THE WESTERN UNION TELEGRAPH CO.
PLANT DEPARTMENT

Stencil #1857-B
June 12, 1944

TELEPRINTER HANDBOOK

INDEX

WIRING

L 1A Operating Table 31-A
L 2B Operating Table 32-A
L 3A Duplex Operating Table 34-A
L 4A Duplex Operating Table 34-A- Power
L 6  Teleprinter 2-B
L 7A  Wiring Cabinets 1-C and 1-S
L 8A  Wiring Cabinets 1-B and 2-B
L 9  Call Signal and Motor Control Boxes 1-A, 2-A and 3-A
L 9.1A  Motor Control Box 7-A
L 9.2  Audible Signal
L 10  Time Signal Equipment
L 11  Printer Concentrator Plan 1-B, V Belt
L 16B  Call Signal and Motor Control Units 1-S, 2-S, 3-S and 3-SX
L 17A  Operating Tables 32-K and 34-K
L 23B  Monitor Sets
L 2A  Teleprinter Short Circuit Tests
L 27C  Wiring Cabinet 1-D
L 28D  Wiring Cabinet 1-R
L 29C  Wiring Cabinet 2-D
L 30C  Wiring Cabinet 2-R
L 31D  Wiring Cabinet 2-R with Selector
L 32B  Wiring Cabinet 9-D
L 33A  Wiring Cabinet 9-D with relay
L 34C  Wiring Cabinet 9-R with Selector
L 35B  Wiring Cabinet 9-R with Relay
L 36B  Wiring Cabinet 9-R with Selector and Relay
L 37   Concentrator, Plan 3, Line Circuits Cabinet 1-A
L 37.1A Concentrator, Plan 3, Line Circuits Cabinet 1-B
L 38   Concentrator, Plan 3, Cord Circuits Potential Cabinet
L 38.1 Concentrator, Plan 3, Cord Circuits Potential Cabinet
L 46A  Concentrator, Plan 3, Cabinet 1-B Modified
L 47A  Operating Table 39-A (Extended Duplex Legs)
L 49   Call Signal and Motor Control Box 3-A
L 50   Home Record Cutout 2-A and 3-A
L 51   Model 12 Page Printer, Signal and Control Circuits
L 52   Model 12 Page Printer, Power Circuits
L 56   Model 15 Page Printer, Wiring Diagram
61     Wiring Cabinet 7-A
62     Concentrators Plans 1 and 3 Reversed battery operation
63     Clock Synchronizing over Teleprinter Circuits
64     Sounder Calling, 32 Type Tables
65X    Adjustments for Relays #158 & 35 (8-A Cabinet)
65  Wiring Cabinet 8-A
66  Wiring Cabinets 7-B and 8-A Modifications
67  Relay Sub Base Adapters 31-C, 32-C, 41-C
68  Relay Sub Base Adapters 42-C, 51-C
69  Teleprinter Table Type 34 Line Circuits
L-604-1 Wiring of Relay Sub Base
70  Teleprinter Table Type 34 Local Circuits
71-B  P.P.R. Set - Shelf Mounted
72-B  Special P.P.B.U. Set - Shelf Mounted
73  Duplex 11-B
74  Wiring Cabinets 11-B and 13-A Rectifier Connections
101  Teleprinter 101, 61a Control
102  Teleprinter 101, 71a Control
103B  Teleprinter 102, Wiring
104C  Teleprinter 102, Console 1-a Wiring Cabinet 30-A
105  Teleprinter 102, Wiring Cabinet 29-a, Table 101
106-A  Telemeter Service, Wiring Cabinets 27-a and 37-a
Dwg. 79652 Wiring Cabinet 37-a (Telemeter)
Dwg. 40623-E-2 Teleprinter Testing & Regulating Set 1-A
Dwg. 51069 Plan 3 Concentrator Cabinet 1-A, 1-B, 1-C
Dwg. 48206-D-2 Wiring Cabinet 2-D (with Selector)
Dwg. 48208-F-2 Wiring Cabinet 2-R (with Selector)
Dwg. 48210-C-2 Wiring Cabinet 9-D (with Selector)
Dwg. 48212-C-2 Wiring Cabinet (with Selector and Relays)
Dwg. 48215-E-2 Wiring Cabinet 9-R (with Selector and Relays)
LAYOUT OF EQUIPMENT

L 5B Tables 31a, 32a, 34A and 34K
L 12 Printer Concentrator 1-B
L 13 Table Layout 31-B, 32-B
L 14A Table Layout 41-A, 52-A
L 15B Table Layout 51-A, Private and Public Branch
L 19A Duplex, Wiring of Bust-up Switches
L 40 Concentrator, Plan 3 Typical Table Layout 43a and 44a
L 41 Concentrator, Plan 3, Typical Table Layout Tables 43a with 51 or 32
L 42 Concentrator, Plan 3, Typical Table Layout Tables 43a with 51 or 32
L 43 Concentrator, Plan 3, Typical Table Layout, 45-a
L 44 Concentrator, Plan 3 Typical Table Layout 51 or 32
L 45 Concentrator, Plan 3 Typical Table Layout 51 type
L 48C Operating Tables 81-a and 81-B
L 55 Layout, Model 15 Printer on 41-a Table Dwg. 60700 Printer Keyboard Layouts

POWER

G 1A Single Phase Induction Motor Connections
G 2A Typical Generator Connections
G 3A Correcting Reversed Magnetism
G 4A Generator Connections, Wall Type Bench and Panel 2-A
G 5A Generator Connections without equalizer
G 6A Generator Connections with equalizer
R 1 Chemical Rectifier, Wiring Diagram
R 2 Chemical Rectifier, Load Voltage Chart
R 3 Lead Tantalum Rectifier, Wiring Diagram
R 4 Lead Tantalum Rectifier, Load Power Diagram
R 5 Copper Oxide Rectifier, Morse Locals
R 6 Copper Oxide Rectifier, wiring local battery for cordless Table Jack units
R 7A Copper Oxide Rectifiers 31a and 32a
R 8A Copper Oxide Rectifiers 33a and 34a
R 9B Mercury Vapor Rectifier Condenser Information
R 10C Mercury Vapor Rectifier Tube Information
R 11A Mercury Vapor Rectifier 2-a, Wiring
R 12A Mercury Vapor Rectifiers 3-a, 5-a, 5-B Wiring
R 13A Mercury Vapor Rectifier 8-A Types Wiring
R 14E Mercury Vapor Rectifiers 10-B and 63-B, Wiring
R 15 Mercury Vapor Rectifier 2-B Wiring
R 16 Cold Cathode Rectifier 151-B Wiring
R 17-B Mercury Vapor Rectifiers 7-B and 11-B Wiring
R 18 Mercury Vapor Rectifier 9-a, Wiring
R 20 Mercury Vapor Rectifiers 69B and 70-A
R 21 Cold Cathode Rectifier 153-A

RADIO INTERFERENCE ELIMINATORS

D 1 Interference Elimination, Single Morse Sets and local circuits
D 2A Interference Elimination, Duplex and Quadruplex
D 3 Interference Elimination, Multiplex Apparatus
D 4 Interference Elimination, Motor Generator Sets
D 7 Spark Killer for Teleprinter 2-B Wiring
D 8A Location of Eliminator Boxes—Teleprinter Tables 31a, 32a, 32K, 33a, 34a, 34K, 37A
D 9 Radio Interference Elimination, Tables 31a, 32a, 32K, 33a and 37a, wiring diagram
D 10 Radio Interference Elimination, Table 34a, wiring diagram
D 11 Radio Interference Elimination, Table 34K, wiring diagram
D 14 Location of Line Choke Coil in Terminal Box—Tables 31a, 32a, 33a and 37a
D 17 Location of Line Choke Coil in Terminal Box—Table 34K
D 18 Location of Line Choke Coil 1-B in Wiring Cabinets 1-S, 1-C, 41a and 51a
D 19 Elimination Equipment, Wiring Cabinets 1-B and 2-B
D 20 Mounting Detail for Radio Elimination Equipment, Wiring Cabinets 1-B and 2-B
D 21B Radio Interference Eliminator 4-A on Teleprinter 2-B wiring
D 22A Radio Interference Eliminator 6-A on Teleprinter 2-B wiring
D 25B Radio Interference Eliminator 6-A on Teleprinter 101 and 2-B wiring
D 24 Radio Interference Eliminator 6-A on Teleprinter 2-B with Home Record Cut-outs 2-a and 3-a wiring
D 25 Radio Interference Eliminator 7-A for Ticker Panels wiring
D 26 Radio Interference Eliminator 9-a (Relay Sub-base)

ADJUSTMENTS

L 21 Call Signal Relay 2-a and 2-S
L 22 Call Signal Relay 3-a and 3-S
L 39 Concentrator, Plan 3, Relay WE 282, WE B-10

SWITCHBOARDS

13.1-A Switchboard Circuits
13.2-A Switchboard Circuits
13.3-B Switchboard Circuits
14-A Switchboard Circuits (Obsolescent)
15-A Switchboard Test Sets
16 Loop Switchboard Circuits
17 Selectors (Transferable, Single)
18 Single Morse Sets (Local wiring)
19 Selector Concentration Unit
20 City Concentration Unit
21 Single Conductor Switchboard Circuits
22 Switchboard Circuit Combinations
23 Switchboard Telephone Set (Circuit E)
24 Time Repeater
MESSENGER & TIME SERVICE

C-1 Call Circuit Class B
C-3 Call Circuit - Gravity Battery
C-5 Time Service Equipment - Small Offices
C-6 Master Clock Circuit
C-7 Time Service Switchboard with Auxiliary Equipment
C-8 Time Messenger Equipment

TIME STAMPS

7.1 Time and Date Stamp Data
7.2 A Time & Date Stamp Guide and Relay Data
7.3 Time Stamp Control Cabinet (Small Installations)
7.4 Time Stamp Remote Control (Branches having DC Power)
7.5 Time Stamp Branch Office Operation from Main Office Power
7.6 Time Stamp Control Cabinet for Duplex Installation (Capacity 300-110 V and 400 - 160 V Stamps)
7.7 Wiring Time Element Control Clock 1-C
7.8 Operation of W.U. #6 Stamps from A.C. Supply

MISCELLANEOUS

L 18B Motor and Shaft Speeds and Gearing
L 20 Use of Call Signal and Motor Control Equipment
L 53 Model 12 Page Printer, Speeds and Gearing W.U.

- 8 -
L-54-A  Models 12 and 15 Printers Speed Combinations.
59-D    Polar and Single Current Relays.
60-B    Jacks.
Dwg.    97500 Standard Jack Types.
L-428-A-1 Cordless Jack Unit (Type 2).
3-A     Office Protection Single Conductor Switchboard.
4-A     Office Protection Double Conductor Switchboard.
4.1     Battery feed wires.
         100 Type Printers - Spring Tensions,
         Teleprinter 2-B - Adjustments.
Terminal Box.

Bunch 10: Main 20 to Line 10 to Battery at Switch.

To give 50mA. Put bulk 552A fuses.

Teletype Table 32A.

Operating
See L-4.

"A" or "L"A in Lam. Rec.

Remove Shrapnel from C.T.12 and A.T.

When extended legs are used, legs are used only.
Used on lines from Plan 1 Conctr. or Regular Tables.

**1A**

Primarily for Telegraph lines from Plan 2 (100 line) concentrator.
May be used in place of Unit PH-8660.

Used on unexpanded lines from Plan 2 Conctr.

**2A**

Used for Telegraph lines from Plan 2 Conctr.

**3A**

Cell Signal & Motor Control Boxes.

---

Spec 2425B: Opn.
2332B: Mfr.

Spec 2568A: Opn.
2568A: Mfr.

Spec 2698A: Opn.

Note: All types "Off" Signal lamp position.
On: Operating position.
All relays shown dereenergized.

Motor Control Units:

Teletypewriter: Call Signal &

3.5 3.7 V. Removed. 3.5 3.7
AD. 5 &L. AD5D. F.P.S.
3.13-41-38. Red designations reversed on 3.5X.

Unit 3.5X added.

All relays shown deenergized.

Auto Electric has 2 & 3 screws in armature.

2A & 2S 21 Cal Relay
1TE. 15S. Slow Relay
L, 13, 35, 200U

Resistance of Relays.
has two insulated terminals. It must be protected by a fuse unless it feeds to rectifier. Condenser must line battery connected. Main line necessary to apply when required.

To give 30GOMA (Most of Branch)

Resist. A

20 LINE - " GND " 10 BAT AT MAIN LINE AT MAIN 10 AT GROUND

15A BLOCK CONNECTIONS

F - KBD.  } TEST
E - PTT. R. } TEST
D - NAME RECORD CUT OUT.
C - PTT RELAY LOCAL.
B - PTT (TOWARD WITHOUT RELAY)
A - KBD.

JACKS:

Dv's. 480x20

Spec. J3065 A

Telephone Wiring Cab. 2xK
SPECS 3065A
110/220VAC
Note 4: Selector coils connected in series.

