distributor contacts are not available, cleaning of existing contacts are extremely important. Paper dust and oil on contacts will cause malfunctions to occur in the unit.



Figure 1.1 AN/UGC-20 Teletypewriter

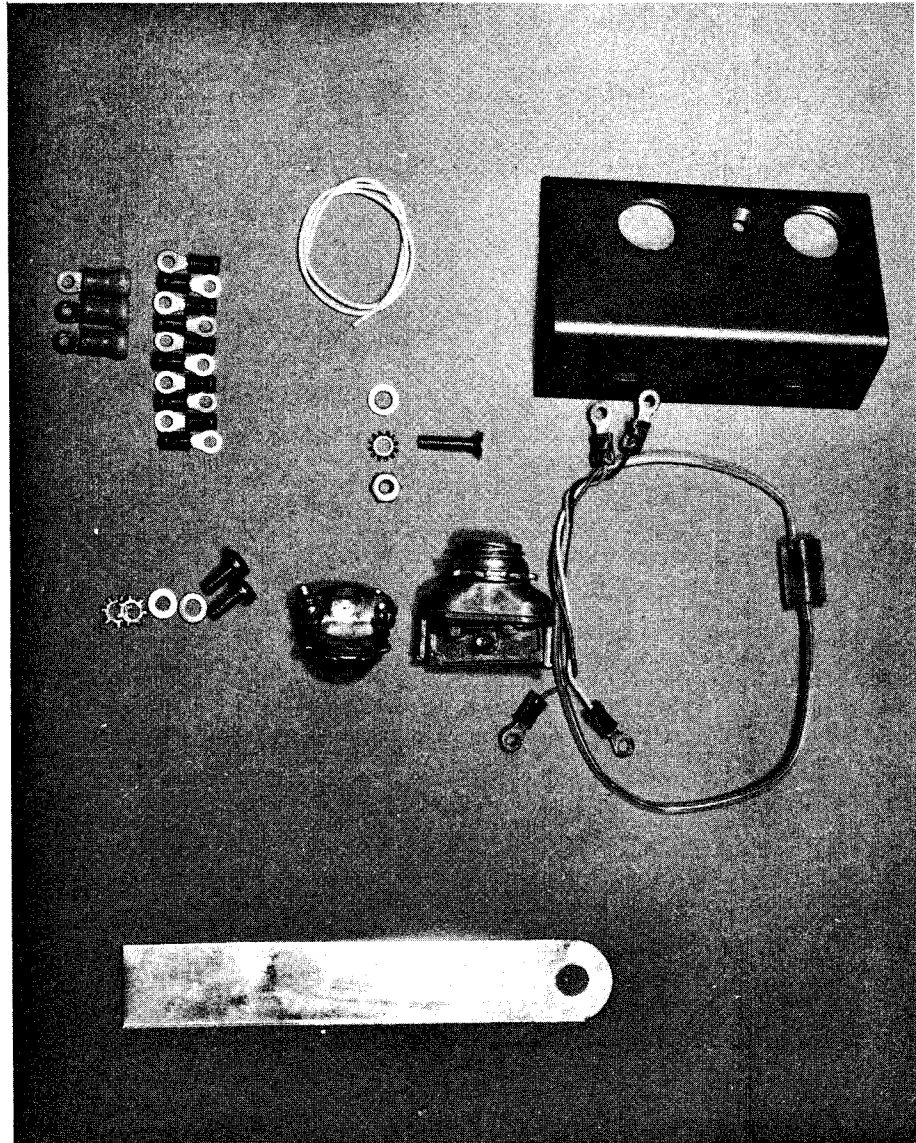


Figure 1.2 NIK Modification Kit for AN/UGC-20 Teletypewriter

1.3 ASSOCIATED EQUIPMENT REQUIREMENTS

The unit value of certain components in the NIK modification kit depends upon the system configuration. Read the instructions for the following configurations carefully before installing the NIK modification kit on the AN/UGC-20 Teletypewriters.

1.3.1 System Configuration: AN/UGC-20 and KW-7/TSEC (MOD 13 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the encapsulated filter network (Item 14) supplied with the NIK modification kit and install two 4.7K ohm resistors (not furnished) in their place. Connect a 50V 0.01 uf capacitor across the input to the 4.7K resistors.

1.3.2 System Configuration: AN/UGC-20 and KW-26/TSEC (MOD 14 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the encapsulated filter network (item 14) supplied with the NIK modification kit and install wire straps from pin 2 on TB P to pin 4 on TB KS, and from pin 1 on TB KS to pin 3 on TB KS (wire straps are not provided).

1.3.3 System Configuration: AN/UGC-20 KW-7/TSEC (MOD 13 Installed) and KW-26/TSEC (MOD 14 Installed) With SB-3176/UGQ Patch Panel

1. Remove the encapsulated filter network (item 14) supplied with the NIK modification kit and install wire straps from pin 2 on TB P to pin 4 on TB KS, and from pin 1 on TB KS to pin 3 on TB KS.
2. Install the encapsulated filter network (Item 24 of SB-3176/UGQ MOD Kit) in the patch panel as directed in the SB-3176/UGQ installation manual.

NOTE

In all cases when using the SB-3176/UGQ Patch Panel, the encapsulated filter network (Item 24) must be installed at the SB-3176/UGQ Patch Panel where the KW-7/TSEC (J8 loop-in) cable connects.

- 1.3.4 System Configuration: AN/UGC-20, KW-7/TSEC
(MOD 13 Installed) and KW-26/TSEC (MOD 14 Not Installed)
With SB-3176/UGQ Patch Panel

Install the NIK modification kit as directed in the installation procedures, Section II.

- 1.3.5 For All System Configurations Using the SB-3176/UGQ Patch Panel

1. Read the appropriate section of the KAM-85/TSEC for pre-conditions required prior to connecting the KW-26/TSEC to the (NIK) normal input keying system.
2. Read the appropriate section of the KAM-143/TSEC for pre-conditions required prior to connecting the KW-7/TSEC to the (NIK) normal input keying system.

1.4 PHYSICAL CHARACTERISTICS

Table 1.1 lists the major parts contained in the modification kit.

1.5 ELECTRICAL CHARACTERISTICS

Refer to KAM-85/TSEC and KAM-143/TSEC for the electrical characteristics of NIK.

1.6 REFERENCE DATA

1.6.1 Weight Change Due To Modifications

The modifications are estimated to have added less than one pound of weight to the AN/UGC-20 Teletypewriter.

1.6.2 Dimension Changes Due To Modifications

The modifications increased the depth of the chassis approximately three inches with external cables in place.

Table 1.1 AN/UGC-20 Modification Kit

Item	Quantity	Part
1	1	Bracket (two connector)
2	1	Box Connector
	1	Box Connector Double
3	1	Encapsulated filter network with leads
4	7	Insulated wire terminals
5	1	8-32 x 1 inch phillips head screw, star washer, flat washer and hex-nut.
6	3	Insulated wire terminals
7	1 foot	#20 Insulated wire
8	1	Ground strap
9	2	10-32 x 1/2 inch screw-head screw, star washers, and flat washer
10	1	Decal

SECTION II

INSTALLATION

2.1 GENERAL

This section contains detailed steps for removal of components no longer used and installation of new components to the AN/UGC-20 Teletypewriter. Figures 2.1 through 2.5 at the end of this section, show before and after views of the modification. Figures 2.6 and 2.7 show the installation drawings.

2.2 REMOVAL OF REPLACED COMPONENTS

Perform the following steps in the order listed. The tools required for the modification are listed in Table 2.1.

1. Secure ac power and dc (signal) line current.
2. Remove the cover and remove connectors to the keyboard and page printer.
3. Remove page printer from base plate.
4. Disconnect ac power cable and dc signal line cable.
5. Remove motor and gear unit assembly by removing inner base.
6. Remove keyboard from base plate.
7. On the "G" distributor contact terminal board, located on the distributor assembly, unsolder the leads going to the 153631 capacitor. Loosen the plastic clamp and remove the capacitor.

CAUTION

Be careful to maintain solder connections to the other wires when unsoldering the capacitor leads.

Table 2.1 Tools Required

Quantity	Item
1	1/4 inch Electric drill
3	Bits, 1/4 inch, 1/8 inch and No. 27 Drill
2	Screwdrivers, medium and small
1	Screwdriver, medium Phillips
3	Open end wrench 7/16 inch, 5/16 inch, 1/4 inch and 3/8 inch
1	6' Tape measure
1 roll	Plastic insulation tape
1	Side cutter
1	Wire stripper
1 roll	Resin core solder
1	Soldering iron
1	Wire brush, small
1	Center punch
1	Hammer
2	Chassis hole cutters, 7/8 inch
1	Round file, 3/16 inch
1	10-32 Tap

8. Remove the green lead going to G-2-G from pin 3 on terminal block P. Tape the lead and relocate it so that it will not interfere with normal operation of the equipment.

2.3 INSTALLATION OF MODIFICATION KIT

Use caution during the installation of the modification kit, by not misaligning any mechanical assembly or stretching a wire in the cable harness.

2.3.1 Installation of the Connector Bracket and Box Connectors

1. Turn the base plate upside down and from the rear, locate the connector bracket (item 1) in position on the base plate. See installation drawing, Figure 2.7. The bracket should be 3 1/2 inches from the left side and overlapping the rear edge of the base plate. The side with the connector holes should be pointing down. Scribe the patterns for the two bolt holes on the bottom of the base plate.
2. Drill the two holes as marked above with a No. 21 drill bit and tap for 10-32 screws.
3. Mount the bracket in position with the two 10-32 x 1/2 inch screws (item 8) and star washers (item 9).
4. With the base plate right-side-up and facing the rear of the unit, mount the double box connector (item 2) on the left and the box connector (item 3) on the right side of the bracket.

2.3.2 Installation of the Encapsulated Filter Network

1. Use the plastic clamp on the "G" distributor contact terminal board to install the encapsulated filter network (item 14). The orange and white leads should be on the right end. Incline the capsule (about 15°) so that these two leads clear the top of the adjacent capacitor. Secure the plastic clamp in this position.
2. Connect the orange lead to pin 1 on terminal block KS. Connect the white lead to pin 2 on terminal block P.

3. Two wires enter the left end of the encapsulated filter network. Connect the yellow lead to pin 4 and the brown lead to pin 3 on terminal block KS.
4. Solder the 12-inch white wire, to the terminal lug in the lower-left corner of the "G" distributor contact terminal board. Solder a red terminal lug (item 12) on the other end of the white wire and connect to pin 1 on terminal block KS.
5. Install the bonding strap (item 10) under right front mounting stud on the base plate if required.
6. Re-install the motor and gear unit inner assembly on the base plate.
7. Re-install the keyboard on the baseplate.
8. Re-install the printer.
9. Insert all connectors in the proper receptacles.

2.3.3 Installation of Cables

1. Using standard procedures, make up a two-wire shielded cable to go to the SB-3176/UGQ Patch Panel and a two-wire shielded cable to go to the SB-1210/UGQ Patch Panel. Solder red terminal lugs (item 12) on the four signal wires and yellow terminal lugs (item 13) on the cable shields.
2. Clamp the two cable ends in position using the double box connector clamp. See installation drawing, Figure 2.7.
3. Connect the two leads in the SB-3176/UGQ Patch Panel cable to pin 3 and pin 4 on terminal block KS.
4. Connect the two leads in the cable to the SB-1210/UGQ Patch Panel to pin 1 and pin 3 on terminal block P.
5. Run the 115 vac power cable through the single box connector. Install two red terminal lugs (item 12) and connect the leads to pin 2 and pin 4 on terminal block S. Install a yellow terminal lug (item 13) on the power cable third wire or shield.

6. Connect the yellow lug (item 13) on all three cables to the bracket using a 8-32 x 3/4 inch screw (item 4), star washer (item 6), flat washer (item 5) and hex-nut (item 7).

2.3.4 Modification of Teletypewriter Cover

1. On the back of the teletypewriter cover draw two 1 1/4 inch long vertical lines one inch and two inches to the right of the present cable opening. See installation drawing Figure 2.7. Duplicate the cutout of the present opening between these two lines leaving one inch of panel between the new and old cable openings.
2. Drill a series of holes just inside the area to be cut out and file to required size.
3. Use vacuum cleaner to pick up chips, filings, et cetera.
4. Install the cover.
5. Install decal adjacent to the name plate.

WARNING

Before applying power to the AN/UGC-20, Teletypewriter, SB-1210/UGQ Patch Panel, and the associated KW-7 cryptographic equipment, ensure that the loop-out cable (J4) from the KWF-1/TSEC to the SB-1210/UGQ, and to the selector magnets of the page printer are free of all grounds by checking with an ohmmeter from each side of the line to ground. A grounded receive signal line will cause damage to the KW-7/TSEC.

2.4 ADDITIONAL REQUIREMENTS

The modification of the AN/UGC-20 Series Teletypewriter with the NIK modification kit, requires that the equipment listed below be modified before being used with the NIK modified equipment.

2.4.1 KW-7/TSEC

MOD 13 must be installed prior to NIK installation.

2.4.2 KW-26/TSEC

MOD 14 must be installed prior to NIK installation.

2.4.3 SB-1210/UGQ Patch Panel

The SB-1210/UGQ Patch Panel must be wire strapped for remote battery prior to NIK installation. See NAVSHIPS 95718.

2.4.4 Removal of KWL-4/TSEC Unit and Installation of Dummy Connectors

The KWL-4 unit and its associated cables must be removed prior to NIK installation. Proceed as follows.

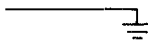
1. Remove the KWL-4 unit and its associated cables.
2. Using standard procedures, make up two dummy connectors for J4 and J7 on the KWF-1/TSEC rack. Wire strap pins B and C together on each of the connectors and install.
3. Using standard procedures, make up a shielded two-wire cable and connect from the SB-3176/UGQ Patch Panel to J8 on KWF-1. See Table 2.2 for cable connections. Use connector type MS3116E-14-5S (connector not furnished).

Table 2.2 J8 of KWF-1 to SB-3176/UGQ Patch Panel Cable Connections

KWF-1 J8 Pins	SB-3176/UGQ Patch Panel Conn. Pins
B	B
C	C
A	D

4. Using standard procedures, make up a shielded two-wire cable and connect from the SB-1210/UGQ Patch Panel to J~~4~~ of KWF-1. See Table 2.3 for cable connections. Use connector type MS3116E-14-5PW (connector not furnished).

Table 2.3 J3 of KWF-1 to SB-1210/UGQ Patch Panel Cable Connections

KWF-1 J 4 Pins	SB-1210/UGQ Patch Panel Conn. Pins
C	1 (3) (5) etc.
D	2 (4) (6) etc.
A	

2.4.5 Typical Cryptographic System

Figure 2.8 shows a typical cryptographic system using the AN/UGC-20 Teletypewriter.

