

**ST-8000**

**HF MODEM**

**TECHNICAL**

**MANUAL**

**VOLUME II**



**HAL COMMUNICATIONS CORP.**  
**BOX 365**  
**URBANA, ILLINOIS 61801**

ST-8000

HF MODEM

TECHNICAL MANUAL

VOLUME II

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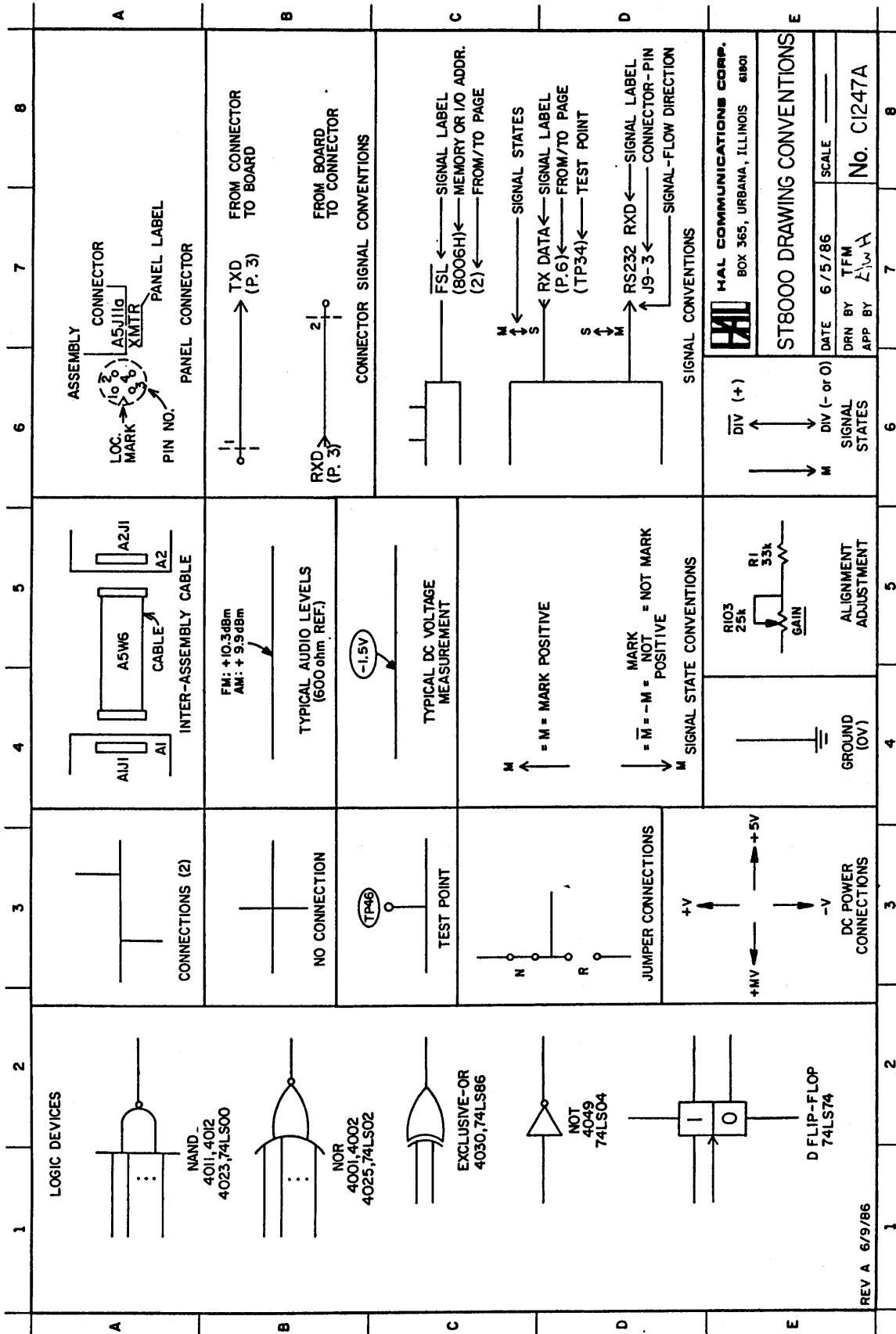
CHAPTER 6  
TECHNICAL DIAGRAMS

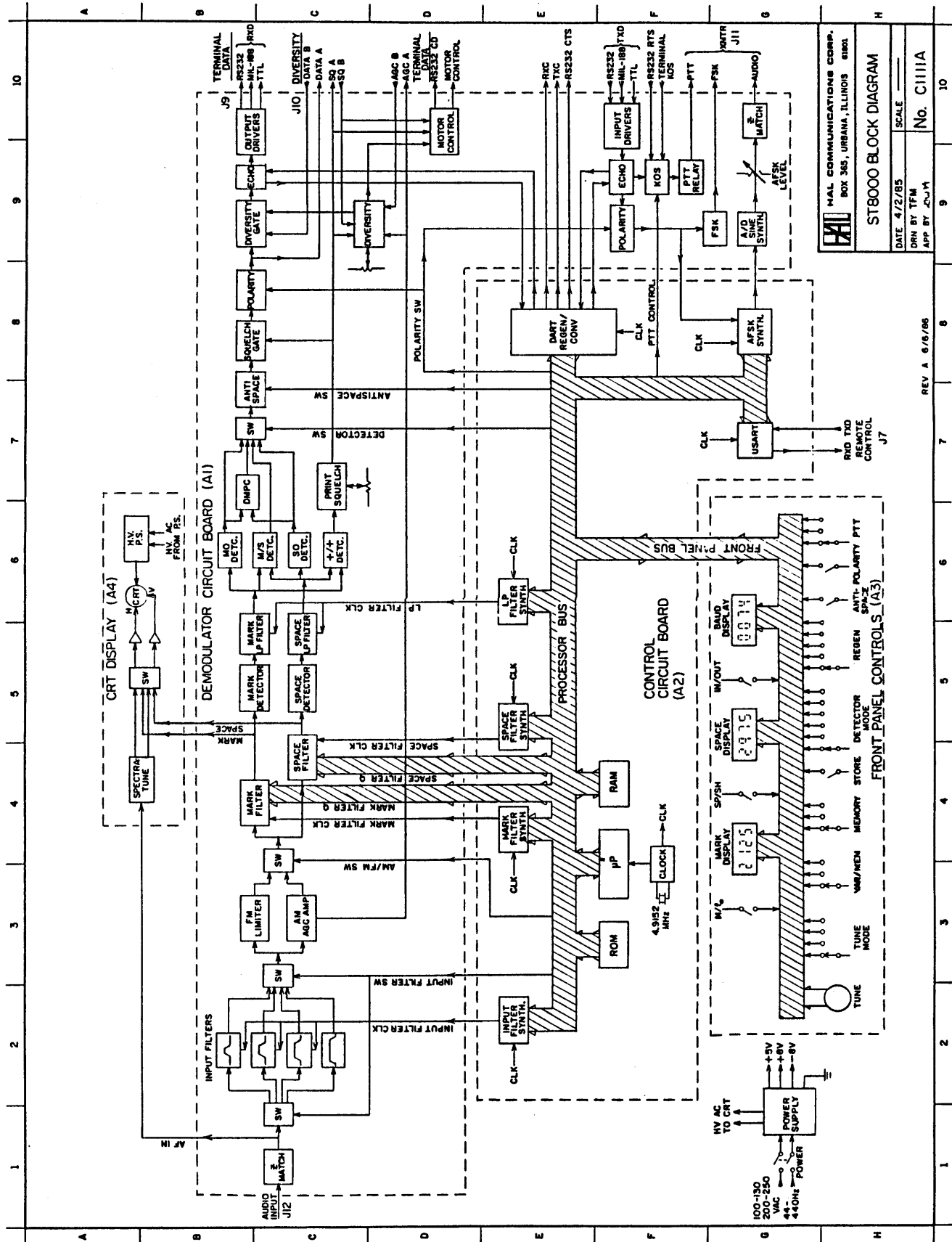
This Volume II of the ST8000 Technical Manual contains all of the schematic and pictorial diagrams for the HF MODEM. The diagrams are arranged on facing pages so that the schematic and its related partial or full pictorial may be studied without turning pages. The following is the cross-reference between Figure numbers in this manual and HAL drawing numbers.