15A Block connections:
10 BAT AT MAIN LINE AT COM
10 GND

Jacks:
A: KBD
B: PTR
C: PTR REVERSE LOCAL
D: PHOENIX REVERSE CUTOFF
E: KBD
F: PTR

TEST:
Note: To work without relay plug in jack A, B.
1. In this case, relay does not operate.
2. Test relay plug or 103-3 Resistor.
A: To give 50-60Ma.

Teletype Wiring Cab 2R with Selector.

Dwg 48208

L-31D
Wiring Cab.9R with Selector.

* SWITCH C-H 8375

JACKS
A-KBD.
B-DXTR-XTR.CALLING KEY
OR SEND. PTR.
C-REC. PTR.
D-"LEG
E-KBD.) TEST
F-PRTR.)
15 A BLOCK CONNECTIONS
9-REC. LEG
19-"GROUND
10-SEND."GROUND
20-"GROUND
18-PUSH BUTTON GND.

RESIS A-REC.LEG, B-SEND. LEG 1000 OHM LIMIT CURRENT TO 50 MA.

SPEC. 3065-A
NOTE 'A'-SELECTOR COILS CONNECTED IN SERIES INSTEAD OF MULTIPLE-APOX B1
'B'-5-11-26 LAMX

NOTE 'B'-SWITCH 8602 REPLACED PER SPEC. 3542-A
"C SWITCH ADDED, RESISTOR ADDED ACROSS 7210. 3-14-41.
NOTE:

SPEC. 2174-A

PRINTER CONCENTRATOR
Teletypewriter Circuit with 3A 5,EMC.
Telexprinter Home Record Cutout.

Schematic.
5. Signal Relay 16, 3C or 3D added to each clock.
   (Approx. 300ohm for 110; 700 for 160)
6. Adjust resistance at outer TAP to give 5.5MA
7. Change to 1000 ohm for 110; 1500 ohm for 160
8. Signal Relay 510C or 50 3D at time switch.
9. Add relay E22A in middle 3A with cover E1
10. Add relay E32A in middle 3A with cover E1

Diagrams:

Cpx Plan 1
- Telephone
- Clock
- Synchronizing

Cpx Plan 2

Cpx Plan 3

Diagrams
If installed (See L10)

Remove toggle switch for time.

Corner as shown on L5 & L10.

Sounder located at night rear.

Table 32A or 32K.

1. Handle 10185.
2. Separator 101784.
2 Switch CH 8315 modified per 76201.

Wiring Cabinet 2B, 2D or 2R.

1. Outlet box. Gem 3" x 2" x 2" deep.
2. Plate, blank, brass.
3. Handle 10185.
4. Separator 101784.

Switch Unit 10730.

Configuration of:

PT. 76227.

Digital 8315.
B.C. and C.H. B262.
A & C are C.H. B275.

Connections for ATL. Line TA.

B. Inductor.


Line Circuits

Telexprinter Table Type 34
### Wiring of Relay Coils

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>Line</th>
<th>Aux Line</th>
<th>Aux.</th>
<th>No. of Turns</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-A</td>
<td>4600</td>
<td>2000</td>
<td>225</td>
<td>160</td>
<td>4000</td>
</tr>
<tr>
<td>1-B</td>
<td>4600</td>
<td>2000</td>
<td>225</td>
<td>160</td>
<td>4000</td>
</tr>
<tr>
<td>1-C</td>
<td>3000</td>
<td>1500</td>
<td>120</td>
<td>80</td>
<td>2200</td>
</tr>
<tr>
<td>1-D</td>
<td>3000</td>
<td>1500</td>
<td>120</td>
<td>80</td>
<td>2200</td>
</tr>
<tr>
<td>1-E</td>
<td>4760</td>
<td>2200</td>
<td>300</td>
<td>200</td>
<td>4000</td>
</tr>
<tr>
<td>1-F</td>
<td>4760</td>
<td>2200</td>
<td>300</td>
<td>200</td>
<td>4000</td>
</tr>
</tbody>
</table>

Positive battery applied to side of any winding will actuate armature to left.

Wheatstone & 178 relays.

Connection & coil ends.

NOTE: Connections shown in base are in relay.
Teleprinter Table Type 34
Local Circuits.

Polar or S.C.
(42 type Subbase adapter
reqd. if 41 Xtr relay used.)

Line

80° WE 1B-K
1½ MF 21AL

Rec leg.
3dg

13
14

Resistors 53.

160° 110°
1000 1000
2000 2000
2000 2000
1000 500
2000 50

1000 1000
2000 1000
2000 1000
5000 5000

For tables not

equipped with bust-up
facilities Res #2 = 1000 w
and Res. #8 = 2000 w.

15A Block

11
12

19
20

Time Stamp.

AC or DC

Light.

For wiring of older sets
see L3, L4, L17 & L19.

Table of Resistors revised Per Dwg 91673-0 5-10-43.
and connect flexible lead to post 3.

When 15 Pt. motor control used, reverse wires + & - and disconnect A & tape.

Remove Motor Control G1 or G7.

When 10 Pt. used in Console.

Console IA-Wiring Cab 30A
106A
12-18-39

Sheet 204 202 now obsolete.

For 101 P200 tableau, use Cab C2A.

Wiring cabinet 27A & 27A.

Telemeter Service.

Table P200 (2 tape pips) Tobacco brown.
Wiring Cab: 37A (left-hand) used on:
1. P200 (2 page -2 tape pips) Tobacco.
2. TO1 (2) - Tobacco brown.

Wiring 202 (7 tape pips) Tobacco colors.

S4R resistors to give 65 MA.
S4R resistors to give 65 MA.
S4R resistors to give 65 MA.

* First look for 9A lamp still.

* First look for 2A lamp still.

* First look for 2A lamp still.

* First look for 2A lamp still.

* First look for 2A lamp still.

* First look for 2A lamp still.

* First look for 2A lamp still.

* First look for 2A lamp still.

* First look for 2A lamp still.

* First look for 2A lamp still.
In Plan 3 Printer Concentrator Cabinet: HB and L, this wire is included in hard form to Bakelite block on Pilot Relay mounting. Pass wire through one hole and back through other end tie.

This strap connection used in Printer Concentrator Cabinet 1A only.

I Amp. N.E. Code 1.5A in Trumbull cutout 5P3ML.

Resistance R-7A and 6-8 in Resistance Mounting 6-1A.

VOLTAGE 110° 160°
A 1500° 6-0 2500° 1-0
B 550° 0-0 250° 0-0

Heavy dotted lines indicate wiring to be in accordance with N.E. Code Rules for low potential systems. Use stranded Instrument wire for all other wiring.
NOTE: MAKE SURE THAT LOCATION OF TEST PANEL UNITS IS SUCH THAT RELAY COVERS MAY BE OPENED PRELAYS CLEANED.

IN PLACE, ADJUSTED

TERMINAL BOX

SWITCH & PLUGGER TO

TABLES NOT SHOWN

EASIEST COMMON TO SPK.

WIRE 2POS. CPX.

WHEN OPENED
OF RELAY WILL CLEAR
BE MOVED UP SO CAP

MOVE BLOCK IF

HANDLE 2

TIME STAMP TO CLEAR

Necessary to clear

SUPPORTE

RETIEME

FOR CIRCUIT WIRING SEE SHEET LII OR SPECIFICATION 2308-B 
1829-9-5

L-12

G38

G38
TYPE 31-B
A - TIME STAMP
B - MSG.CPT STAND IN NON-BELTED OFFICES
C - SUPY'S HOOK IN NON-BELTED OFFICES
D - LIVE MSG.RETR.5-A IN NON-BELTED OFFICES
E - CALL SIG. & MOTOR CONTROL BOX 1-A OR 2-A
F - BOX-SENT MSG. FILE 1-A
G - BOX- TAPE PRINTER FILE A
H - TFR. INST. CARD HOLDER 40-A; NON-BELTED OFC.
I - GUMMING DESK
J - JACK BOX
K - STAMP-BATES NUMBERING
L - H&H TOGGLE#84147 FOR NOON TIME SIGNAL
M - SOUNDER 1-B-400" ONLY WHEN AUTHORIZED
N - RELAY SUB-BASE 2-B

49½”

21”

TYPE 32-B
2'-2½” HIGH.

ALL DIMENSIONS SHOWN ARE COMMON TO BOTH TABLES.

SEE SPEC. 2480
A: TELEPHONE
B: PRINTING UNIT
C: DOWEL HOLE IN BEAM OR CONCRETE PLATE
D: MOTOR CONTROL BOX
E: CORDLESS TABLE LAMP IN STANDARD 6-A
F: PILOT LAMP IN LINE 2-B
G: VENTILATION GRILLE
H: WIRING CABINETS
I: FILE BOX 2-A
J: TAPE PRINTING DESK 2-A
K: GUMMING DESK 2-A

TABLE 43-A
FOR PRINTING EQUIPMENT
SEE SHEET L-40

TABLE 310B34

PRINTING CONCENTRATOR
PLAN 5 SPEC. 3174-A
TYPICAL TABLE LAYOUT

L-1
H.A.L.
6-6-34
A - TELEPRINTER 2-B (WITH 3-A GUMMING DESK AS REQ'D.  
B - PLAN 3 CONCENTRATOR CABINET 1-B  
C - MOTOR CONTROL BOX 6-A  
D - CORDLESS TABLE JACK UNIT 2-B  
E - PILOT LAMP IN LAMP STANDARD 6-A  
M - INSULATING BUSHING DWG. 33872 OR COMMERCIAL RUBBER OR COMPOSITION BUSHING WITH NUT.  
N - N & H TOGGLE SWITCH #20394 WITH OFF-ON PLATE.  
G - CONNECTING BLOCK 7B  
L - MESSAGE GUARD 3A  
F - BOX FILE SENT MSG. 2A
Iovolt Gюcycle A.C. Only

Power Source

Unit Morse Set

Key

Morse Relay

400 Ohm

4B, 4C or 4D

VENIENT LOCATION NEAR
ON WALL OR OTHER CON-
-REceptor FSE-12 Mounted
-Box Gem Type B or
-SPARTAN FEE AND SWIT In

Copper Oxide

Copper Oxide Rectifier

Copper Oxide Rectifier

No other resistance needed.

One Rectifier shall be connected to any Morse wire. Five 400 Ohm

Schematic Wiring Diagram for Operation of Morse Locals

Copper Oxide Rectifier
<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Installation Notes</th>
<th>Used On Early Models</th>
<th>Later Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>Standard</td>
<td>Dual connector</td>
<td>2400, 2500</td>
<td>2500</td>
</tr>
<tr>
<td>90</td>
<td>Deluxe</td>
<td>Dual connector</td>
<td>2400, 2500</td>
<td>2500</td>
</tr>
</tbody>
</table>

**Diagram:**
- Type 75: Standard dual connector.
- Type 90: Deluxe dual connector.

**Note:**
- Type 2 and Type 5 are available in both models.
- Type 3 and Type 4 are not available in older models.

**Mercury Vapor Rectifier Condenser Information:**
- Type 5: Positive lead to frame negative.
- Type 3A and 5A: Both lugss.
- Type 2A and 5B: 2A and 5B.
SOCKETS
FROM OR INSTALLING IN
BEFORE REMOVING TUBES
CONNECT A.C. POWER
IMPORTANT: ALWAYS DIS-

MERCURY VAPOR RECTIFIER TUBE INFORMATION

**NOTES:**
- Rectifiers replaced by GE 16X697
- Replace in reverse order
- New tubes now used in all installations

**DIAGRAM:**
- Rectifiers 66-A, 66-B, 66-R
- Connect a.c. power
- Important: Always disconnect
- Sockets required

**TABLE:**
<table>
<thead>
<tr>
<th>Tube Type</th>
<th>Amperage</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>6L6</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6V6</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6V6G</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6V6GT</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6V6GT-6</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6G6</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6G6GT-6</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6G6GT-7</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6G6GT-7L</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6G6GT-8</td>
<td>65-85</td>
<td>400</td>
</tr>
<tr>
<td>6G6GT-8L</td>
<td>65-85</td>
<td>400</td>
</tr>
</tbody>
</table>

**CHART:**
- Tube removal
- Current per tube: 0.65-0.85
- Continuous rating: 0.65-0.85
- Maximum wattage: 0.65-0.85
- Normal working: 0.65-0.85
- Cathode amper: 0.65-0.85
- Cathode volts: 0.65-0.85
- Socket: 0.65-0.85
- Tube: 0.65-0.85

**DIAGRAM:**
- Rectifiers 66-A, 66-B, 66-R
- Connect a.c. power
- Important: Always disconnect
- Sockets required
Specifications: 1847-A

Elimination of interference to radio receiving sets

From single Morse sets and local circuits. See drawing Z4710.81

All local circuits and direct short should be killed, leads. All spark

Relay

Radio Relay, Neutal

Wheatstone

Common

Same as Morse sounder equipped relay and repeating switch

Table:

| 1/4" Main Line | 30 VDC | 50 VDC
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Local 16-20 VDC</td>
<td>20 OHM</td>
<td>30 OHM</td>
</tr>
<tr>
<td>Local 5-80 Vohms</td>
<td>20 OHM</td>
<td>30 OHM</td>
</tr>
</tbody>
</table>

Choke Volts: 472-21 V

Local circuit

Main line

Local Chf
Interference Eliminator 94 Per Spec. 1949
Note: If these measures are inadequate install Radio

Disconnect MF condenser from pole-changer.