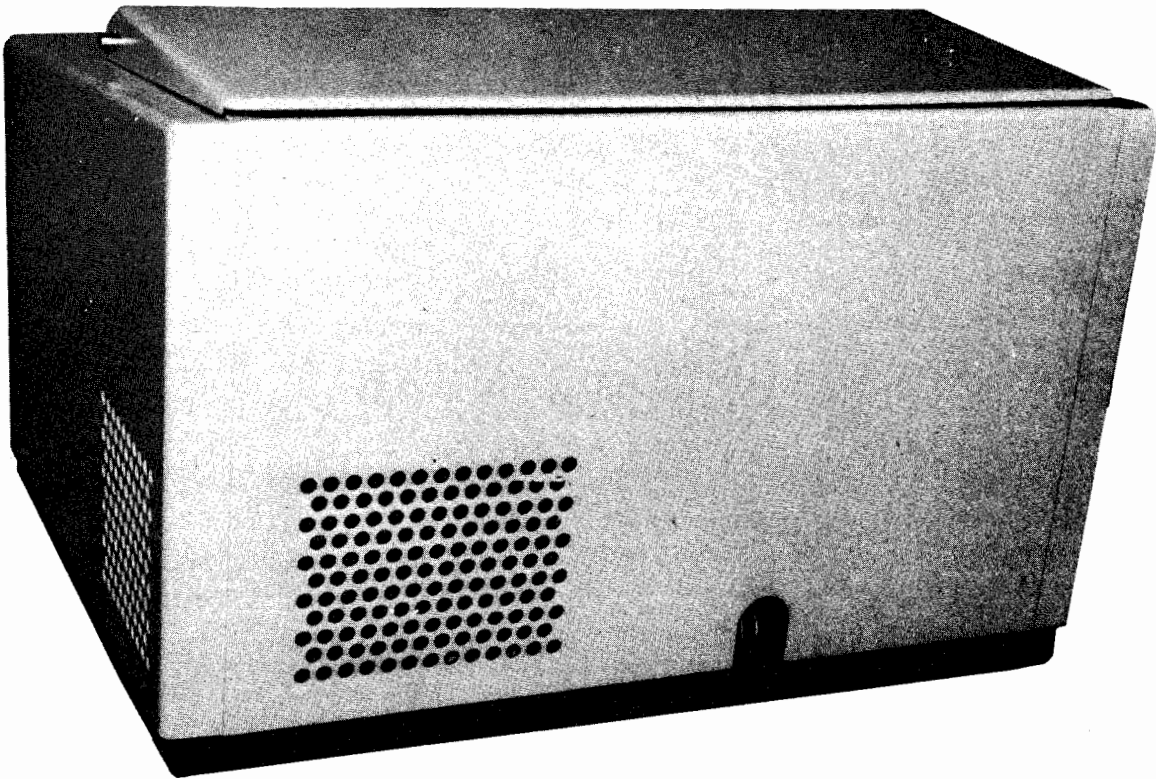


Figure 2.1 Rear View of AN/UGC-20 Cabinet Before Modification

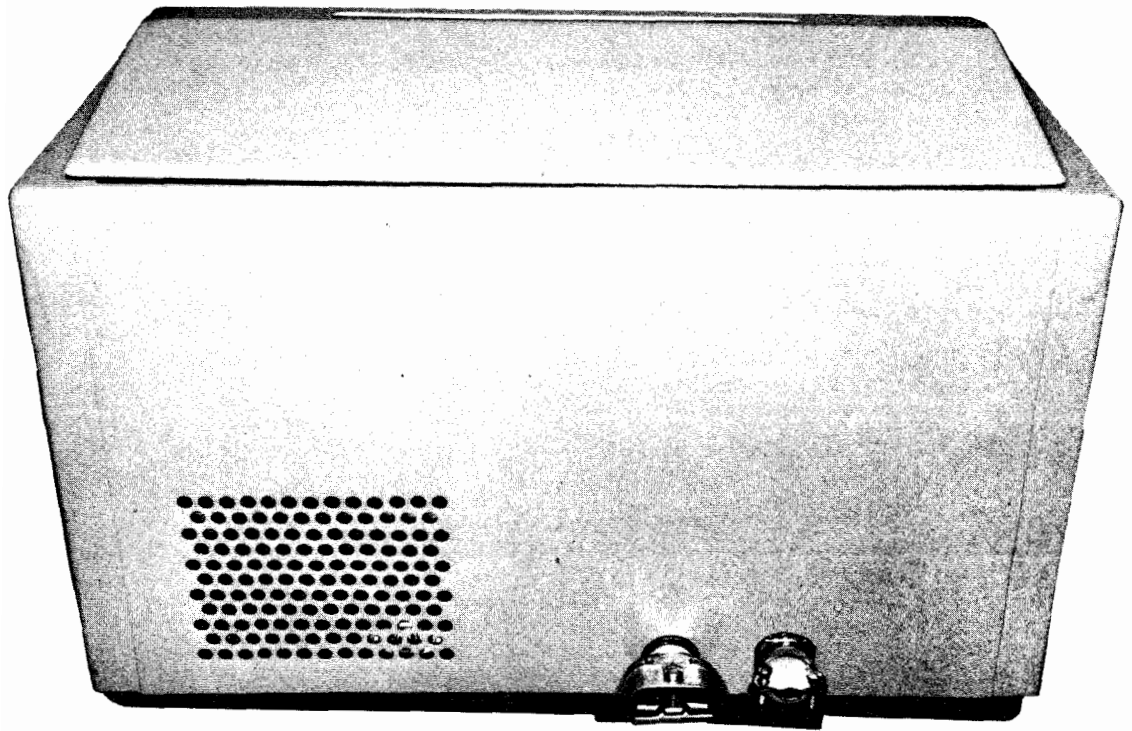


Figure 2.2 Rear View of AN/UGC-20 Cabinet After Modification

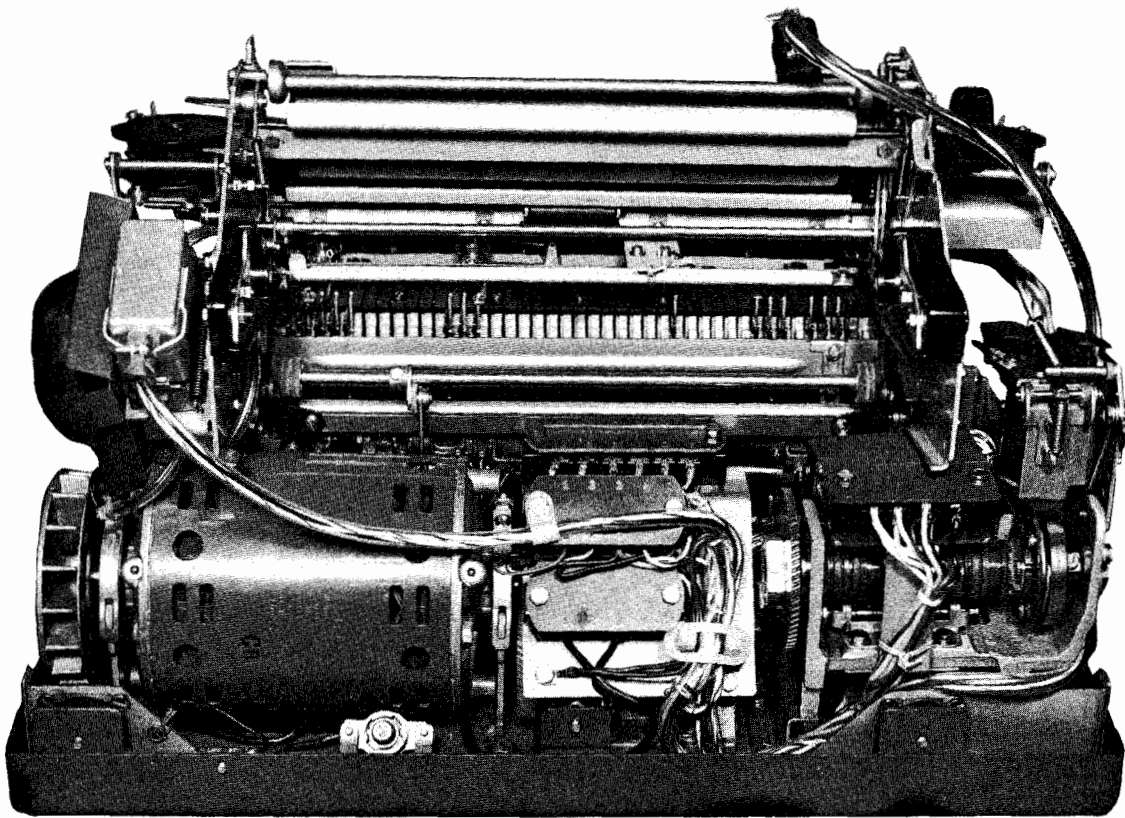


Figure 2.3 Rear View of AN/UGC-20 Interior Before Modification

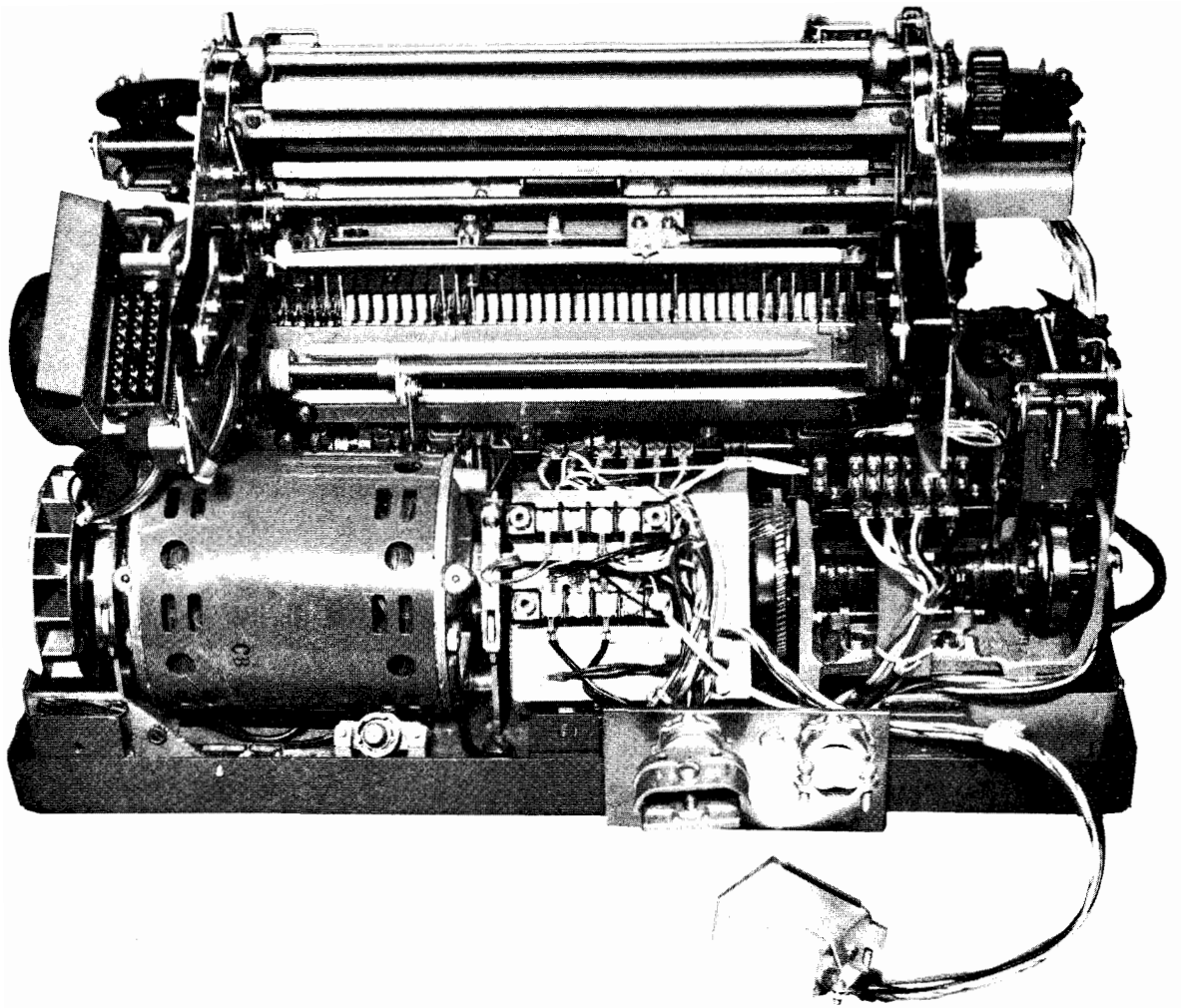


Figure 2.4 Rear View of AN/UGC-20 Interior After Modification

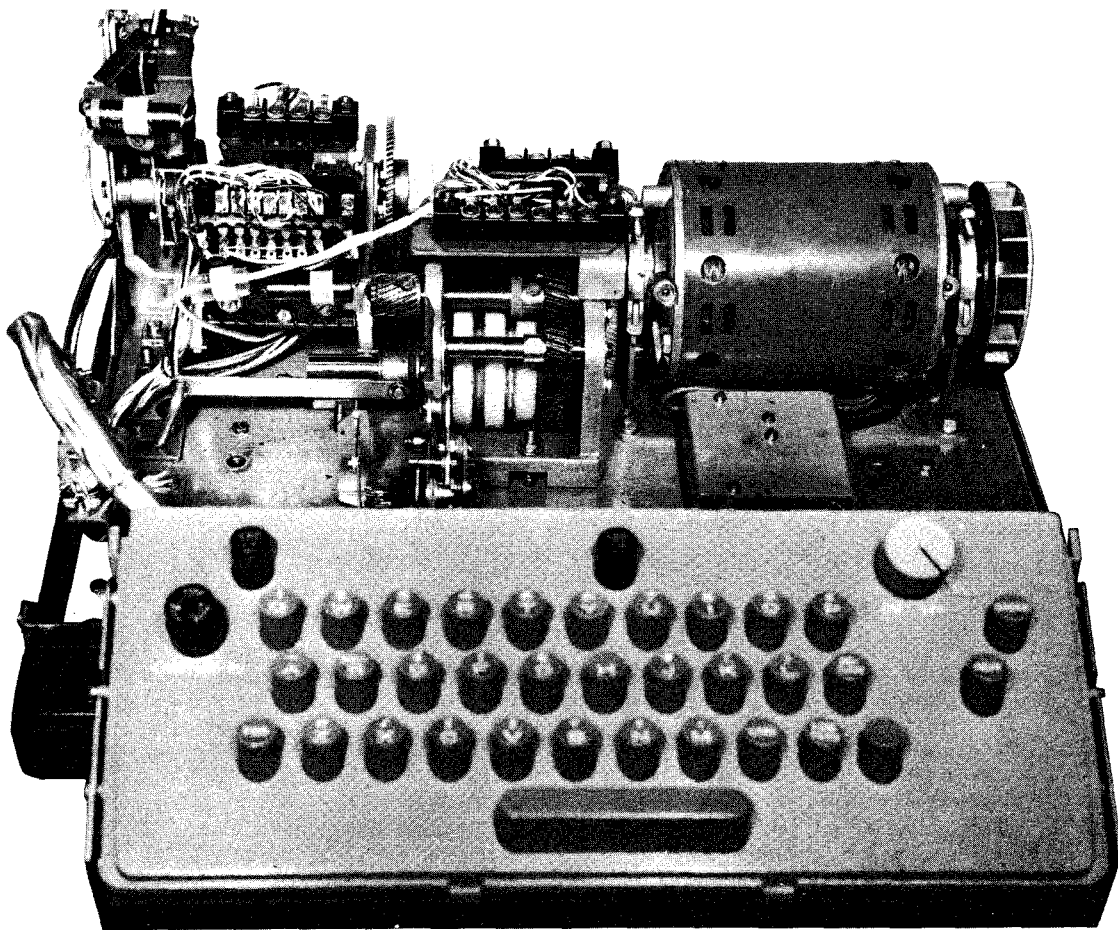


Figure 2.5 Front View of AN/UCG-20 Interior After Modification

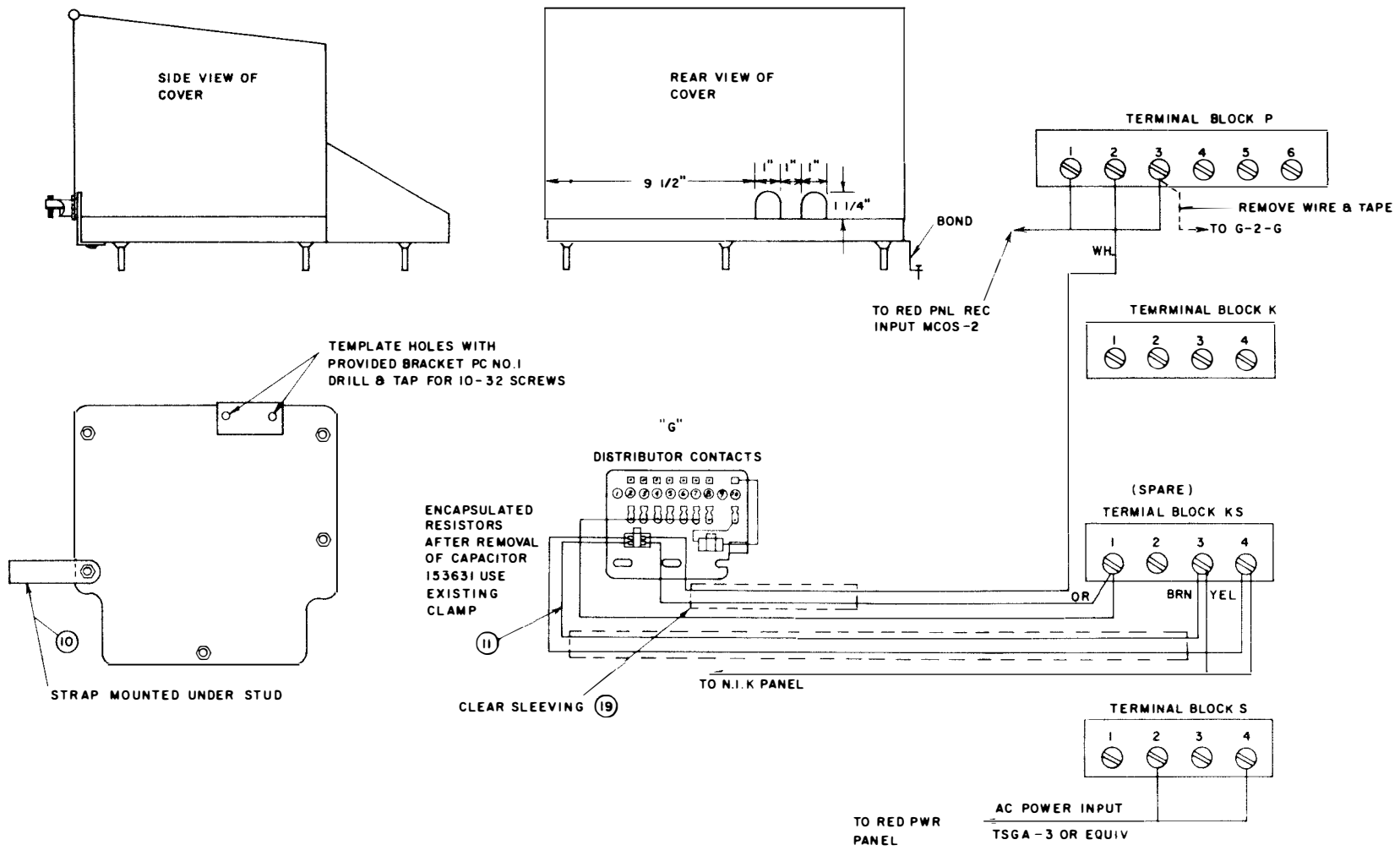


Figure 2.6 AN/UGC-20 Installation Drawing (Part 1)

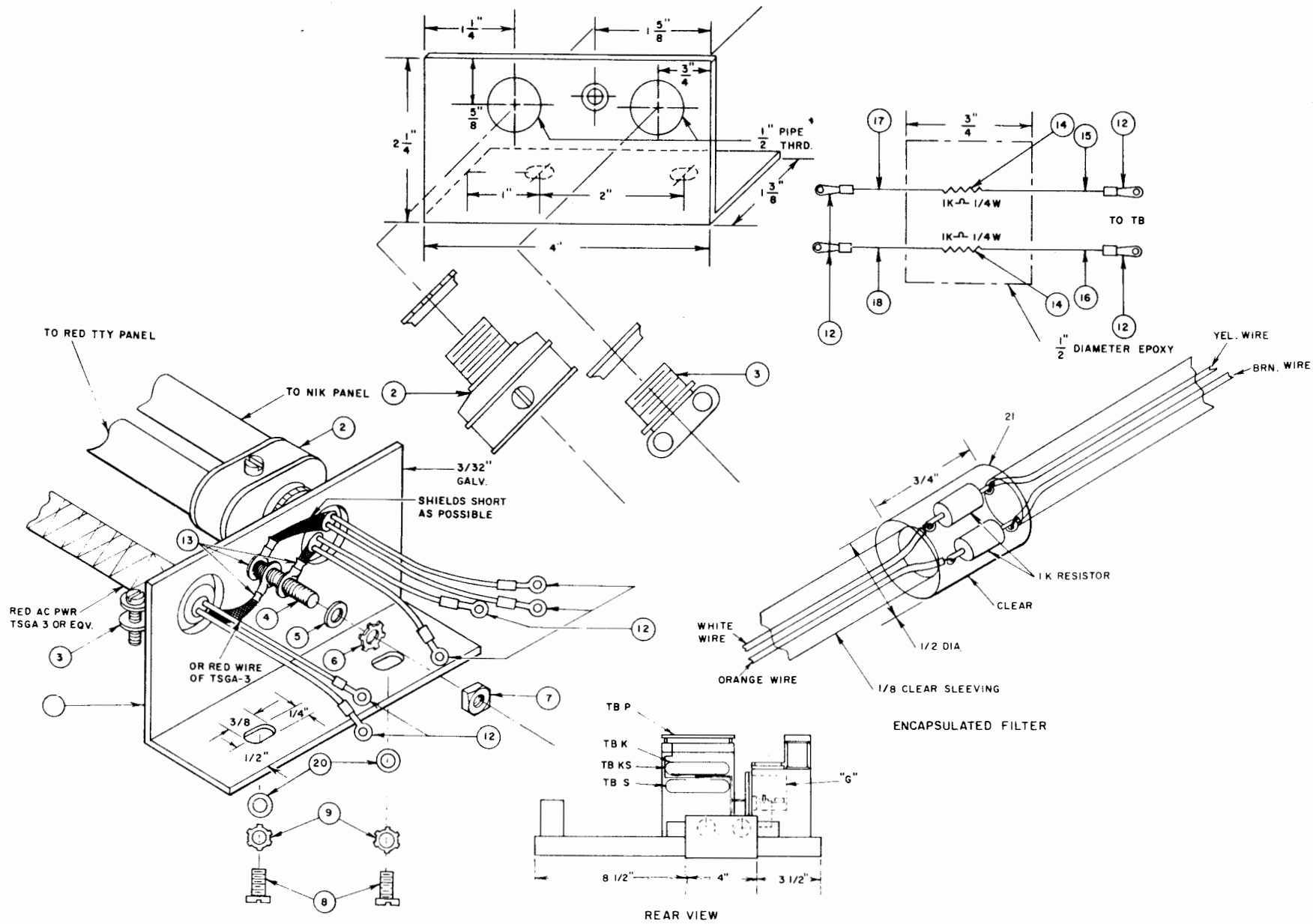


Figure 2.7 AN/UGC-20 Installation Drawing (Part 2)

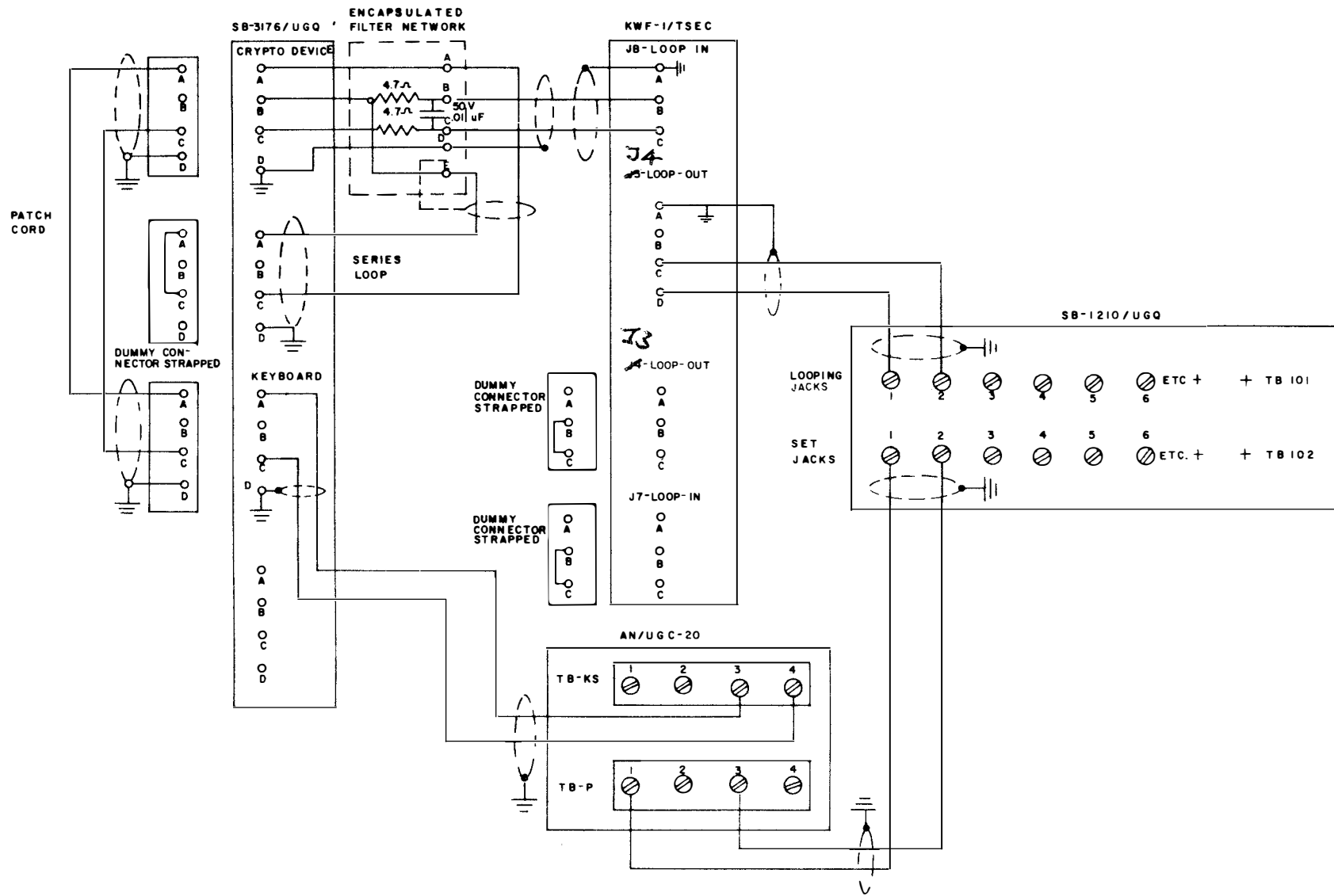


Figure 2.8 Typical System Installation Using the AN/UGC-20 Teletypewriter

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SECTION III

OPERATION

3.1 OPERATIONAL CAPABILITIES

The AN/UGC-20 Series Teletypewriters is affected by the NIK modification kit as follows:

1. Keyboard and page printers are not in series.
2. Signal line shunt relay is inoperative.
3. The electrical portion of the break key is inoperative.

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SECTION IV
TROUBLESHOOTING

4.1 INSPECTION

Perform periodic inspection on all installed assemblies, connections, etc.

1. Ensure that all terminals are tight and clean.
2. Ensure that all cables are in proper place and do not interfere with equipment operation.

4.2 CHECKOUT

NOTE

The following tests should be limited to a volt-ohmmeter with an internal resistance of 20,000 ohms per volt, using minimum current application.

1. A suspected "open" cable may be checked by using an ohmmeter (low ohms range) connected from pin A on one end of the disconnected cable, to pin A on the other end of the cable and etc.
2. A suspected "short" in the disconnected cable may be determined by setting the ohmmeter to a higher scale and checking from pin A to pin B, from pin B to pin C and etc. Any resistance reading would indicate a shorted cable.

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SECTION V
MAINTENANCE

5.1 CONTACT MAINTENANCE

The maintenance on the installed NIK modification kit will normally be limited to the replacement of wires, 1K resistors, and cables as required. Use standard installation procedures for replacement of hardware.

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SECTION VI

PARTS LIST

6.1 PARTS LIST

Table 6.1 contains the parts list for the AN/UGC-20 Modification Kit.

Table 6.1 Parts List

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
1	Bracket, Galv Iron 3/32"x2 1/4"x1 3/8"	1		
2	Connector, Box 3/8" Duplex	1	9G5975-152-1145	
3	Connector, Box 3/8" Straight	1	9G5975-152-1144	
4	Screw, Flat head, Cadmium, 8-32 x 3/4"	1		
5	Washer, #8 Flat S.S.	1		
6	Washer, #8 Outside Star, S.S.	1		
7	Nut, Hex, Cadmium, 8-32	1		
8	Screw, B.H., 10-32 x 1/2" S.S.	2		
9	Washer, #10 Outside Star S.S.	2		
10	Strap, Bonding 1" x 6" Cad. Plt. Copper	1		
11	Wire, 20G, stranded, 600V, Teflon, White, MIL-15878	12"		
12	Lug, T.B. Red #6	10		2369
13	Lug, T.B. Yellow	3	9G5940-204-8990	R-5107-M
14	Filter, Network (Encapsulated)	2		
15	Wire, 22G, 600V, Teflon, Orange, MIL-16878D	10"		

Table 6.1 Parts List (Continued)

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
16	Wire, 22G, 600V Teflon, Yellow, MIL-16878D	10"		
17	Wire, 22G, 600V, Teflon, Brown, MIL-16878D	10"		
18	Wire, 22G, 600V, Teflon, White, MIL-16878D	10"		
19	Sleeving, Clear 1/8" Dia.	16"		
20	Washer, #10 Flat S.S.	2		

MAKE THE FOLLOWING PEN AND INK CORRECTIONS AS
INDICATED BELOW.

- Page ix, LIST OF TABLES, 5th Line, Change J3
to Read J4.
- Page 2-5, Para 2.3.4(5), under "Warning",
5th Line, Change (J3) to Read (J4).
- Page 2-6, Para 2.4.4(2), 2nd Line, Change J4
to Read J3.
- Page 2-7, Para 2.4.4(4), 3rd Line, Change J3
to Read J4.
- TABLE 2.3, Change J3 to Read J4
where appearing.
- Page 2-15, Figure 2.8, under KWF-1/TSEC
Change J3 Loop-out to Read J4
Loop-out.
Change J4 Loop-out to Read J3
Loop-out.

DONE 9/23/16



NAVSHIPS 0967-284-5060

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TECHNICAL MANUAL

for

NORMAL INPUT KEYING
TELETYPE MODIFICATION KITS (U)

AN/UGC-6/16 SERIES

DEPARTMENT OF THE NAVY
NAVAL ELECTRONICS SYSTEM COMMAND

★

18 November 1967

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v and vi	Original
vii (RB)	Original
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3-1 (RB)	Original
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5-1 thru 5-5 (RB)	Original
6-1 and 6-2	Original

FOREWORD

This technical manual was prepared to MIL-M-15071E by PRC Technical Applications Inc. San Diego, California under contract N0022868CO-118 for the San Francisco Bay Naval Shipyard, San Francisco, California.

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SECTION I

GENERAL DESCRIPTION

1.1 SCOPE

This technical manual provides a description of procedures for installing, operating, troubleshooting, and maintenance for the Normal Input Keying Teletype Modification Kit (NIK) for the AN/UGC-6/16 Series Teletypewriters.

1.2 GENERAL INFORMATION

1. The Normal Input Keying Teletype Modification Kit was designed and manufactured by the San Francisco Bay Naval Shipyard, San Francisco, California.
2. It provides machine to machine interface between the AN/UGC-6/16 Teletypewriters and the associated cryptographic system. The AN/UGC-6/16 Teletypewriter is shown in Figure 1.1.
3. The NIK Modification Kit is shown in Figure 1.2. The modifications are performed at the equipment site by field personnel. A list of tools required to perform the modification, a list of parts in the modification kit, and complete instructions for the installation of the kit are outlined in this manual.

1.3 ASSOCIATED EQUIPMENT REQUIREMENTS

The unit value of certain components in the NIK modification kit depends upon the system configuration. Read the instructions for the following configuration carefully before installing the NIK modification kit on the AN/UG-6/16 Series Teletypewriters.

1.3.1 System Configuration: AN/UGC-6/16 Series and KW-7/TSEC (MOD 13 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the two carbon 1K ohm resistors from the

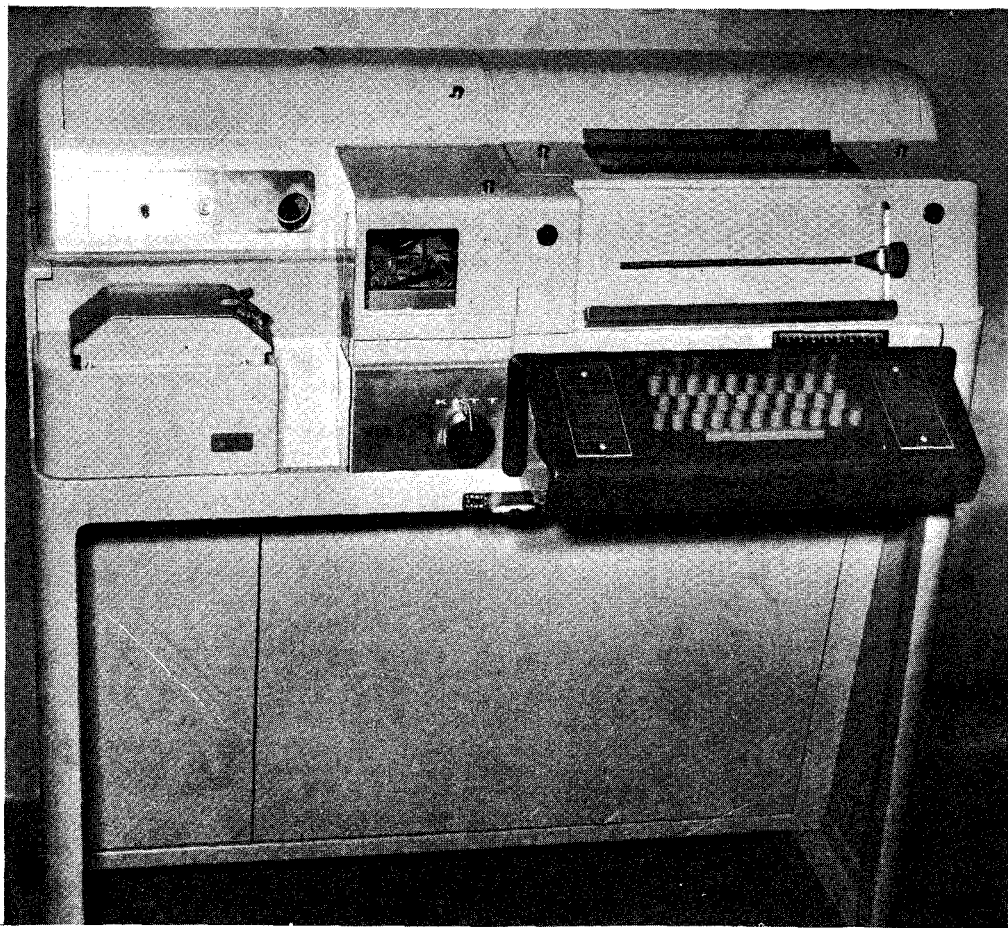


Figure 1.1 AN/UGC-6/16/UG Teletypewriter

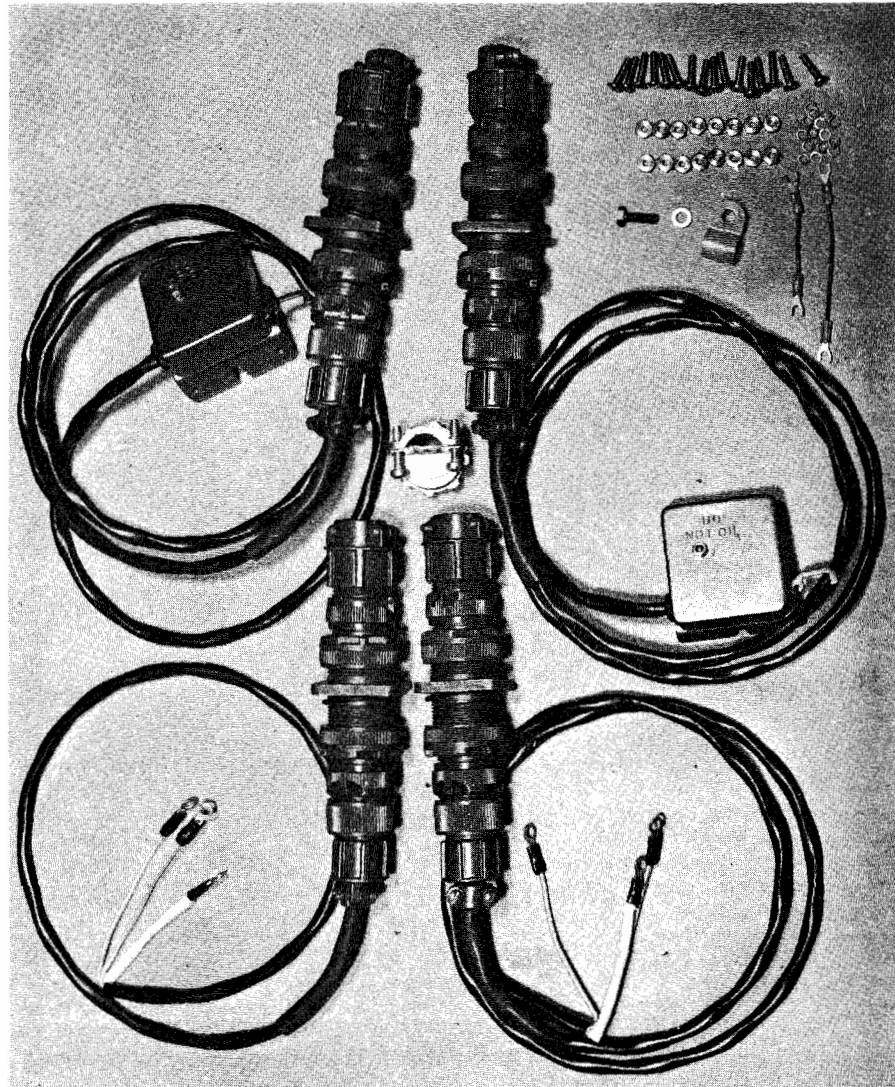


Figure 1.2 NIK Modification Kit for AN/UGC-6/16/UG Teletypewriter

contact box supplied with the NIK modification kit and install two 4.7K ohm resistors (not furnished) in their place. Connect a 50V 0.01 uf capacitor across the input cable leads at the terminals where the two resistors are connected.

1.3.2 System Configuration: AN/UGC-6/16 Series and KW-26/TSEC (MOD 14 Installed) Wired Direct

This configuration does not use a SB-3176/UGQ Patch Panel. Remove the two carbon 1K ohm resistors from the contact box supplied with the NIK modification kit, and install wire straps across the terminals where the resistors were installed. (Wire straps are not provided.)

1.3.3 System Configuration: AN/UGC-6/16 Series, KW-7/TSEC (MOD 13 Installed), KW-26/TSEC (MOD 14 Installed), with SB-3176/UGQ Patch Panel

1. Remove the two carbon 1K ohm resistors in the contact box supplied with the NIK modification kit and install wire straps across the terminals where the resistors were installed. (Wire straps are not provided.)
2. Install the encapsulated filter network in the SB-3176/UGQ Patch Panel as directed in the SB-3176/UGQ installation manual.