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| 6.32   | A1556   | CONTROL ASBLY - SERIAL, DSPLY I/O SCHEMATIC |
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| 6.34   | A1557   | CONTROL ASBLY - SYNTH. CLOCK SCHEMATIC      |
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| 6.36   | A1558   | CONTROL ASBLY - AFSK SYNTHESIZER SCHEMATIC  |
| 6.37   | C1159   | CONTROL ASBLY - MARK SYNTHESIZER PICTORIAL  |
| 6.38   | A1559   | CONTROL ASBLY - MARK SYNTHESIZER SCHEMATIC  |

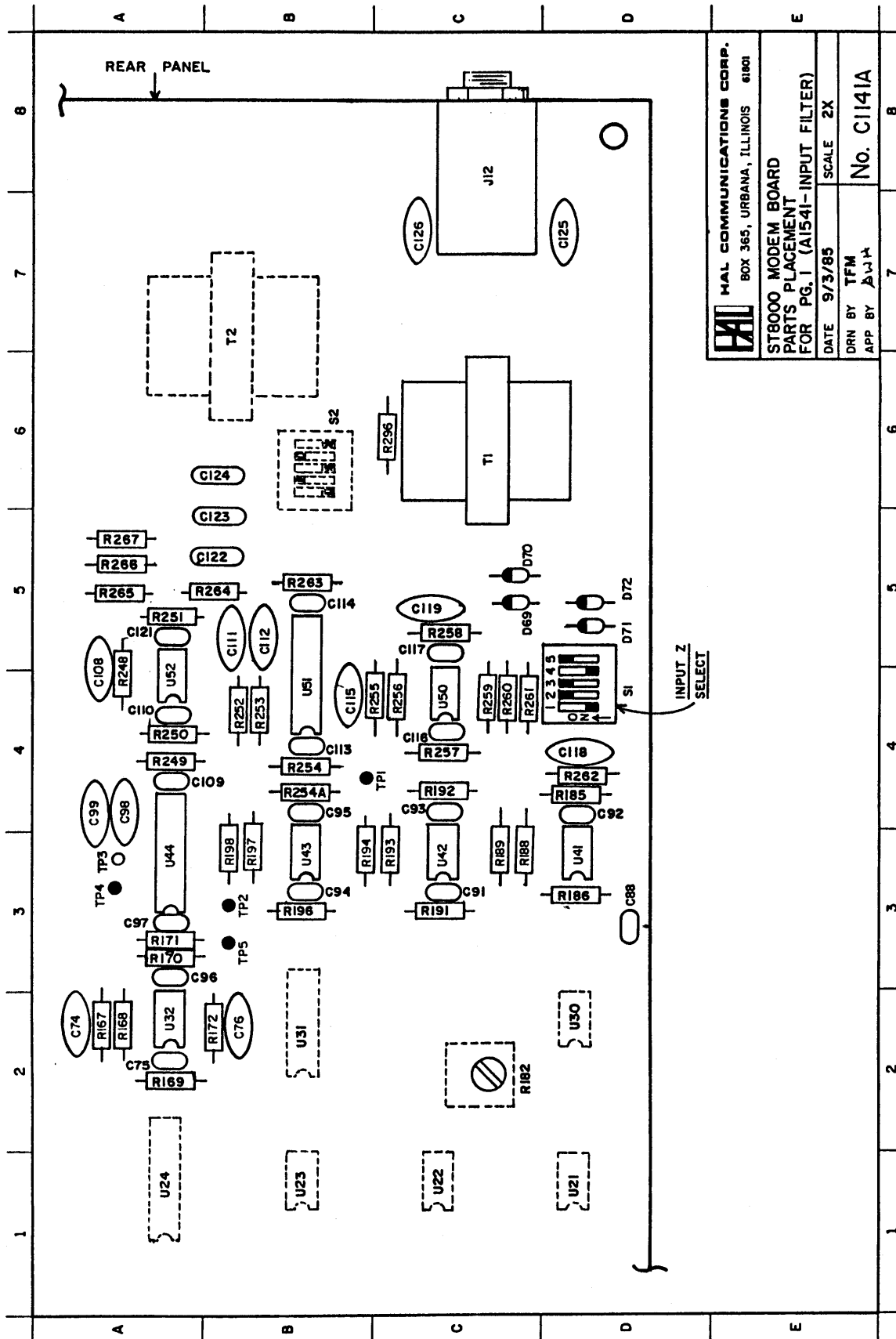


| FIGURE | HAL DWG | DESCRIPTION                                 |
|--------|---------|---|
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| 6.40   | A1560   | CONTROL ASBLY - SPACE SYNTHESIZER SCHEMATIC |
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| 6.42   | A1561   | CONTROL ASBLY - BAND-PASS SYNTH. SCHEMATIC  |
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|                             |            |
|-----------------------------|------------|
| <b>ST8000 BLOCK DIAGRAM</b> |            |
| DATE 4/2/85                 | SCALE      |
| DRN BY TFM                  | No. C1111A |
| APP BY ZGJA                 |            |



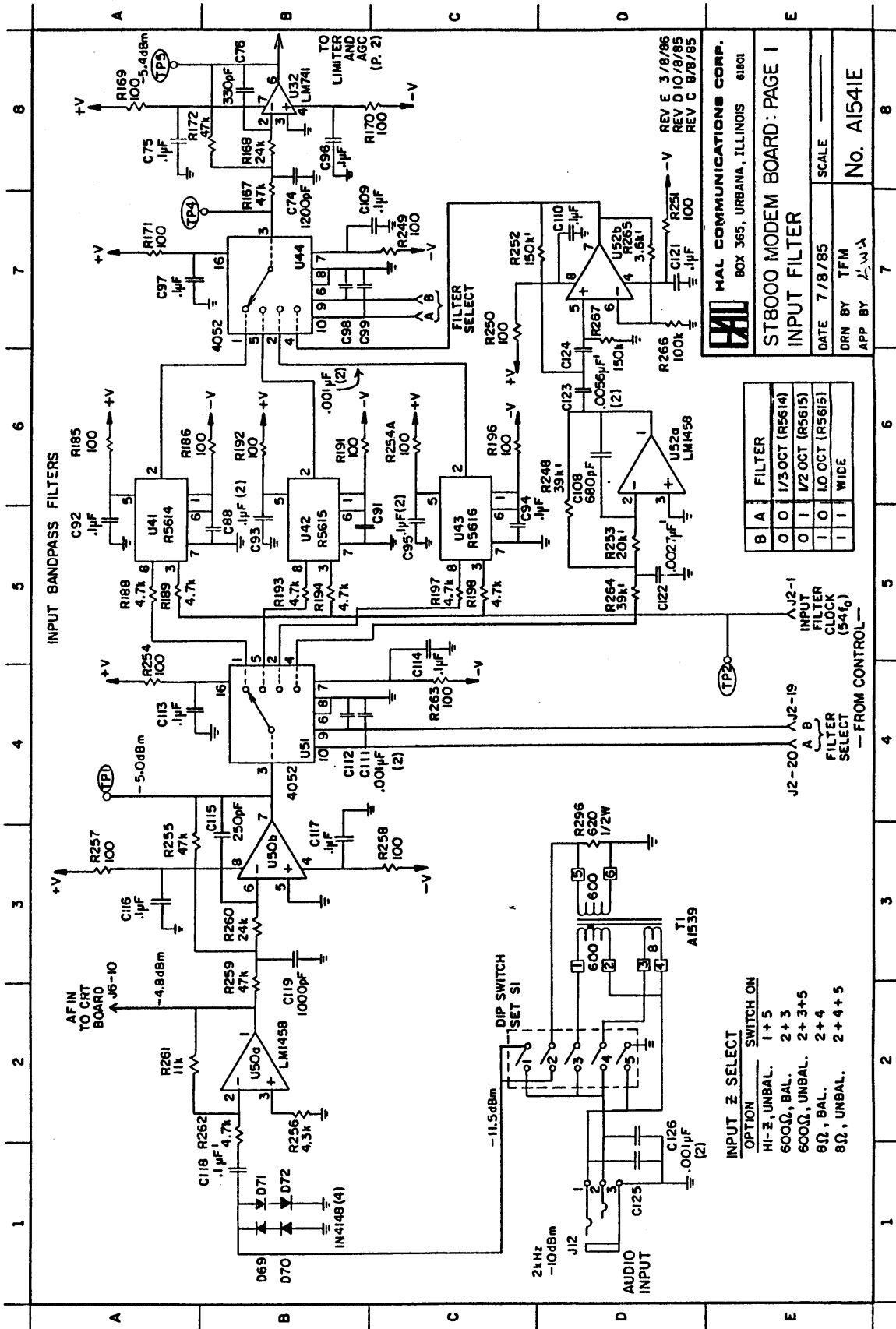
**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801