Make sure spark-killer across pole-changer is functioning properly.

Single pole duplex be sure spark-killer is connected between line wire and apparatus table.

Install 4.5 MF condenser (L.E. 214) condensers from each side of battery to ground installer.

Remove anti-noise set not necessary but installed it should not be.

Equip all local contacts as shown.

Quadruplex.
Elimination of interference caused by relay loops.

Insert 20uH + 1/2uF condenser across relay contacts.

Insert 20uH + 1/2uF condenser (W/F-211) across battery line.

Install special choke coils in local battery leads at switch.

If interference is from D-printer, short 6th pulse contact.

Connect spark trigger across corrector relay contacts.

If interference is noise set. See drawing 24113.4. 1/4 24124.8, spec. 1847.4.

Lead of anti-noise set. See drawing 24113.4. 1/4 24124.8, spec. 1847.4.

By 1/2 M/F + 200w. Insert special choke in ground.

NOTE:

F - Spec. X270-A.

Frequency choke coil is special.

From Multiplex Apparatus

Elimination of interference

D printed

Relay

Corrector

Choke coil is

20uH + 1/2uF condenser (W/F-211) across battery line.

Insert 20uH + 1/2uF condenser across relay contacts.

Connect spark trigger across corrector relay contacts.
D-7

Wiring Diagram

Remove dotted wire.

Terminal block IN.

Resistance 50 ohms 18K.

Condenser 1uf.

Type 21AL.

For new work use.

For 12-32 screws.

Drill and tap.

Drill and tap.

Place frame insulator.

Mount spark killer same as present.

Mount A.C. trans. -120 volt.

Mount B.T. -120 volt.

Mount B.T. -120 volt.

Mount A.C. trans. same as present.

Units on lugs A.C. B.T. B.C.

Mount B.T. A.C. trans. same as present.

Vacant lugs A.B.C.D.E.F.G. As shown.

Mounting condenser at resistance.

Synchronous motor P.T.R. spark killer mounted on.

Location for mounting Spark Killer.

Internal Radio interference.

Radio Inlet Eliminate GA

TPR 2B with Home Record

Possible, Radio contact as a short at

it must be replaced with 10635,

if TPR has mounting plate 103T,
Type IA & 1S.

Telemeter Relay Adjustments.

Type FA42S.

Contact a to open 0.10 mm

0.06 gap

0.20 gap

Armature Travel: 0.15

Each set of contacts should open when
Back off small stop nut to obtain this action.

Armature is 1.00" from core.

Adjust springs by bending so relay
will operate on 30 mA, not on 20 mA.

Slow Relay shall not release on one "Blank" signal
on 30-100 mA.

Complete unit to function on "Letters" signal (222 sec).

Slow . . . . . . . . 20 . . . . . . 15 . . . .

Fast Relay shall operate on 25 mA, not on 20 mA.

a to 15 to require 30 grams to break.

b to open 0.20 mm. (1/16" lumpen).

Contact a to open 0.10 mm
Bottom contacts of relay should be removed from block 7A. Line circuit at switchboard should be removed from block 7A. When adjusting relay, W.E.E.282.

**NOTE:**

**Method of Connection to Relay for Testing:**

- Non-operating current - 0.015 amp.
- Operating current - 0.025 amp.
- Armature travel - 0.015 in.
- Separation at least 0.005 in. when relay is operated.
- Separation of contacts at least 0.009 in. when relay deenergized.

**RELAY W.E. B-10**

- Release current (p-cord 32.5) 0.025 amp max.
- Operating current (p-cord 35.0) 0.05 amp max.
- Armature travel - 0.015 in.
- Separation at least 0.005 in. when relay is operated.
- Separation of contacts at least 0.009 in. when relay deenergized.

**STOP CONTACTS**

- Contact follows.
- At least 0.005 in.
- Armature travel.

**RELAY ADJUSTMENT DATA**

**PRINTER CONCENTRATOR PLAN**

- Spec. 374.

**PRINTER CONCENTRATOR PRINT DATA**

**RELAY W.E. E-82**

- Spec. 374.
14A

Note: All A.C. & D.C. resistance removed.

14A

All new work: Use A.C. & D.C. for existing boards. Use A.C. & D.C. for A.D. & D.C. to be used only for modifying. Note: other wires to flip.

A.D. - 11 & 12

A.C. - 9 & 10 (except for 1 & 2)

A.D. & C - 11 & 12

Switchboard Circuits (in parallel)
Loop Switchboard Circuits
Single Conductor Switchboard Circuits.
Notes:
- 400 2A fuses, units of X:
- 80A fuse block, then thru
- Bring power lead.
- Choose resistance and use 40 Ohm
- For 26 Volt local at 6B 4BB
- Points of Relay Sounder, exactly
- and connect by relays directly
- Required, omit Relay Sounder
- (1) 100 Ohm 500W
- (4) 24V .1000W
- (1) 24V .500W
- (1) 24V .1500W
- (1) 24V .2500W
- (1) 24V .5000W
- (1) 24V .10000W
Note: This installation will not satisfactorily operate more than 5 W.U. & G stamps.

Transformer and rectifier

Relay

D.C.

I.O.V. Circuit wiring may be used

W.U. & G stamps

Standard clock

Operation of W.U. & G stamps from A.C. supply - Dwg. 638356-1
2275 cycles.
line frequency, 60 words per min.
XTR. COMS.
XTR. short 300 R.P.M.
Clutch, use 12A.5 Volts, H.T.
19 teeth, 19 teeth.
4285 R.P.M.
Gear, 35 teeth, 1690 R.P.M.
Main shaft, 19 teeth, 19 teeth.

Synchronous Motor

Running
Starter load current 10. Amp.
Synchronous Motor

Running
Starter load current 1.6 Amp.
Series A.C. motor

12 necessary
Service transformer GE. GTM 616-4
If power supply is 220 Volts, a
supply.
be connected in one side of power
in ventilated metal box must
consisting of 2.1 ohm. 20 mms.
a 30 ohm series resistance
When used on 22 cycle power
on 50 or 60 cycle power.

AL series motors may be used governor
Above motor have no governor

Telesprinter: Speeds & gearing.
Motor & shaft

With 60 cycle Synchronous Motor

gear & 25 tooth pinion with Syn. Motor on 50 cycle.
Use 1A Box if available.

425 Unit no longer furnished.

Separate Table or Concentrator (6 wires)
PLAN 103

1A or 2A1 Box 320452
1A or 2A1 Box 310514
15 of 25 Unit 410314

Main Office

Concentrator (100 wire)
PLAN 2

2A Box 323452
3A Box 310514

35X or 35 Unit 315314
Box or Unit Table.
Cell Sign.

Branch Office

Teletypewriter - Use a Call Signal

L20
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<th>60 \times \frac{90}{RPM}</th>
<th>XTR cam RPM</th>
<th>60 \times \frac{90}{RPM}</th>
<th>XTR cam RPM</th>
<th>60 \times \frac{90}{RPM}</th>
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Spec 573: Adjustment & Mtc. Polarged Type Relays.  
2519: Single Current. Type IC.  
2234: Relay Test Set. 1A  
4103: " 41A
Singly Mounted.


Strip Mounted.

Jacks 500B, 504B, 503B, 528B, 505A, 606A

504 504 503 Lamp 503

Jack Strips.

5B 7B All 504.
SB " 500.
IA " 503.

504 500

BB Used on Type 3 Call Ctrl Equip

500 500 500 500

15A Used on Distr. Tables.

Extra
Cont.

Sleeve

Extra Contact

Tip

Sleeve

Cordless Jack Unit 2B.

Unit 2A same as 2B except has screw connections.
" 1A " " 2A " sleeves all in one piece.
<table>
<thead>
<tr>
<th>200 SERIES</th>
<th>500 SERIES</th>
<th>600 SERIES</th>
<th>OTHER TYPES</th>
</tr>
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<tbody>
<tr>
<td><img src="image1.png" alt="Image of 200 Series Lamp Socket" /> Spec. 729</td>
<td><img src="image2.png" alt="Image of 500 Series Lamp Socket" /> Spec. 4310</td>
<td><img src="image3.png" alt="Image of 600 Series Lamp Socket" /> Spec. 2643</td>
<td>0 Pin Jack 1-A Spec. 2996</td>
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<tr>
<td><img src="image4.png" alt="Image of 202 Series Lamp Socket" /> Spec. 729</td>
<td><img src="image5.png" alt="Image of 500 Series Lamp Socket" /> Spec. 4115</td>
<td><img src="image6.png" alt="Image of 600 Series Lamp Socket" /> Spec. 2643</td>
<td>6 Pin Jack 10-A Spec. 3952</td>
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<td><img src="image10.png" alt="Image of 224 Series Lamp Socket" /> Spec. 3049</td>
<td><img src="image11.png" alt="Image of 504 Series Lamp Socket" /> Spec. 4119</td>
<td><img src="image12.png" alt="Image of 600 Series Lamp Socket" /> Spec. 2643</td>
<td>14 Cond. Jack 1-A Spec. 3842</td>
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<td><img src="image13.png" alt="Image of 228 Series Lamp Socket" /> Spec. 729</td>
<td><img src="image14.png" alt="Image of 505 Series Lamp Socket" /> Spec. 4309</td>
<td><img src="image15.png" alt="Image of 600 Series Lamp Socket" /> Spec. 2643</td>
<td>Indicates spring equipped with Ag-Zn contacts.</td>
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<tr>
<td><img src="image16.png" alt="Image of 228 Series Lamp Socket" /> Spec. 729</td>
<td><img src="image17.png" alt="Image of 528 Series Lamp Socket" /> Spec. 4207</td>
<td><img src="image18.png" alt="Image of 600 Series Lamp Socket" /> Spec. 2643</td>
<td>* Requires Jack Plunger 2-A Spec. 5400 or 3-A, Spec. 5401.</td>
</tr>
<tr>
<td><img src="image19.png" alt="Image of 800 Series Lamp Socket" /> Spec. 4203</td>
<td><img src="image20.png" alt="Image of 599 Series Lamp Socket" /> Spec. 4000</td>
<td><img src="image21.png" alt="Image of 600 Series Lamp Socket" /> Spec. 2643</td>
<td>+ Jack Spring Assembly 1-A Spec. 2680 or 2-A Spec. 4883 can be added to these jacks.</td>
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<tr>
<td><img src="image22.png" alt="Image of 800 Series Lamp Socket" /> Spec. 4203</td>
<td><img src="image23.png" alt="Image of 600 Series Lamp Socket" /> Spec. 2643</td>
<td><img src="image24.png" alt="Image of 600 Series Lamp Socket" /> Spec. 2643</td>
<td>Jacks of 200 and 600 Series mount individually.</td>
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</table>

Jacks of 200 and 800 Series mount in Jack Strips.
Battery feed wires.

Additional data on #4.1 for No. 93 office.

Office Protection Switch

*2 Office.
Notes:
- Do not use 5A fuse in Battery feed wires.
- Use a fuse block with 5G 60A fuse for the 11445-5A 60A fuse block.
- Use a fuse block with 5G 60A fuse for the 11445-5A 60A fuse block.
- If protector is not present, use a fuse block for over 50MA current. Use protector if present.
- Inside switches, install fuses and/or overload fusing.
- Opt out of card stack for non-metallic tubing.

Wiring:
- Battery feed wires are protected by fuses.
- No fuses are used for the cable feed wire.
- The fuse protector is set for 2 A. NEC wiring rule.
- Grounding to the cabinet is by the 110VAC power source.
- The switch is used to control the power.
- The fuse protector is set for 2 A. NEC wiring rule.
- Grounding to the cabinet is by the 110VAC power source.
- The switch is used to control the power.

Specs: 2220-D54C
Battery feed wires
### Self-Winding and Universal Ticklers

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<th>Type of Ticker</th>
<th>Magnet &amp; Tag</th>
<th>Cat. No.</th>
<th>Size of Wires</th>
<th>Turns Per Coil</th>
<th>Ohms Per Coil</th>
<th>Total Ohms</th>
<th>DWG No.</th>
<th>Type Wheels</th>
<th>FIGS</th>
<th>DWG No.</th>
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* Shift magnet used only to hold shift position after being operated mechanically. Coil not electrically connected.