NOTE

The encapsulated filter network must be installed in the SB-3176/UGQ Patch Panel whenever a KW-7/TSEC cryptographic device is used.

1.3.4 System Configuration: AN/UGC-6/16 Series, KW-7/TSEC (MOD 13 Installed), KW-26/TSEC, (MOD 14 Not Installed) with SB-3176/UGQ Patch Panel

Install the NIK modification kit as directed in the installation procedures, Section II.

1.3.5 All System Configurations Using the SB-3176/UGQ Patch Panel

1. Read the appropriate section of the KAM-85/TSEC for pre-conditions required prior to connecting the KW-26/TSEC to the (NIK) normal input keying system.
2. Read the appropriate section of the KAM-143/TSEC for pre-conditions required prior to connecting the KW-7/TSEC to the (NIK) normal input keying system.

NOTE

In all cases when using the SB-3176/UGQ Patch Panel, the encapsulated filter network must be installed at the SB-3176/UGQ Patch Panel where the KW-7/TSEC (J8 Loop-in) cable connects.

1.4 PHYSICAL CHARACTERISTICS

Table 1.1 list the major parts contained in the NIK modification kit.

1.5 ELECTRICAL CHARACTERISTICS

Refer to KAM-85/TSEC and KAM-143/TSEC for electrical characteristics to normal input keying.

1.6 REFERENCE DATA

1.6.1 Weight Change Due To Modifications

The modifications are estimated to have added less than two pounds to the weight of the AN/UGC-6/16 Teletype-writers.

1.6.2 Dimension Changes Due To Modifications

The modifications increased the depth of the chassis approximately one inch with the external cable disconnected,

Table 1.1 AN/UGC-6/16 Modification Kit

Item	Quantity	Part
1	2	Cable assembly (W1 and W3) with contact box connected to one end; and with MS3106A-16S-6S connector on the other end.
2	2	Cable assembly (W2 and W4) with MS3106A-16S-6P connector on one end; and terminal lugs on the other end.
3	1	Strap - Three inch wire with terminal lug at each end.
4	1	Strap - Two inch wire with terminal lug at each end.
5	1	Box connector - straight.
6	1	Cable clamp, plastic with a 6-40 screw and No. 6 flat washer.
7	16 ea.	4-40 screws, nuts and split lock washers.

and increased the depth required behind the cabinet by approximately four inches with external cables in place.

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SECTION II
INSTALLATION

2.1 GENERAL

This section contains detailed steps for removal of components no longer used, and installation of new components to the AN/UGC-6/16 Teletypewriter. Figures 2.1 through 2.8 at the end of this section, show the AN/UGC-6/16 before and after views of the modification. Figures 2.9 and 2.10 show the installation drawings.

2.2 REMOVAL OF REPLACED COMPONENTS

Perform the following steps in the order listed. The tools required for the modification are listed in Table 2.1.

1. Secure ac power and dc (signal) line current.
2. Raise top cover of cabinet and lock open.
3. Remove the K-KT-T knob on front panel.
4. Remove K-KT-T stainless steel wrap-a-round plate.
5. Remove the character counter cover cross bar from the cabinet.
6. Remove top TD (stainless) cover.
7. Remove side TD wrap-a-round cover.
8. Remove two screws and take off the TD front plate.
9. Disconnect page printer and keyboard connectors.
10. Remove four screws on base of printer, and remove printer from baseplate.
11. Remove the covers from both contact boxes. Remove or cut the two wires and pull cable from contact box.

Table 2.1 Tools Required

Quantity	Item
1	1/4 inch electric drill
3	Bits, 1/4 inch, 1/8 inch and No. 27
2	Screwdrivers, medium and small
4	Open end wrenches 7/16 inch, 5/16 inch, 1/4 inch and 3/8 inch
1	6' Tape measure
1 roll	Plastic insulation tape
1	Side cutter
1	Wire stripper
1 roll	Resin core solder
1	Wire brush, small
1	Center punch
1	Hammer
2	Chassis hole cutters, 1 inch and 7/8 inch
1	Round file, 3/16 inch
1	Tool to clamp terminals to wires No. 16 through No. 20
1 set	Wire feeler gauges

12. Tape the wires and the shield so that there is no possibility of making an electrical contact with another metal part.
13. Re-position the cable ends so that they will not interfere with normal operation of the equipment.
14. Remove the ends of the link springs nearest the contact boxes. Do not discard the springs.
15. Remove the two mounting screws holding each contact box.
16. Remove the two contact boxes and tape the two eccentric screws in place. Retain the mounting screws.
17. Remove the covers from the page printer and reperforator selector magnet terminal strips.
18. Remove all external cable wiring from the page printer selector magnet terminal strip.
19. Remove the external wiring from the reperforator selector magnet terminal board. Do not disconnect the two wire straps.
20. Tape all wire so that they cannot make electrical contact with any metal surface.
21. Re-position the wires so that they will not interfere with normal operation of the equipment.
22. Remove the 115 vac power cable from the terminal board if necessary.

2.3 INSTALLATION OF THE MODIFICATION KIT

Use caution during the installation of the modification kit, by not misaligning any mechanical assembly or stretching wire in the cable harness.

2.3.1 Installation of Cable Connectors

1. Draw a line across the back of the cabinet 19 7/8 inches above the bottom of the cabinet. See installation drawing, Figure 2.9.
2. On the rear of the cabinet, draw intersecting lines 7 inches, 9 1/4 inches, 11 1/2 inches, 13 3/4 inches and 16 inches from the left side.
3. Drill pilot holes where each of the five lines intersect the horizontal line.
4. Use a 3/4 inch chassis hole cutter or a hole saw, to enlarge the pilot hole on the extreme left to cut a hole through the back of the cabinet to mount the Box Connector (item 35).
5. Using the one inch chassis hole cutter or a hole saw, cut four holes around the four pilot holes to mount the Cable Connectors TBF-16S-6PS (item 25).
6. Hold a TBF-16S-6PS Connector in each of the four one-inch holes so that the sides are true vertically and horizontally. Scribe the four mounting holes on the cabinet for each connector.
7. Using the four-hole patterns scribed on the cabinet, drill the mounting holes for each of the four connectors with a No. 27 drill bit.
8. Mount the four TBF-16S-6S Connectors with key up. Use four 4-40 x 1/2 inch screws, (item 32) split lock washers (item 34) and hex nuts (item 33) for each installation. Cables W2 and W4 (center hole and right hole) have their connectors mounted with the female connector facing out. Disregard the 0 ring. Cables W1 and W3 (on each side of the center hole), have their connectors mounted with the male ends facing out. See installation drawing, Figure 2.9.
9. Mount the Box Connector (item 35) in the extreme left hole in the back of the cabinet.

2.3.2 Installation of New Contact Boxes

1. Remove the tape holding the contact box eccentric screws in position. Place the new Contact Boxes (item 15 and 16) and link in position

using the mounting screws retained from the old contact box, secure friction tight.

2. Re-install the link-springs (86304) to the links (156644) near the contact boxes.
3. Run the cables down to the chassis and back to the proper connector on the back of the cabinet. See installation drawing, Figure 2.9.
4. The keyboard contact box cable, W2, connects to number three connector, as seen from the front of the cabinet. The TD contact box cable, W4, connects to number one connector, as seen from the front of the cabinet.
5. Use the Plastic Cable Clamp (item 21) and Screw (item 48) to clamp the keyboard contact box cable, W2, to the baseplate to the left of the contact box. See installation drawing, Figure 2.9.

2.3.3 Installation of Cables

1. On the page printer selector magnet terminal board, connect the two outside terminals together using the three inch Wire Strap (item 45).
2. On the same board, connect the two inside terminals together using the two inch Wire Strap (item 46).
3. Connect one wire in the new cable (W1) to either outside connector on the terminal board. Connect the other wire to either inside terminal.
4. Use an existing screw on the page printer to ground the shield just behind the terminal board. Replace the terminal board cover.
5. On the reperforator selector magnet terminal board, connect one wire in the new cable (W3) to either outside terminal. Connect the other wire to either inside terminal.
6. Use an existing screw to connect the shield to the frame just behind the terminal board. Replace the terminal board cover.

7. Connect the above cable, W3, to the connector located second from the left side in the back of the cabinet.
8. Use a vacuum cleaner to remove chips, filings, et certera from the cabinet.
9. Re-install the page printer on the baseplate and re-install the cross bar on the cabinet.
10. Insert all connectors into the proper receptacles.
11. Connect cable W1, from the page printer selector magnet, to the fourth connector (inside view) on the back of the cabinet

CAUTION

Dress all cables away from motor flywheel and moving parts.

12. Run the new or existing power cable through the box connector on the back of the cabinet and connect the 115 vac terminals. If a three wire cable is used, ground the third wire. If a shielded 2 wire cable is used, ground shield.
13. Using standard procedures, make up four, shielded, two-wire cables as shown in Table 2.2. Pins B and C are the signal lines, pin A is ground.
14. Replace all panels removed before the modification kit was installed.

Table 2.2 External Cables

AN/UGC-6/16 FROM	Function	Cable Termination TO
(W1) MS3106A-16S-6S	P.P. Sel. Mag.	Red Panel (SB-1210/UGQ)
(W2) MS3106A-16S-6P	KYBD	SB-3176/UGQ Patch Panel
(W3) MS3106A-16S-6S	Repref. Sel. Mag.	Red Panel (SB-1210/UGQ)
(W4) MS3106A-16S-6P	TD	SB-3176/UGQ Patch Panel

15. Install decal adjacent to name plate.

NOTE

The alignment procedures in Section V, (Maintenance), must be performed before the equipment can be operated.

CAUTION

Before applying power to the AN/UGC-6/16, SB-1210/UGQ, and the associated KW-7 cryptographic equipment, ensure that the loop out cable (J4) from the KWF-1/TSEC to the SB-1210/UGQ, and to the selector magnets of the page printer, are free of all grounds. Check with an ohmmeter from each side of the line to ground. A grounded receive signal line will cause damage to the KW-7/TSEC.

2.4 ADDITIONAL REQUIREMENTS

The modification of the AN/UGC-6/16 Series Teletypewriter with the NIK modification kit, requires that the equipment listed below be modified before being used with the NIK modified equipment.

2.4.1 KW-7/TSEC

MOD 13 must be installed prior to NIK installation.

2.4.2 KW-26/TSEC

MOD 14 must be installed prior to NIK installation.

2.4.3 SB-1210/UGQ

The SB-1210/UGQ Patch Panel must be wire strapped for remote battery prior to NIK installation. See NAVSHIPS 95718.

2.4.4 Removal of KWL-4/TSEC Unit and Installation of Dummy Connectors

The KWL-4 unit and its associated cables must be removed prior to NIK installation. Proceed as follows.

1. Remove the KWL-4 unit and associated cables.
2. Using standard procedures, make up two plugs for J4~~3~~ and J7 on the KWF-1/TSEC rack. Wire Strap pins B and C together on each of the connectors and install.
3. Using standard procedures, make up a shielded two-wire cable and connect from the SB-3176/UGQ Patch Panel to J8 of KWF-1. See Table 2.3 for cable connections. Use connector type MS3116E-14-5S (Connector not furnished).

Table 2.3 J8 of KWF-1 to SB-3176/UGQ Cable Connections

KWF-1 J8 Pins	SB-3176/UGQ Patch Panel Conn. Pins
B	B
C	C
A	D

4. Using standard procedures, make up a shielded two-wire cable and connect from the SB-1210/UGQ Patch Panel to J~~4~~ on KWF-1. See Table 2.4 for cable connections. Use connector type MS3116E-14-5PW (connector not furnished).

Table 2.4 J~~4~~ of KWF-1 to SB-1210/UGQ Cable Connections

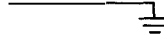
KWF-1 J 4 Pins	SB-1210/UGQ Patch Panel Conn. Pins
C	1 (3) (5) etc.
D	2 (4) (6) etc.
A	

Figure 2.11 shows a typical cryptographic system using the AN/UGC-6/16 Series Teletypewriter.



Figure 2.1 Rear View of AN/UGC-6/16/UG Before Modification

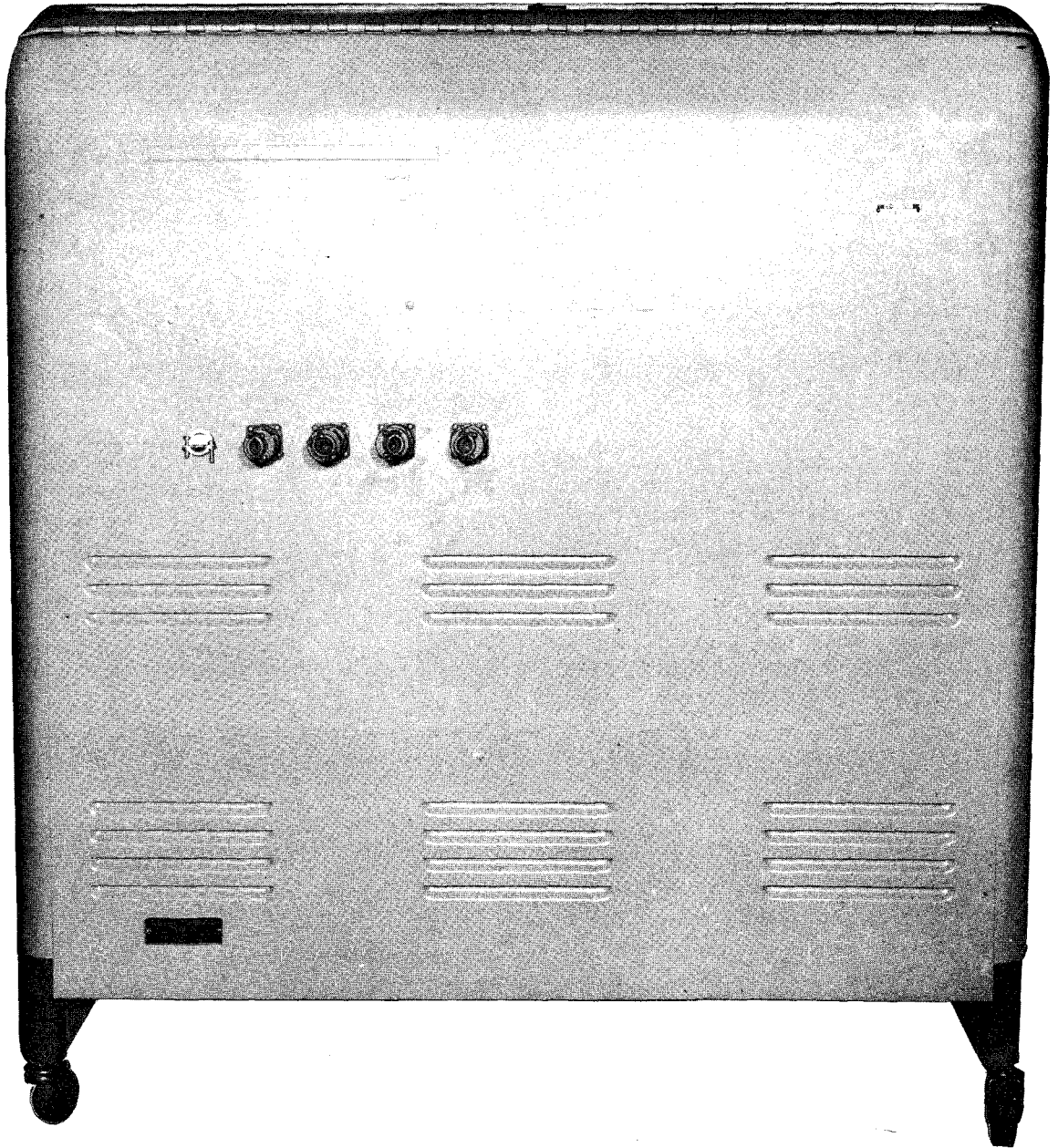


Figure 2.2 Rear View of AN/UGC-6/16/UG After Modification

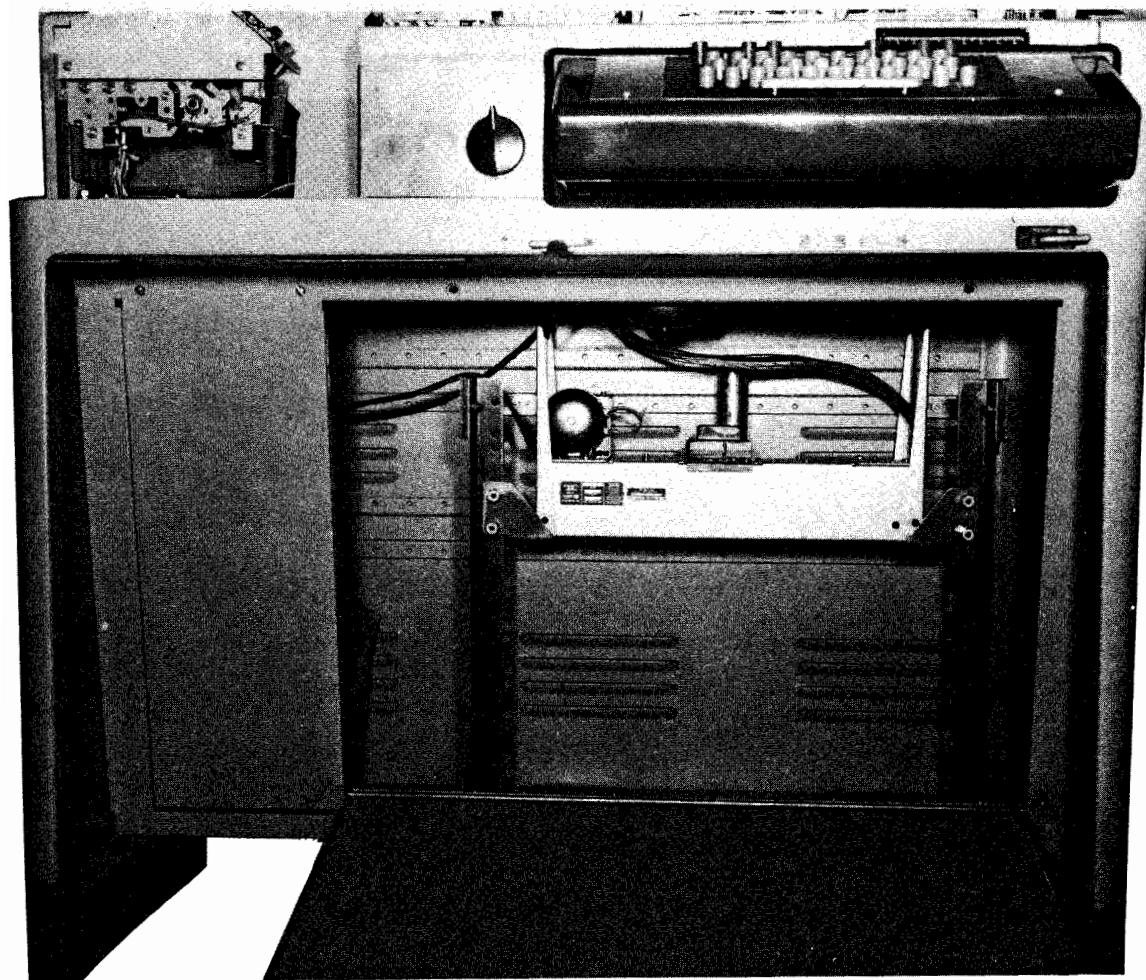


Figure 2.3 AN/UGC-6/16/UG Teletypewriter, Panels Removed, Before Modification

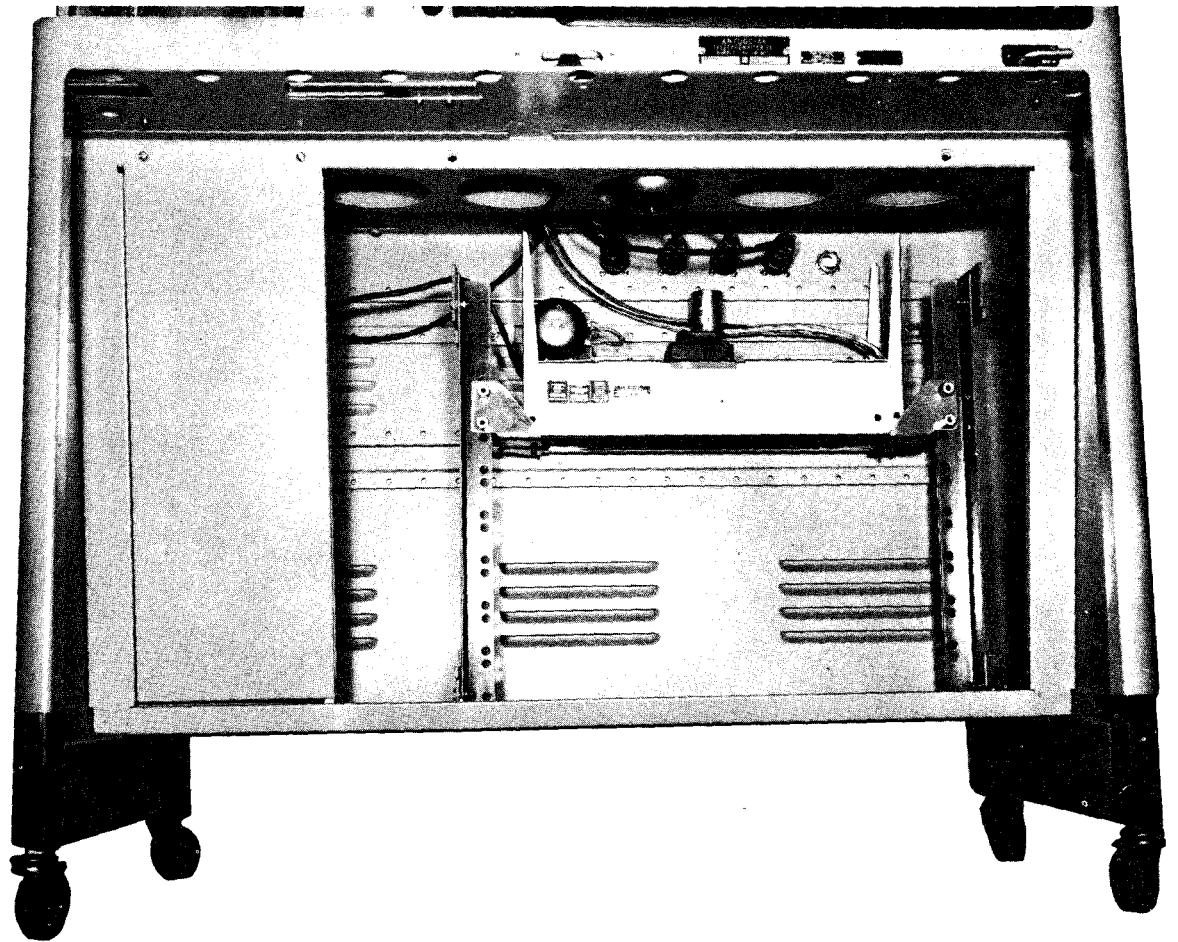


Figure 2.4 AN/UGC-6/16/UG Teletypewriter, Panels Removed, After Modification

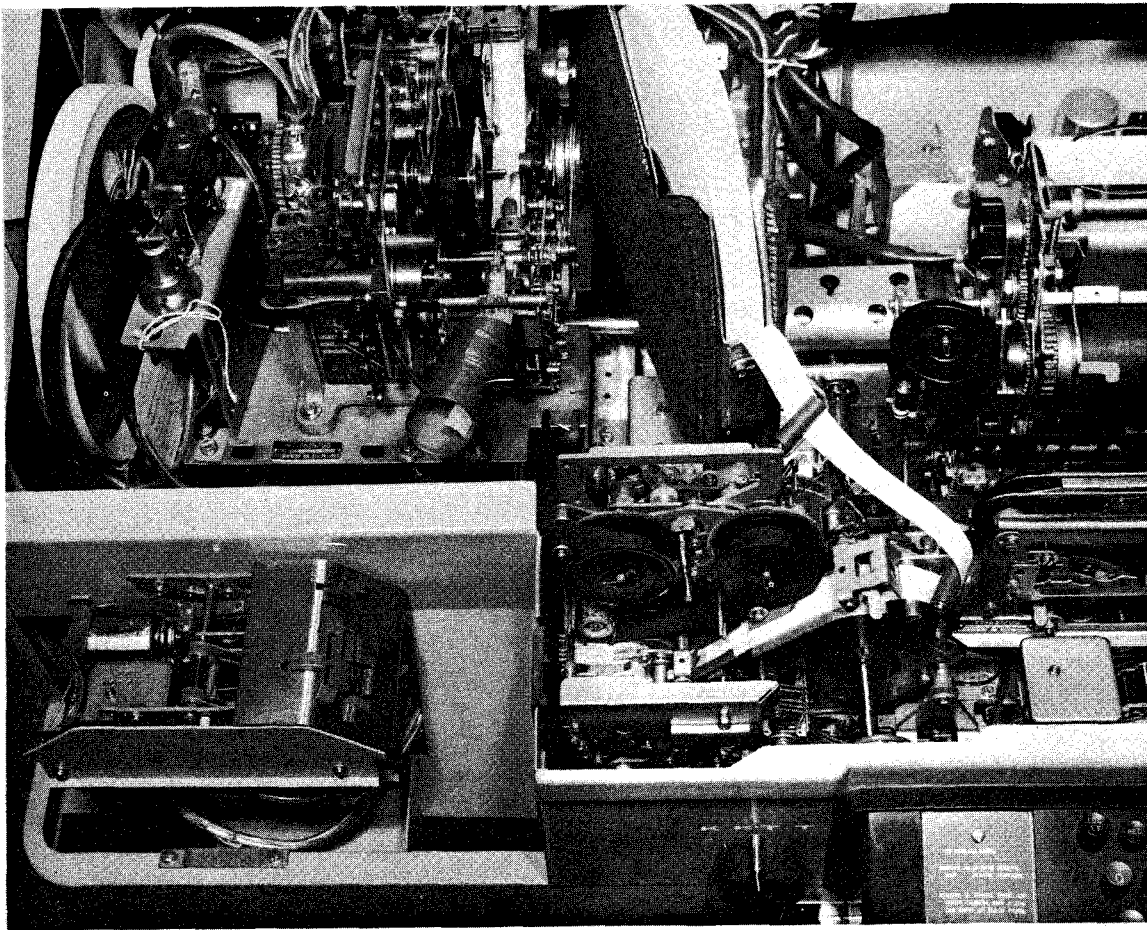


Figure 2.5 Interior View of AN/UGC-6/16/UGC Teletypewriter
Showing Two Contact Boxes and Reperforator Selector
Magnet Before Modification