**ST8000 MODEM BOARD**  
**PARTS PLACEMENT**  
**FOR PG. 1 (A1541-INPUT FILTER)**

DATE 9/3/85 SCALE 2X

DRN BY TFM  
 APP BY A1541

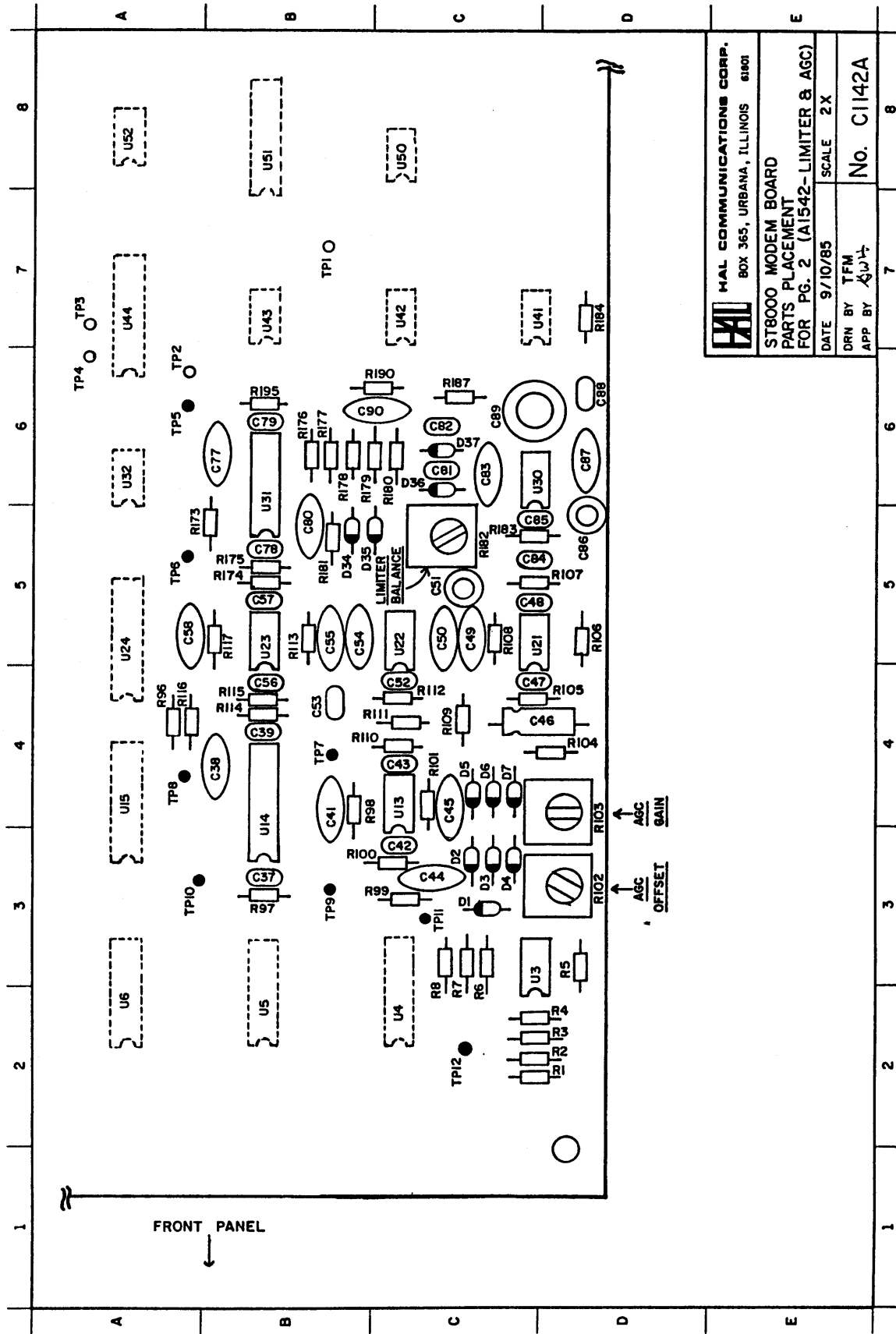
No. C1141A

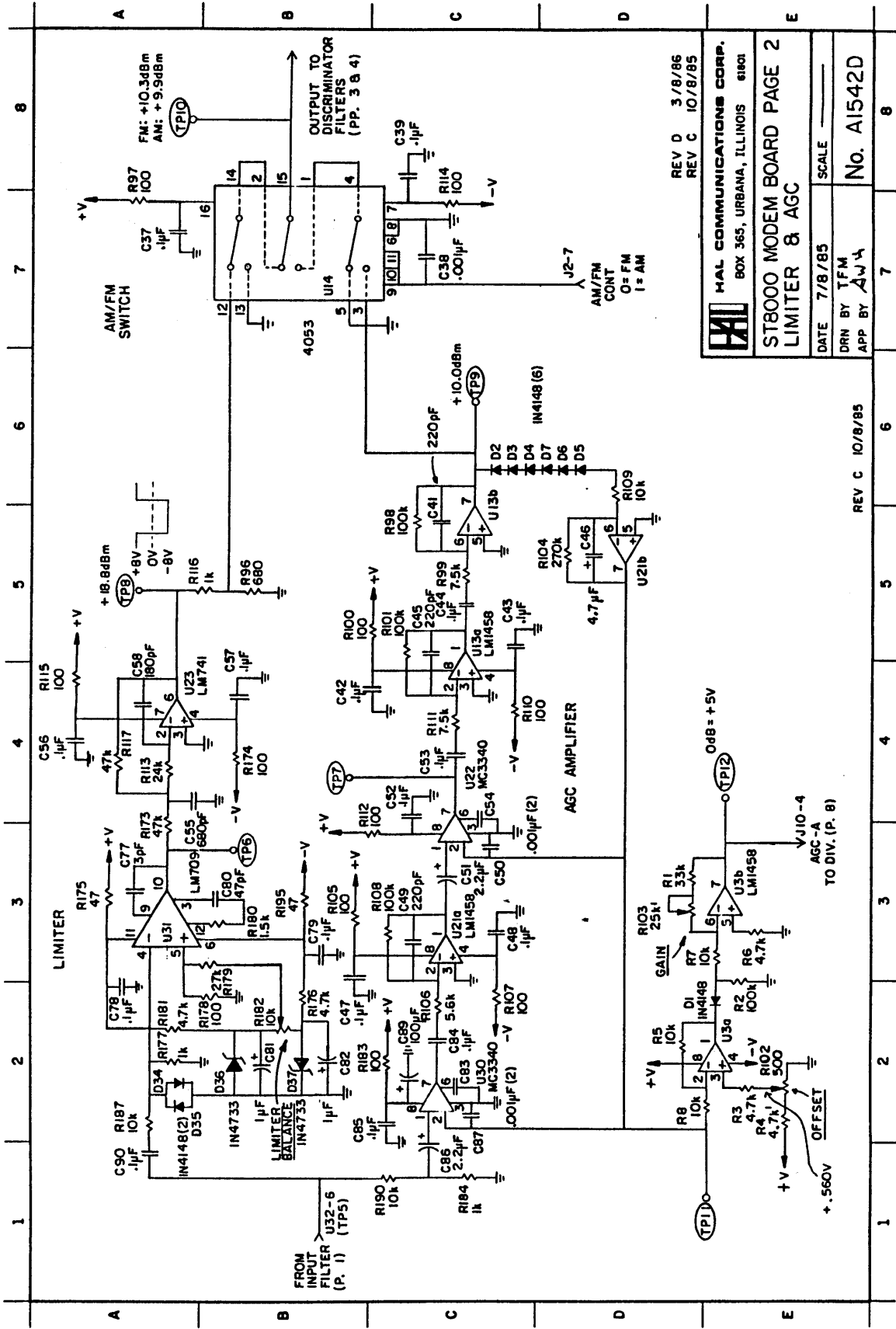



**HAL COMMUNICATIONS CORP.**  
BOX 365, URBANA, ILLINOIS 61801

**ST8000 MODEM BOARD: PAGE 1**  
**INPUT FILTER**

DATE 7/8/85  
SCALE  
DRN BY TFM  
APP BY [Signature]  
**No. A1541E**



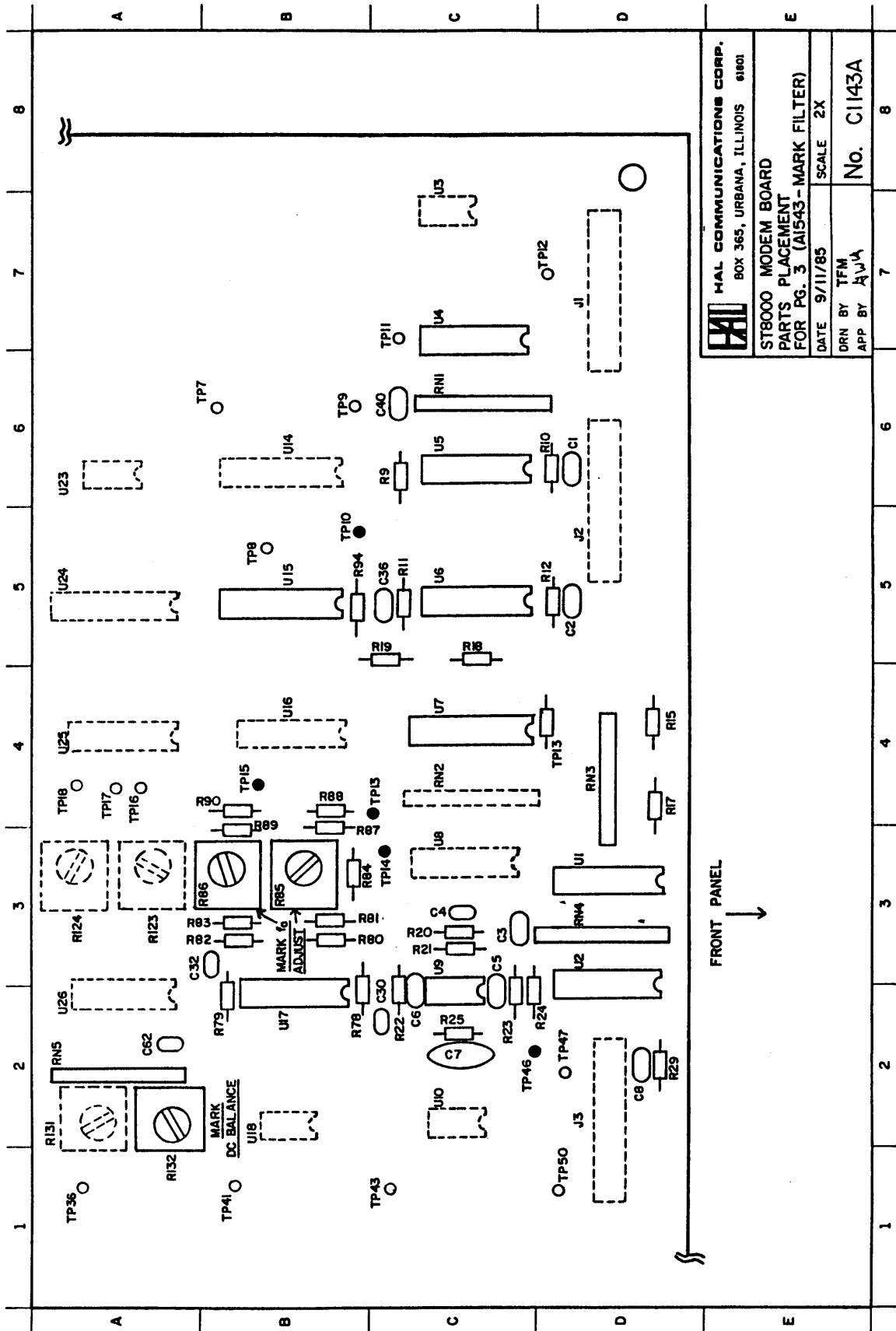



**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801  
**ST8000 MODEM BOARD PAGE 2**  
**LIMITER & AGC**  
 DATE 7/8/85 SCALE \_\_\_\_\_  
 DRN BY TFM  
 APP BY AWY