Catalogue number covers ample coil. 1-2 Cat. 2-2400 required for 22-A, 2-2 Cat. 21600 required for 24-A, and 4 Cat. 21600 for 34-A.
<table>
<thead>
<tr>
<th>Spring</th>
<th>Tension</th>
<th>Scale or Weight Applied At</th>
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<tbody>
<tr>
<td>(1) Signal Bell Bar</td>
<td>9 to 10 oz.</td>
<td>Right end of bell bar</td>
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<tr>
<td>(2) Clearance Lever</td>
<td>1/2 oz.</td>
<td>Push just above stop screw (Sel. fingers held away from lever)</td>
</tr>
<tr>
<td>(3) Clutch Detent Lever</td>
<td>26 to 30 oz.</td>
<td>Detent Lever Spring Hole</td>
</tr>
<tr>
<td>(4) Clutch Trip</td>
<td>4 to 5 oz.</td>
<td>Clutch Trip Spring Hole</td>
</tr>
<tr>
<td>(5) Code Bar</td>
<td>5 to 7 oz.</td>
<td>End of code bar (to move from marking to spacing position)</td>
</tr>
<tr>
<td>(6) Code Bar Latch</td>
<td>2 to 3 oz.</td>
<td>Push in line with end of #1 latch</td>
</tr>
<tr>
<td>(7) Drop in Bail Arm</td>
<td>3 to 4 oz.</td>
<td>Top and rear of cam roller arm (Pull parallel with spring)</td>
</tr>
<tr>
<td>(8) Drop in Bar</td>
<td>1½ to 2 oz.</td>
<td>Cam roller on low part of cam</td>
</tr>
<tr>
<td>(9) Driven Clutch</td>
<td>20 to 25 oz.</td>
<td>Drop in bar just above spring bar (Cam roller on low part of cam)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cam on driven Clutch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Pull in line with shaft)</td>
</tr>
<tr>
<td>Tension</td>
<td></td>
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<td>---------</td>
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</tr>
<tr>
<td>Scale or Weight Applied At</td>
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<tr>
<td>Knife Spring Hole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring Eye</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lever on low part of cam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Range Unit Stop |
| 3 to 4 oz. |

| Lever |
| 3 to 4 oz. |

| Receiving Pilot |

| Clutch |
| 4 to 5 oz. |

| Reset Lever |
| 4 to 4½ oz. |

| Retaining Pawl |
| 4 to 4½ oz. |

| Selector Finger |
| ½ to 1 oz. |

| Selector Lever |
| 3 to 4 oz. |

| Armature Spring Post |
| To start Armature from spacing. |

| Magnet |
| 3½ to 3¾ oz. |

| Spring |
| Armature |

| #2 |
| (10) Knife Lever |

| Range Unit Stop |
| (11) |

| Lever |
| (12) Receiving Pilot |

| Clutch |
| (13) Reset Lever |

| Retaining Pawl |
| (14) Spacing |

| Selector Finger |
| (15) Selector Lever |

| Armature |
| (17) Selector Lever |

<p>| Armature Spring Post |
| (18) Armature from spacing. |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Tension</th>
<th>Scale or Weight Applied At #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(19) Spacing Latch</td>
<td>3/4 to 1 oz.</td>
<td>Latch spring Post (Swinging Plate Unlatched)</td>
</tr>
<tr>
<td>(20) Spacing Pawl</td>
<td>1 1/2 to 2 oz.</td>
<td>Pawl spring post (spacing latch held away from pawl)</td>
</tr>
<tr>
<td>(21) Spacing Swinging Plate</td>
<td>11 to 12 oz.</td>
<td>Plate spring Post (Pull from unlatched to latched position)</td>
</tr>
<tr>
<td>(22) Transm. Cam Clutch</td>
<td>18 to 22 oz.</td>
<td>End of Stop arm on cam assembly</td>
</tr>
<tr>
<td>(23) Transmitting Pilot Clutch</td>
<td>2-3/4 to 3 1/2 oz.</td>
<td>End of clutch stop arm (long leg)</td>
</tr>
</tbody>
</table>

**LOWER UNIT - KEYBOARD**

<table>
<thead>
<tr>
<th>Item</th>
<th>Tension</th>
<th>Scale or Weight Applied At #3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Keylever</td>
<td>20 gms (start)</td>
<td>Key Cap</td>
</tr>
<tr>
<td></td>
<td>15 gms (not)</td>
<td></td>
</tr>
<tr>
<td>(2) Keylever Spacer Bar</td>
<td>35 gms (start)</td>
<td>Spacer Bar</td>
</tr>
<tr>
<td></td>
<td>20 gms (not)</td>
<td></td>
</tr>
<tr>
<td>(3) Lock Loop Bell Crank</td>
<td>1-1/2 to 2 oz.</td>
<td>Top of lock loop bell crank (Hold sel. bar cranks to right)</td>
</tr>
<tr>
<td>(4) Pilot Stop Lever</td>
<td>6 to 8 oz.</td>
<td>Spring eye (Pull to hole in bracket)</td>
</tr>
<tr>
<td>(5) Selector Bar Cont.</td>
<td>1 1/2 to 1 1/2 oz.</td>
<td>Upper ends of springs (Sel. bar bell cranks marking)</td>
</tr>
</tbody>
</table>
LOWER UNIT - KEYBOARD

(6) Self Bar Bell Crank
1/2 to 1 oz.
Just above spring holes (line with spring)
Bell crank spring hole (contacts open)

(7) Stop Arm Bell Crank
14 to 16 oz.
Upper end of spring

UPPER UNIT - TYPING

(1) Carriage Return Ball
2 to 2 1/2 oz.
Left end of carriage
(carriage at extreme left)

(2) Draw Band (right & left)
2 to 2 1/2 lbs.
Push at end of operating
roll carrier

(3) Feed Roll Operating
1 to 1 1/2 lbs.
(Left end of key lever hook)
Key lever spring hole

(4) Hold Fast
2 1/2 to 3 lbs.
Push against hook opposite
draw band (typing unit removed)

(5) Key Lever Hook
1/2 oz.
End of key lever hook

(6) Key Lever
1/2 to 2 1/2 oz.
Pawl end of line space arm

(7) Line Space Pawl
3 to 4 oz.

(8) Print Bail
3 to 5 turns

(9) Shift Bar
1 1/2 to 1 1/2 lbs.

(10) Shift Lever Latch
1 1/2 to 2 oz.

End of shift key lever
(Shift carriage to upper case)
Spring hole in latch (carriage held free)
Top of unshift bail

(11) Unshift Bail
2 to 3 oz.

Crimp in each spring (springs on high part of piston rod)

(12) Dash Pot Striker
5 to 7 ozs.
<table>
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<tr>
<th>INDEX - TELEPRINTER 2-B ADJUSTMENTS</th>
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<tbody>
<tr>
<td>1. Armature Locking Lever Spring Tension</td>
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<tr>
<td>2. Armature Stop Adjustment</td>
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<tr>
<td>3. Armature Tip-off Eccentric Screw Adjustment</td>
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<td>4. Bell Adjustement</td>
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<td>5. Bell Hammer Eccentric Screw Adjustment</td>
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<td>6. Bell Hammer Spring Locating Plate</td>
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<td>7. Carriage Capstan Nuts Adjustment</td>
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<td>8. Carriage Extension Pawl Post Adjustement</td>
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<td>9. Carriage Locking Pawl Spring Tension</td>
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<td>10. Carriage Locking Toe Adjustement</td>
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<td>11. Carriage Return Spring Tension</td>
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<td>12. Code Bar Assembly, Lock Washers and Nuts</td>
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<td>13. Code Bar Assembly, Height of Code Bar</td>
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PAGE PAR.

Motor Adjustments - Syn. Single Start Contact
Centrifugal Weight Spring Tension
Motor Adjustments - Syn. Single Start Contacts
Starting Switch Contact Spring Tension
Motor Thrust Spring Tension
Starting Switch Contact Bracket Adjustment
To Remove the Start Switchout or Cent. Mechanism
To Remove or Replace Bearing at Pinion End
Brush Holder Spring Tension
Brush Holder Spring Tension
Orientation
Pull Bar Guide Adjustments
Pull Bar Lock-Out Lever Adjustment
Ribbon Check Pawl Spring Pressure
Ribbon Feed Lever Spring Tension

Par. 29 77-a 30 77-b 32 77-d 32 77-f 32 77-g 33 77-b 35 77-I 35 77-J 24 73 11 62 10 28 5 9 5 15
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<td>43</td>
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<td>Type Basket - To Remove from Typing Unit</td>
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<td>Type Bars - To Remove a Typebar</td>
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KEYBOARD BASE ADJUSTMENTS

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<tr>
<th>Adjustment</th>
<th>Page</th>
</tr>
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<tbody>
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<td>Bell Extension Stop Adjustment</td>
<td>42</td>
</tr>
<tr>
<td>Bell Hammer Extension Stop</td>
<td>42</td>
</tr>
<tr>
<td>Bell Hammer Spring Tension</td>
<td>42</td>
</tr>
<tr>
<td>Clutch Spring Compression</td>
<td>36</td>
</tr>
<tr>
<td>Clutch Throw-out Lever</td>
<td>59</td>
</tr>
<tr>
<td>Clutch Throw-out Lever Eccentric Adjustment</td>
<td>44</td>
</tr>
<tr>
<td>Clutch Throw-out Lever Spring Tension</td>
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</tr>
<tr>
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<td>42</td>
</tr>
<tr>
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</tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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<td>42</td>
</tr>
<tr>
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<td>43</td>
</tr>
<tr>
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</tr>
<tr>
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<td>45</td>
</tr>
<tr>
<td>Locking Pawl Spring Tension</td>
<td>46</td>
</tr>
<tr>
<td>Rest of Start-stop Contact</td>
<td>47</td>
</tr>
<tr>
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<td>47</td>
</tr>
<tr>
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<td>47</td>
</tr>
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<td>47</td>
</tr>
<tr>
<td>Tape Guide Tube Adjustment</td>
<td>95</td>
</tr>
<tr>
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<td>95</td>
</tr>
</tbody>
</table>

PAR. 91 92 93 94 95 96 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
GENERAL -

The following adjustments and instructions shall apply, in the order in which they appear, for general overhaul and re-assembly of Teleprinters 2-B and 2-C.

The same sequence shall be followed for complete readjustment of assembled machines. For this purpose proper notation is made for removal of such parts as required to make the adjustment.

When making adjustments of individual parts or units always check related adjustments and rectify if incorrect.

The illustrations referred to (Fig. 1, Fig. 2, etc.) appear in Teletype Bulletin 127, Issue 2 and Teletype Letter RE-251.

Unless otherwise directed by the adjustment, new springs should be used to replace those where the tension does not fall within the prescribed limits.
1. RIBBON SPOOL CUP ADJUSTMENT - Fig. 35. Rotate and fasten the ribbon spool cups so that the center of the ribbon spool cup rollers are 4 11/16" to 4-13/16" from the typing unit base.

2. RIGHT AND LEFT RIBBON SPOOL SHAFT GEARS - Fig. 36. Position the bevel gear on the end of each shaft for .001" to .004" and play.

3. RIBBON SPOOL SHAFTS SPRING COMPRESSION - Fig. 36. Move the ribbon feed shaft to disengage the bevel gears. Set the spring adjusting collar so that 3-1/2 to 5 ozs. pull is required to start rotation of the shaft. (Pin at front end of ribbon spool shaft at its highest position with the scale hooked over the pin and held in a horizontal position.

4. RIBBON REVERSE SHAFTS - Fig. 37. Hold the ribbon reverse arm against the bracket. Position the ribbon reverse shaft to clear the back of the ribbon spool cup by .010" to .020". Then lock set screw in the ribbon reverse arm.

5. RIBBON REVERSE SHAFT COLLAR - Fig. 37. Position the collar at the rear end of each shaft for .001" to .004" end play.

6. RIBBON REVERSE PAWL LINK - Fig. 38. Position the main bail so that the vertical portion of the ribbon reverse bail is opposite
the ribbon reverse pawl tooth. Clearance between these members should be .015" to .025" when the ribbon reverse arms are up against the ribbon spool cups. To alter the adjustment loosen the ribbon reverse arm set screw and rotate the ribbon reverse shafts. If any bind of the ribbon reverse pawl link on its shoulder screw exists correct by repositioning its attachment at the rear end of the ribbon reverse shaft.

7. RIBBON FEED SHAFT SAFETY SPRING COMPRESSION - Fig. 39. Place the main bail in the extreme upward position and hold the ribbon feed shaft to the left. Push vertically with 12 lb. scale on upper end of the right ribbon reverse pawl. Reading should be 3 to 5 lbs. to start movement of the spring collar. Slide the ribbon feed shaft to the right and check the ribbon feed shaft left safety spring in a similar manner.

8. RIBBON FEED SHAFT DETENT PLUNGER SPRING COMPRESSION - Fig. 40. Remove the ribbon feed and check pawls. Place the ribbon feed shaft to its left hand position. Apply 12 lb. scale to the left end of the shaft. Pressure of 1-1/2 to 3-1/2 lbs. in line with the shaft should move it to the right hand position. (Feed shaft must not bind in bearings and detent and plunger should be in good condition)
9. RIBBON CHECK PAWL - Fig. 41. Mount the check pawl so that its upper end is 3/64" to 5/64" below the top surface of the casting on which the pull bar guide is mounted. Fig. 41. Attach scale at the bottom end of the pawl and pull at right angles to the pawl spring. If the spring is bent correctly a pull of 6 to 8 ozs. will just lift the pawl away from the adjacent ratchet tooth. (The pawl must not bind against the adjacent ratchet tooth.) (REPLACE THE MAIN BALL LEVER ASSEMBLY. SEE THAT THE MAIN BALL LEVER DOES NOT RUB ON SIDE OF SLOT IN THE PINCH SLEEVE.)