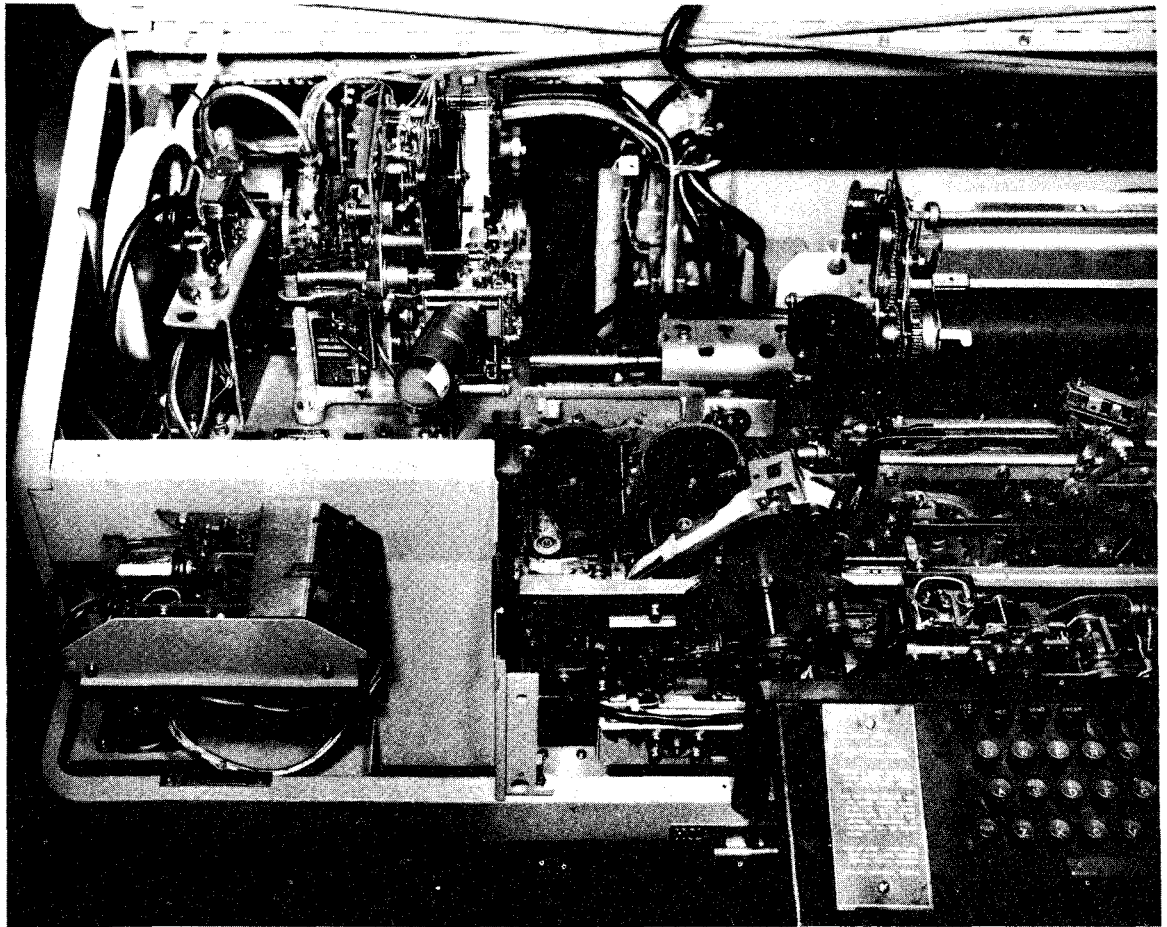


Figure 2.6 Interior View of AN/UGC-6/16/UG Teletypewriter Showing Two Contact Boxes and Reperfector Selector Magnet After Modification

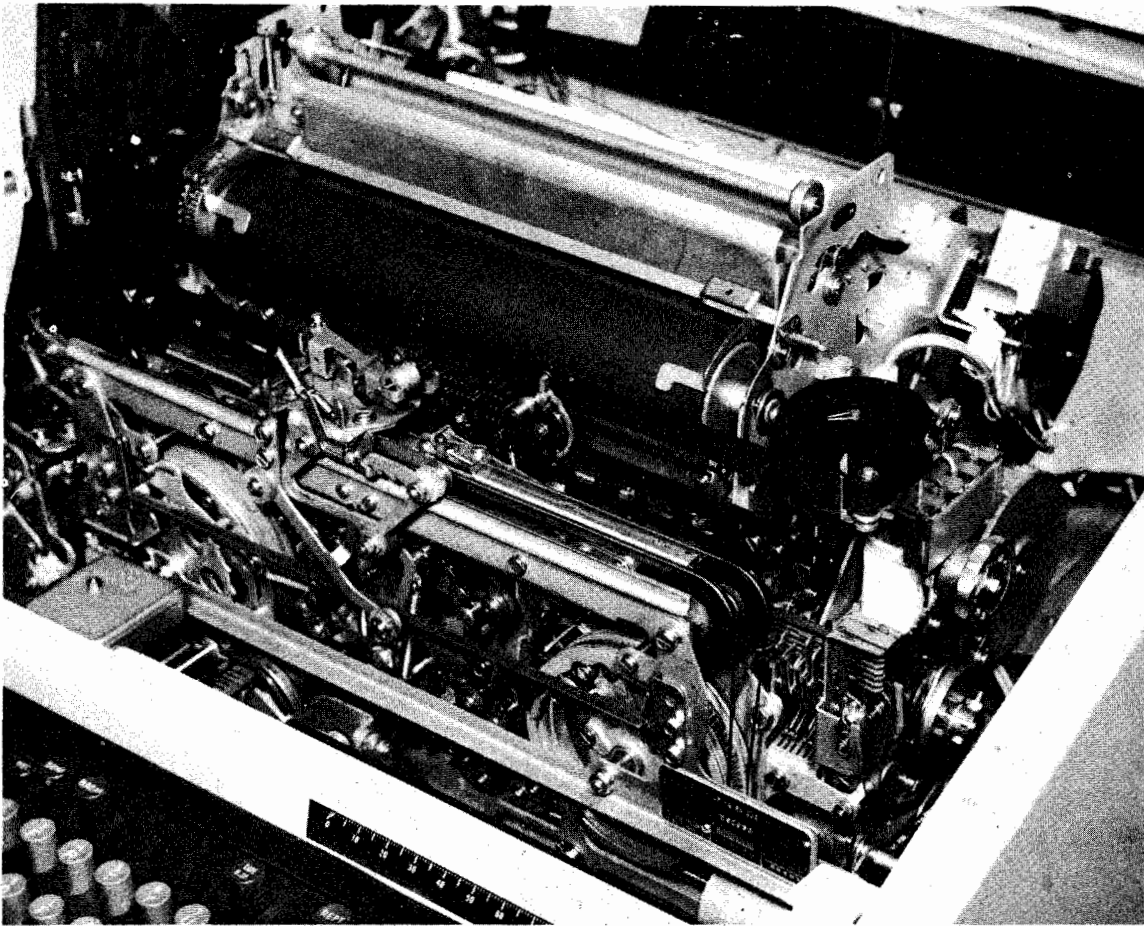


Figure 2.7 Interior View of AN/UGC-6/16/UG Teletypewriter
Showing Printer Contact Box and Selector Magnet
Before Modification

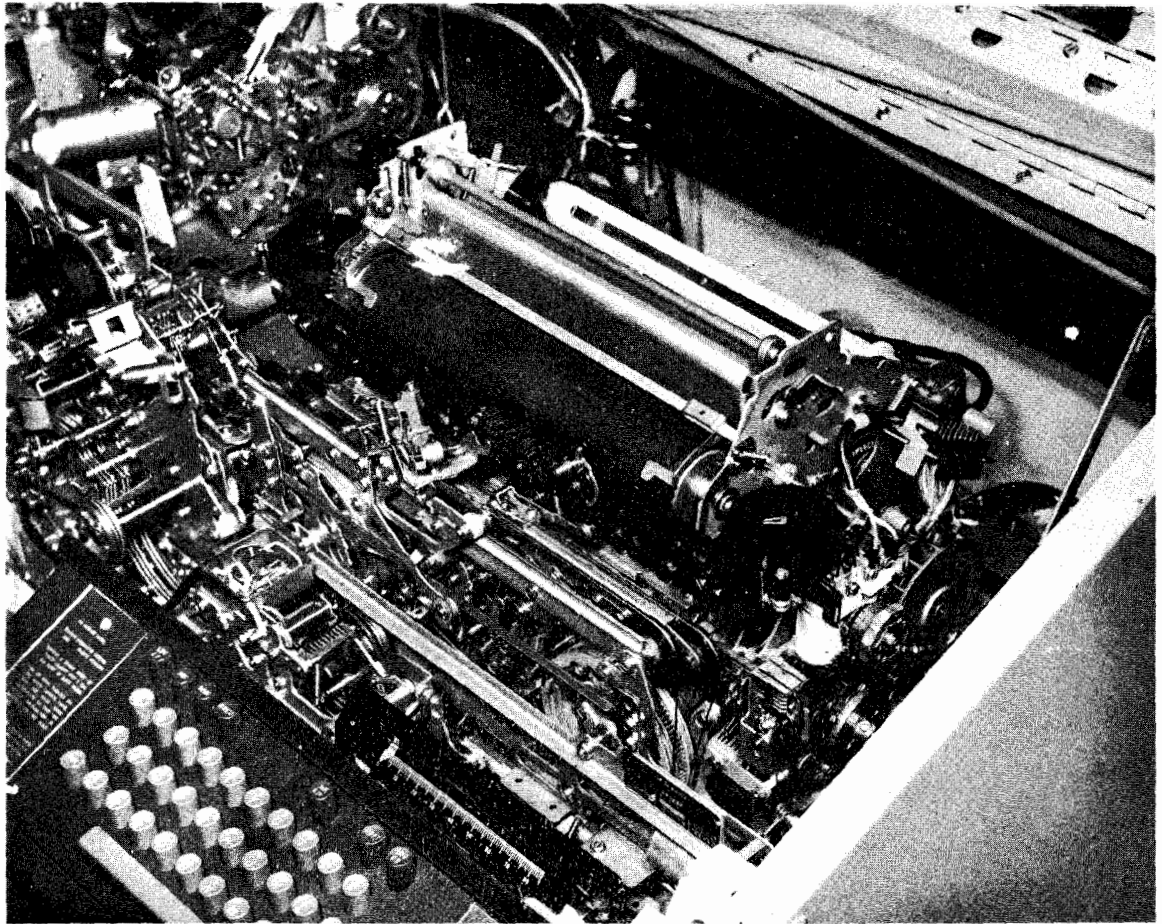


Figure 2.8 Interior View of AN/UGC-6/16/UG Teletypewriter Showing Printer Contact Box and Selector Magnet After Modification

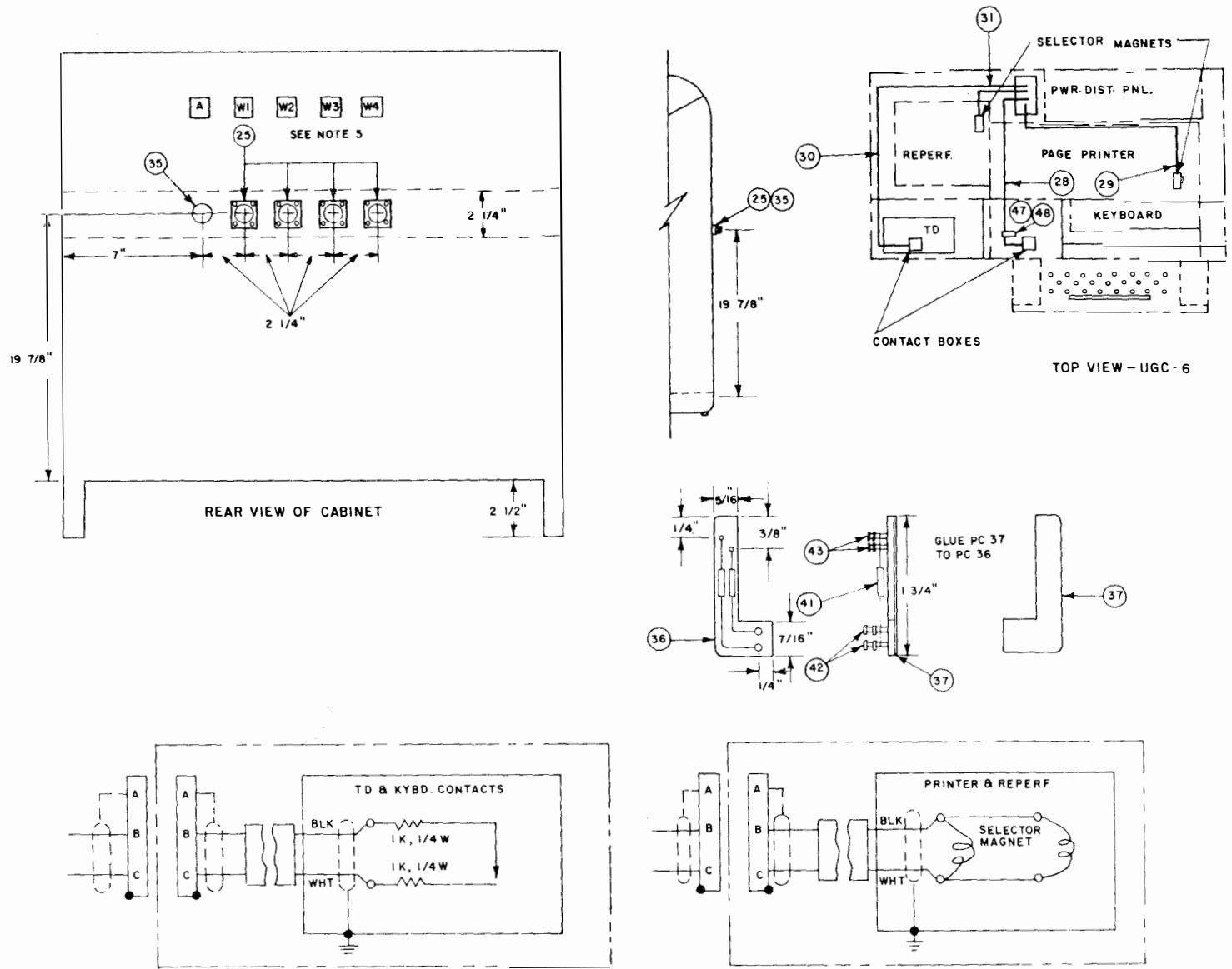
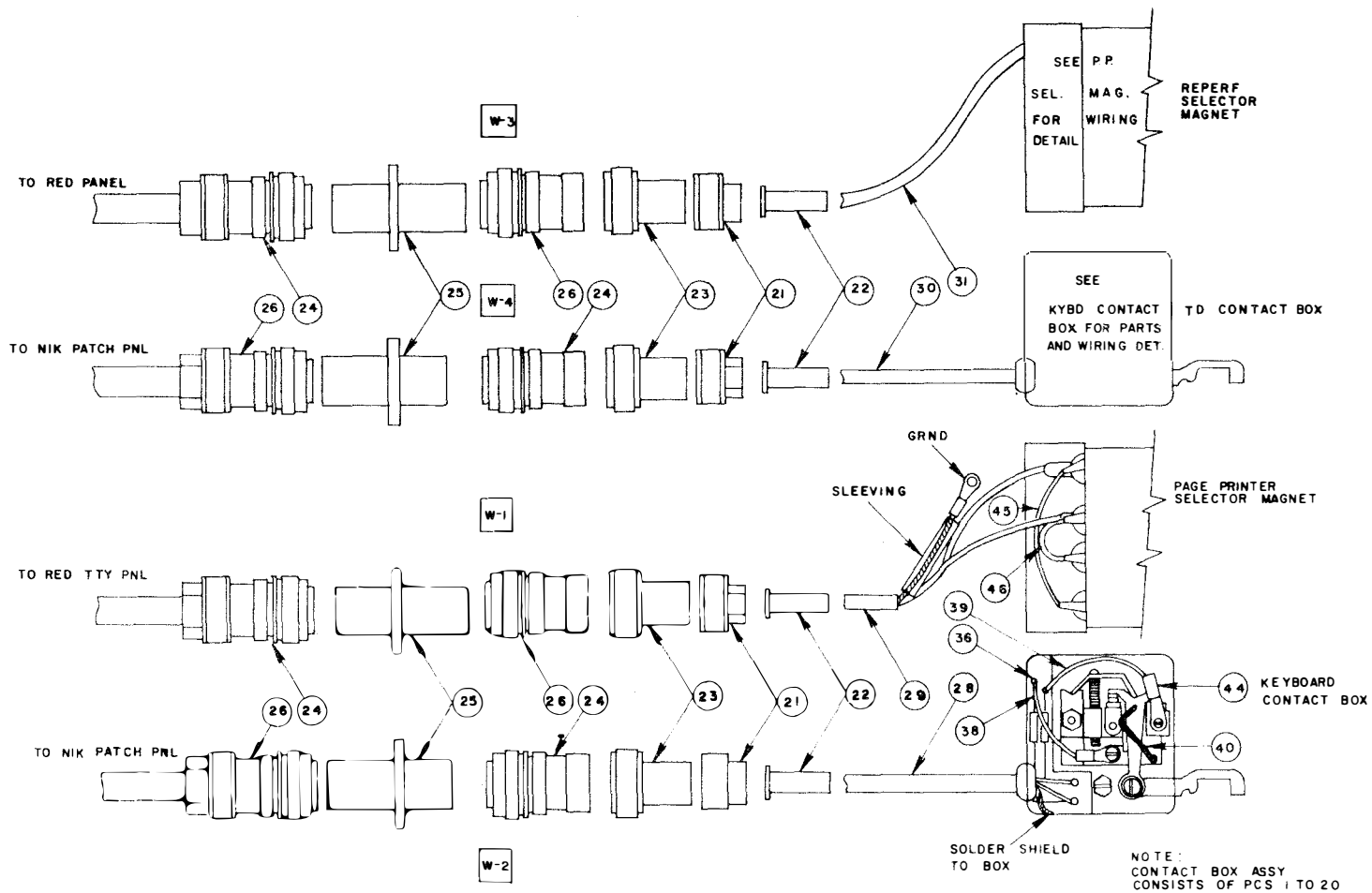


Figure 2.9 AN/UGC-6/16/UG Installation Drawing (Part 1)



NOTE:

1. EACH TBF-16S-6PS SECURED TO CHASSIS WITH 4EA 4-40 X 1/2 SCREWS, 4EA #4 STAR WASHERS AND 4EA 4-40 NUTS.
2. CONNECTORS AND QUANTITY FOR REPERF MOD IS THE SAME AS SHOWN FOR THE PAGE PRINTER MOD.
3. CONNECTORS AND QUANTITY FOR TD MOD IS THE SAME AS SHOWN FOR THE KYBD MOD.
4. RUN CABLES PC NO 28, 29, 30 B 31 AS FEASIBLE.
5.

A	W1	W2	W3	W4
---	----	----	----	----

 IDENTIFY CABLES

A

 FOR POWER CABLE.
6. WHEN MOD 14 TO TSEC/KW-26 IS INSTALLED, REPLACE BOTH 1K RESISTORS IN CONTACT BOX WITH JUMPERS.

Figure 2.10 AN/UGC-6/16/UG Installation Drawing (Part 2)

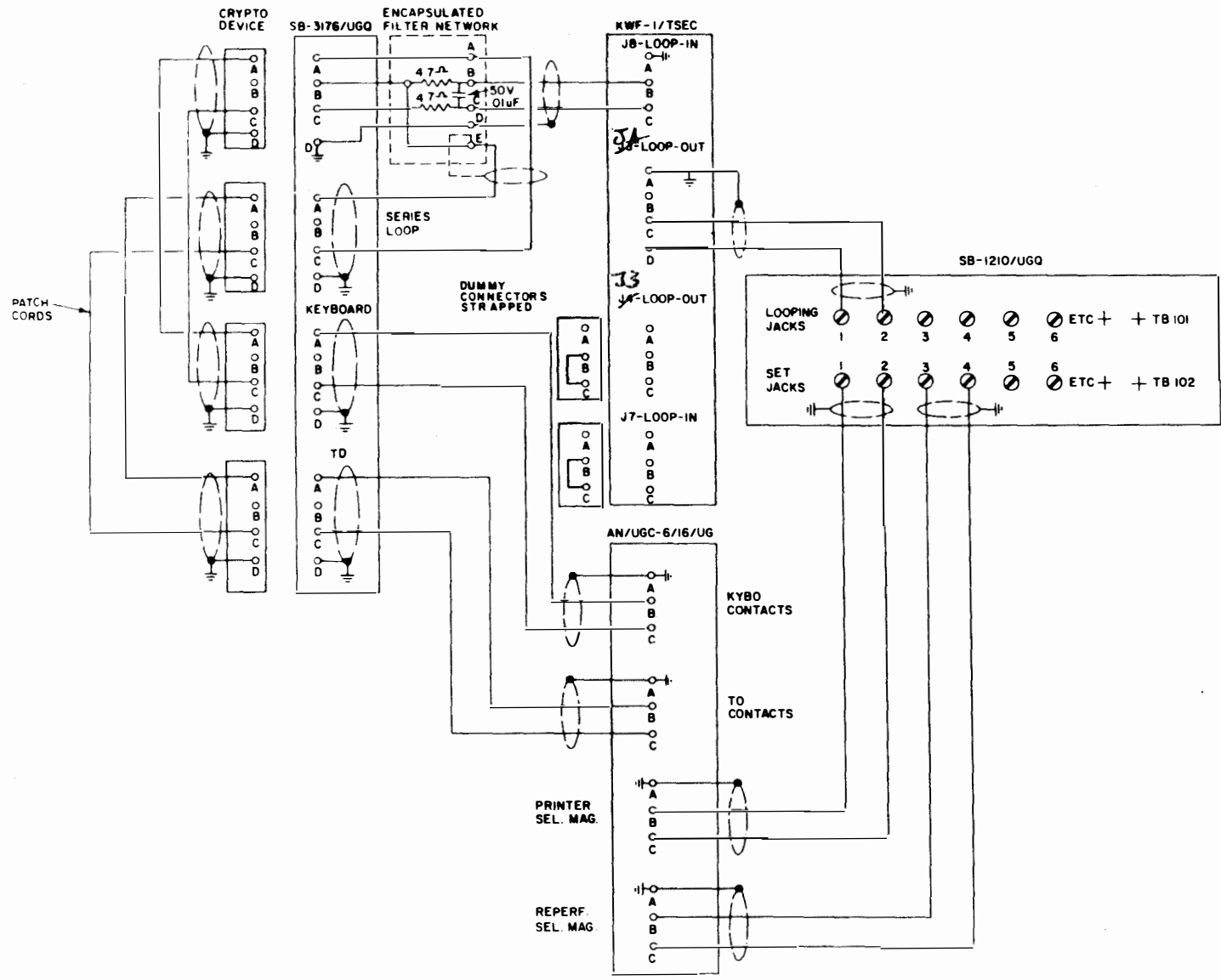


Figure 2.11 Typical Cryptographic System Using the AN/UGC-6/16/UG Teletypewriter

SECTION III

OPERATION

3.1 OPERATIONAL CAPABILITIES

The AN/UGC-6/16/UG Series Teletypewriters is affected by the modification kit as follows;

1. Keyboard and page printer are not in series.
2. Signal line shunt relay inoperative.
3. The electrical portion of the break key inoperative.
4. Line test switch inoperative.
5. Tape feed-out function for the reperforator inoperative.

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SECTION IV
TROUBLESHOOTING

4.1 INSPECTION

Perform periodic inspection on all mechanical assemblies, connectors, etc.

1. Ensure that all terminals are tight and clean.
2. Ensure that all connector contacts are clean and straight.
3. Ensure that all connectors are run up tight to provide firm contact with the other connector.
4. Ensure that all cables are in proper place and do not interfere with equipment operation.

4.2 CHECKOUT

NOTE

The following tests should be limited to a volt-ohmmeter with an internal resistance of 20,000 ohms per volt, using minimum current application.

1. A suspected "open" cable may be checked by using an ohmmeter (low ohms range) connected from pin A on one end of the disconnected cable to pin A on the other end of the cable and etc.
2. A suspected "short" in the disconnected cable may be determined by setting the ohmmeter to a higher scale and checking from pin A to pin B, from pin B to pin C and etc. Any reading would indicate a shorted cable.

4.3 DISTORTION OR GARBLED MESSAGE

Distortion or intermittent garble may be caused by dirty contact points. Refer to paragraph 5.2 for cleaning procedures.

SECTION V
MAINTENANCE

5.1 ALIGNMENT PROCEDURES

The proper operation of the keyboard is dependent upon the signal generator contact adjustment. Three methods of adjustment are provided. Method I or Method II is preferred. It is recommended that a 6 volt battery be used when making Method I or Method II adjustments. Battery should be connected across pins B and C of keyboard input connector.

5.1.1 Contact Adjustment, Method I

1. Connect the input leads of an oscilloscope directly across the contacts in the signal generator box. The input leads may be connected to the mark contact terminal and the fixed terminal, to which the jumper or pigtail is soldered.
2. Insert a test tape in the TD. The tape should contain a repetitive character such as an R. Start the TD and adjust the scope sweep controls to obtain a stationary pattern including several marks and spaces. A pattern similar to that shown by Figure 5.1 should be obtained. The marking and spacing levels should be symmetrical with respect to the scope base line.

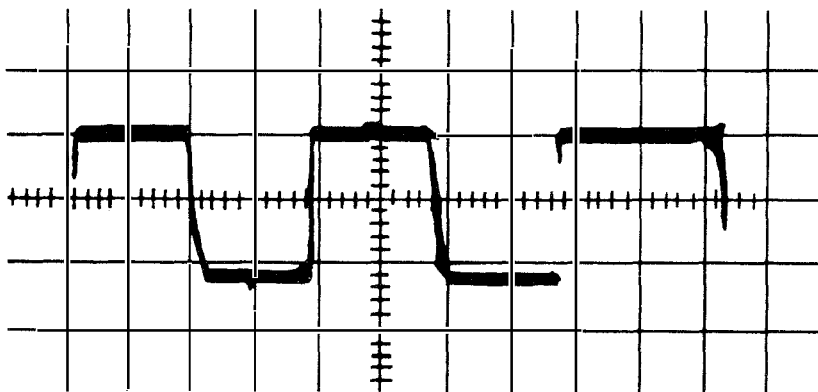


Figure 5.1 Waveform Method I

3. Loosen the contact box mounting screws until they are friction tight.
4. Adjust the eccentric contact adjusting screw to make the marking and spacing elements displayed on the oscilloscope base line of equal length.

CAUTION

Do not use the stop baud as a marking element. It is of a longer time duration than the other elements of the signal. The stop baud appears at the right hand side of the trace shown by Figure 5.1.

5. Tighten the contact box mounting screws and re-check the oscilloscope display to verify the presence of equal marking and spacing signal elements.

5.1.2 Contact Adjustment, Method II

This method of adjusting the contacts can be used to obtain a precise contact adjustment more easily than by the use of Method I.

1. Connect the oscilloscope as in sub-paragraph 1 of Method I. In addition, provide a connection from the signal input lead at the contact assembly to the external sync or trigger input on the oscilloscope.
2. Insert a test tape containing alternate R's and Y's in the TD. Start the TD and adjust the oscilloscope controls to obtain a stationary display, including a complete character having marking and spacing levels arranged symmetrically with respect to its base line. A sweep rate of approximately 5 ms per cm will display one character. A display similar to that shown by Figure 5.2 should be obtained.