REV D 3/8/86  
 REV C 10/8/85

REV C 10/8/85

No. A1542D



**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801

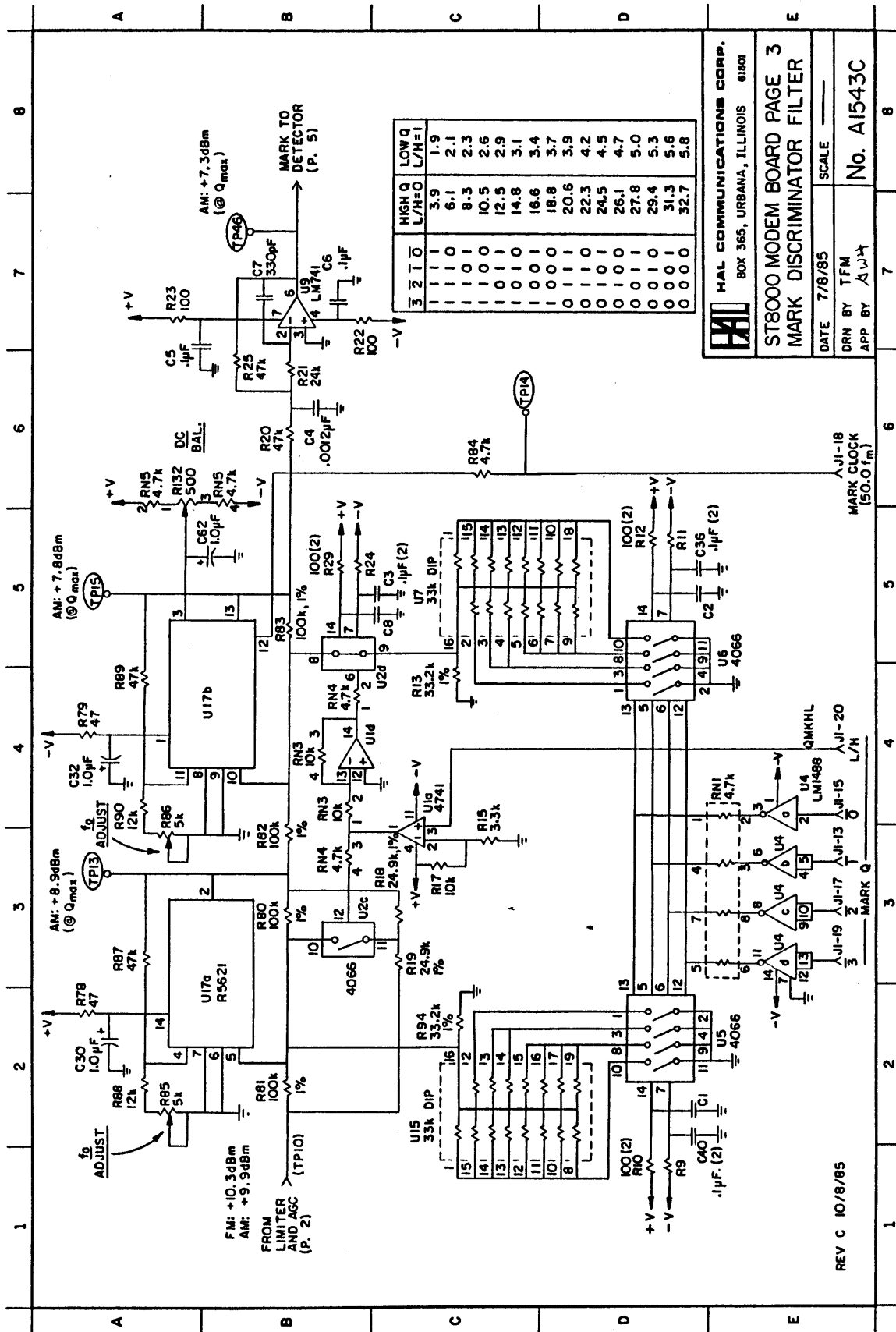
**ST8000 MODEM BOARD**  
**PARTS PLACEMENT**  
**FOR PG. 3 (A1543-MARK FILTER)**