10. SELECTOR SEPARATOR PLATES - Fig. 45. Remove the separator plates from the assembly and bend the leaf springs at the narrow portion of the straight portions. (Approximately thickness of a sword) Replace separators in assembly. (REPLACE THE CLUTCH THERM-O-OUT LEVER AND SELECTOR LEVER ASSY.)

11. MAIN SHAFT CLUTCH SPRING TENSION - Fig. 2. Place the clutch members so that the teeth of the driven member rest on the driven member throw-out cam and pulled downward as nearly vertical as possible the teeth should separate on 24 to 30 ozs. If
13. MAIN SHAFT ADJUSTMENT - Remove the range finder assembly, loosen bearing cap screws and regulate the position of the shaft so that bearing cap screws and regulate the position of the shaft so that numbers on the end of the bearing caps must correspond to the numbers on the casting.

14. MOTOR POSITION ADJUSTMENT - Locate the motor on its mounting plate for fullest possible mesh of pinion with the main shaft. Check for one complete revolution of the main shaft.

15. RIBBON FEED LIFTER SPRING TENSION - Fig. 22. (The type basket must be removed to make this adjustment.) Remove ribbon feed.
pawl or move it away from the ratchet. Place the main bail plunger so the ribbon feed lever roller is in the plunger indent. Hook scale over top of the feed lever and pull horizontally. 12 to 18 ozs. pull should start the lever moving.

TO REMOVE THE TYPE BASKET FROM TYPING UNIT -

METHOD #1 - Unhook springs from the following: code bar locking lever, signal bell hammer, letters pull bar and space release pull bar. Remove the three type basket mounting screws. Remove the front mounting screw from the right ribbon spool bracket, loosen the rear mounting screw and swing the bracket so that the ribbon spool cup will not interfere with the basket. Place a piece of wire or string around and in back of the pull bars and pull forward to disengage them from the guide. Lift the type basket, at the same time turning it sufficient to free the toes of the function pull bars.

METHOD #2 - Unhook all springs connecting the type basket with the base mechanism. Loosen and turn the bell hammer away from the pull bar toes. Remove the code bar assembly. Remove the type basket, rotating it sufficiently to clear the other pull bar toes.

(REPLACE THE RIBBON FEED PAWL)
16. RIBBON FEED PAWL - Fig. 41. Position the feed pawl to provide two teeth advancement of the ratchet for each revolution of the main shaft. (Readjustment of the check pawl may be necessary)

17. RIBBON FEED PAWL SPRING TENSION - Fig. 41. Attach scale to the extreme front edge of the pawl and pull vertically. 6 to 8 ozs. pull required to start feed pawl away from the ratchet. (Pawl must not bind against adjacent tooth) Bend the spring to regulate the tension.

18. RIBBON REVERSE PAWLS SPRING TENSION - Fig. 39. Place the ribbon feed shaft to the left. With scale hooked over the left hand ribbon reverse lever spring post and pulled in line with the spring, it should require 2-1/2 to 3-1/2 ozs. to start the lever moving. Move the ribbon feed shaft to the right and check the right hand lever spring in the same manner.

19. SPACER DETENT ADJUSTMENT - Figs. 20 and 21. (The type basket must be removed to make this adjustment) When the spacer operating lever roller is at the bottom of the main bail plunger indent and the spacer detent roller rests between two teeth there should be .002" to .012" clearance between the face of the spacer feed pawl and the face of each tooth on the spacer ratchet wheel. Adjust by moving the detent lever plate.
(It is possible to acquire this adjustment with the spacer detent position one full tooth off which will affect the detent spring tension considerably. Always check this spring tension when making the above adjustment)

20. **SPACER DETENT LEVER SPRING TENSION - Fig. 20** (The type basket must be removed when making this adjustment) Allow detent roller to rest between two teeth of the ratchet. Hook scale in the lever spring hole and pull in line with the spring. 3-1/4 to 3-3/4 lbs. pull should start the lever moving.

21. **SPACER FEED PAWL SPRING TENSION - Fig. 20.** (The type basket must be removed when making this adjustment) Attach the scale near the upper end of the pawl, holding it at right angles to the pawl. 1 to 2 ozs. pull should start the pawl moving.

22. **SPACER OPERATING LEVER SPRING TENSION - Fig. 21.** (The type basket must be removed when making this adjustment) With the operating lever roller at the bottom of the main bail plunger indent, hook scale over the lever just below the roller and pull horizontally. The lever should start moving at 5 lbs. (Where printers are still equipped with old style spring 35-27 vertically mounted, this tension shall be 4 lbs.)

23. **SPACER LOCKING BAIL SPRING TENSION - Fig. 23.** (The type basket
must be removed when making this adjustment. Hold the spacer locking pawl away from the ball. Hook scale in the spring hole of the ball and pull vertically. 1-1/2 to 2 ozs. pull required to start movement of the ball.

24. SPACER LOCKING PAWL BRACKET POSITION - Fig. 23. Place the spacer operating lever roller on the high part of the main ball plunger. Lift the spacer locking ball allowing the locking pawl to engage so that the distance between the locking pawl shoulder and the notched part of the operating lever is .040".

25. SPACER LOCKING BALL FINGER ADJUSTMENT - Fig. 27. Hold the spacer locking ball down and position the main ball plunger so that the spacing between the latching edges of the spacer locking pawl is .015" to .025". The clearance between the latching edges should be .015" to .025" inserted from the front of the typing unit, and then adjust using tool #72574 inserted from the left side of the typing unit.
26. SPACER LOCKING PAWL SPRING TENSION - Fig. 23. Place the spacer operating lever roller on the high part of the main bail plunger. Turn the typing unit on its side, and while holding the spacer locking bail operated, hook the scale through the hole in the typing unit base onto the locking pawl and pull in line with the spring. 1-1/2 to 2-1/2 ozs. pull required to start the pawl moving.

27. FUNCTION BAR BRACKET PLATE ADJUSTMENT - Fig. 24. Adjust both the right and left bracket plates by rotating them on their mounting screws so that the pull bars supported by them have equal amount of play in the segment.

28. PULL BAR SPRING TENSION - Fig. 25. (The type basket must be removed when making this adjustment) Unhook the spring from each pull bar. While holding the pull bar vertical attach scale to the eye of the spring and pull vertically until the eye is opposite the spring hole in the pull bar. The character pull bar springs should weigh 3 to 4 ozs. and those for the function bars 5-1/2 to 6-3/4 ozs. (REPLACE THE TYPE BASKET IN THE TYPING UNIT)

CODE BAR ASSEMBLY - LOCK WASHER POSITION AND TIGHTENING OF NUTS - Excessive tightening of the code bar post nuts may
cause the separator collars to become embedded in the german silver separator washers and bind the code bars. Remove the lock washers if under the lower nuts and place between the pileup of collars and separators without excessive pressure. Then hold the lower nut with a wrench and tighten the upper nut against the lock washer.

CODE BAR ASSEMBLY - MOVEMENT OF BARS — The code bars must operate freely. If the assembly is held in a vertical position and the bars raised to the extent of their travel and then released they should return quickly to their other limit.

CODE BAR ASSEMBLY - HEIGHT OF CODE BARS — Each code bar must align horizontally with its respective "W" lever without overlapping an adjacent lever. This condition may be acquired by adding or removing shims between the pull bar guide and the casting to which it is fastened.

PULL BAR GUIDE ADJUSTMENT — Fig. 25. Set up the "blank" combination and position the main ball opposite the pull bar humps. The clearance between all pull bar humps and the main ball should be .008" to .020" while the ball is held in a direction to make
this clearance a minimum. Adjust the position of the pull bar guide for the above clearance. Check the clearance also with the "letters" combination set up. The foregoing adjustment should provide .004" to .080" clearance between the end of #1 lever and the bottom of its slot in #1 code bar.

31. MAIN BAIL ADJUSTING SCREW - FIG. 1. Set up the "blank" combination and place the main bail roller on the high part of its cam. Adjust the main bail screw for clearance .010" to .050" between the back surface of the pull bar tops and the front of the code bars while holding the code bars in the marking position. Check this adjustment with all code bars in.

32. MAIN SHAFT CLUTCH THROW-OUT LEVER - FIG. 1. With the clutch throw-out lever resting on the high part of the clutch cam adjust the pivot screws so that the clutch teeth are separated "010" to .020". The end play of the throw-out lever must be
at a minimum without binding the lever.

33. MAIN SHAFT CLUTCH THROW-OUT LEVER SPRING TENSION - Fig. 1
Place the clutch throw-out lever on the low part of the driven clutch member. 2-1/2 to 4 ozs. pull on scale attached at the spring hole should start the lever moving.

34. SELECTOR LEVER SPRING TENSION - Fig. 11. Position all code bars "spacing" and rotate the selector cam sleeve to its stop position. Hold the lock bar and the figures shift pull bar away from the code bars. Hook scale at right end of the code bar. 5 to 7 ozs. pull toward the right should move each bar to its extreme right position. It should start back at no less than 1-1/2 ozs.

35. SELECTOR ARMATURE HEIGHT - Fig. 13. Place the #1 selector lever on the peak of its cam. Hold #1 sword lightly against the upper separator plate. Under these conditions the lower surface of the locking wedge should clear #1 sword by .002" to .008". Adjust the armature pivot screws to obtain, at the same time limiting the armature end play to a minimum.

36. SELECTOR ARMATURE BRACKET LINK - Fig. 14. Remove the range finder, unhook the locking lever spring, loosen the bracket mounting screws and the link screw. Move the bracket eccentric
out of the way and back off the armature stops. Place #1 selector lever on the peak of #1 cam. Insert gauge pins #72581 between the stop posts and the sides of the swords. Place locating gauge #73370 so that its legs are over the ends of the two arms of #1 sword. Hold the bracket with the armature extension arms against the flat surface between the legs of the gauge and tighten the link screw. Remove the locating gauge and gauge pins.

37. SELECTOR ARMATURE BRACKET - Figs. 14 and 15. With the #1 selector on the peak of #1 cam and the selector armature in the unoperated or spacing position move the spacing arm of #1 sword against the armature extension. Then rotate the armature toward marking until the extension arm just leaves the spacing arm of the sword. The sword at this position should be .004" to .040" from the spacing stop post. Locate the armature bracket to obtain this clearance. Unhook the armature spring and place the armature to the marking position with the marking arm of the sword against the extension arm. Move the armature toward spacing until the extension arm just leaves the sword arm. This should produce .004" to .040" clearance between the sword and the marking stop post. Position
ARMATURE LOCKING LEVER SPRING TENSION - Fig. 11. Set the locking lever on the long high part of the locking cam, hook scale in line.
the lever spring hole. Pull of 10 ozs. in line with the spring should start the lever moving.

41. STOP LEVER ECCENTRIC SCREW - Fig. 17. (The range finder assembly must be removed when making this adjustment) Adjust the eccentric screw for .004" to .006" clearance between the eccentric and the back edge of the stop lever when this lever is resting against the latching surface of the trip latch.

42. STOP LEVER SPRING TENSION - Fig. 18. (The range finder assembly must be removed when making this adjustment) Hold the trip latch plunger operated. Attach scale at the end of the stop lever. 3/4 to 1-1/4 ozs. required to start the lever moving.

43. TRIP LATCH SPRING COMPRESSION - Fig. 17. (The range finder assembly must be removed when making this adjustment) Hold the range finder in a horizontal position. Apply scale vertically at the step of the trip latch. An upward push of 1 to 1-1/2 ozs. should start the trip latch moving. (REPLACE THE RANGE FINDER)

44. ARMATURE TRIP-OFF ECCENTRIC SCREW - Figs. 17 and 19. Place the selector armature spacing. Turn the trip-off eccentric until the trip latch engages the stop lever preventing it
from releasing the selector cam. Now adjust the eccentric to raise the latch sufficiently to just clear the stop lever; not to exceed .002". Hold the armature marking with the latching surfaces of the latch and stop lever engaged. The clearance between the end of the trip latch plunger and the trip-off eccentric should be at least .002". If this condition does not prevail both armature stops may be backed off slightly.

45. MAGNET COILS POSITION - Fasten the coils on the magnet bracket so that the top edge of the upper core aligns within 1/64" of the top edge of the armature.

46. MAGNET BRACKET POSITION - Fig. 15. Energize the magnet causing the selector armature to rest against the operated stop nut. Adjust the position of the bracket for .002" to .007" clearance between the magnet cores and the armature. (usually one thickness of printer tape) The cores must align with the armature and their faces must be parallel with the face of the armature. (REPLACE THE CARRIAGE ASSEMBLY)

47. CARRIAGE BRACKETS AND LOCATING PLATE - Position both brackets so that the gears of the platen and spacer shafts mesh with minimum backlash and without binding rotating or lateral movement of the platen shaft. Fasten the locating plate with its
three projections resting against the base of the front bracket.