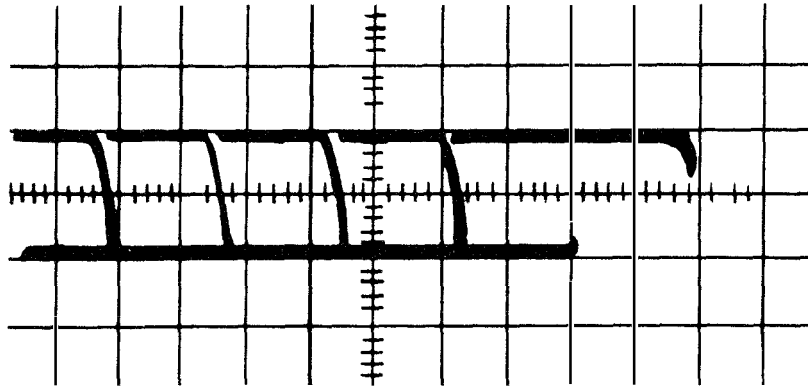


Figure 5.2 Waveform Method II

3. Adjust the contacts in the manner set forth in Method I, to obtain equal marking and spacing elements as indicated on the scope base line by the crossover points on the scope trace. The use of alternate R's and Y's will result in an overlap of the alternate marks and spaces due to scope persistence, which results in the rise and fall portions of the traces crossing at the scope base line.

5.1.3 Contact Adjustment, Method III

Use only when an oscilloscope is not available.

1. Remove the contact box cover. See Figure 5.3.
2. Loosen the two contact box mounting screws until friction tight.
3. Engage the clutch and rotate the main shaft slowly until one set of points are at maximum clearance.
4. Check the clearance with a clean (no oil) wire feeler gauge. If the clearance is less than 0.008 inches or more than 0.010 inches adjust the eccentric screw until a clearance of approximately 0.009 inches is obtained.
5. Remove the feeler gauge and slowly rotate the main shaft until the other set of points are at maximum clearance. Check with the feeler gauge. The two sets of points must open at least 0.008 inches and not more than 0.010 inches. The difference between the two readings must be held to less than 0.002 inches.

6. Tighten the mounting screws and verify with the feeler gauge that the readings have not changed.
7. Replace the contact box cover.

5.2 CLEANING PROCEDURES

The gold contacts require that no abrasives be used for cleaning purposes. If cleaning is required use a dry, clean, lint free cloth.

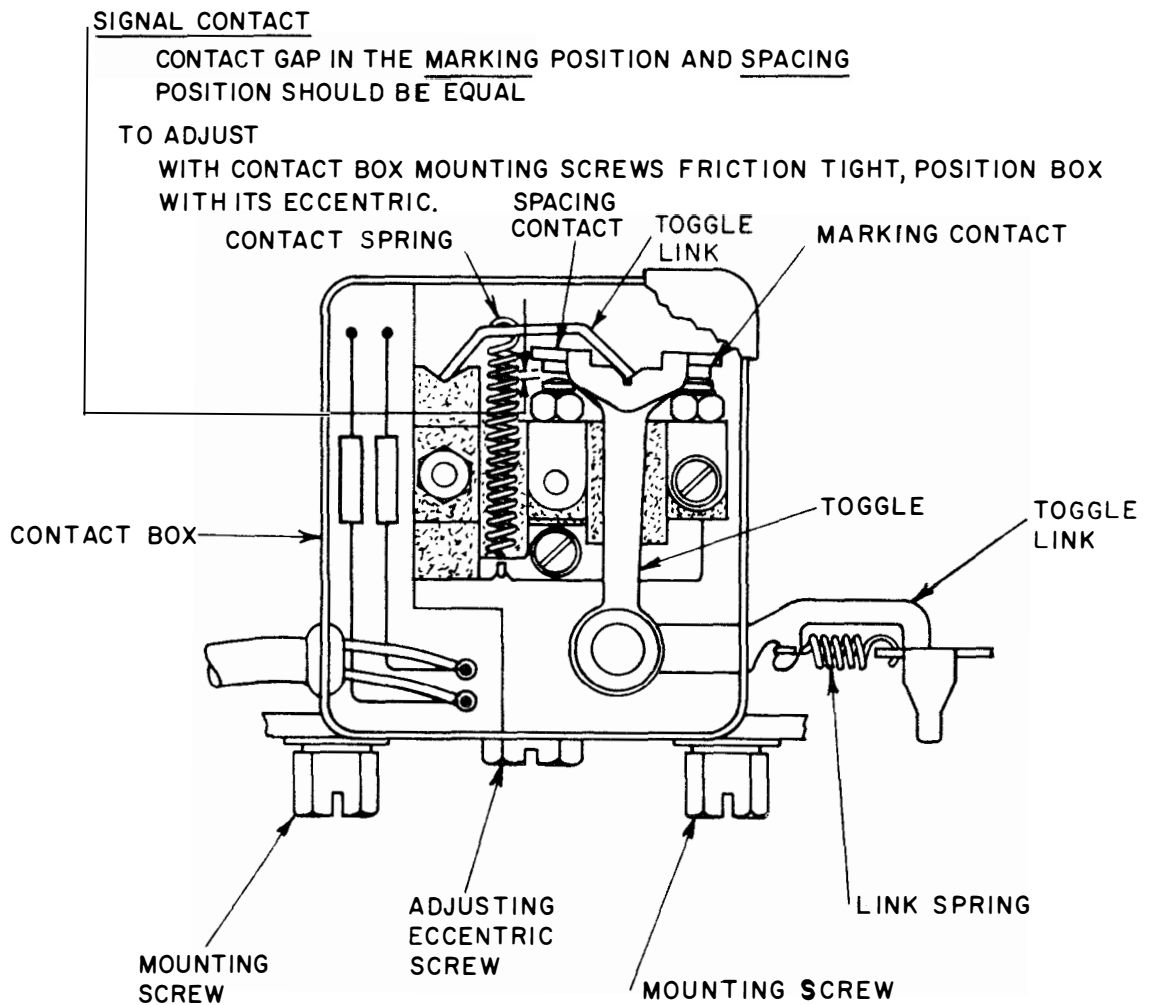


Figure 5.3 Contact Point Adjustment

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SECTION VI

PARTS LIST

6.1 PARTS LIST

Table 6.1 contains a detailed parts list of the AN/UGC-6/16 Series Teletypewriters NIK Modification Kit.

Table 6.1 Parts List

Pc.	Description	Qty	Mfg or FSN	TTY No.
1	Screw	4	9Z5305-285-5575	1293
2	Nut	2	9Z5310-194-8195	3599
3	Washer	8	9Z5310-194-1478	3640
4	Washer	2	9Z5310-209-0929	90791
5	Washer	4	9Z5310-209-3861	110743
6	Screw	2	Teletype Corp. Skokie, Illinois	125126
7	Screw	2	9Z5305-370-0809	151152
8	Nut	2	9G5310-514-7394	151880
9	Washer	2	9Z5330-599-8282	151182
10	Screw	2	IN5815-738-4518	195186
11	Screw	2	9Z5305-514-7391	153817
12	Assembly, Contact Gold	2	9N5935-878-1051	179639
13	Bracket, Kybd	1	IN5815-676-6971	154056
14	Bracket, TD	1	IN5815-767-5644	156643
15	Box, Contact	2	IN5815-675-6992	154130
16	Cover, Contact Box	2	IN5915-676-6993	154131
17	Grommet	2	Teletype Corp. Skokie, Illinois	154156
18	Insulator	2	9G5970-691-2733	154189
19	Link	2	IN5815-652-1569	156644
20	Insulator	2	9G5970-691-2343	156663
21	Clamp, Cable AN3057-4	4	Cannon or Equal	
22	Bushing, AN3420-4	4	Cannon or Equal	
23	Adapter, AN3055-16-4	4	Cannon or Equal	
24	Connector, MS3106A-16S-6S	4	Cannon or Equal	
25	Connector, TBF-16S-6PS	4	Cannon or Equal	
26	Connector, MS3106A-16S-6P	4	Cannon or Equal	
27	Clamp, Cable, AN3057-8	4	Cannon or Equal	
28	Cable, RG-108	40"	9Z6145-553-7823	

Table 6.1 Parts List (Continued)

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
29	Cable, RG-108	40"	9Z6145-553-7823	
30	Cable, RG-108	45"	9Z6145-553-7823	
31	Cable, RG-108	26"	9Z6145-553-7823	
32	Screw, 4-40 x 1/2 B.H. CRS	16		
33	Nut 4-40 Hex Head CRS	16		
34	Washer, Split Lock #4	16		
35	Connector, Box 3/8" Straight	1		
36	Board, Melamine, 1/16" Thk, 2"x1", MIL-P-78A	1		
37	Insulator, Fishpaper 2" x 1"	2		
38	Wire, 22G, Teflon, 600V, Red, MIL-16878D	6		
39	Wire, Teflon, 22G, 600V, Yellow, MIL-16878D	6		
40	Wire, Green	1	Teletype Corp. Skokie, Illinois	195648
41	Resistor, Carbon, 1K 1/4W	4	9N5905-885-9198	
42	Terminal, USECO 2035-B1	4	USECO Div. of Litton Industries	
43	Terminal, USECO 2520-B1	4	USECO Div. of Litton Industries	
44	Lug, AMP 325914	4	9G5940-819-2960	
45	Strap (Long)	1	5815-325-1902	156880
46	Strap (Short)	1	5815-325-1903	156881
47	Clamp, Nylon 1/4"	1		121244
48	Screw	1		151442
	Assembly (Complete) Part No. GO-1369, Consists of pc. # 23, 24, 25, 26, 27.	4	Glenair Inc. Glendale, Calif.	

MAKE THE FOLLOWING PEN AND INK CORRECTIONS AS INDICATED BELOW.

- Page ix, LIST OF TABLES, 6th line, Change J3 to Read J4.
- Page 2-7, Para 2.3.3(15), under "Caution" 4th line Change (J3) to read (J4).
- Page 2-8, Para 2.4.4(2), 2nd line, Change J4 to Read J3.
- Page 2-9, Para 2.4.4(4), 3rd Line, Change J3 to Read J4.
- TABLE 2.4, Change J3 to read J4 where appearing.
- Page 2-20, Figure 2.11, under KWF-1/TSEC Change J3 Loop-out to read J4 Loop-out.
Change J4 Loop-out to Read J3 Loop-out.

DUNE 9/23/16



NAVSHIPS 0967-284-5070

★

TECHNICAL MANUAL

for

**NORMAL INPUT KEYING
TELETYPE MODIFICATION KITS (U)**

SB-3176/UGQ

**DEPARTMENT OF THE NAVY
NAVAL ELECTRONICS SYSTEM COMMAND**

★

18 November 1967

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5-1 (RB)	Original
6-1 and 6-2	Original

FOREWORD

This technical manual was prepared to MIL-M-15071E by PRC Technical Applications Inc. San Diego, California under contract N0022868CO118 for the San Francisco Bay Naval Shipyard, San Francisco, California.

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SECTION I

GENERAL DESCRIPTION

1.1 SCOPE

This technical manual provides a description of procedures for installing, operating, troubleshooting and maintaining the Communication Patch Panel SB-3176/UGQ.

1.2 GENERAL INFORMATION

1. The SB-3176/UGQ Patch Panel was designed and manufactured by the San Francisco Bay Naval Shipyard, San Francisco, California.
2. The SB-3176/UGQ Patch Panel provides interfacing between the KW-26/TSEC and KW-7/TSEC cryptographic equipment, the TT-176/UG, TT-47/48/69/70/UG, TT-187A&B/UG, AN/UGC-20, and AN/UGC-6/16 Series Teletypewriters and Reperforators, which have the Normal Input Keying (NIK) teletype modification kits installed.

NOTE

The SB-3176/UGC Patch Panel cannot be used with teletypewriters or reperforators that do not have the normal input keying kit installed.

3. The SB-3176/UGQ Patch Panel kit is shown in Figure 1.1.
4. The SB-3176/UGQ Patch Panels are installed at the equipment site by field personnel. A list of tools required to perform the installation and a list of parts included in the SB-3176/UGQ Patch Panel kit with complete instructions for the installation of the SB-3176/UGQ Patch Panel, are outlined in this manual.

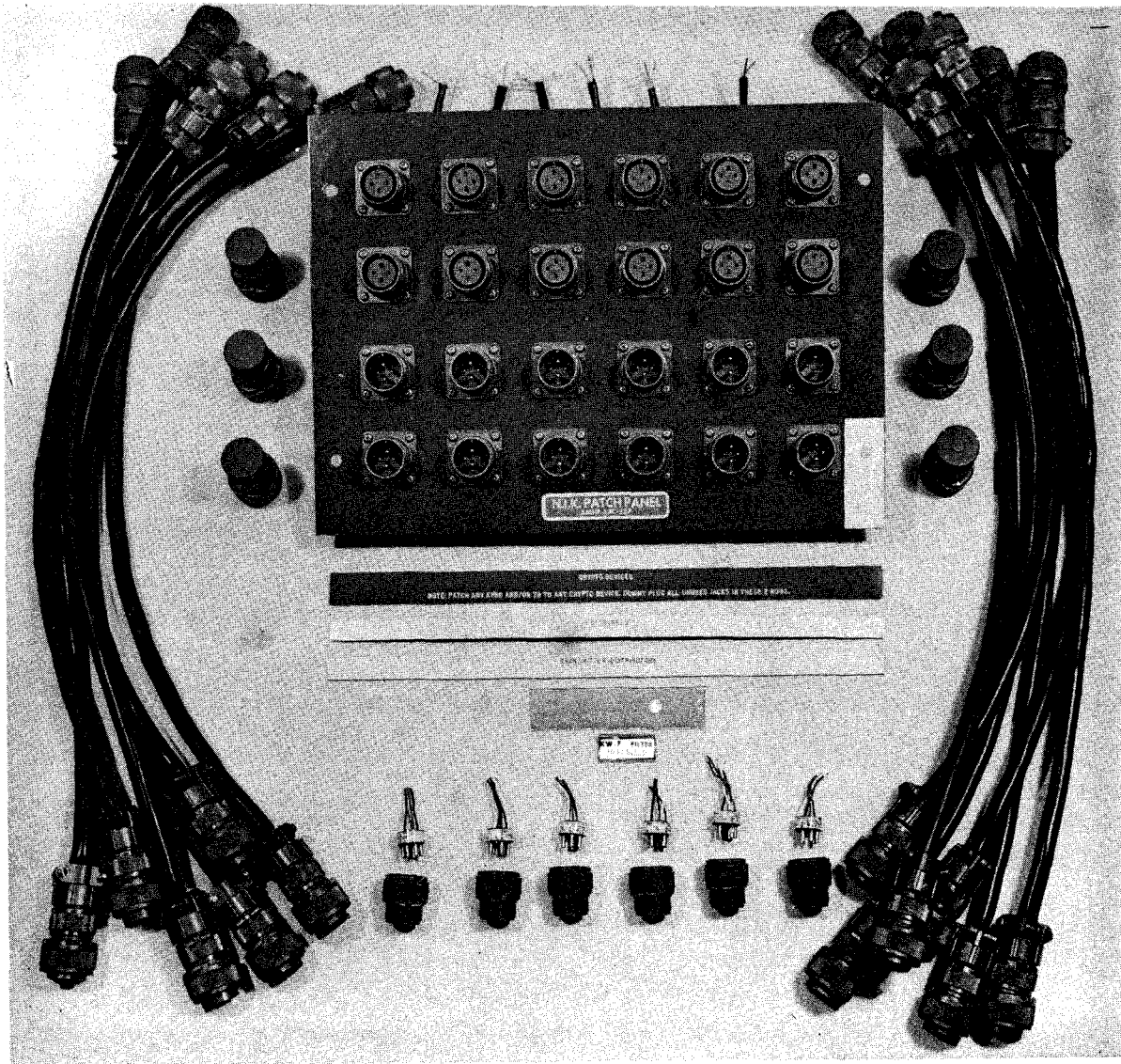


Figure 1.1 SB-3176/UGQ Patch Panel Kit

1.2.1 Physical Characteristics

1. The SB-3176/UGQ Patch Panel is 13 1/2 inches long, 9 3/4 inches high and weighs 11 1/2 pounds complete with patching cables.
2. The panel is constructed of 1/8 inch aluminum plate and contains 12 four-wire female and 12 four-wire male connectors, laid out in four rows of 6 connectors each. Table 1.1 contains a list of the major parts contained in the SB-3176/UGQ Patch Panel kit.
3. The SB-3176/UGQ Patch Panel is painted red on the front side (except where the ground strap is to be located). No paint is used on the back side. It is drilled for mounting on bulk-head extension brackets.

1.2.2 Electrical Characteristics

Refer to KAM-85/TSEC and KAM-143/TSEC for electrical characteristics on (NIK) normal input keying.

Table 1.1 SB-3176/UGQ Patch Panel Kit

Item	Quantity	Part
1	1	Panel, with 24 four-wire connectors installed, with eight-inch leads wired to six connectors on second row.
2	12	Patch cords, 24 inches long, wired with four-wire female connectors on one end and four-wire male connectors on the other end.
3	6	Male connectors, four-wire, wired (shorted) and capped.
4	6	Connector extensions.
5	8	Encapsulated filter networks.
6	3	Plastic name strips
7	1	Ground strap, 1 inch x 4 inch
8	1	Installation decal.

SECTION II
INSTALLATION

2.1 GENERAL

This section contains detailed steps for the installation of the SB-3176/UGQ Patch Panel.

2.2 PRE-INSTALLATION REQUIREMENTS

1. Table 2.1 lists the tools required to install the SB-3176/UGQ Patch Panel components.
2. Before installing the SB-3176/UGQ Patch Panel, the following requirements must be accomplished (See Figure 2.4).

2.2.1 Installation of Encapsulated Filter Networks for the KW-7/TSEC Loops.

NOTE

The encapsulated filter network is not required for loops using the KW-26/TSEC.

1. Remove (unbolt) the back half of the connectors in the top row on the NIK patch panel, for the required number of filters to be installed.
2. Solder the encapsulated filter network (item 24), to the pin connectors. (See details shown in Figure 2.1 and 2.2.) Keep the leads as short as possible.
3. Separate the cable clamps from the removed connectors and replace the back half of the connectors on the panel where the filters were installed.

Table 2.1 Tools Required

Quantity	Item
1	1/4 inch Electric drill
2	Bits, 1/4 inch and 1/8 inch
2	Screwdrivers, Medium, Phillips and regular
2	Open end wrench, 1/4 inch and 5/16 inch
1	6' Tape measure
1	Side cutters
1	Wire stripper
1 roll	Resin core solder
1	Soldering iron
1	Volt-ohmmeter
1	Wire brush, small
2 ft.	3/32 inch plastic tubing

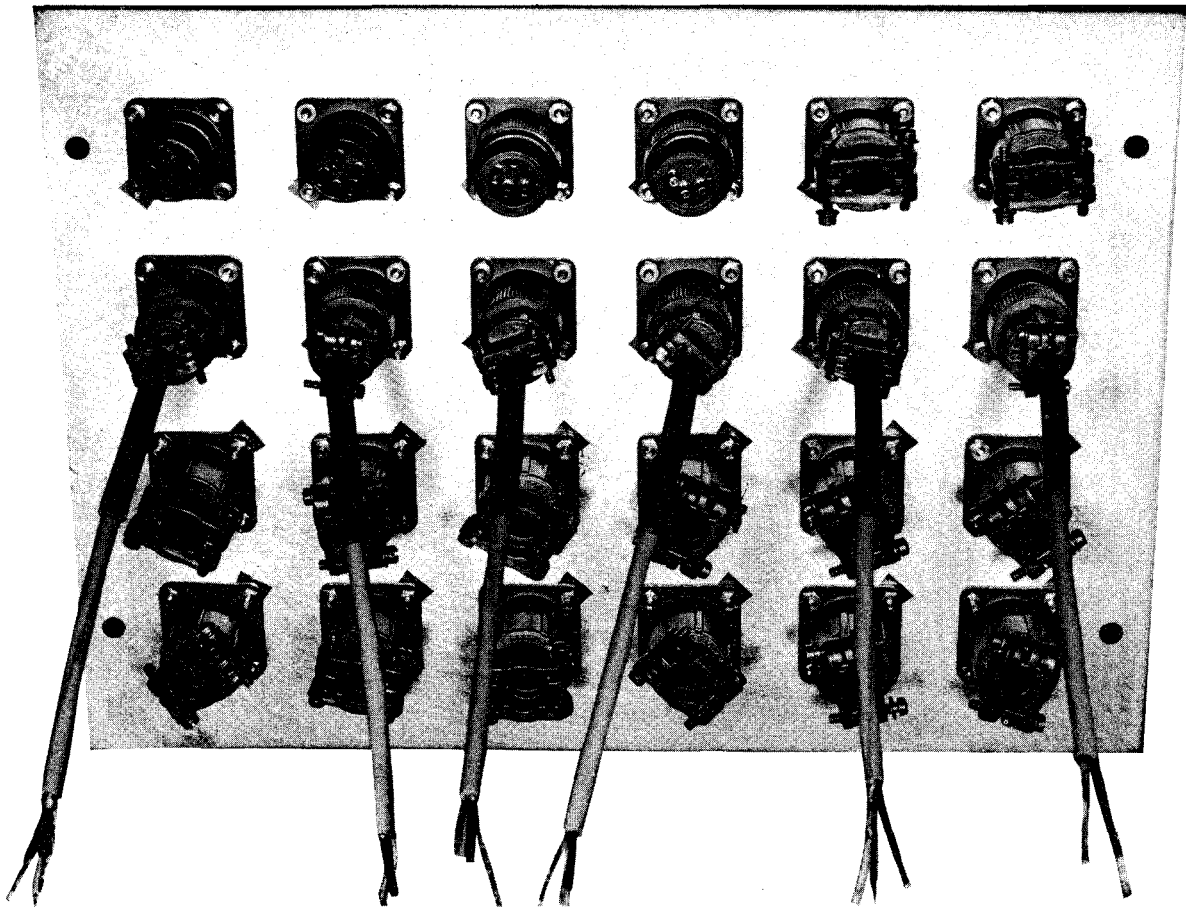
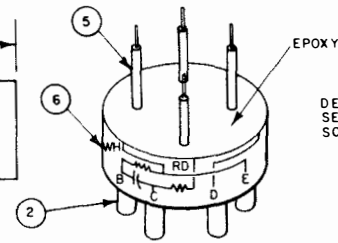
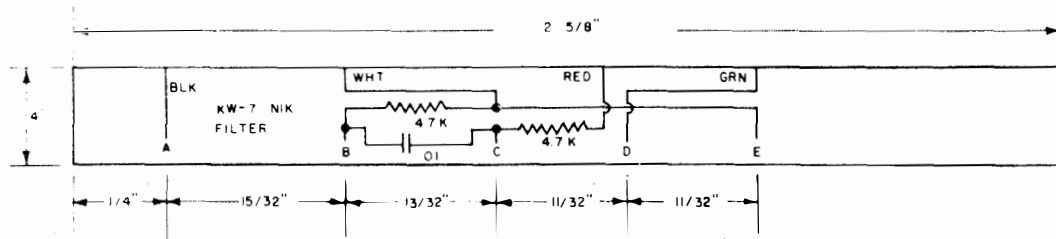


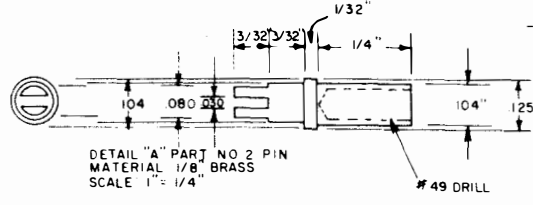
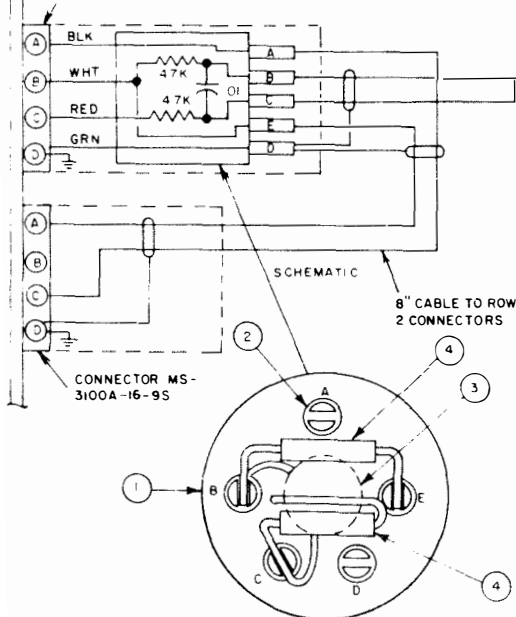
Figure 2.1 NIK Filters Partially Installed for KW-7 Loops

DETAIL "C" PART NO 6 DECAL
 MATERIAL PLASTIC WITH ADHESIVE BACKING
 SCALE 1" = 1/4"

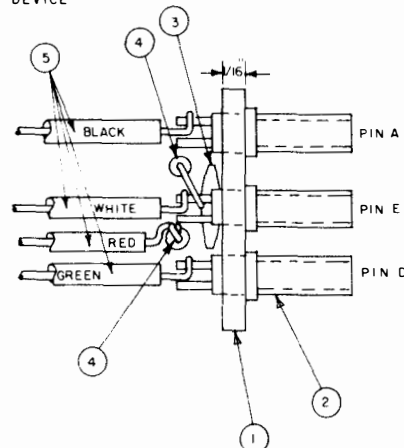


DETAIL "D" FILTER
 SEE NOTE 4
 SCALE: 1" = 1/2"

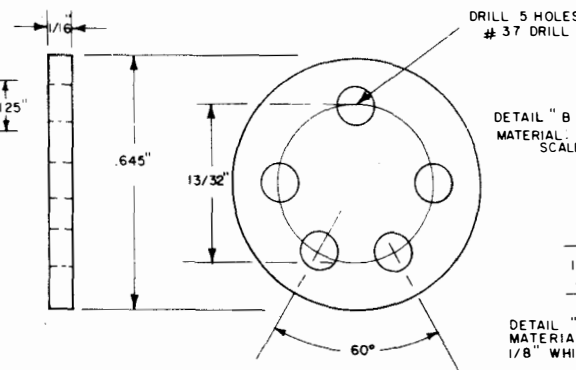
PC NIK PATCH PANEL
 CONNECTOR MS 3100A-16-9S



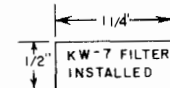
DETAIL "A" PART NO 2 PIN
 MATERIAL 1/8" BRASS
 SCALE 1" = 1/4"



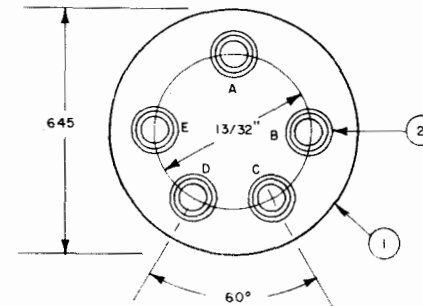
COMPONENTS ASSEMBLY DETAIL
 SCALE: 1" = 1/4"



DETAIL "B" PART NO 1 DISK
 MATERIAL 1/16" MELAMINE
 SCALE 1" = 1/4"



DETAIL "E" PART NO 7 NAMEPLATE
 MATERIAL RED PHENOLIC
 1/8" WHITE LETTERING



GENERAL NOTES

- 1 FILTER ASSEMBLY IS TO BE LOCATED WITHIN CONNECTOR SHELL ON NIK PATCH PANEL (REF 1) FOR INSTALLATIONS USING KW-7 CRYPTO DEVICE
- 2 SECURE PINS (PC NO 2) TO DISK (PC NO 1) WITH SPECIAL SWEDGING TOOL & RIVETING JIG
- 3 DECAL (PC NO 6) IS TO BE PHOTO-ENGRAVED FROM DETAIL "C" AND ADHESIVE BACKING IS REQUIRED

- 4 WRAP DECAL (PC NO 6) AROUND FILTER ASSEMBLY TO FORM MOLD FOR POURING EPOXY INSURE THAT THE LETTERS ON THE DECAL ARE LOCATED SO THAT IT WILL BE ADJACENT TO THE CORRESPONDING PINS
- 5 MIXTURE OF EPOXY IS 10 PARTS EPOCAST 202 TO 2 PARTS HARDENER 946
- 6 NAMEPLATE (PC NO 7) IS TO BE INSTALLED ON NIK PATCH PANEL (REF 1) WHENEVER FILTER ASSEMBLY IS INSTALLED.