DATE 9/11/85 SCALE 2X

DRN BY TFM  
 APP BY AWA

No. C1143A





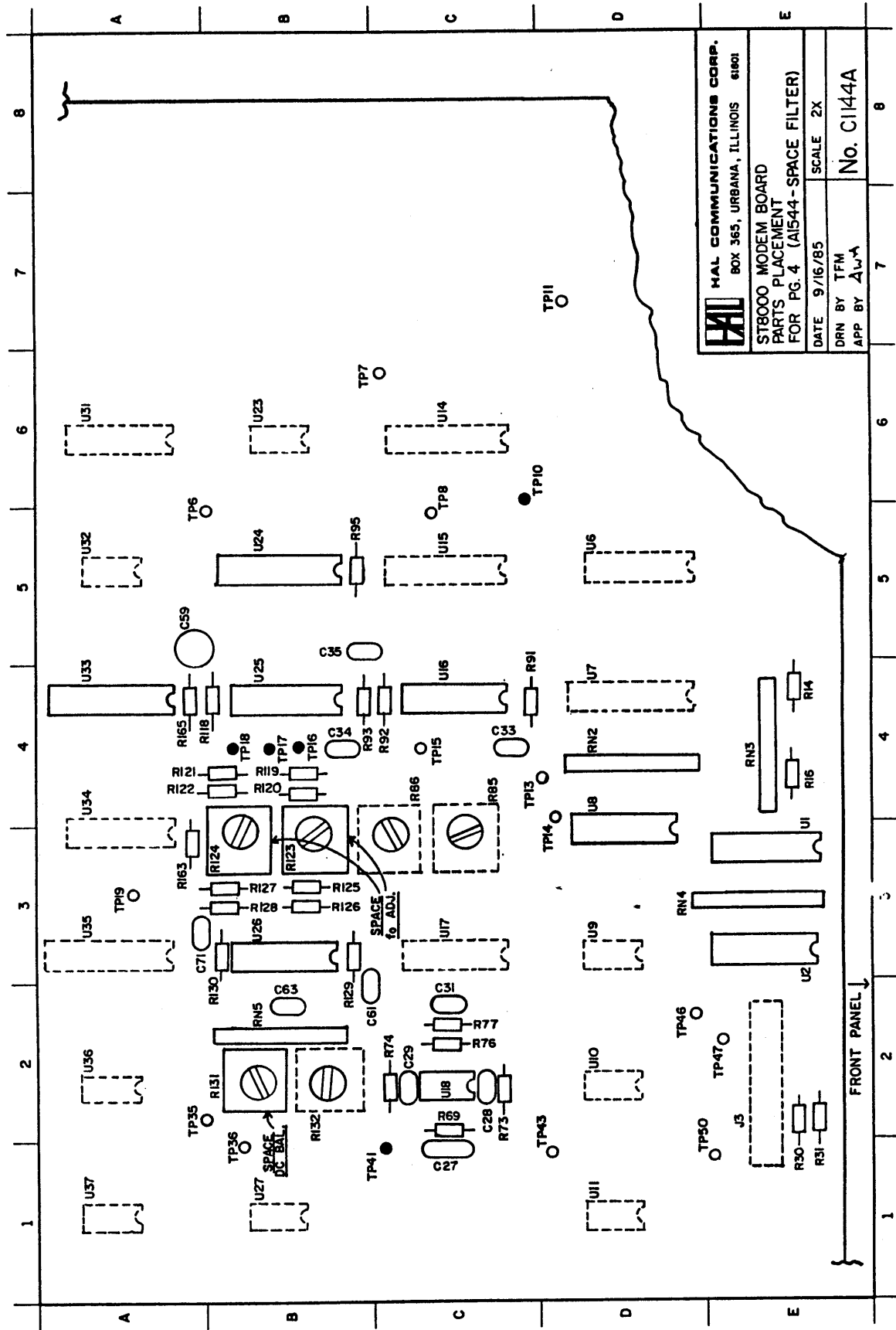
**HAI** HAL COMMUNICATIONS CORP.  
 BOX 365, URBANA, ILLINOIS 61801

**ST8000 MODEM BOARD PAGE 3**  
**MARK DISCRIMINATOR FILTER**

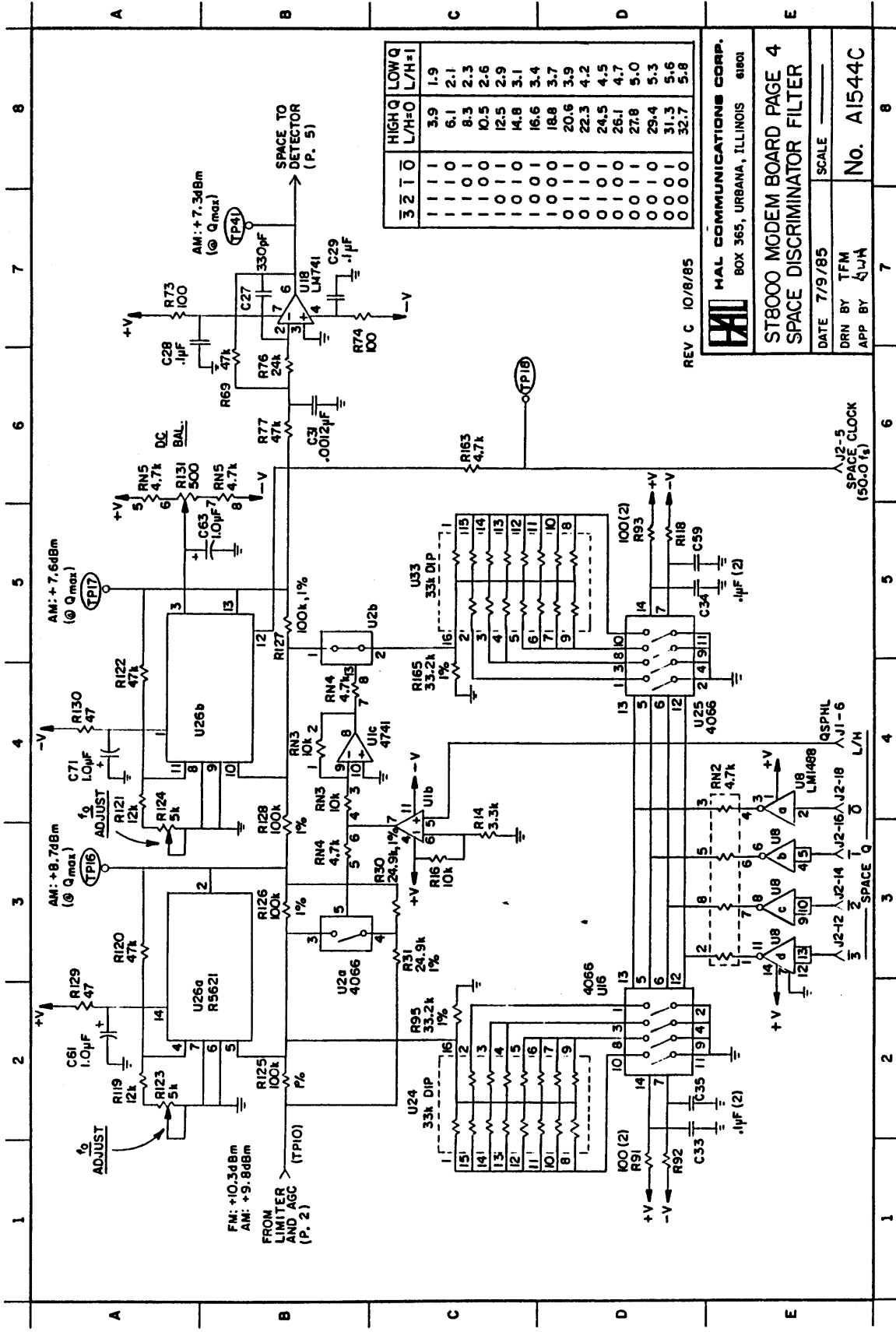
DATE 7/8/85 SCALE \_\_\_\_\_  
 DRN BY TFM  
 APP BY AJW

No. A1543C

REV C 10/8/85

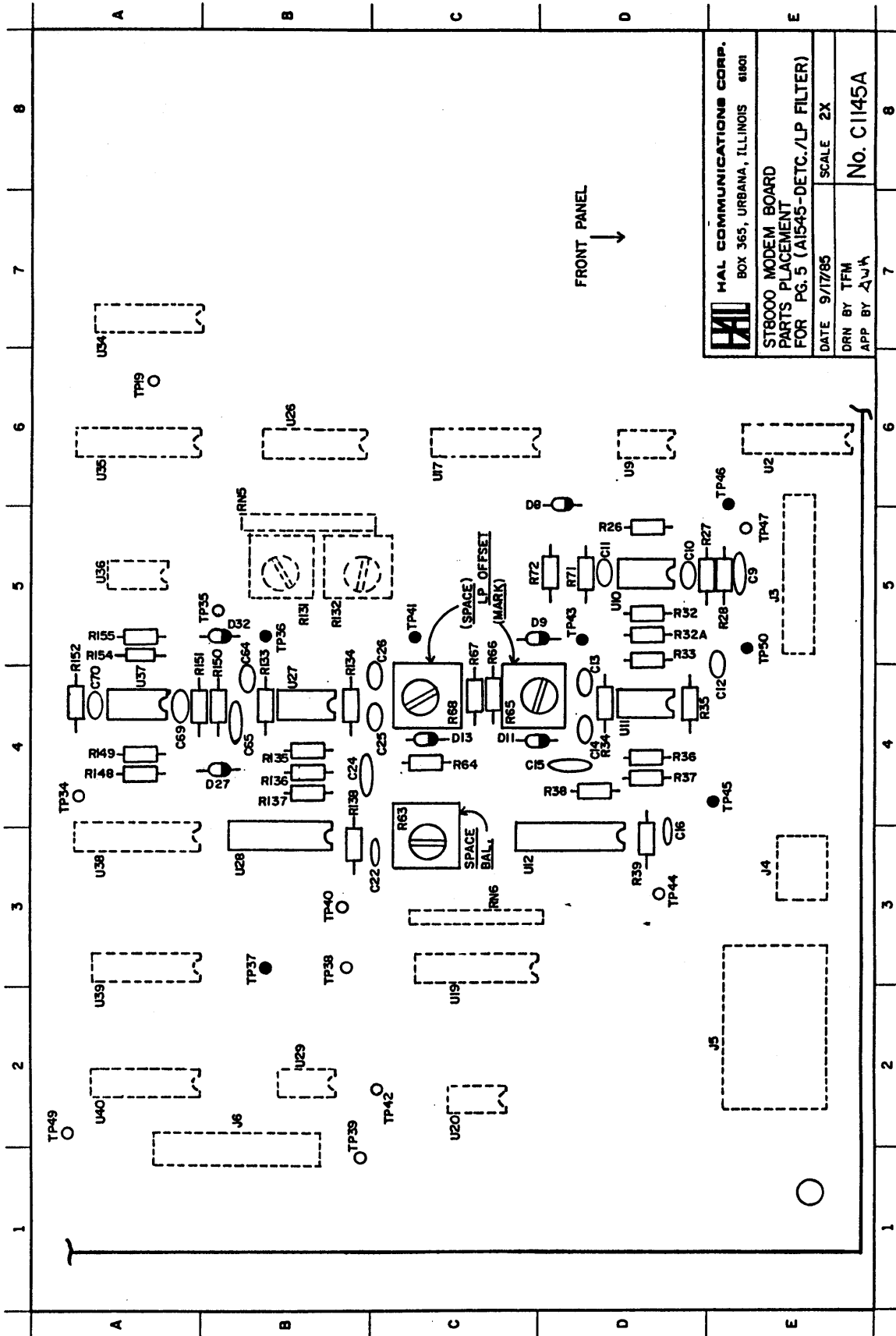



**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801  
**ST8000 MODEM BOARD**  
**PARTS PLACEMENT**  
**FOR PG. 4 (A1544-SPACE FILTER)**  
 DATE 9/16/85 SCALE 2X  
 DRN BY TFM  
 APP BY ALW-A  
**No. C1144A**