48. TAPE FEED ROLL SPRING TENSION - Fig. 30. Hook scale over the feed roll bearing screw. 6 to 8 ozs. pull at right angles to the feed roll lever should start the lever from the surface of the platen.

49. LEFT TAPE GUIDE - Fig. 30. Adjust this guide to clear the platen roll by .004" to .010" throughout one complete revolution of the roll.

50. RIGHT TAPE GUIDE - Fig. 30. Thread tape through both tape guides. Position the right guide so that the tape aligns with the platen roll. Bend the guide to provide .010" to .020" clearance between its end and the platen roll throughout one complete revolution.

51. RIBBON GUIDE - Set height of the ribbon guide so that both sides are .040" to .050" above the printing surface of the platen. Bend the guide to obtain 3/16" to 7/32" clearance between its tongue and the side of the platen roll.

52. FIGURES STOP SCREW - Fig. 28. Place the carriage in the figures position and print "figure 2" directly on the platen. Regulate the stop screw so the printing occurs in the middle of the platen roll.
53. CARRIAGE LOCKING PAWL POST - Position this post for full engagement of the locking pawl with the carriage locking toe. Place the carriage locking in the letters position and print "W" directly on the platen roll. Parallel to the platen shaft.

54. CARRIAGE RETURN SPRING TENSION - Fig. 28. Place the carriage in the letters position attached to the spring eye, pull the spring to its normal position length, read the spring should be 6-1/2 to 7-1/2 ozs.

55. CARRIAGE EXTENSION - Fig. 29. Hold Carriage in the letters position. Hook scale just below the small hole with the spring pull of 1-1/2 to 2-1/2 ozs in line with the pawl. An upward pull of the pawl moving.

56. SHIFT ROCKER POST - Fig. 31. The sides of this post should be in line with the figures to the right of the carriage.

57. CARRIAGE EXTENSION - Fig. 32. The front surface of this post should be parallel to the front edge of the base plate. Adjust each side of the shift rocker post when the carriage is moved from the figures to the letters position.
60. **SHIFT ROCKER ADJUSTMENT** - Fig. 32. Back off the carriage capstan nuts. Place the carriage in the figures position. Set up the "letters" combination and rotate the main shaft until the main bail roller is on the low part of its cam. Lift the main bail by hand to its highest position. This should cause the carriage locking toe to just engage the notch of the carriage locking pawl. (overtravel must not exceed .020") If the printer incorporates "unshift on space" and this function gives the carriage less travel than "letters" then it should be used in making the adjustment.

61. **CARRIAGE CAPSTAN NUTS** - Fig. 29. With the carriage held in the letters position by the locking pawl and toe adjust the capstan nuts for .020" to .025" clearance between the rear nut and the front of the bearing bracket.

62. **PULL BAR LOCKOUT LEVER** - Figs. 33 and 34. Place the platen in the figures position and select the bell pull bar, positioning the main bail approximately .010" below the bell pull bar notch (Fig. 33-A) Adjust the pull bar lockout lever so that its right hand roller clears the bell pull bar .010" to .040" (Fig. 33-B) and at the same time cems
the top of the adjacent "J" or "S" pull bar out of the code
bar slot by .004" to .020" (Fig. 53-C). Move the carriage to
the letters position. The left hand roller of the lookout lever
should clear the "J" or "S" pull bar should be cammed out of the code bar slot
by .004" to .020" (Fig. 53-A, B, C).

63. LEFT FUNCTION PULL BAR SPRING BRACKET - Fig. 42. With the main
ball in its lowest position and with scale attached to the letter
pull bar just below the hump, pull horizontally. Adjust the
spring bracket to obtain reading of 1 to 1-1/2 0zs.

64. RIGHT FUNCTION PULL BAR SPRING BRACKET - Fig. 43. Place the
main ball in its lowest position. Hook scale over the code bar
locking lever in line with #1 code bar and pull horizontally.
Adjust the spring bracket so that 5 to 6 0zs. pull will start
the lever moving.

65. BELL HAMMER ECCENTRIC SCREW - Fig. 44. Set up the bell selection
and run the ball to its highest position. Adjust the eccentric
screw for .045" to .075" clearance between the post for alignment
of the end of the pull bar toe with the outer edge of the
eccentric screw.

66. BELL HAMMER SPRING TENSION - With the bell hammer lip resting against the post, attach scale to the threaded end of the bell hammer eccentric screw and pull upward. 2 to 2-1/2 ozs. should start the hammer moving.

67. BELL ADJUSTMENT - Position the bell so that its lower edge clears the bell bracket .010" to .020". There should also be at least .004" clearance between the side of the bell and the tape chute.

(MOUNT THE INTERMEDIATE GEAR ASSEMBLY)
(PLACE THE ASSEMBLED TYPING UNIT ON THE KEYBOARD)

68. MOTOR SPEED - For printer motors equipped with governors check the speed with tuning fork. If the target spots appear to move in the direction of rotation of the transmitting shaft, the motor is fast and should be decreased by pressing the governor adjusting bracket against the governor adjusting wheel. If the spots appear to move in the opposite direction the motor speed is slow and should be increased by operating the adjusting lever which is fastened to the top of the motor frame next to the governor.

69. MAIN BAIL CAM CLUTCH TORQUE - Fig. 45. Remove the intermediate gear guard and the tape container. Run the motor at
least 10 minutes with the main shaft held stationary. Press the main ball down in order to move the main ball roller away from its cam and hook scale into screw hole on the top of the cam. Pulling at right angles to the radius should require 18 to 24 ozs. to start the cam moving opposite to its normal direction of rotation.

SELECTOR CLUTCH TORQUE — Fig. 46. Run the motor at least 10 minutes with the main shaft held stationary. Hook scale to the selector cam sleeve stop arm and release the main shaft.

MAIN BALL SPRING TENSION — Increase the main ball spring tension until printing fails then increase the tension until a good copy is obtained without embossing the paper. (REPLACE THE GEAR GUARD)

(REPLACE THE RIBBON)
Note this point. Then shift the range finder to the high-
est position on the scale at which printing is correct. Set the range finder midway between these two limits. Now range
the armature spring, finding the two limits of tension at
which printing is correct and set the tension in the center
of this range. Then recheck the orientation range.
Printers with range finders scaled from zero to one hundred must develop at least sixty-five points on current of approximately
fifty-five milliampere flowing in the circuit. The lower limit of
checked on a local test circuit with current at 85
range should be at 20 on the scale and the high limit at 85
or above. The following table gives the equivalent values
of the new and old type range finders:

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<table>
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<tr>
<td>65.0</td>
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<td>85.0</td>
<td>90.0</td>
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COPY - Check tape container, tape tension spring and roller and tape guide tube, adjusting them to prevent any drag on the tape. Depress the letter "N" key. Hold keyboard clutch throw out lever operated allowing "N" to print continuously for several revolutions of the platen. Observe the spacing between characters and if not uniform refine the spacing mechanism adjustments. Print all letter characters several times separated by "N" thus, "NANANANANBNNBNNNCNCCNCDNDNDNDN etc." Bend the "N" type bar near the segment to obtain uniform spacing with the majority of the characters. (use pliers or bender to hold and another plier or bender to bend the pull bar.) Then bend the type bars of those characters that do not space properly. Check spacing of figure characters separated by letter "N". To correct these hold the type bar near the slug or pallet and bend only the upper portion of type bar so as not to change the position of the letter character. If a character prints heavier on one side than the other or if it leans toward one side, hold the type bar near the pallet and bend upper end of the bar in the proper direction to correct. Should either the top or bottom of a character print too heavily it will be necessary to unsolder and reposition the pallet. Align the characters horizontally by
unsoldering the pallets where necessary and moving them on the type bar so that printing is in the center of the tape with the bottom of the letters in line.

75. TYPE BARS - MOVEMENT - Check freeness of each type bar by pulling it down until the pallet touches the platen. When released it should return quickly to the unoperated position against the leather back stop. When a new type bar is installed it may be necessary to grind down and polish that portion fitting in the segment slot to prevent binding.

(To remove a type bar take the carriage front bracket off and remove the carriage assembly. Rotate the type bar forward and lift the pull bar until the teeth of these members are disengaged. Then unhook the type bar from the fulcrum rod and remove from the segment. To replace, lift the pull bar a short distance and hook type bar over fulcrum rod. If the teeth mesh properly the top of the pull bar will line up with the other pull bar tops and the type bar will rest against the leather back stop)

76. GOVERNOR ADJUSTMENTS -

a. SPEED ADJUSTING WHEEL FRICTION WASHER SPRING PRESSURE -

FIGS. 3 and 5. - Remove the governor guard and the
governor cover. Attach scale to the contact spring next to the contact and while pulling parallel to the speed adjusting spring regulate the speed adjusting wheel for 13 to 14 ozs. contact pressure. Then place a bank pin radially in the leather of the adjusting wheel and hook the scale over this. Pull of 8 to 16 ozs. should start the wheel moving. To correct, remove the friction washer and bend its projections.

b. GOVERNOR BRUSH SPRING TENSION - Fig. 4. (The brush holder bracket must be removed to check this adjustment). Press the scale against the end of and in line with the brush. 3 to 4 ozs. pressure should permit the brush to protrude .015" to .050" from the brush holder.

c. GOVERNOR BRUSH POSITION - Fig. 4. Locate the brush holder bracket on the base so that the brushes project from the brush holder .015" to .050" and ride in the center of the collector rings.

77. MOTOR ADJUSTMENTS

AC SERIES AND DC MOTORS - Keep the commutator free of oil and grease. Do not remove the brownish discoloration, however, if there is any appreciable sparking the commutator may be sanded with a very light grade of sandpaper. Remove and clean the brushes and brush holders. Replace each brush in the holder from
which it was withdrawn and in its original position. When
installing a new brush the end that bears against the com-
mutator must be sanded to the curvature of the commutator.
To install Fibre Guard Washers, Cat. #83129, take out the
motor brushes and remove the motor armature. Loosen set
screw and remove brush holder rings. Place a guard washer
with its long end up on each brush holder. Replace the
brush holder rings, clamping the guard washers against the
fibre bushings in the frame and tighten the set screws. Re-
place the armature and brushes.
SYNCHRONOUS MOTORS HAVING A SINGLE STARTING CONTACT - (The
following adjustments should be checked when it is believed
that the starting switch is out of order and when the motor
is dismantled for complete overhauling. The starting switch
failing to close fully may prevent the motor starting or it
may run backward. If the switch fails to open, the starting
winding will burn out)
a. CENTRIFUGAL WEIGHT SPRING TENSION - Fig. 1, EE 251 - Remove
the motor pinion and handwheel. Take out the switch and
shield screws and pull the shield out about half an inch.
Remove the two switch mounting screws noting the number and
thickness of the shims at each end of the switch bracket. Remove the end shield. Remove the centrifugal weight springs. Hold one end of spring stationary, hook scale in other end and pull until spring measures 1-3/4" over all. Reading should be 3-3/4 to 4-1/4 ozs. Check the centrifugal push collar and weights for freeness.

b. STARTING SWITCH CONTACT SPRING TENSION - Fig. 1. With this contact resting against the backstop hold the bracket so that the contact spring clears the rotor shaft and the centrifugal push collar. Hook scale over the contact spring just below the backstop and pull at right angles to the spring. 1/2 to 1 oz. pull should start the spring moving away from the backstop. Bend the contact spring to meet this requirement. Replace the centrifugal weight springs, also replace the switch end shield on the shaft. Assemble the starting switch on the end shield. See that the shim pile-up is equal on both sides of the switch bracket. Then tighten the two switch mounting screws, each a little at a time until both are tight. Check for fibre washer between rotor and the pinion and shield. Replace the switch end shield mounting screws and tighten in the same manner as used in tightening the switch mounting screws.
c. STARTING SWITCH CONTACT BRACKET ADJUSTMENT - Fig. 2, EE-251.
To make this adjustment the motor must be supplied with
110 volts DC and connected through 800 ohm resistances as
shown by figure 2, and with a milliammeter across the start-
ing contacts. Also required is a collar which can be placed
on the switch end of the rotor and fastened with set screws.
Collar #32262 may be used or a similar tool may be construc-
ted locally.

(1) Fasten the collar on the switch end of the rotor shaft so
that it clears the motor end shield 1/32". Hold the shaft
with the collar against the end shield and slowly rotate
the rotor one complete revolution while watching the test
set meter. If the start contacts remain closed the meter
reading will be zero. Should the contacts open, shims
must be added between the starting switch bracket and the
motor end shield.

(2) Relocate the adjusting collar so that it clears the motor
end shield by 1/16". Again press against the end of the
rotor shaft until the collar is against the end shield and
rotate the shaft one revolution. The contacts should remain
open, giving a meter reading of not less than 100 miles.
An interruption of the current flow indicates closing of the starting switch.

**NOTE:** The shim pile-up should be equal at both ends of the switch bracket. Shim may be obtained in 1/64", 1/32", and 3/64".