Figure 2.2 Encapsulated Filter Network, Assembly Details and Pin Connections

4. Insert the appropriate cable from the cryptographic device and the eight-inch cable from the connector immediately below the NIK filter, through a cable clamp and connector adapter (item 20). Connect the adapter to the cable clamp.
5. After preparing the cables for installation, insert each wire in the two cables through a piece of 3/32 inch plastic tubing approximately 1/2 inch long. (Not provided in kit.)
6. Solder the cable wires to the encapsulated filter network pins (item 24). The eight-inch cable wires, from connector row two, should go to pin A and E. The wires in the cable from the cryptographic device should go to pins B and C. The two cable shields are connected to pin D. See Figure 2.2.
7. Slide the plastic tubing down over pins A, B, C and E to prevent possible shorts in the connector shell.
8. Slide the connector clamp and adapter down the cables and screw on the panel connector.
9. Insure that the cable clamp is on an area of the cable where the insulation has not been removed, then secure cable clamp.
10. Duplicate this installation for each of the NIK filters installed.

2.2.2 Installation of Cables for KW-26/TSEC Loops

NOTE

The encapsulated filter network is not required for loops using the KW-26/TSEC.

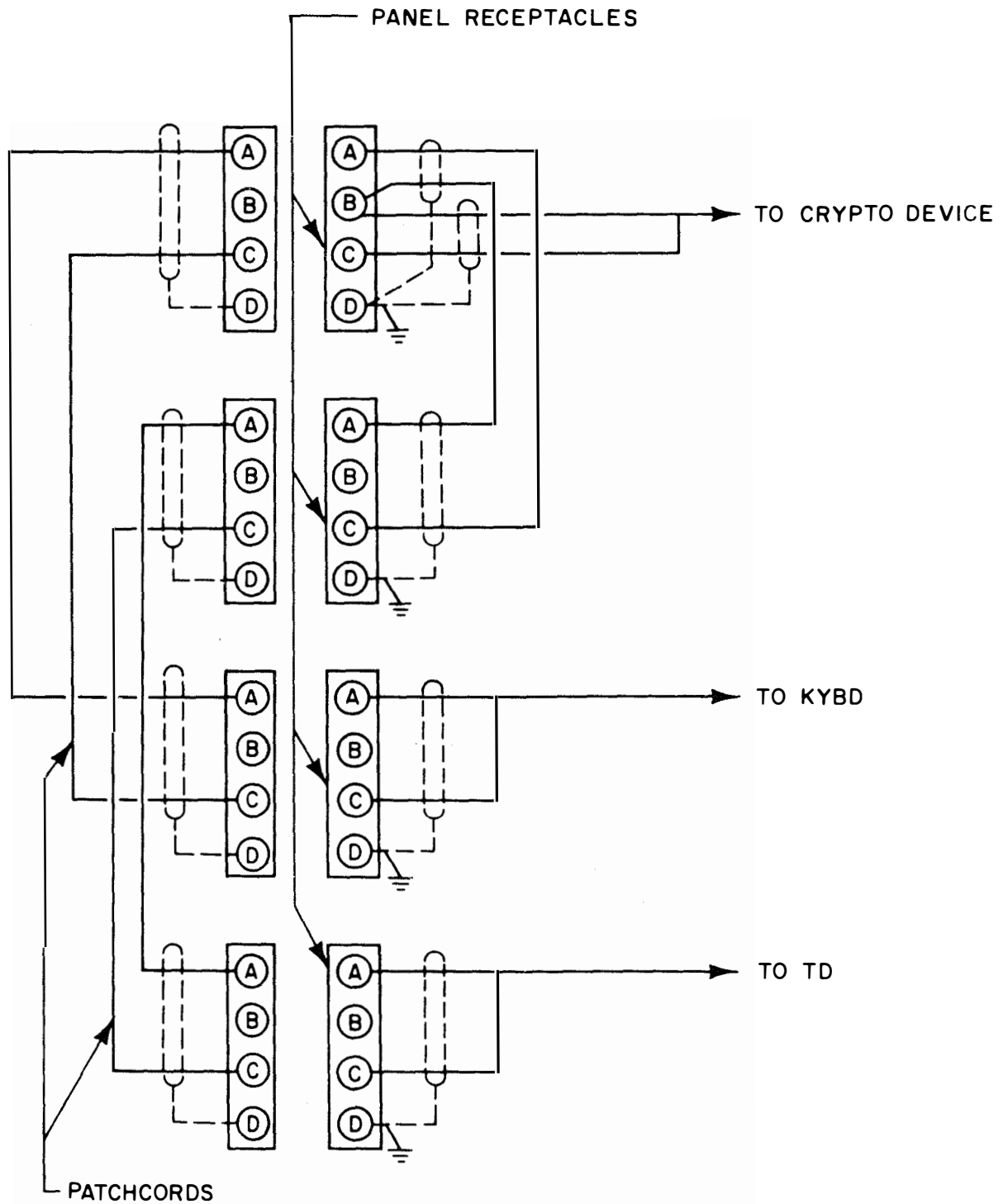
1. Remove (unbolt) the back half of the connectors in the top row, on the NIK patch panel, for the required number of cables to be installed.

2. Insert the appropriate cable from the cryptographic device and the eight inch cable lengths from the connector immediately below (on the second row), through a cable clamp and connector.
3. After preparing a cryptographic cable for installation, solder the cable wires to connector pins B and C on the first row. The eight inch cable leads from the connector on the second row, are connected to pins A and B on the first row. The shields of the two cables are connected to pin D on the first row (See Figure 2.3).
4. Slide the connector and connector clamp down the cables and bolt to the patch panel.
5. Connect the clamp to the connector and ensure that the cable clamp is placed on an area of the cable, where the insulation has not been removed. Secure cable clamp.
6. Duplicate the above procedures for each of the KW-26/TSEC cable loops installed.
7. Figure 2.3 shows typical wiring details for one KW-26 loop.

2.2.3 Installation of Teletypewriter Keyboard and Transmitter Distributor Cables

The keyboard cables are wired to the connectors on the third row, as required. The TD cables are wired to the connectors on the bottom (fourth) row, as required.

1. After preparing the required cable lengths for installation, remove each cable clamp and insert the cable to be connected through the clamp.
2. Remove (unbolt) the back half of the connector to be wired and pass the cable through it.
3. With the cable clamp and connector shell on the cable, solder the wires to the applicable connector pins. Pins A and C are signal lines. Pin D is ground (shield).
4. Slide the connector down the cable and remount the connector on the panel, then secure with four screws.



FOR KW-26 ONLY

**WITH KYBD & TD PATCHED TO A CRYPTO
DEVICE (KW-26)**

Figure 2.3 Typical Wiring Details for one KW-26 Loop

5. Ensure that the cable clamp is on an area of the cable where the insulation has not been removed, then tighten cable clamp.
6. Duplicate the above instructions for each of the required installations.

2.2.4 Installation of Name Plates

The SB03176/UGQ Patch Panel kit contains three engraved phenolic name plates (item 14) with self-adhesive backing. Use an engraving machine to identify on the three phenolic strips, the type systems wired to the connectors on the patch panel. See Figure 2.3 for nomenclature and locations. After peeling off the paper backing, install the strips as follows.

- a. CRYPTO DEVICES: install just above the top row of connectors by pressing the adhesive side to the patch panel.
- b. Skip the second connector row.
- c. KEYBOARDS: install just above the third row of connectors by pressing the adhesive side to the patch panel.
- d. TRANSMITTER-DISTRIBUTER: install just above the bottom row of connectors by pressing the adhesive side to the patch panel.

2.3 INSTALLATION OF THE SB-3176/UGQ PATCH PANEL

1. The SB-3176/UGQ Patch Panel should be bolted to a frame, constructed out of welded angle iron or aluminum which is welded to the bulkhead.
2. Since the fabrication of the mounting frame is the responsibility of the installing activity, only an outline sketch is provided in the installing drawing, however, the activity can choose other configurations to fit the situation. (See Figures 2.4, 2.5 and 2.6.)

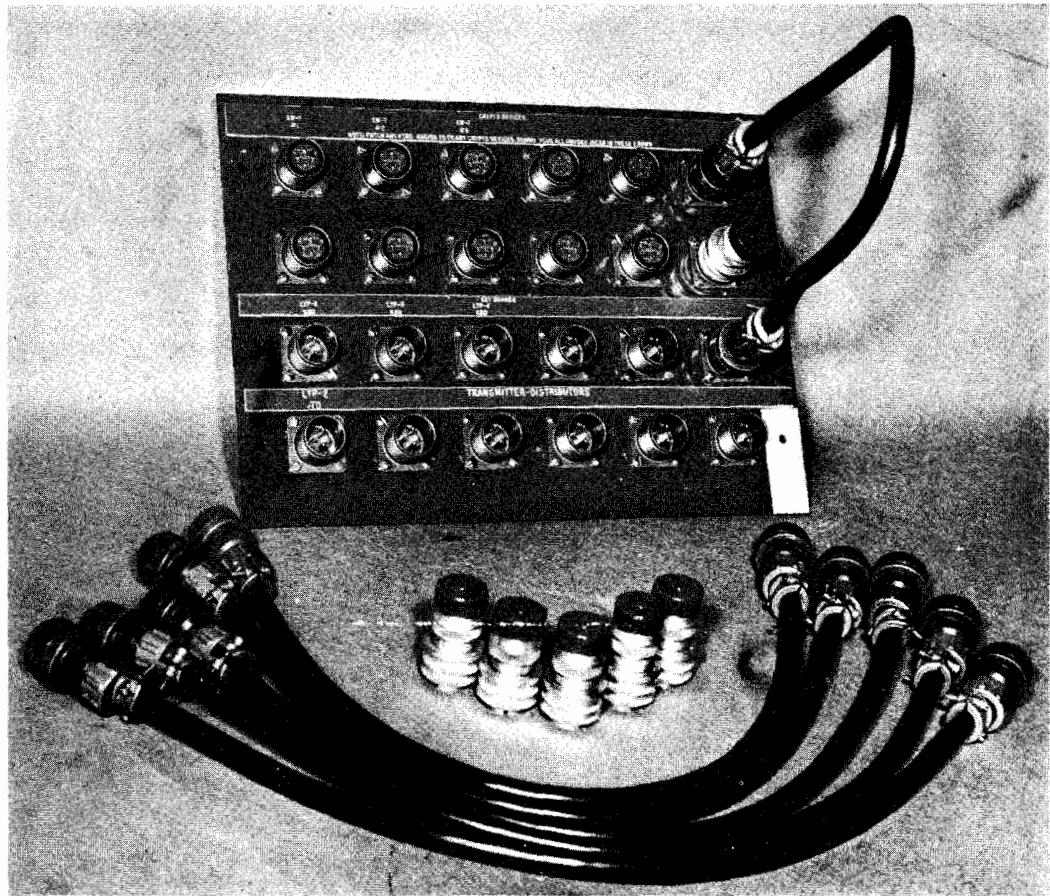


Figure 2.4 SB-3176/UGQ Patch Panel Showing Name Plates Installed

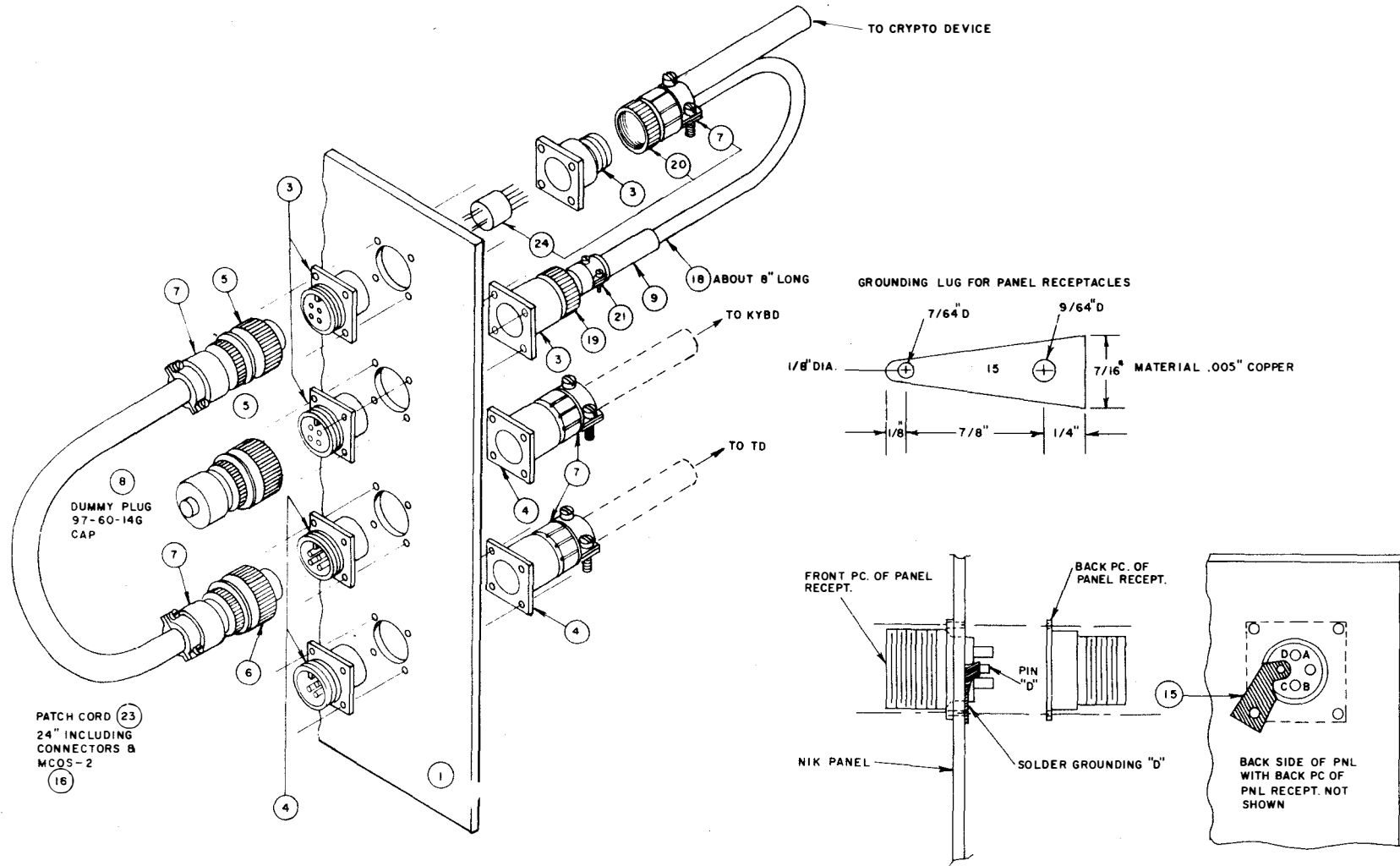


Figure 2.5 SB-3176/UGQ Installation Drawing (Part 1)

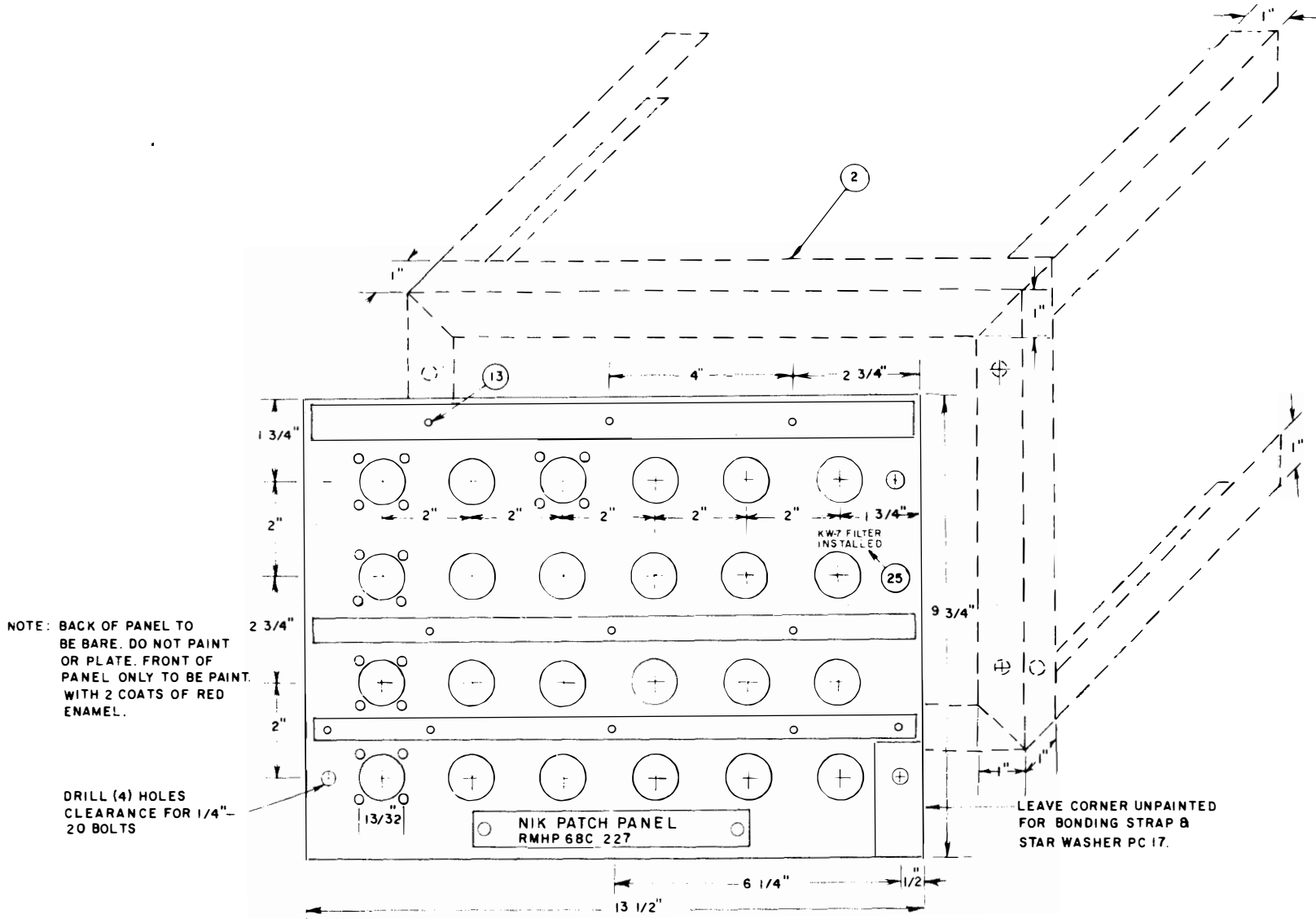


Figure 2.6 SB-3176/UGQ Installation Drawing (Part 2)

3. To obtain a low impedance ground, all metal-to-metal contacts must be:
 - a. CLEAN: use sandpaper or similar abrasive to remove dust, paint, oxide, etc. on both faces of the adjoining metals. Refer to MIL STD 1310.
 - b. SECURE: bolt the metal patch panel firmly to the frame using a minimum of four 1/4 inch screws with lock washers.
4. Bond the SB-3176/UGQ Patch Panel to ground using the ground strap (item 10) provided.

SECTION III

OPERATION

3.1 SB-3176/UGQ PATCH PANEL OPERATION

The SB-3176/UGQ Patch Panel is equipped with 12 patch cords and 6 dummy connectors, for flexible patching configurations of teletypewriters and cryptographic systems.

3.1.1 Series Patch, Keyboard and Transmitter-Distributor

1. Figure 3.1 through 3.3 shows the patching required for operation of a keyboard and transmitter distributor in series.
2. Figure 3.4 through 3.6 shows single patching required for keyboard operation only. Dummy connectors are required.
3. Figure 3.7 through 3.9 shows the patching required for transmitter distributor operation only. Dummy connectors are required.

3.2 TYPICAL INSTALLATIONS

1. Figures 3.10, 3.11, 3.12, 3.13 and 3.14 show typical installations using various cryptographic equipment.
2. Figure 3.15 exhibits a typical equipment configuration, as a possible system for operations.

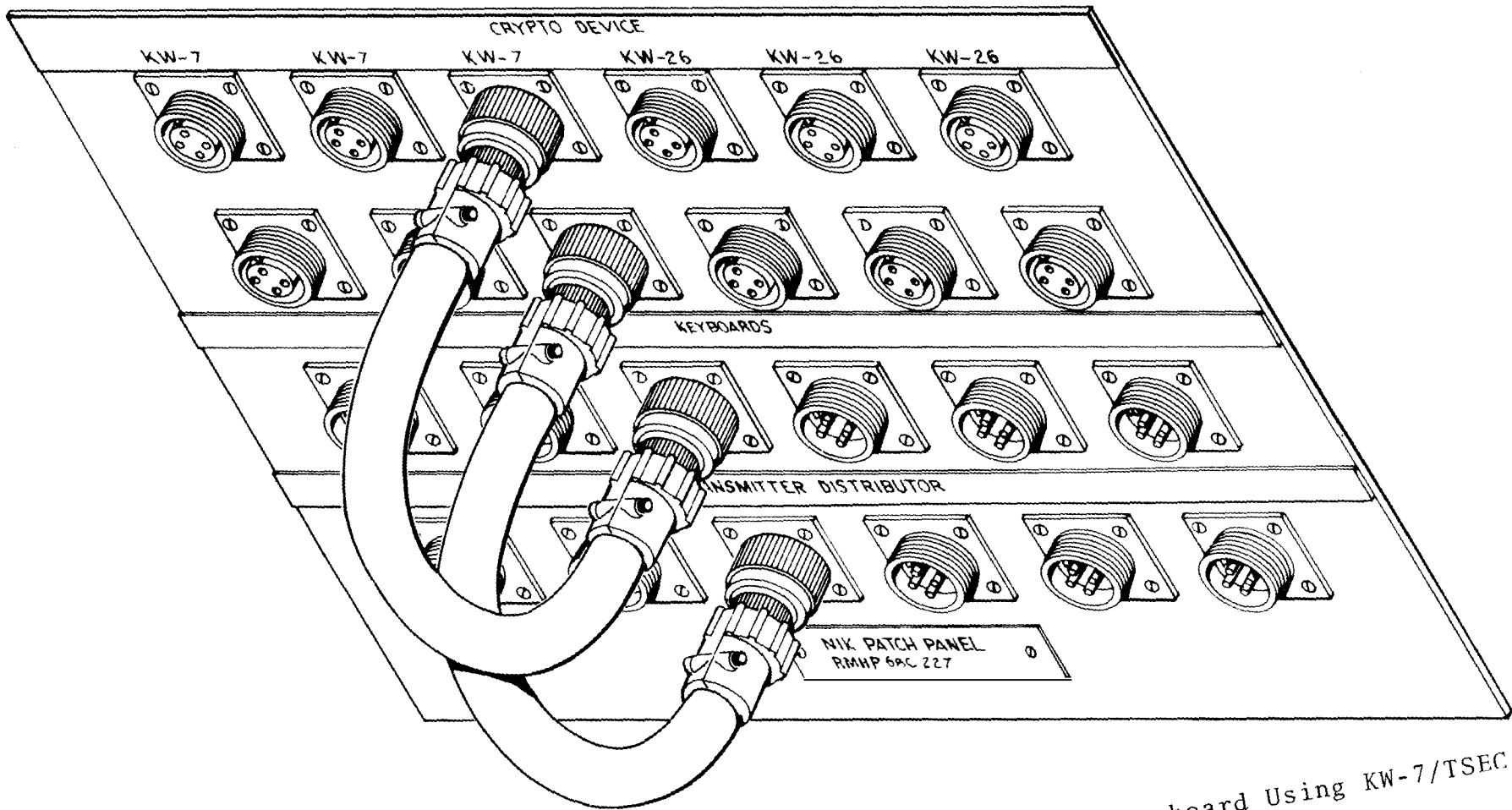


Figure 3.1 Series Patching For Transmitter-Distributor and Keyboard Using KW-7/TSEC

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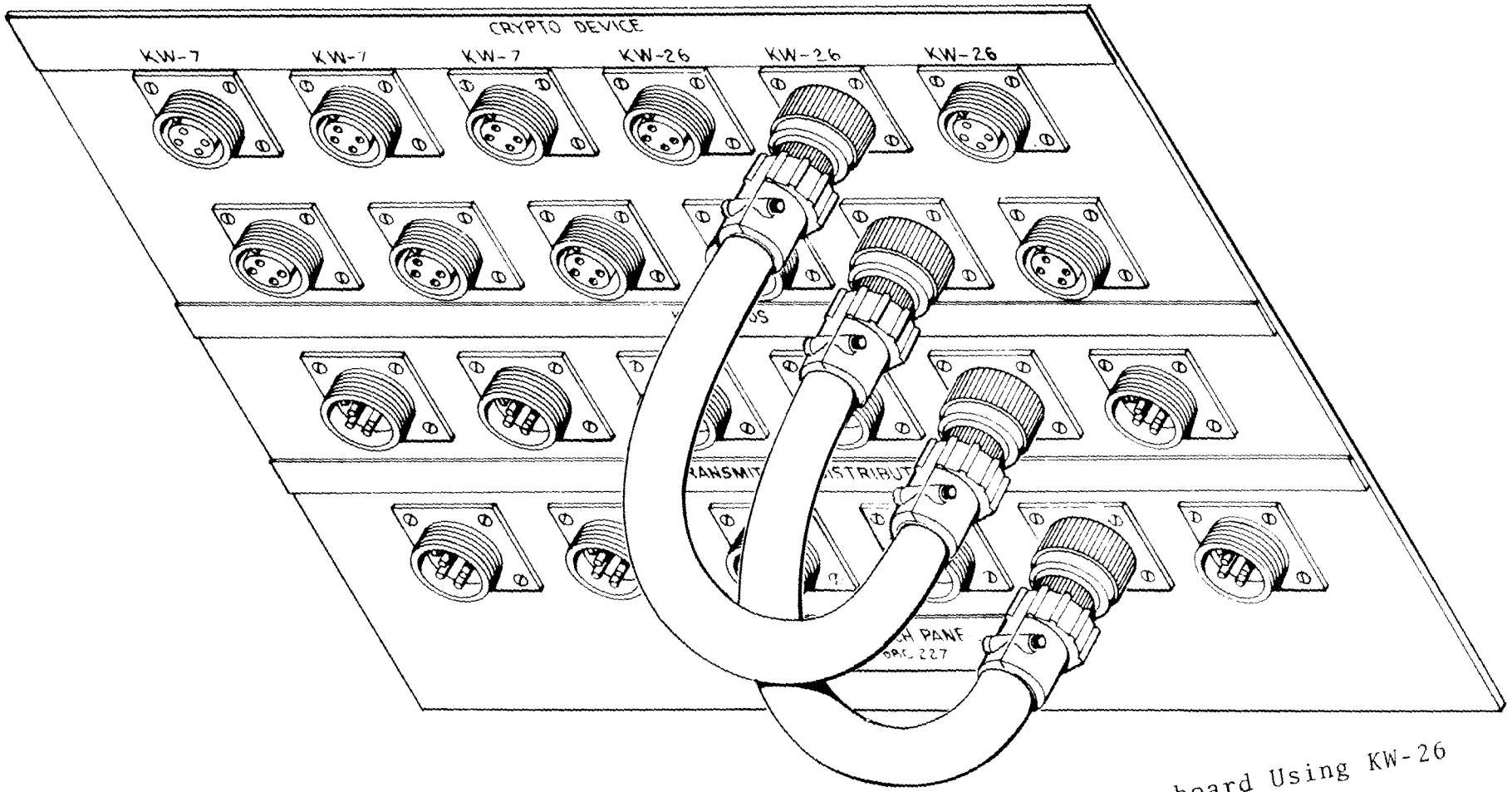