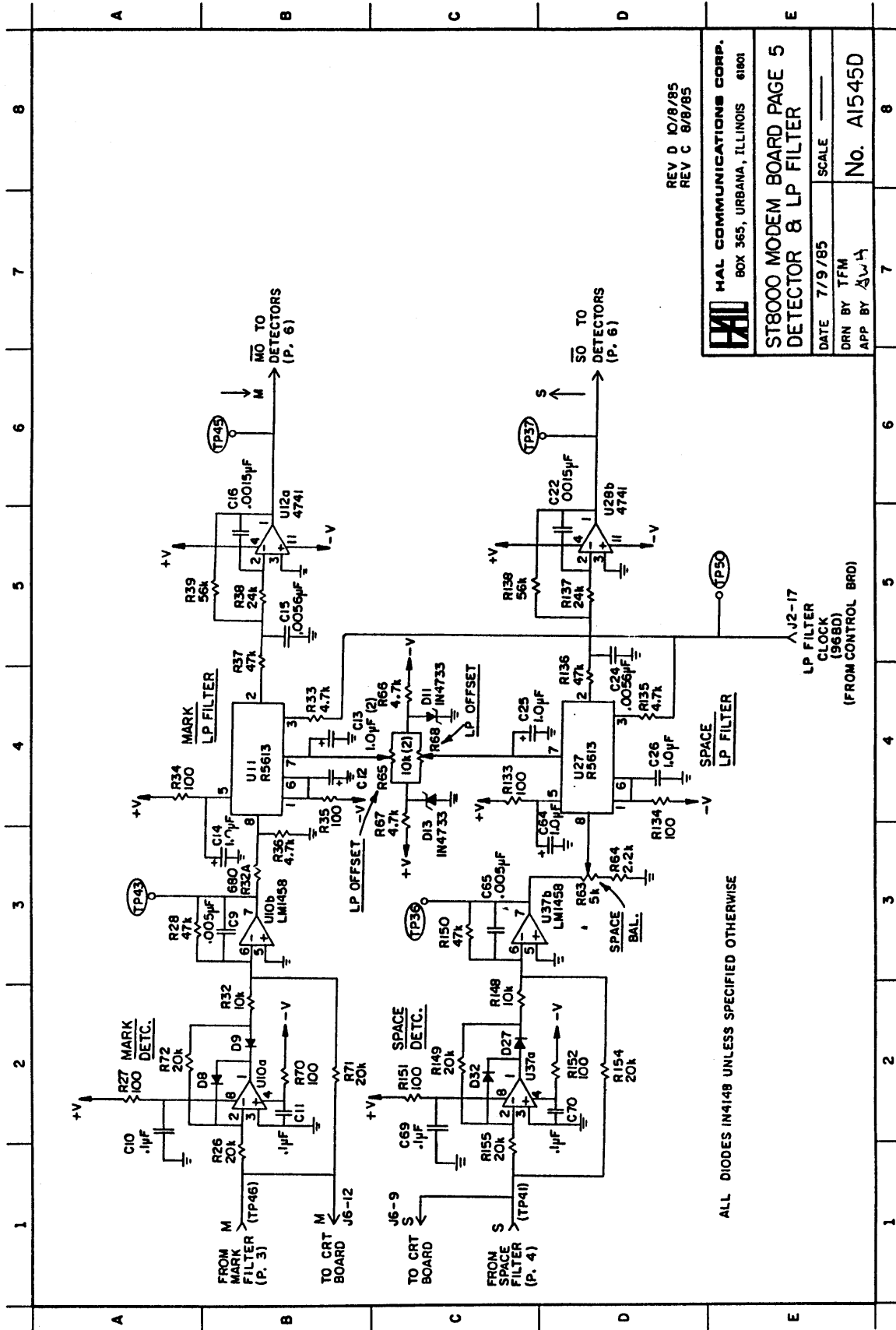


| 3     | 2     | 1     | HIGH Q | LOW Q |
|-------|-------|-------|--------|-------|
| L/H=O | L/H=I | L/H=I | L/H=O  | L/H=I |
| 1     | 1     | 1     | 3.9    | 1.9   |
| 1     | 1     | 0     | 6.1    | 2.1   |
| 1     | 1     | 0     | 8.3    | 2.3   |
| 1     | 1     | 0     | 10.5   | 2.6   |
| 1     | 1     | 0     | 12.5   | 2.9   |
| 1     | 1     | 0     | 14.8   | 3.1   |
| 1     | 1     | 0     | 16.6   | 3.4   |
| 1     | 1     | 0     | 18.8   | 3.7   |
| 1     | 1     | 0     | 20.6   | 3.9   |
| 1     | 1     | 0     | 22.3   | 4.2   |
| 1     | 1     | 0     | 24.5   | 4.5   |
| 1     | 1     | 0     | 26.1   | 4.7   |
| 1     | 1     | 0     | 27.8   | 5.0   |
| 1     | 1     | 0     | 29.4   | 5.3   |
| 1     | 1     | 0     | 31.3   | 5.6   |
| 1     | 1     | 0     | 32.7   | 5.8   |

**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801  
**ST8000 MODEM BOARD PAGE 4**  
**SPACE DISCRIMINATOR FILTER**  
 DATE 7/9/85 SCALE \_\_\_\_\_  
 DRN BY TFM  
 APP BY JLM  
**No. A1544C**



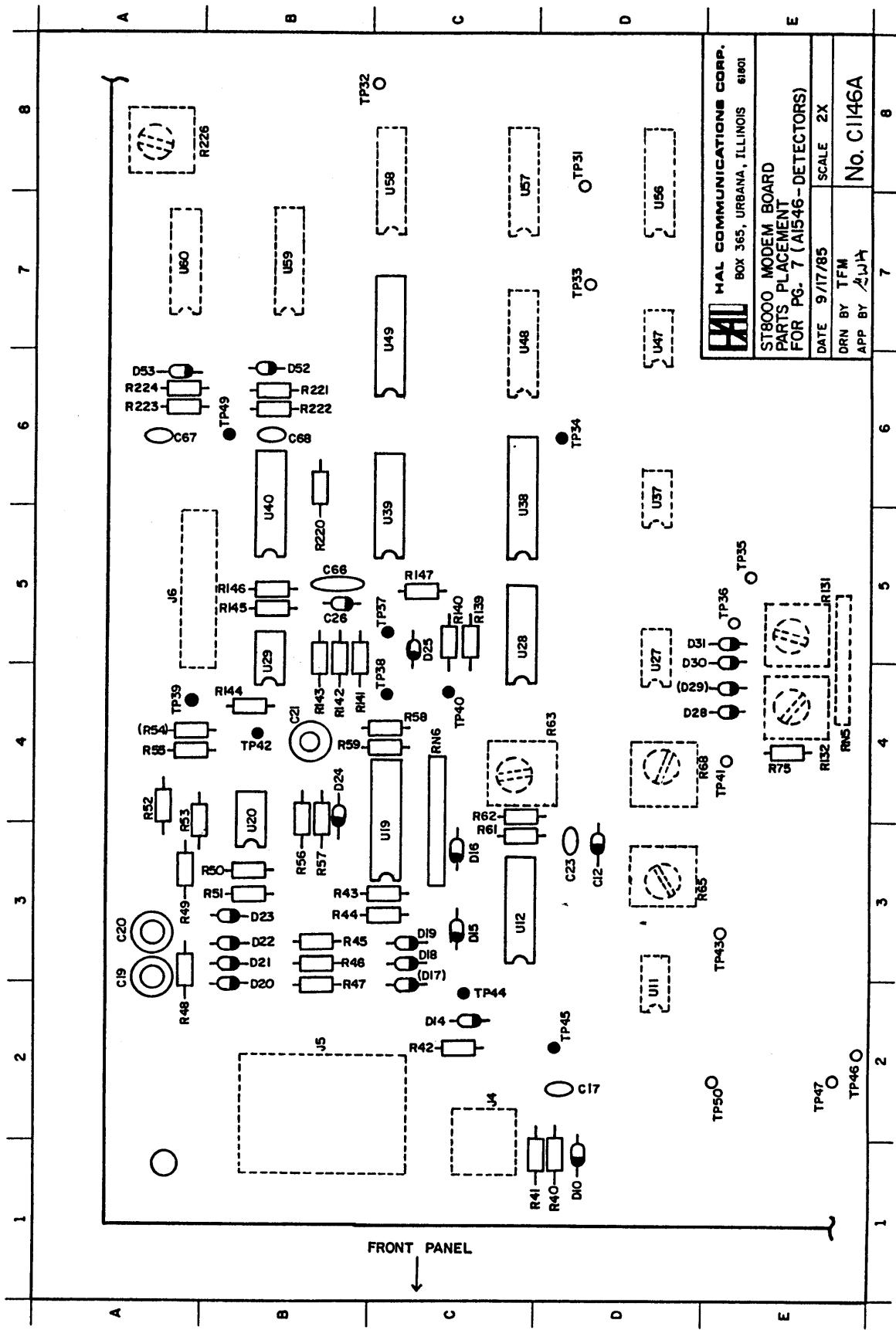

**HAI COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801  
**ST8000 MODEM BOARD**  
**PARTS PLACEMENT**  
**FOR PG. 5 (A1545-DETC./LP FILTER)**  
 DATE 9/17/85 SCALE 2X  
 DRN BY TFM  
 APP BY AJW



REV D 10/8/85  
REV C 8/8/85

ALL DIODES IN4148 UNLESS SPECIFIED OTHERWISE

J2-17  
LP FILTER  
CLOCK  
(96BD)  
(FROM CONTROL BRD)