Removal of the adjusting collar from the shaft requires at least 7 lbs. pressure to start the shaft moving. Replace the motor pinion and fan or handwheel.

**REQUITE - FIG. 1.** Remove the motor pinion and handwheel. Remove the switch distance and thickness of the shaft and motion the shaft mounted screws. Pull the end shield out of the bracket. Unsolder the ball bearing tools #21550.

Carefully remove the starting switch. The starting mechanism may now be removed by removing its two mounting screws.

**TO ASSEMBLE THE STARTING MECHANISM -**
Fig. 1. Replace the centrifugal mechanism and mounting screws making sure the insulator is in place. Place the push collar fibre washer on the shaft in front of the push collar. Place the rotor partly in the stator with the switch end projecting out of the frame. Replace the starting switch on the shaft and against the push collar fiber washer with the contact spring toward the rotor. With the starting switch contact points in the upward position solder the two wires that are tied together to the upper terminal of the starting switch. After applying grease to the bearing replace it, using bearing tools #21550. Place a felt washer, then a retaining washer in the switch end shield. Slide the switch end shield over the rotor shaft inserting the ball bearing into its recess in the shield. Tighten the mounting screws each a little at a time until fully tightened. Check shaft rotation for binds. Also check the preceding starting switch adjustment.

g. TO REMOVE AND REPLACE THE BALL BEARING AT THE PINION END OF THE ROTOR - Remove the handwheel or fan. Remove the motor pinion and the end shield at that end of the motor. Using bearing tools #21550 remove the bearing. After greasing,
replace the bearing using the above bearing tools. Assemble in the pinion end shield recess the following in this order, felt washer, cup washer, thrust spring and thrust spring washer. Slide the end shield into position and tighten the mounting screws as described in paragraph (f) above.

SYNCHRONOUS MOTORS HAVING A THREE BRUSH STARTING SWITCH - (Check these adjustments when the motor is being overhauled or when trouble with the starting switch has developed) Remove the handwheel, motor pinion, switch commutator mounting screws and the switch end shield. Pull out the rotor until the brush holder spring is accessible and remove the spring.

h. BRUSH HOLDER SPRING TENSION - Hold one end of the spring stationary and hook scale in the eye at the other end and pull the spring to an over-all length of 5 inches. For 60 cycle motors the scale should read 3 to 3-3/4 ozs. For 50 cycle motors the reading should be 1-1/2 to 2-1/2 ozs. See that the brush holders are mounted by means of the center set of mounting holes and are free. Also see that the brush holder stop pins are safely within the holes of the fibre disc when the brush holders are held so that engagement of the pins with the disc is a minimum.
Replace the brush holder spring. Replace the switch commutator screws and the switch end shield screws and tighten as described in paragraph (f).

i. ROTOR THRUST SPRING TENSION - This adjustment is same as given in paragraph (f)

Replace the motor fan or handwheel and the pinion.

j. SYNCHRONOUS MOTORS-WIRING REPAIRS - When the insulation of the internal leads between the stator and starting switch become defective unsolder the wires at the switch and strip off the insulation. Place "Isolantite beads #1116" over the entire length of the bare wire and re-solder to the switch. Replace the external lead from the switch with "#18 gauge art silk covered single conductor Deltabeston stranded fixture wire, type AF"

Repair the external lead from the stator by removing all of the insulation and covering the entire lead with "#11 black flexible, impregnated, varnished tubing." A more permanent repair can be made by cutting off the stator wire about 3" from the stator winding, stripping the insulation from this section, then covering the bare wire with five isolantite beads. After this, splice and solder a piece of the above deltabeston wire
to the short section, covering the splice with one layer of rubber tape and two layers of friction tape.

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KEYBOARD BASE ADJUSTMENTS

78. CLUTCH SPRING COMPRESSION - Fig. 68. Hold the transmitter shaft so that the clutch teeth are almost fully engaged with their faces just separated. Hook scale over the projection of the driven clutch member and pull in line with the shaft. 9 to 12 ozs. pull should start movement of the driven member. (9 ozs. adjustment preferred)

REPLACE THE TRANSMITTING SHAFT AND BRACKET

79. TRANSMITTING SHAFT REAR BEARING ADJUSTMENT - The rear bracket must be positioned to allow the shaft to revolve freely. Adjust the rear bearing nuts for .002" end play of shaft.

ATTACH THE TRANSMITTING SHAFT GEAR.

MOUNT THE TRANSMITTING CONTACT ASSEMBLY ON THE BRACKETS AND SOLDER WIRE CONNECTIONS. - Do this after contacts have been cleaned, kinks removed from the contact springs and backers and a slight bow made in them to provide sufficient pressure
at the contacts.

REPLACE THE KEY LEVERS AND THE KEY LEVER SHAFT (if previous-
ly removed) SELECTOR BAR ASSEMBLY AND UNIVERSAL BAR AND
BRACKETS. Restore the shims that were removed from under
the brackets. Selector bars should move freely, bend slightly-
ly if necessary to provide maximum side play of the bars in
the bracket slots.

UNIVERSAL BAR PILOT SCREW ADJUSTMENT - If the keyboard is
equipped with these screws adjust them so that the keyboard base
pawl is approximately in the center of the universal bar to .004", to
.015". REMOVE THE FRONT KEY LEVER GUIDE, CLEAN AND REPLACE. (It is
unnecessary to remove this guide unless key levers were not
taken out. In which case, while guide is off, clean that
part of the key spacer bar and loop - remove the spacer key
lever spring and tighten the left bearing post nut only. The
spacer bar should drop freely when raised to its highest
position and released. Tighten the middle and then the
right post nuts checking after each operation for free movement of the spacer bar. Replace the key lever spring.

REPLACE THE INTERMEDIATE PAWL
REPLACE THE TRIP-OFF PAWL AND SPRING.

81. LOCKING LEVER SHAFT ADJUSTMENT - Fig. 65. Place the contact levers on the high part of their cams and the locking levers to the spacing position. The clearance between the bottom surface of the locking lever toes and the top of the contact levers shall be .002" to .008". Adjust height of the locking lever shaft to meet this requirement.

82. LOCKING LEVER TRAVEL - Fig. 65. With the lock loop roller resting on the low part of its cam, check the clearance between the side of the lock loop blade and all locking lever fingers. Clearance should be at least .010", when the locking levers are held in the marking and spacing positions by the "letters" and "blank" key levers. Loosen the main bracket mounting screws and shift the bracket to correct.

83. LOCK LOOP ROLLER ADJUSTMENT - Fig. 65. (This applies only to keyboards having an elongated hole for the lock loop roller pivot screw) Place the transmitting cam assembly at the stop position with the clutch teeth disengaged. Press the roller against the
cam to insure the cam being at the stop position. Move the locking lever fingers directly under the lock loop blade. The blade should clear the tops of the fingers .008" to .015". Adjust by positioning the roller pivot screw in the elongated mounting hole.

84. **LOCK LOOP SPRING TENSION** - Fig. 65. Place the lock loop roller on the low part of its cam. Hook the scale in the lock loop spring hole and pull in line with the spring. A pull of 4 to 5 ozs. should start the lock loop moving.

85. **CLUTCH THROW-OUT LEVER ADJUSTMENT** - Fig. 60. Move the transmitting cam assembly to the stop position (make certain that the clutch is fully disengaged) Place the required number of shims between the clutch throw-out lever post and the bracket to obtain .005" to .015" separation of the teeth of the clutch members. This adjustment may be refined by shifting the position of the driving clutch member on the shaft.

86. **CLUTCH THROW-OUT LEVER SPRING TENSION** - Rotate the transmitting cam assembly beyond the stop position allowing the clutch throw-out lever to rest against the low part of the driven clutch member. Attach scale at the throw-out lever spring hole. While holding the intermediate pawl against its eccentric...
TRANSMITTING CONTACT GAP AND SPRING PRESSURE - FIGS. 65 & 67

1. Start the throw-out lever moving. (1-1/2 oz. preferred)

2. Place the locking levers in the spacing position.

3. Bend the lower part of the cam assembly opposite to the hump of the cam assembly. Bend #1 front contact spring to obtain contact gap of .015" to .020" (gap will permit .015" gauge to pass freely, .020" gauge will not). Adjust gap of the cam assembly to 3, 4 and 5 contacts in a similar manner, rotating the hump of the cam to pass through freely, .020" gauge when the cam assembly is at its starting position.

4. Adjust the lower part of the cam assembly in the marking position (to the left). Rotate the cam assembly until the contact lever hump on the high part of the cam assembly is at the marking position. Place all locking levers to the marking position. Adjust the cam assembly with hump in the low part of the cam.

5. Limit the contact lever by adjusting the stop contact. Adjust the back contact spring in a like manner.

This should be 4 to 4-1/2 oz. Adjust the remainder of the contact springs in a like manner.

87.
manner. Recheck and adjust the contact gaps. See Paragraph 105 for additional adjustment of the start-stop contact gap.

88. **Typing Unit Slip Connections Spring Tension** - Bend the slip connections spring at each end of the slip connections block so that the crimped part of the spring is 7/16" to 15/32" from the block mounting post. Place a straight edge lightly against the high part of the crimp in these two springs and adjust the others so their crimped portions are within .015" of the straight edge.

REPLACE THE SLIP CONNECTIONS GUARD.

89. **Line Jack Spring Tension** - Apply the scale to the curved part of the jack spring. 1-1/2 to 3 lbs. pressure should open the jack .030".

REPLACE THE GEAR GUARD AND BELL HAMMER SPRING.

90. **Gear Guard Adjustment** - Fig. 62. Position the gear guard for .002" to .004" clearance between the bell hammer and the bell operating post, when the bell hammer is held in its locked position by the locking pawl.

91. **Bell Adjustment** - Fig. 63. Adjust the position of the bell so that there is .001" to .004" clearance between the bell and bell hammer when the latter is in the unlocked position.
92. **BELL HAMMER EXTENSION STOP ADJUSTMENT** - Fig. 62. (The tape reel container should be removed to check this adjustment) Position the bell hammer extension stop to obtain .020" to .040" clearance between the lower side of the bell hammer extension and the bell hammer extension stop. (With the locking pawl engaging the bell hammer extension)

93. **BELL HAMMER SPRING TENSION** - Fig. 62. (The tape reel container should be removed to check this adjustment) With the bell hammer resting against the gear guard, hook scale in the spring hole and pull in line with the spring. 3 to 5 ozs. pull should start the hammer moving.

94. **TAPE LEVER SPRING TENSION** - (The tape reel container should be removed to check this adjustment) Remove the locking pawl spring. With the front edge of the locking pawl against the casting, hook scale in the pawl spring hole and pull at right angles to the front edge of the pawl. Scale should read 3-1/4 to 4-1/4 ozs. when the pawl and tape lever start to move.

95. **LOCKING PAWL SPRING TENSION** - Fig. 64. Allow the locking pawl to rest against the face of the bell hammer extension and hold the tape lever down. Attach scale in the spring hole. 1/4 to 3/4 ozs. pull in line with the spring toward the front should
start the pawl moving.

96. SELECTOR BAR HEIGHT - Height of the selector bar assembly shall be set so that the selector bars will start to move immediately after any key lever has been started downward, and there must be sufficient clearance between tops of the selector bar combs and bottoms of key levers that the latter will not obstruct movement of the selector bars. To adjust, place shims between the selector bar brackets and the keyboard casting. To check clearance, depress various keys at each side of the keyboard and while holding each down try all other keys. It will be impossible to move keys where there is no clearance. Adequate clearance is indicated if it is possible to move every key a short distance before the key levers strike the selector bar combs.

REPLACE THE TAPE GUIDE TUBE
REPLACE THE TAPE CONTAINER.

97. TAPE LEVER ADJUSTING CLAMP - Fig. 61. (The keyboard base cover should be removed to check this adjustment) Position the adjusting clamp so that there is a clearance of 1/4" plus or minus 1/32", between the tape lever roller and the
tape roller, with the locking pawl touching the front of the bell hammer extension and the play of the bell hammer taken up in a direction away from the bell. (Make sure that the locking pawl bushing has no end play on shaft after clamping screw is tightened)

PLACE TYPING UNIT ON THE KEYBOARD BASE.

98. CLUTCH THROW-OUT LEVER ECCENTRIC ADJUSTMENT - Fig. 60. Run motor and depress key levers slowly. Adjust the clutch throw-out eccentric so that the clutch trip off occurs and the cam assembly starts rotation when the locking lever fingers have just passed the knife edge of the lock loop. The trip off must take place before the key lever stroke is finished. Try all keys. If the trip off occurs too early the lock loop will obstruct movement of the locking levers or the knife edge will strike the tops of the locking lever fingers. If too late the keyboard action will be slow. When adjustment of the eccentric will not permit proper positioning of the locking levers at the time of trip off, shims should be added or removed as required between the universal bar brackets and the selector bar brackets.

99. INTERMEDIATE PAWL ECCENTRIC ADJUSTMENT - Fig. 60. With the
clutch throw-out lever resting on the low part of the driven
clutch member 0.050" from the surface of the driven member.