Figure 3.2 Series Patching For Transmitter-Distributor and Keyboard Using KW-26

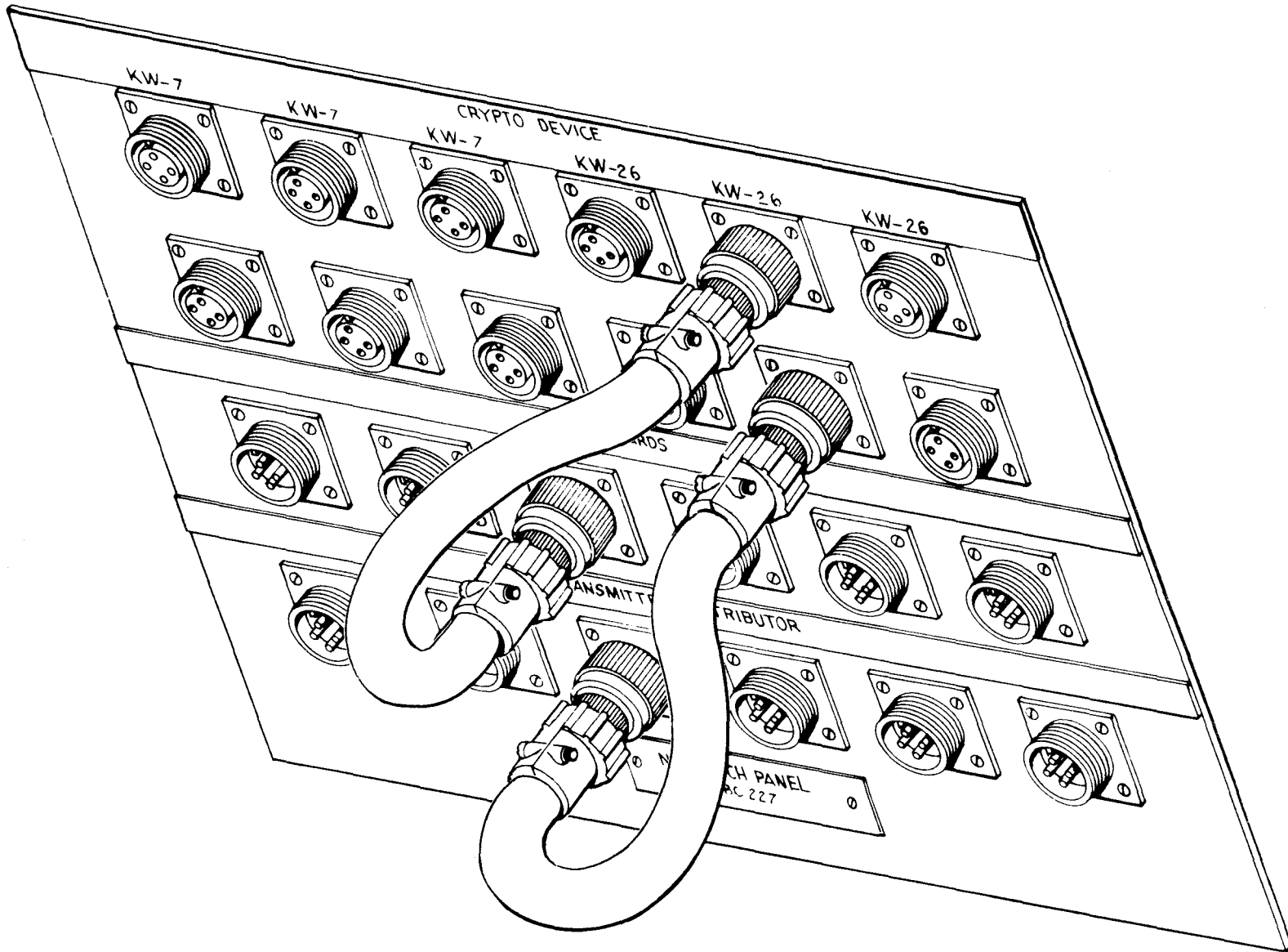


Figure 3.3 Series Patching For Transmitter-Distributor and Keyboard Showing Cross Patching