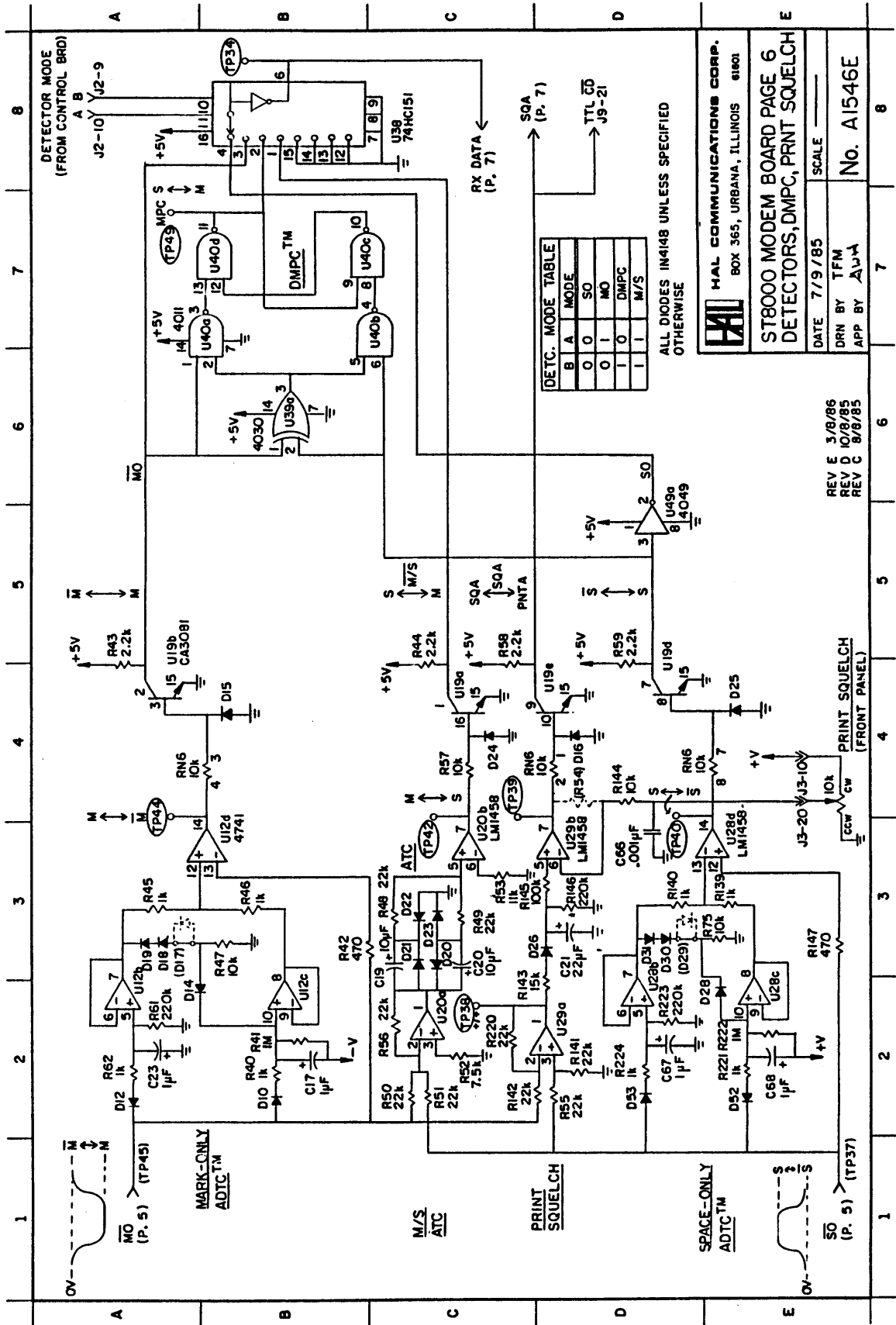
**RAI** HAL COMMUNICATIONS CORP.  
 BOX 365, URBANA, ILLINOIS 61801

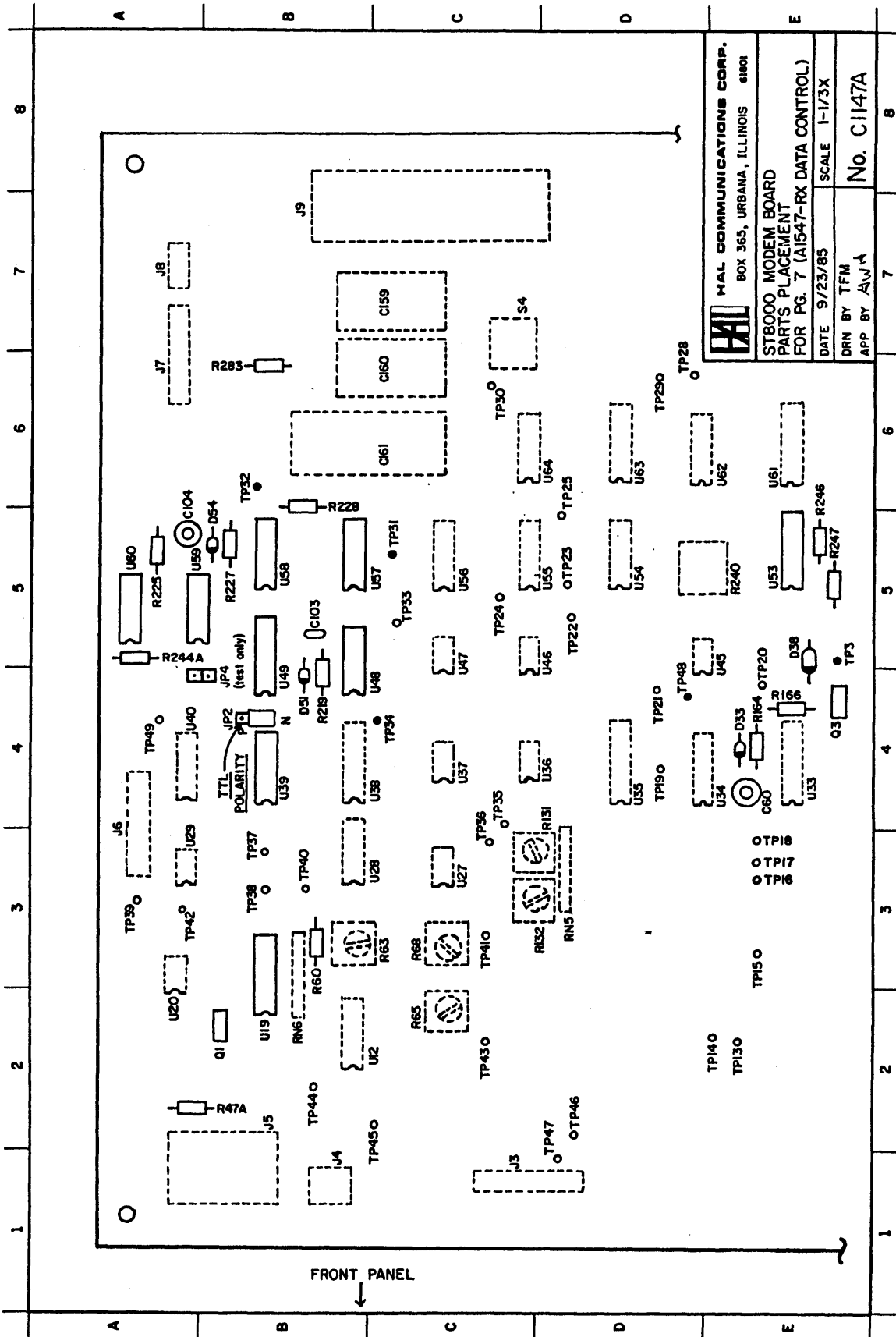
ST8000 MODEM BOARD  
 PARTS PLACEMENT  
 FOR PG. 7 (A1546-DETECTORS)