100. TRIP-OFF PAWL ECCENTRIC ADJUSTMENT — Fig. 60. Turn the trip-
off pawl eccentric screw to its highest position. The screw
will result in repeated printing of that character. Then
turn the eccentric screw clockwise until the trip-off pawl
will just pass the toe of the intermediate pawl upon opera-
tion of the key lever. Depress each key very slowly and if
repeated characters result due to the slow key action turn
the trip-off eccentric further in a clockwise direction to
eliminate. TRY ALL KEYS.

101. TRIP-OFF PAWL STEP PLATE — Fig. 60. Position the stop plate
to obtain "050" to "060" clearance between the toes of the
intermediate and trip-off pawls, with the trip-off pawl
against the stop plate and the front arm of the intermediate
pawl against its eccentric screw.
spring shall have the minimum amount of tension that will re-
turn the trip-off pawl quickly to the unoperated position.

103. KEY LEVER SPRING TENSION - Unhook the trip-off pawl spring and
depress each key to position the selector bars before checking.
Bend the key lever springs so that the levers will not operate
when a 15 gram weight is placed on the key top but will start
to move downward with a 20 gram weight on the key top. The
spacer bar should start to operate on 35 grams and not operate
on 20 grams.

104. TAPE GUIDE TUBE ADJUSTMENT - Position the right hand end of the
tube 1/32" from the outside edge of the keyboard and fasten with
the clamping screws so that it aligns with the right tape guide.

105. REST OR START-STOP CONTACT GAP - The printer range limits may be
shifted to some extent to new positions on the orientation scale
by increasing or decreasing the start-stop contact gap. In no
case should the gap be made less than .005" or more than .040".
The purpose of this adjustment is to match the range limits of
all keyboards. (If possible, check the keyboard being adjusted
against a keyboard known to produce normal range.)
SAME BASIC TABLE IS USED WITH OTHER WIRING CABINETS TO FORM VARIOUS OPERATING TABLES — AS 124, 224, 324, ETC.

RIGHT FRONT END EXTENSION 20" X 14" REMOVED

WIRING CABINET 1-8

FOR OPERATION WITHOUT LINE RELAY

TELEGRAPH TABLE 1-4

40 1/2" X 21" X 30 1/2"
SAME BASIC TABLE IS USED WITH OTHER WIRING CABINETS

WIRING CABINET 2-P

REMOTE PHONE AND EXTENSION 27" X 1.5" REMOVED

4-PH. X 27" X 240"
Terminal Duplex Table Half Set 12A

Teleprinter Table 83-A

Composed of basic 30 type table with strip 40" x 6" loaded to rear, wiring cabinet TYPE 2A converted into wiring cabinet 12A for self-printer operation.
TELEPRINTER TABLE 918

WIRING CABINET 1-5
(ALONG RIGHT END CONTAINING CALL-SIGNAL
    MOTOR-CONTROL UNIT 1-5

COMING DESK 4-A WOULD BE USED WITH THIS TABLE

TAPE BOX 8-A REMOVED

FOR USE IN PRIVATE AND PUBLIC BRANCH OFFICES
AND POLAR RELAY 21-5-A
MOUNTING PLATE E23-A, CONNECTING BLOCK 1A-B.
COVER PLATE 700-A IS REMOVED TO PROVIDE FOR
WHEN OPERATION WITH LINE RELAY IS REQUIRED.
TABLE 610-A BEING REDUCED IN LENGTH TO 204-7
(TABLE 610-C IS 207/8 x 277/8 X 277/8 DECREASED FROM
EUMING DECK (p1) 1-C
277/8 x 277/8
TELEPHONE TABLE (p1) 610-A

AS USED WITH FACE TELEPHONE
LESS EUMING DECK (p1) 311-A
WARRANTY PANEL 261-A
277/8 x 207/8
TELEPHONE TABLE (p1) 262-A
EXTENSION AT REAR 20" x 6" x 21\frac{1}{2}"

FOR SPROCKET FEED TYPE 100 PAGE TELEPRINTERS

CONSOLES TYPE 1 USED FOR FRICTION FEED OPERATION

AND RIGHT HAND CABINETS FOR SPECIAL REQUIREMENTS

WIRING CABINET 30-A (LEFT HAND) FOR REGULAR TEL-LINE OPERATION, VARIOUS WIRINGS FOR LEFT HAND
NOTE: ANY OF THESE WIRING CABINETS IS A 2-O CABINET WITH A RECTIFIER.

2-O'S MAY BE WIRED WITH A SELECTOR.

SELECTOR. WHICH IS A 2-O CABINET WITH A RECTIFIER.

32-A SAME AS 31-B, BUT USING 2-P WIRING CABINET.

BREAK SIGNALS.

32-P SAME DIMENSIONS AND CONSTRUCTION AS 31-B.

TO TOP OF CABINET.

32-A SAME AS 31-B, WITH RECTIFIER ADDED FOR USE.

31-D SAME AS 31-E, EXCEPT POWER SWITCH RELOCATED.

TO TABLE IS FOR TYPE PRINTER USE.

31-B SAME DIMENSIONS AND PLANE AS 31-A, BUT

32-B SAME TABLE AS 31-B, BUT USING 2-D WIRING

SPECIFICATIONS 2-40-2-A.

7-A MAY BE USED WITH THIS TABLE.

CALL SIGNAL MOTOR CONTROL BOXES 2-A, 2-A, 2-A, 2-A.

32-D SAME DIMENSIONS AND CONSTRUCTION AS 32-A

SPECIFICATIONS 1-32-2-D.

CALL SIGNAL MOTOR CONTROL SUPPORT BOX 2-40-2-A.

32-D SAME DIMENSIONS AND CONSTRUCTION AS 32-A.

NOTE: ANY OF THESE WIRING CABINETS 1-32-A, B, C.

7-A MAY BE USED WITH THIS TABLE.

CALL SIGNAL MOTOR CONTROL BOXES 2-A, 2-A, 2-A, 2-A.

32-D SAME DIMENSIONS AND CONSTRUCTION AS 32-A.

NOTE: ANY OF THESE WIRING CABINETS 1-32-A, B, C.
SET-UP. THIS TABLE IS FOR TAPE PRINTER USE. THE CABINET 1-3 IS WIRED PER DWG. 3B209. EITHER 1-3, 2-3, OR 3-3 RELAY UNIT MAY BE USED.

141-A 20" DEEP X 30" LONG. HAS A BLACK COMPOSITION TOP AND COMPOSITION BANDS ON A WOOD BASE. (IN A FEW CASES, A TYPE 41-A TOP HAS BEEN USED ON THIS TABLE.) THIS TABLE IS SIMILAR IN CONSTRUCTION TO 41-A, EXCEPT THAT THE LEGS ARE ROUND, AND THE TABLE HAS A TOBACCO BROWN CRINKLE FINISH. HOLES MUST BE DRILLED IN THE COMPOSITION TOP FOR CLEARANCE OF EQUIPMENT MOUNTING SCREWS. THE TYPE 1-3 WIRING CABINET IS USED. THIS TABLE IS FOR TAPE PRINTER USE.

34-A 66" X 27" DEEP. MADE UP WITH ANGLE IRON FRAME WITH SOLID OR VENEER TOP WITH OR WITHOUT LINOLEUM SURFACE. HAS TWO RELAYS, MISCELLANEOUS SWITCHES, POWER AND TIME STAMP OUTLETS, METER, RESISTANCE BOX, SOUNDER, POLE CHANGER KEY, AND CORDLESS TABLE JACK BOX ON TOP OF TABLE, A TERMINAL BOX CONTAINING RESISTANCES, FUSES, AND TERMINAL BLOCK IS MOUNTED EITHER ON END OF TABLE OR BETWEEN CENTER LEGS. THIS TABLE USED WHERE AMOUNT OF TRAFFIC WARRANTS DUPLEX OPERATION. TABLES ARE WIRED ACCORDING TO SPEC. 1622-D. THE A TYPE IS USED WHERE DC POWER IS AVAILABLE FOR OPERATION OF TELEPRINTER MOTORS, AND THE K TYPE WHERE ONLY AC POWER IS AVAILABLE FOR MOTORS, AND DC IS FURNISHED BY EITHER MOTOR GENERATORS OR RECTIFIERS.

34-AA COMPOSED OF BASIC 30-TYPE TABLE, WITH STRIP 49 3/4" X 8" ADDED ALONG REAR FOR MOUNTING VARIOUS ITEMS OF DUPLEX CIRCUIT EQUIPMENT. WIRING CABINET OF 1-B TYPE USED TO ACCOMMODATE DUPLEX CIRCUIT WIRING. FREQUENTLY USED INSTEAD OF TABLES 34-A AND 34-K; IS WIRED PER DWG. 45,001.

41-A 20" DEEP X 30" LONG. IT HAS A BROWN LINOLEUM TOP ON WOOD BASE, AND METAL BANDED EDGES, METAL FRAMEWORK OF FURNITURE TYPE CONSTRUCTION WITH INITIATION WOOD GRAIN FINISH IN OAK, WALNUT, MAHOGANY, OR PLAIN GREEN. THIS TABLE HAS A 1-3 WIRING CABINET, CONSISTING OF JACK, RELAY MOUNTING, SIGNAL LIGHT RECEPTACLE, PRINTER OUTLET, AND TWO SWITCHES. THE SWITCH ON THE SIDE OF CABINET CONTROLS THE POWER ONLY, AND THE OTHER SWITCH IN TOP OF CABINET CONTROLS SIGNAL AND OPERATING

51-A 24" DEEP BY 49 1/2" LONG. THIS TABLE IS OF SAME CONSTRUCTION AND FINISH AS THE TYPE 41-A TABLES. THIS TABLE MAY BE EQUIPPED WITH 1-B OR 1-C WIRING CABINET. THE LATTER BEING A SMALL CABINET THE SIZE OF TYPE 1-S AND IS WIRED PER DWG. 39942. THE 1-C WIRING CABINET HAS TIME STAMP OUTLET, PRINTER OUTLET, ONE JACK AND ONE POWER SWITCH. THIS TABLE IS FOR TAPE PRINTER USE WITH CALL-SIGNAL MOTOR-CONTROL BOXES OF ANY OF THE TYPES USED WITH 31-A TABLES.

51-B 24" DEEP X 49 1/2" LONG. OF SAME CONSTRUCTION AND FINISH AS THE TYPE 41-A AND 51-A TABLES, BUT USES 1-3 WIRING CABINET. THIS TABLE IS FOR TAPE PRINTER USE.
These tables have the same dimensions and construction as the 91-A table. They are for use with type 27-A printers and the type 91-A table is for use with type 100 page printers. This table is designed to mount in the bottom of the cabinet. It is 29 1/4" X 30" X 30" long. This table is used as a type 27-A wiring cabinet for a type 100 page printer. It uses a 29 1/4" long drawer for mounting the printer. This table is for use with type 27-A printers. It is 29 1/4" X 30" X 30" long. This table is used as a type 91-A table and is for use with type 27-A printers. It is 29 1/4" long. This table is used as a type 91-A table and is for use with type 27-A printers.
COVER PLATE 705-A IS REMOVED TO PROVIDE FOR MOUNTING PLATE 823-B, CONNECTING BLOCK 18-B, AND POLAR RELAY 215-A. (610-C TABLE IS 610-A TABLE REDUCED IN LENGTH TO 202")

CONSOLE 24" X 21½" DEEP X 40" HIGH. OVERALL THE 1-A OR 1-B COVER OF THE PRINTER AND THE TABLE ARE IN ONE UNIT; ALL OF A TOBACCO BROWN CRINKLED FINISH. THIS UNIT WHEN USED FOR TIE LINE SERVICE IS EQUIPPED WITH A 30-A WIRING CABINET, WIRED PER DRAWING #76144, WHICH IS SIMILAR TO THE 1-B WIRING CABINET, BUT HAS AN EXTRA JACK. THIS UNIT IS FOR PAGE PRINTER USE ONLY; THE 1-A CONSOLE ACCOMMODATING THE 101 OR 102 TYPE; THE 1-B CONSOLE PRIMARILY FOR 103 TELEPRINTER BUT MAY BE USED WITH 101 AND 102 TYPES WITH MINOR ADJUSTMENT OF RAILS IN CONSOLE.

CONSOLE 24" X 21½" DEEP X 40" HIGH, BUT WITH AN EXTENSION AT REAR 20" X 6" X 21½". SAME FINISH AND CONSTRUCTION AS 1-A AND 1-B CONSOLES, BUT WITH THE BUILT-IN COMPARTMENT AT REAR FOR SPROCKET-FEED FANFOLD PAPER. USES SAME WIRING CABINET AS 1-A OR 1-B FOR TIE LINE SERVICE. CAN BE ADAPTED TO 101, 102, OR 103 TELEPRINTERS IN SAME MANNER AS 1-B CONSOLE.

NOTE: FOR SPECIAL SERVICES THESE CONSOLES MAY BE FINISHED IN DIFFERENT COLORS, AND MAY USE COMBINATIONS OF SEVERAL DIFFERENT KINDS OF WIRING CABINETS.