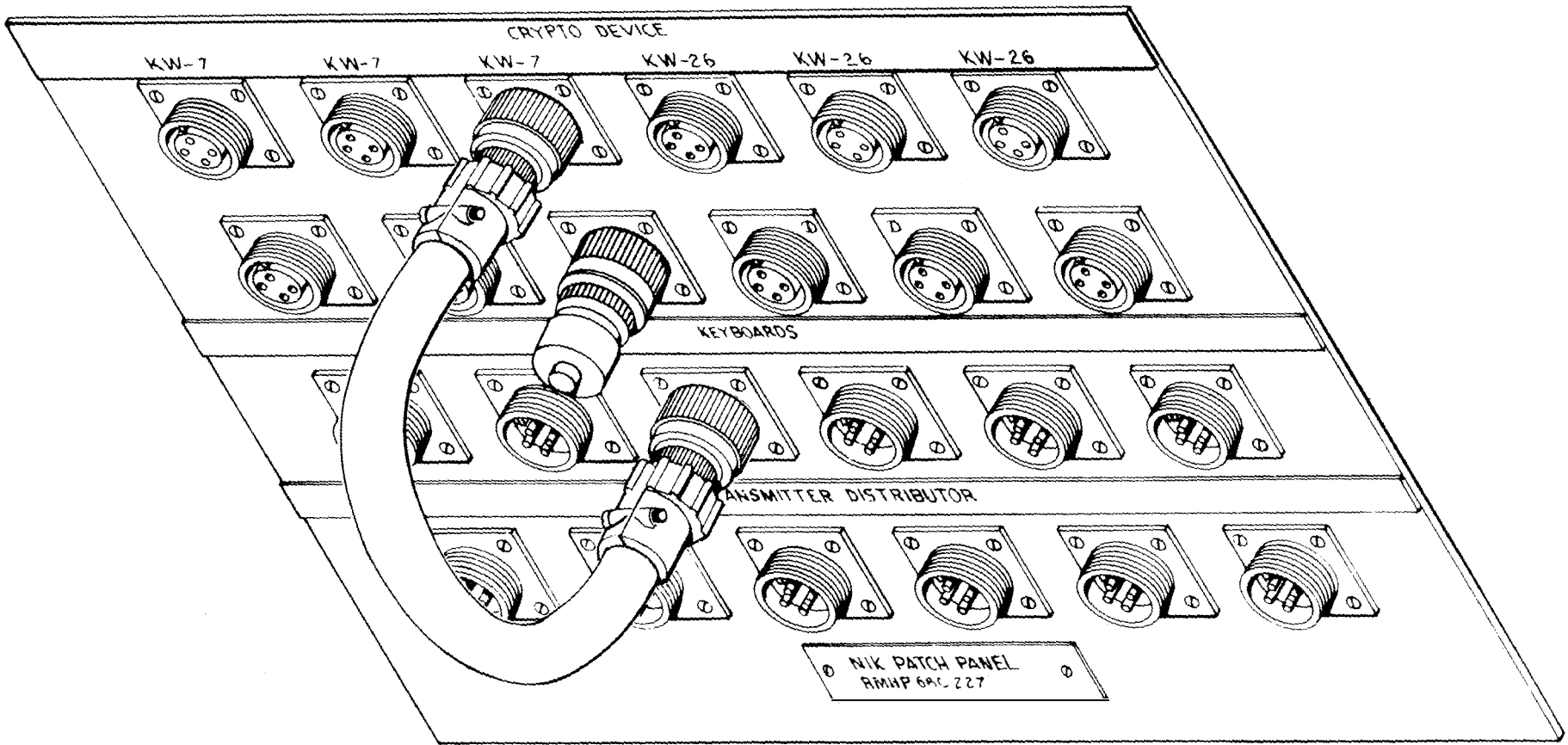


Figure 3.4 Single Patching For Keyboard Using KW-7/TSEC

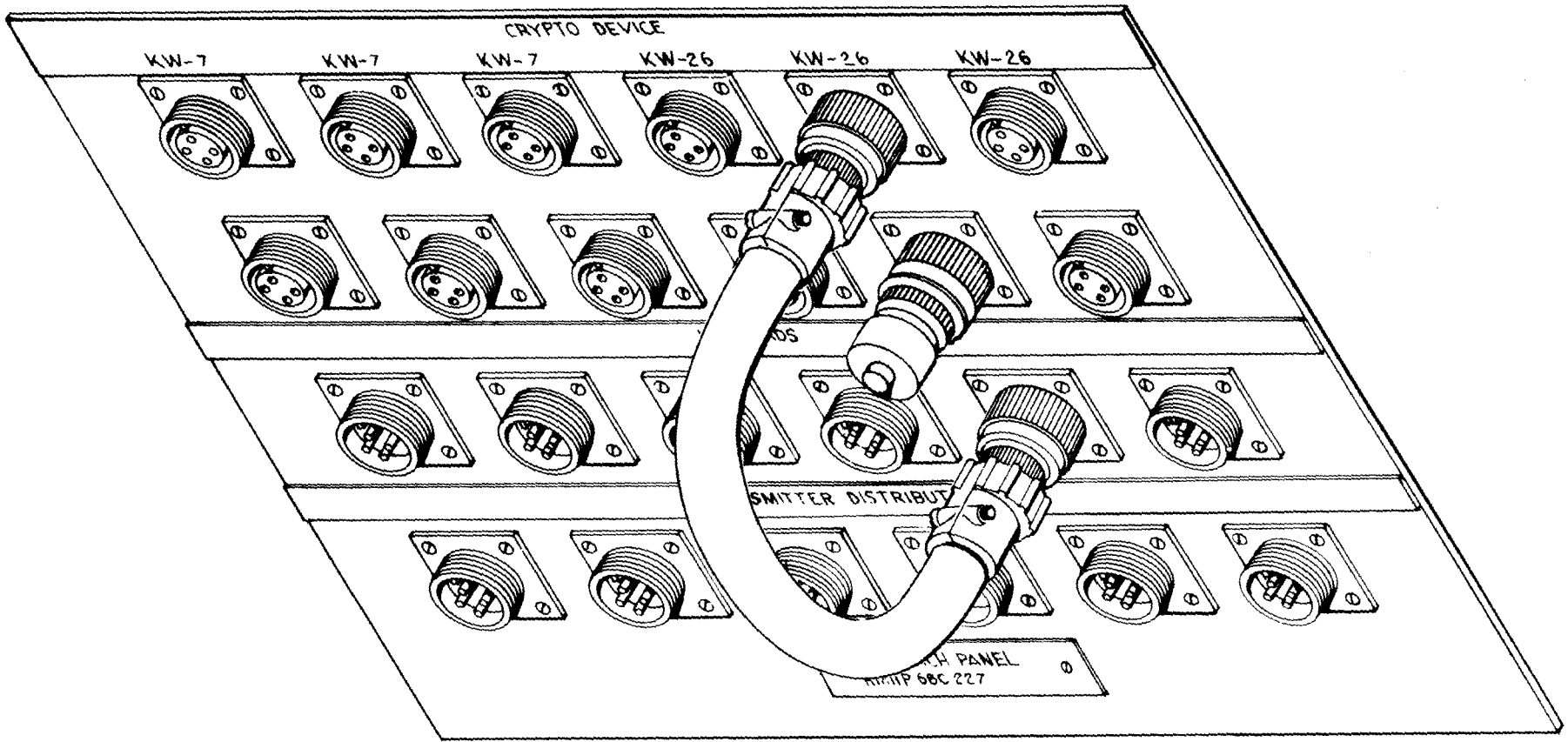


Figure 3.5 Single Patching For Keyboard Using KW-26/TSEC

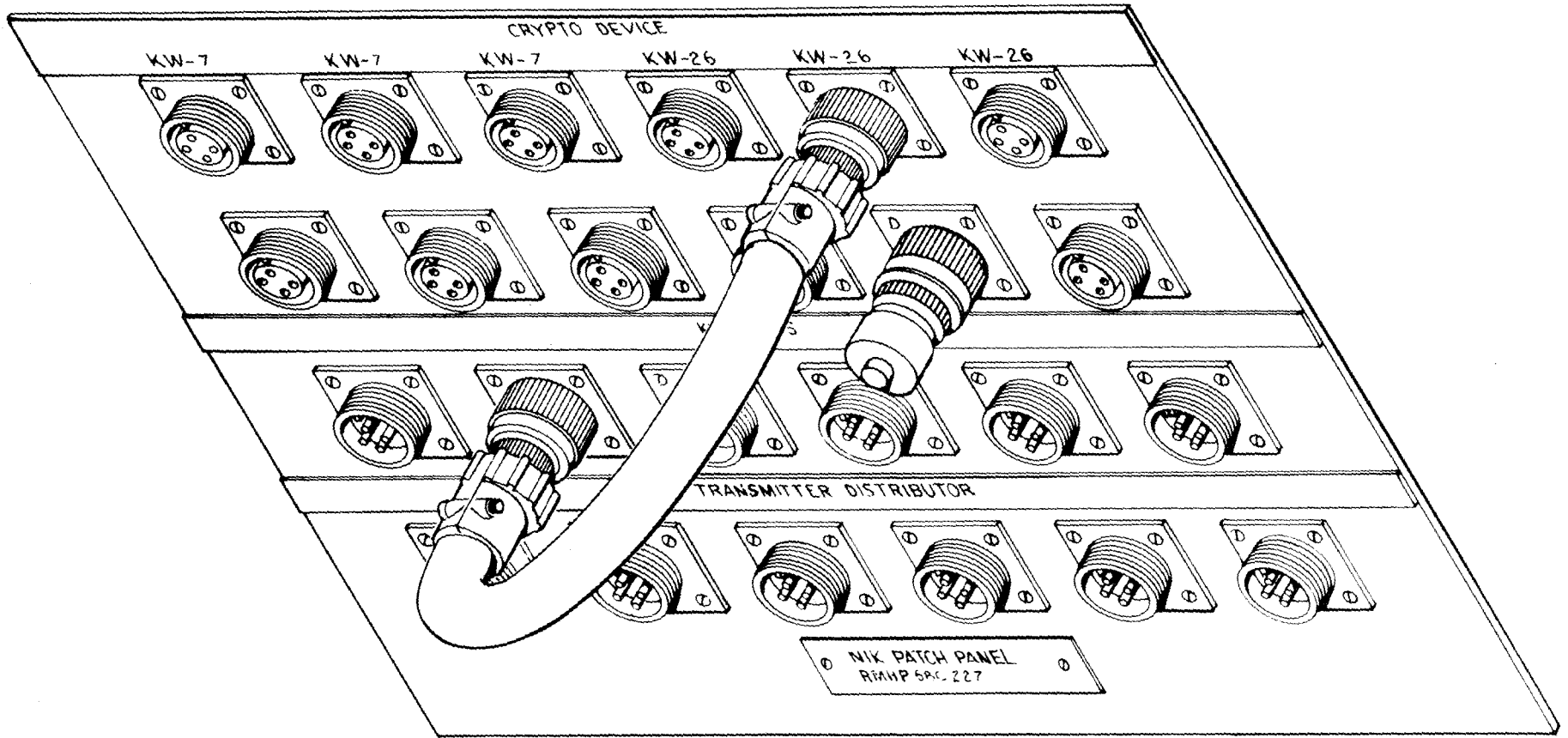


Figure 3.6 Single Patching For Keyboard Showing Cross Patching

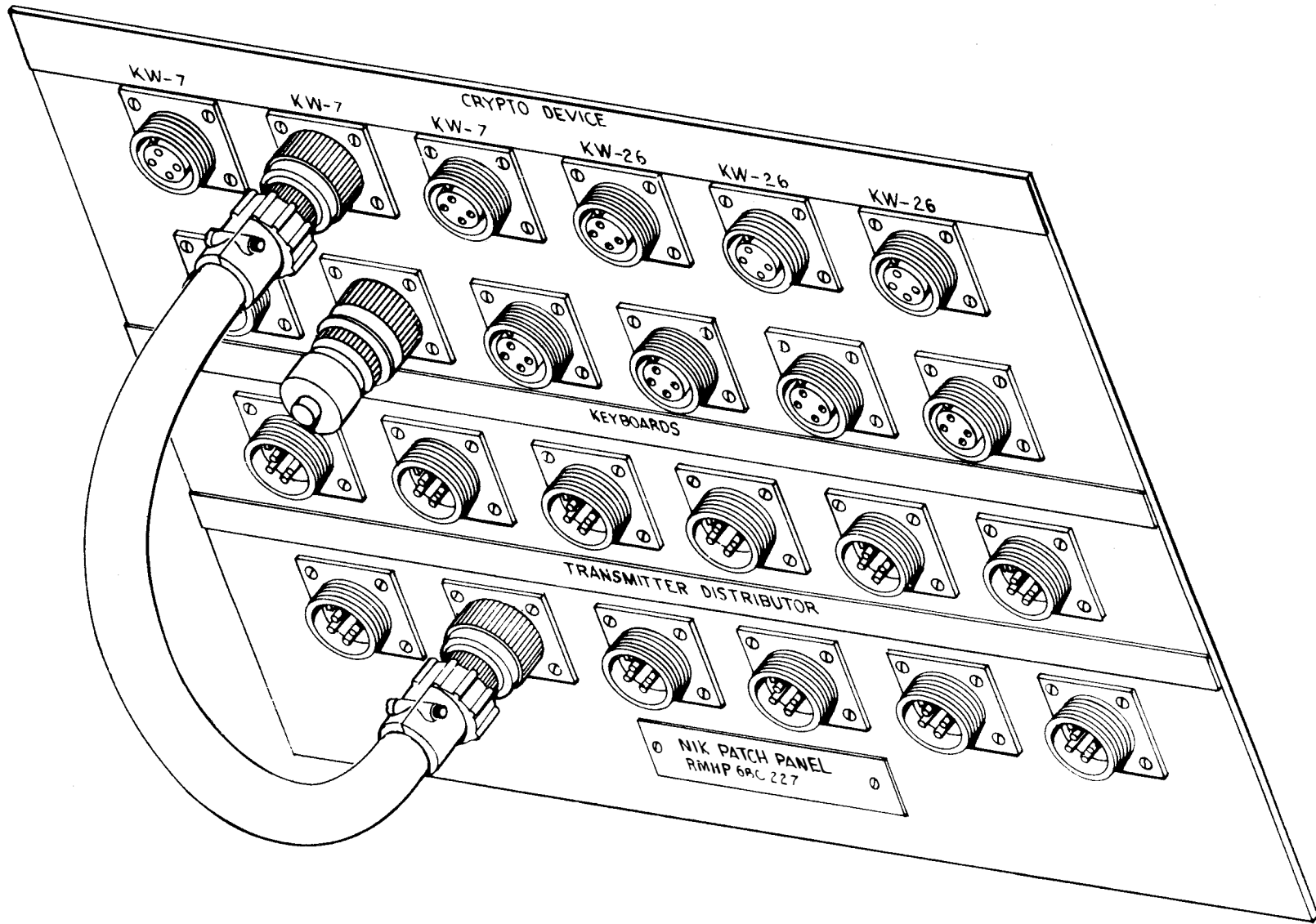


Figure 3.7 Single Patching For Transmitter-Distributor Using KW-7/TSEC

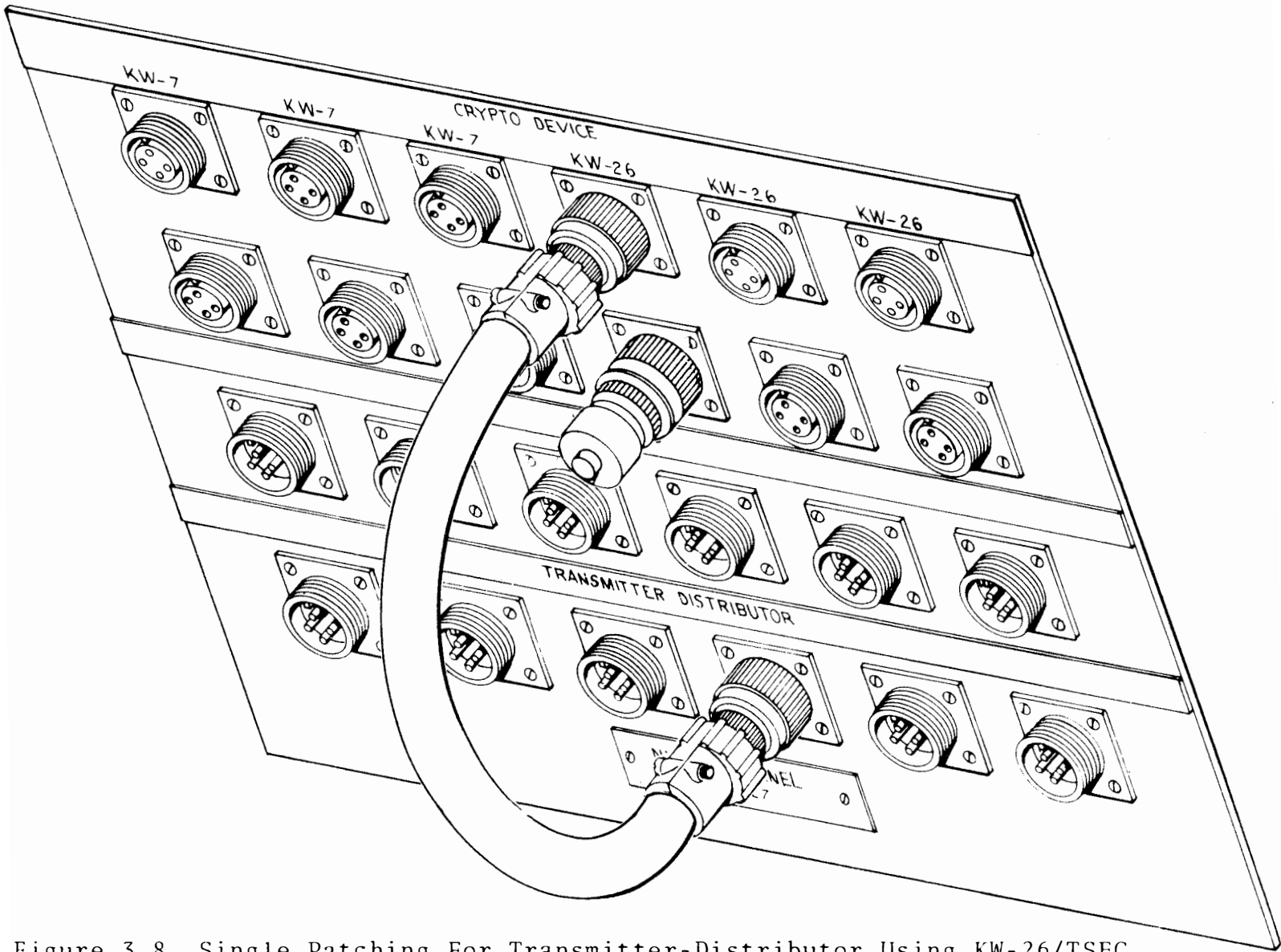


Figure 3.8 Single Patching For Transmitter-Distributor Using KW-26/TSEC

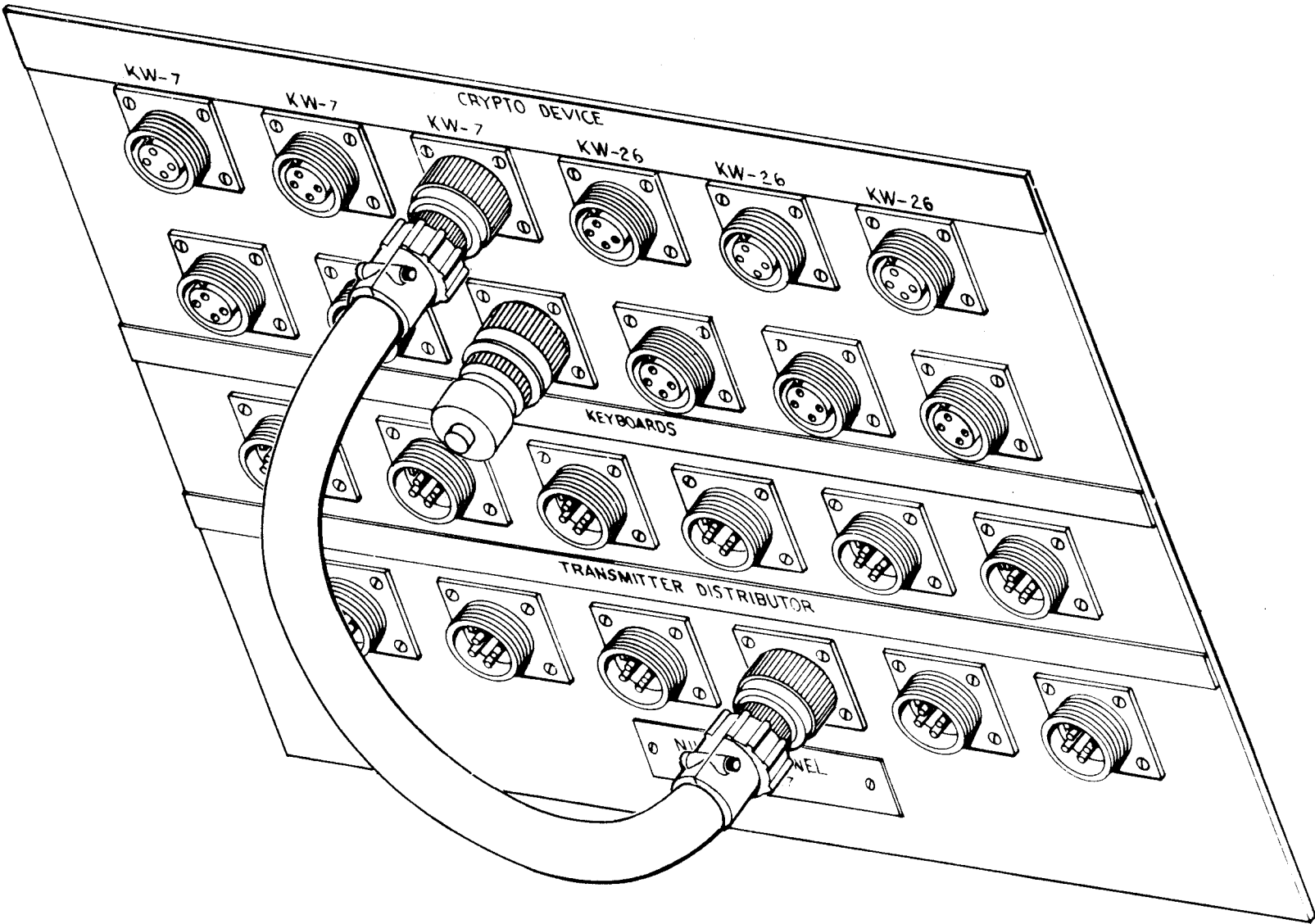


Figure 3.9 Single Patching Transmitter-Distributor Showing Cross Patching

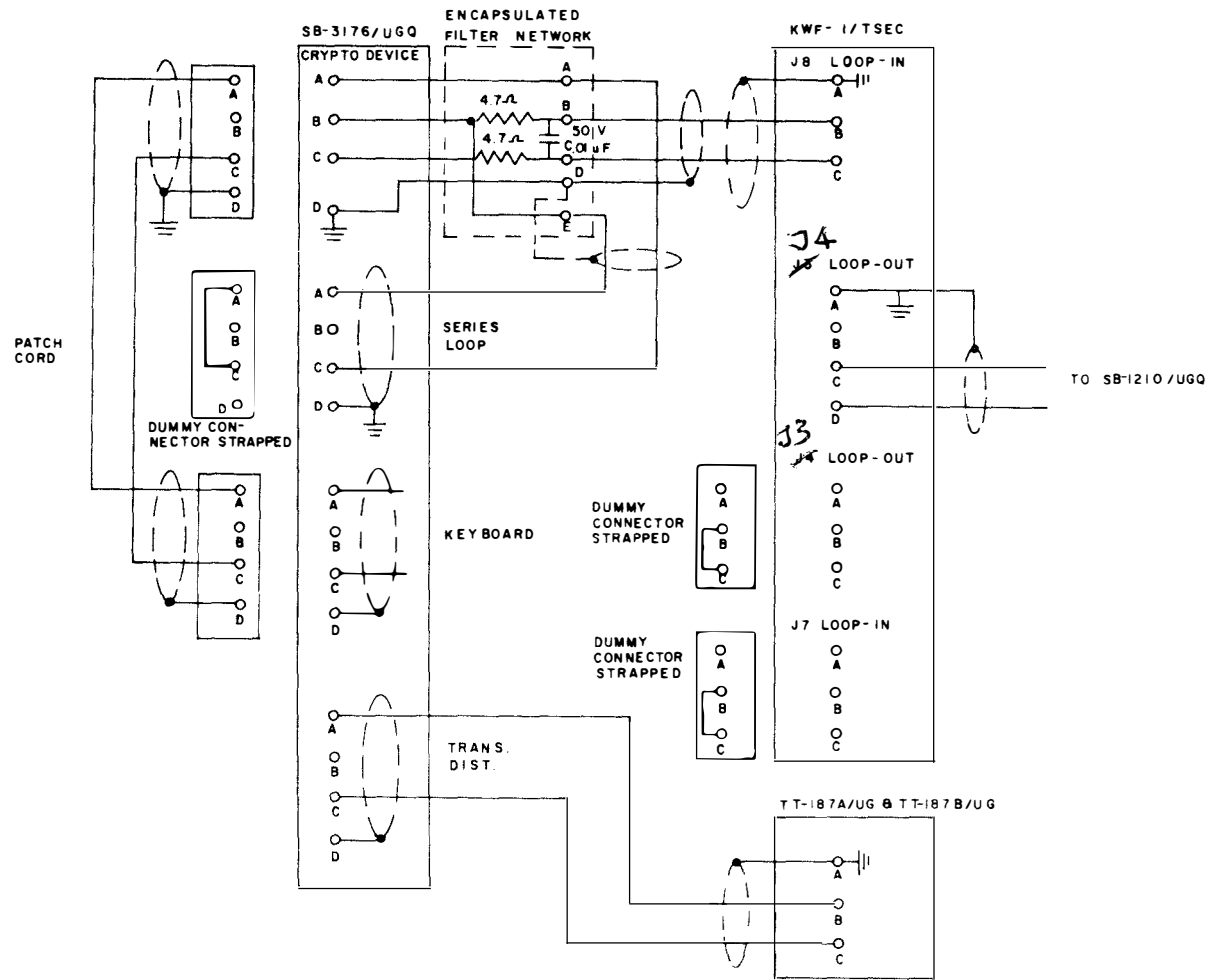


Figure 3.10 Typical Cryptographic System using the TT-187A/UG Series Transmitter-Distributor

PATCH CORD

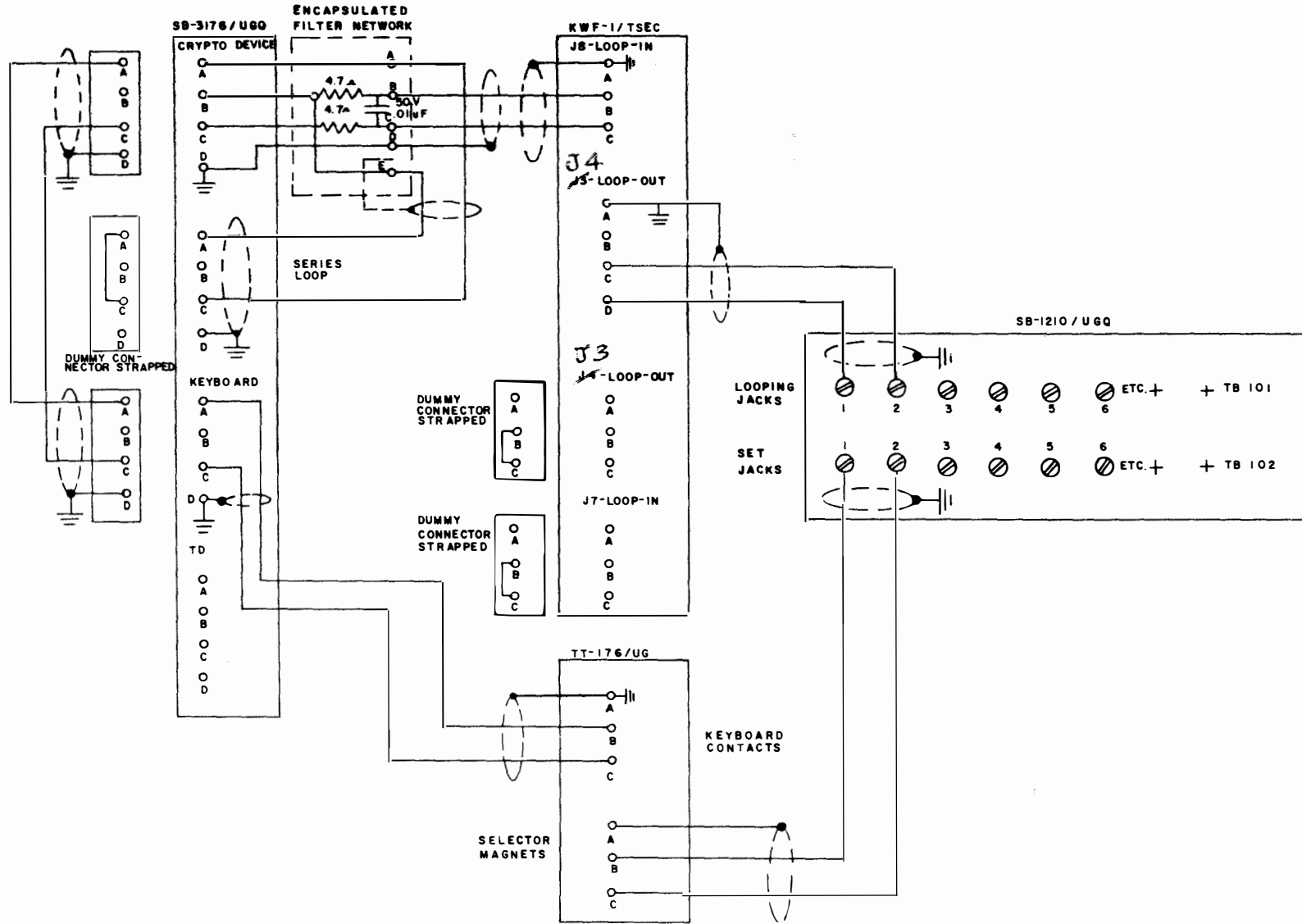
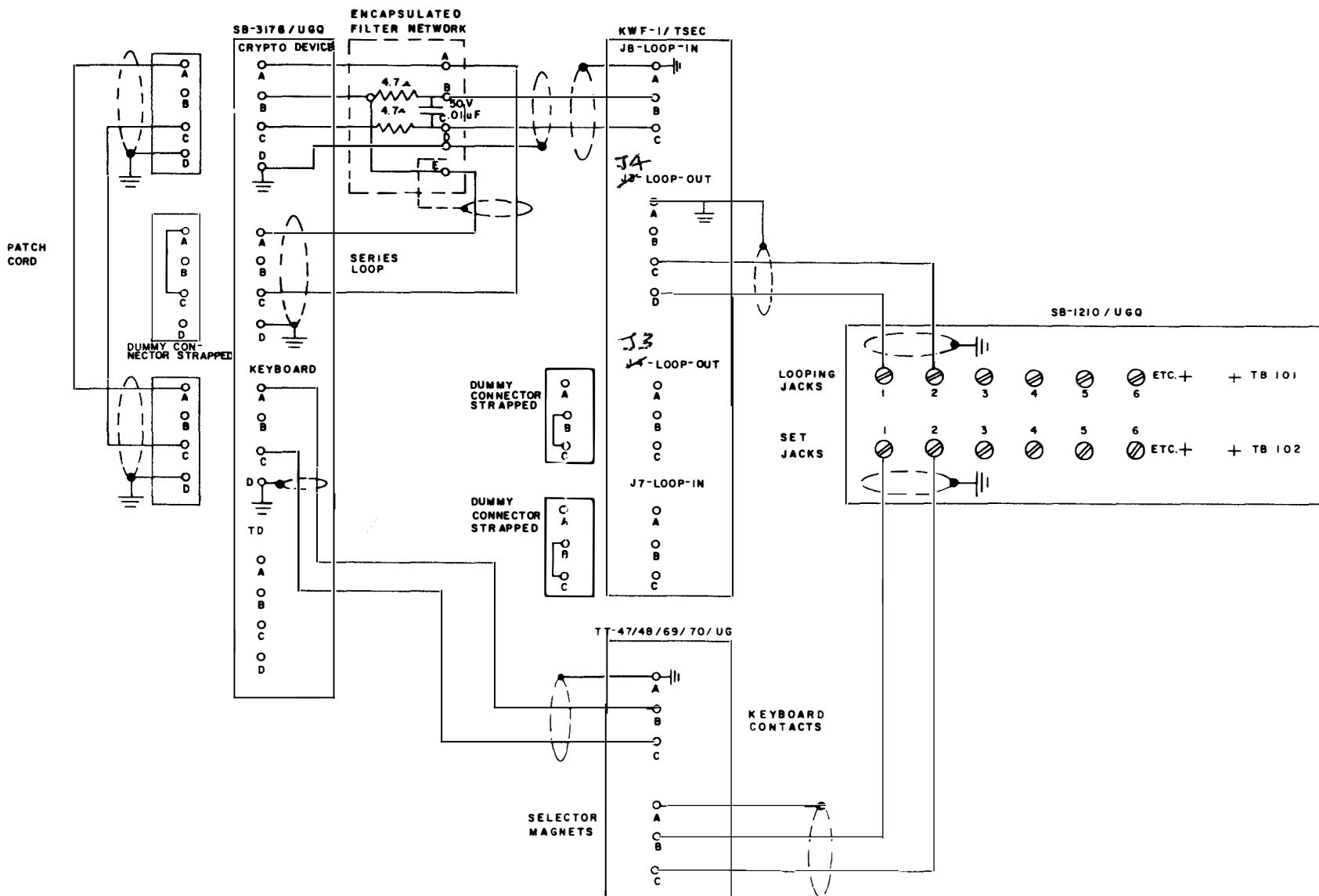


Figure 3.11 Typical Cryptographic System Using the TT-176/UG Series Teletypewriters



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Figure 3.12 Typical Cryptographic System Using the TT-47/48/69/70/UG Series Teletypewriters

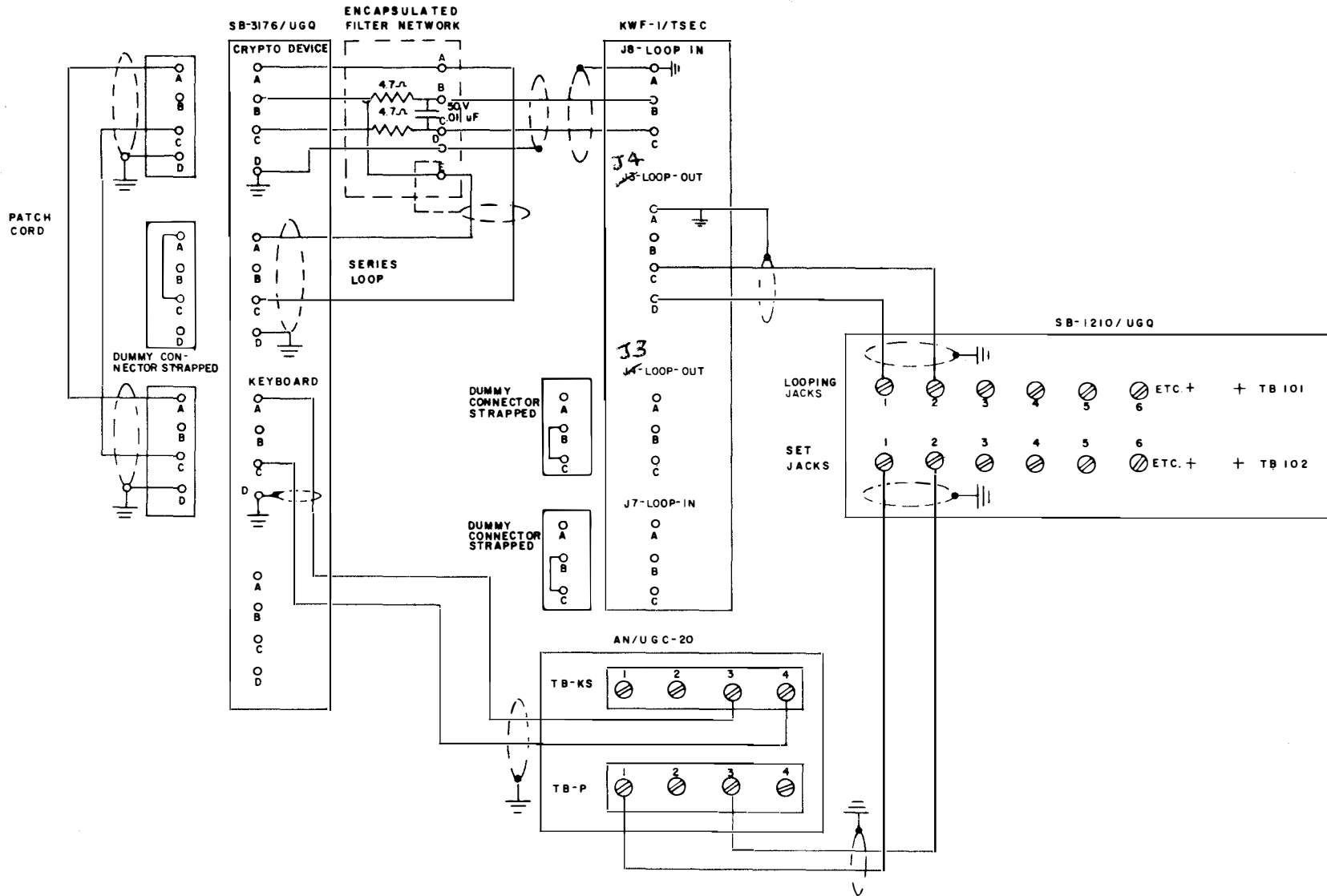
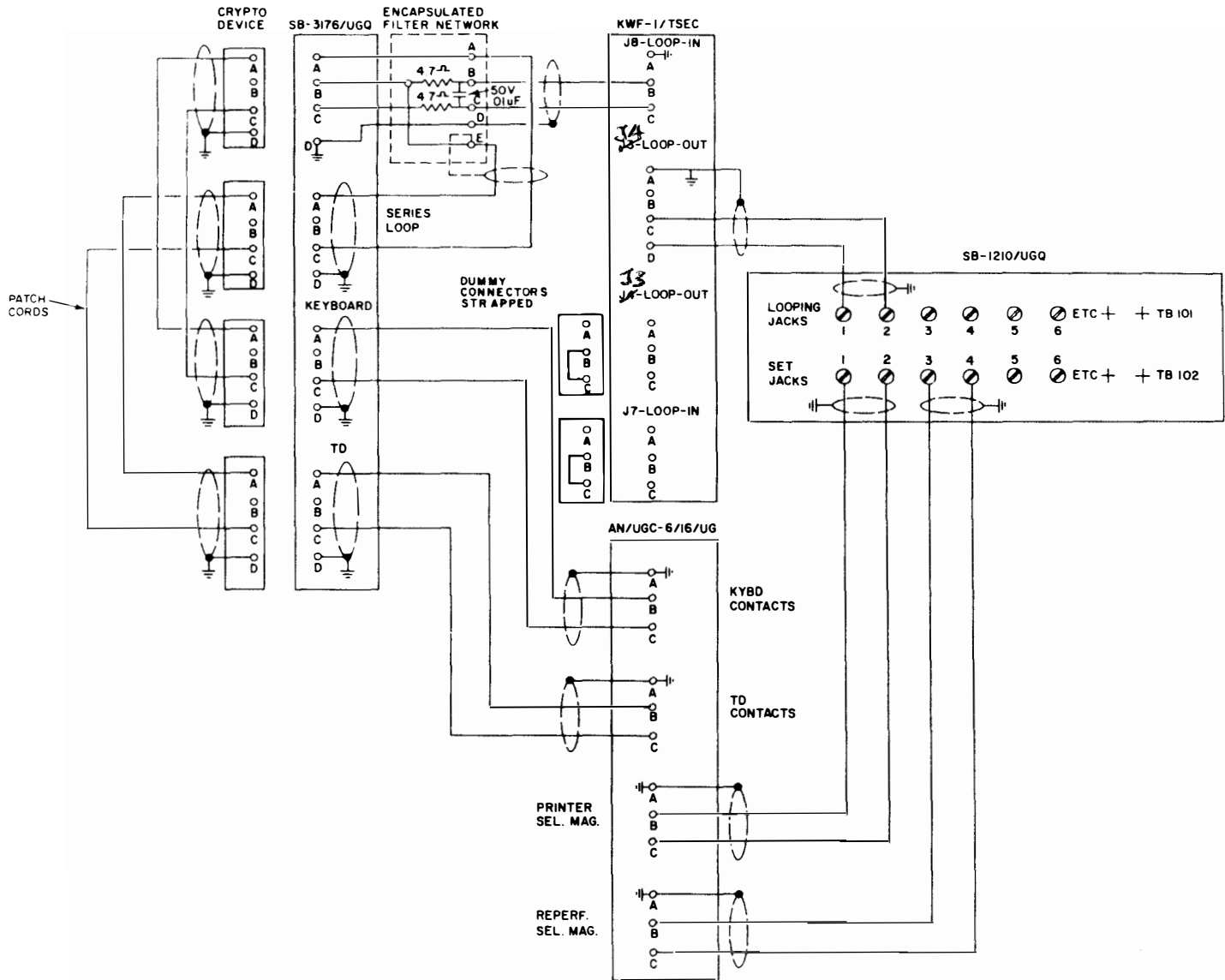


Figure 3.13 Typical Cryptographic System Using the AN/UGC-20 Series Teletypewriters



NAVSHIPS 0967-284-5070

Figure 3.14 Typical Cryptographic System Using the AN/UGC-6/16 Series Teletypewriters

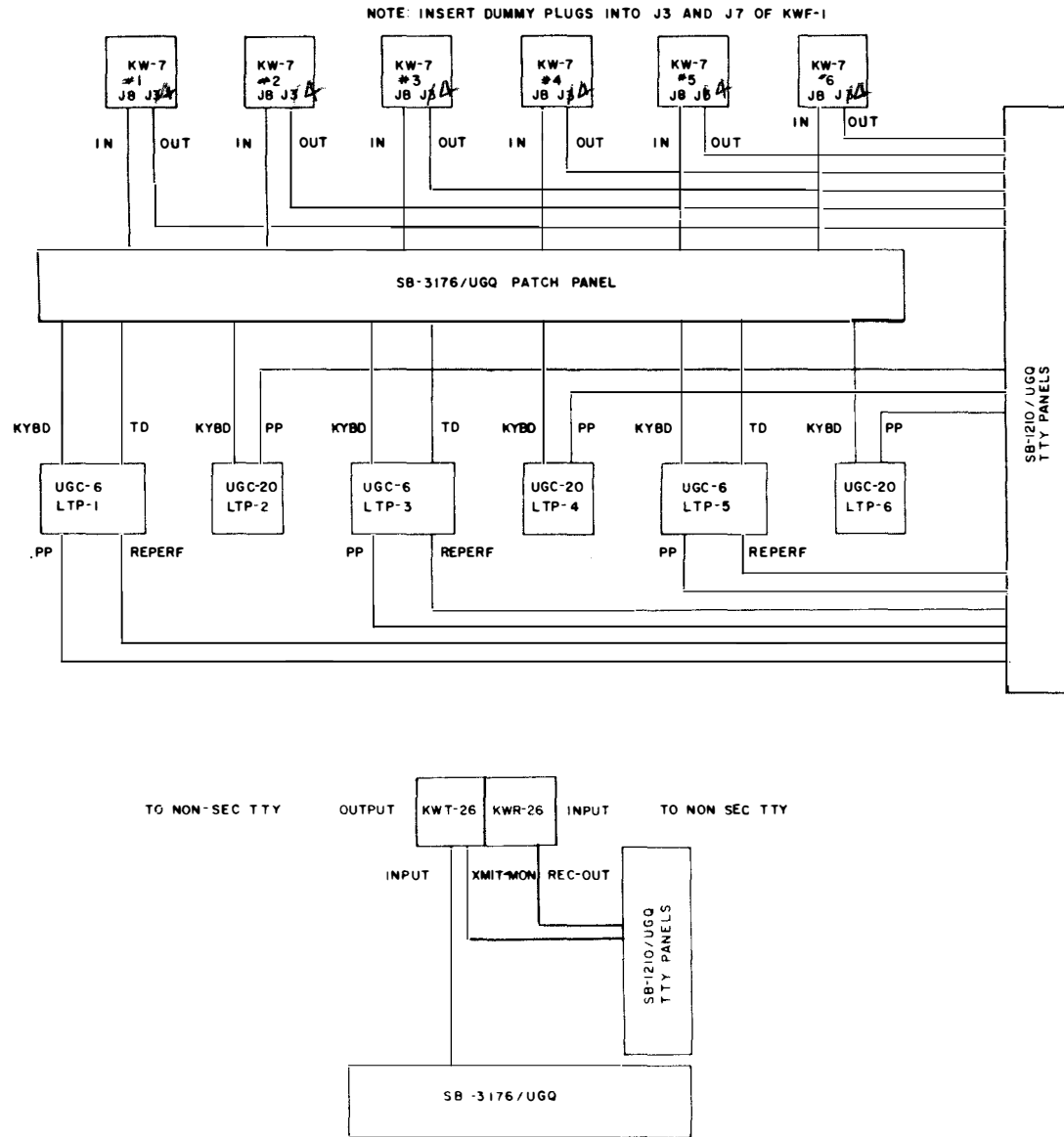


Figure 3.15 Typical System Configuration

SECTION IV
TROUBLESHOOTING

4.1 INSPECTION

Establish periodic inspections on all mechanical connections, connectors cable assemblies and patch cords.

1. Ensure that all connector contacts are clean and straight.
2. Ensure that all connectors are run up tight to provide firm contacts with the other half of the connector.
3. Ensure that all cables are in good condition.
4. Ensure that the dummy plug is installed when keyboard or transmitter-distributor circuits are being used.
5. If TTY unit runs open or intermittant garble exist. Check and see that all patching connectors are secured.

4.2 CHECKOUT

1. A suspected "open" cable may be checked by using an ohmmeter (low ohms range). Connect one lead to each end of the wire in the cable and check each wire and the shield using this method.
2. A suspected "high resistance short" in the disconnected cable or connector, may be determined by setting the ohmmeter to a higher scale and checking from pin A to pin B, pin A to pin C, pin A to pin D and etc., until all possible combinations have been tested. Any reading would indicate a shorted cable.

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SECTION V
MAINTENANCE

5.1 MAINTENANCE ROUTINES

1. Maintenance on the NIK patch panel will consist of replacing any connector or cable found defective, utilizing the troubleshooting procedures outlined in Section IV.
2. In the event of suspected encapsulated filter failures, remove and replace with one of the spares provided with the kit.

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SECTION VI

PARTS LIST

6.1 PARTS LIST

Table 6.1 contains the parts list for the SB-3176/UGQ Patch Panel.

Table 6.1 Parts List

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
1	Panel Front 0.125 Alum, Matl 6061-T6, AL SPEC QQ-A-327 1/8" x 9 3/4" x 13 1/2"	1	Local Mfg.	
2	Frame, Mounting	1	Not provided	
3	Receptacles, Box, MTG MS-3100A16-9S	12	Cannon or Equal	
4	Receptacles, Box, MTG MS-3100A16-9P	12	Cannon or Equal	
5	Plug, Straight MS-3106A16-9P	18	Cannon or Equal	
6	Plug, Straight MS-3106A16-9S	12	Cannon or Equal	
7	Clamp, Cable MS-3057A-8	42	Cannon or Equal	
8	CAP, 9760-14G	12	Cannon or Equal	
9	Bushing, AN3420-4	6	Cannon or Equal	
10	Strap, Bonding Alum, 1" x 4"	1		
11	Screw, 4-40 x 1/2 R.H.S.S.	96		
12	Nut, Hex 4-40			
13	Screw, 3-56 x 3/8	11		
14	Name Plate, 1/16 Lamacoid phenolic	4		
15	Lug, Grounding .005 Copper	24		
16	Cable, MCOS-2	52"		
17	Washer, Star 1/4"	4		
18	Cable, 1 Shield pair	48"		
19	Reducer, AN3055-16-4	6	Amphenol	
20	Adapter, AN3055-16-8	6	Amphenol	

Table 6.1 Parts List (Continued)

Pc. No.	Description	Qty	Mfg or FSN	TTY No.
21	Clamp, Cable MS-3057A-4	6	Cannon or Equal	
22	Washer, Split Lock #4	64		
23	Assembly, Patch Cord	12		
24	Filter Network Encapsulated	6		
25	Name Plate	6		
	Assembly (complete) part number GO-1369, consists of the above pc. # 3 through 9, 19,20 and 21	6	Glenair Inc. Glendale, Calif.	

MAKE THE FOLLOWING PEN AND INK CORRECTIONS AS INDICATED BELOW.

Page 3-11, Figure 3.10

Page 3-12, Figure 3.11

Page 3-13, Figure 3.12

Page 3-14, Figure 3.13

Page 3-15, Figure 3.14; under KWF-1/TSEC

Change J3 Loop-out to Read J4 Loop-out.

Change J4 Loop-out to Read J3 Loop-out.

DONE 9/23/16