DATE 9/17/85 SCALE 2X

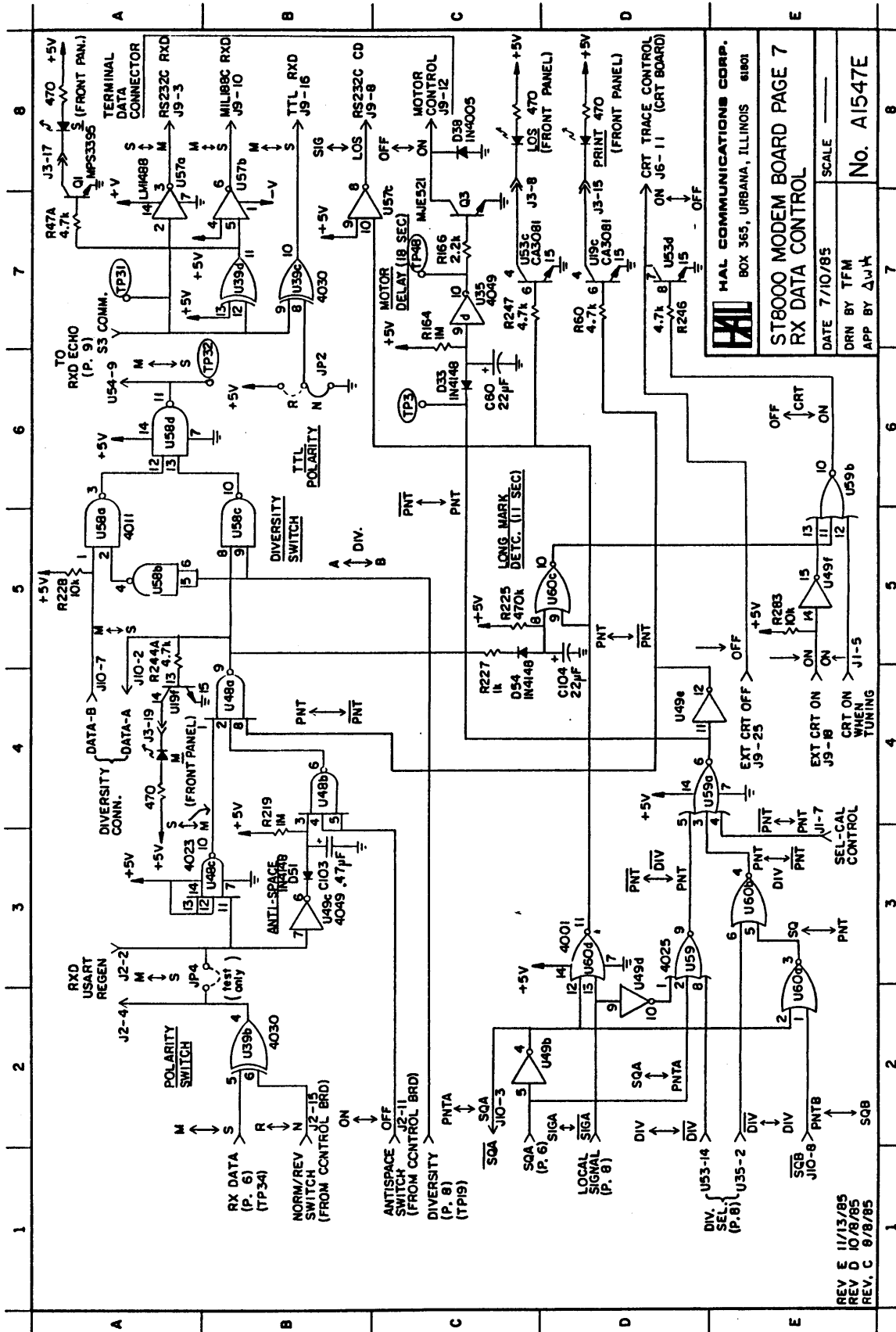
DRN BY TFM  
 APP BY JJJ

No. C1146A







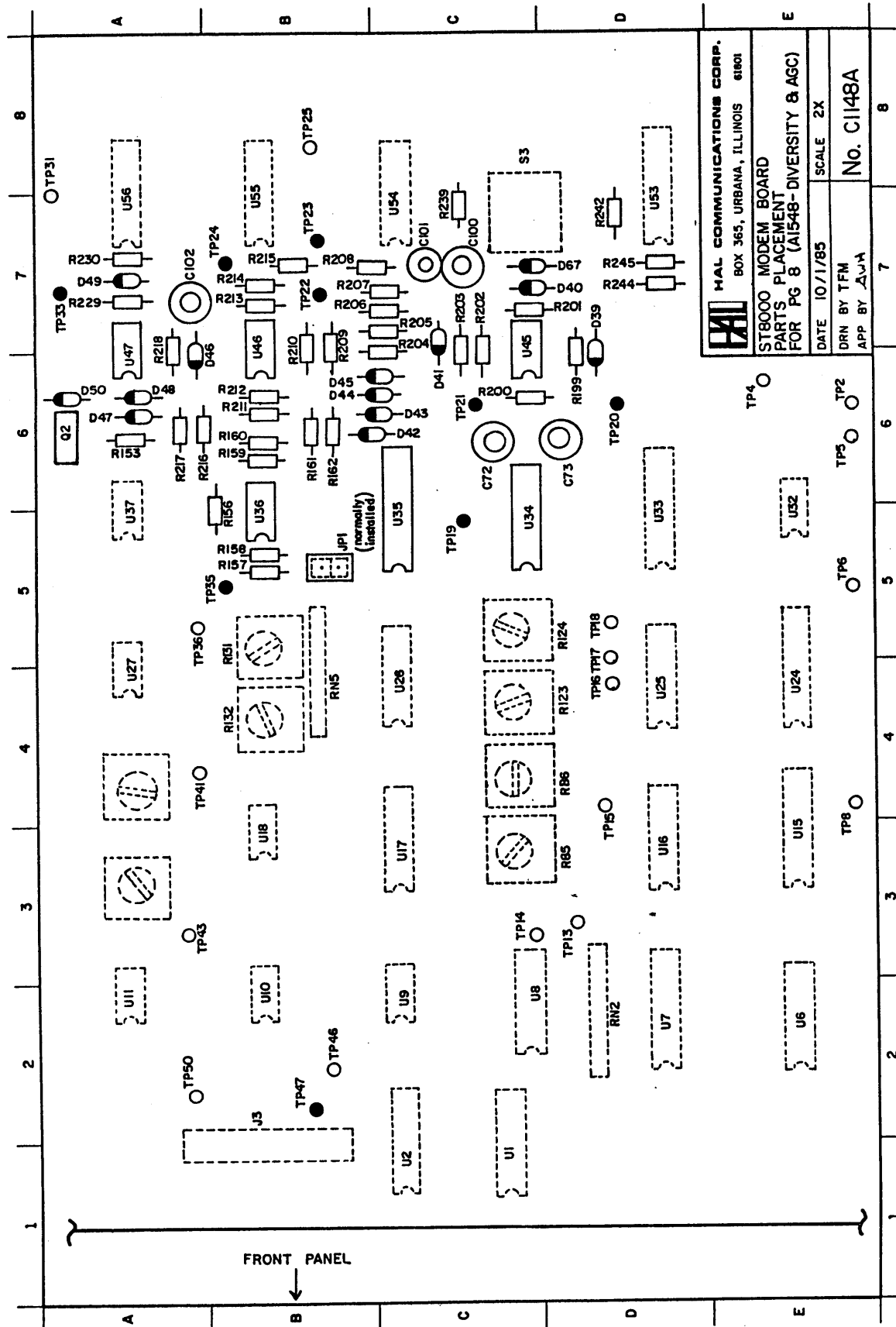


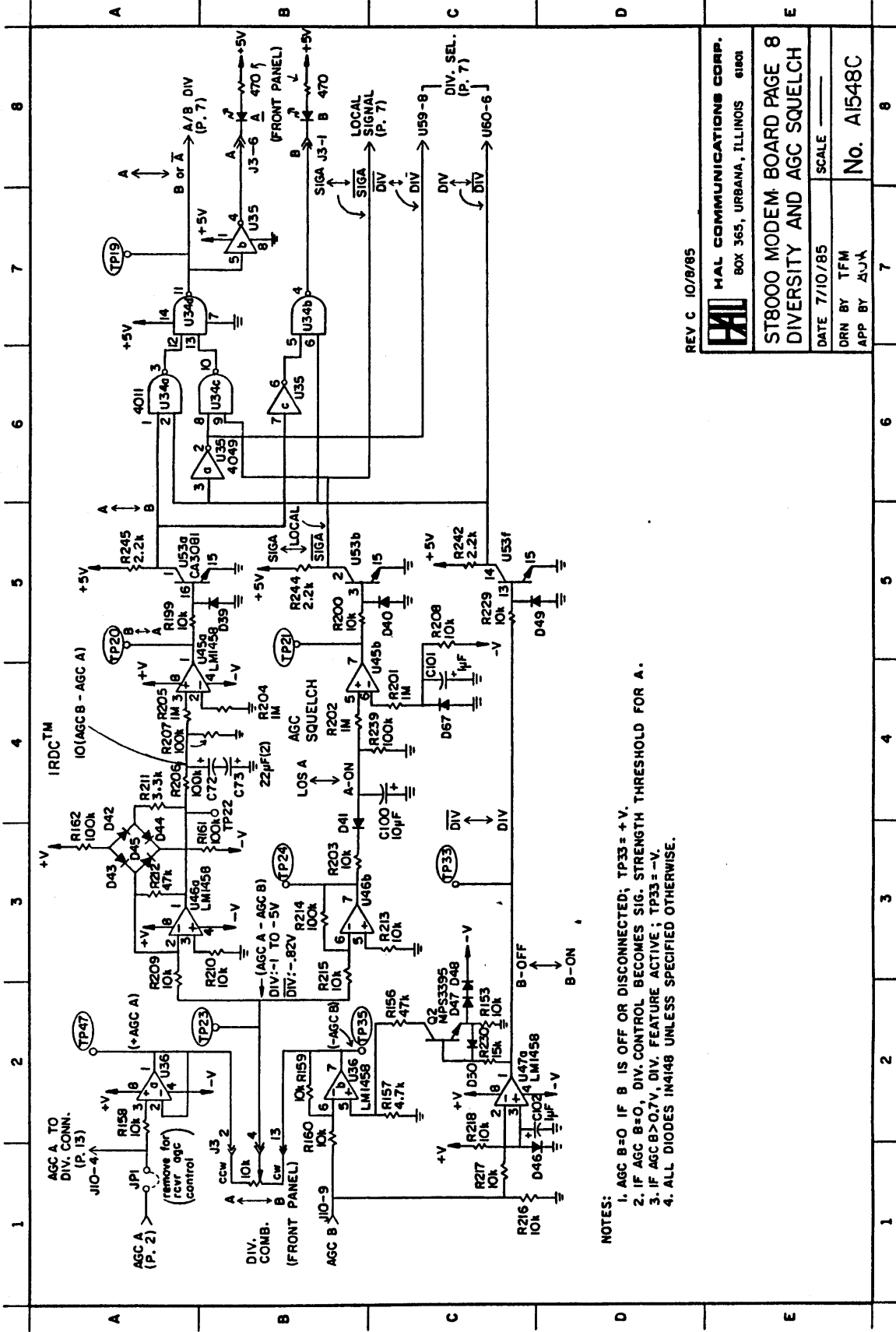
**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801

**ST8000 MODEM BOARD PAGE 7**  
**RX DATA CONTROL**

DATE 7/10/85  
 DRN BY TFM  
 APP BY ΔΔΔΔ

SCALE \_\_\_\_\_  
 No. A1547E





- NOTES:
1. AGC B=0 IF B IS OFF OR DISCONNECTED; TP33 = +V.
  2. IF AGC B=0, DIV. CONTROL BECOMES SIG. STRENGTH THRESHOLD FOR A.
  3. IF AGC B>0.7V, DIV. FEATURE ACTIVE; TP33 = -V.
  4. ALL DIODES IN4148 UNLESS SPECIFIED OTHERWISE.

REV C 10/8/85

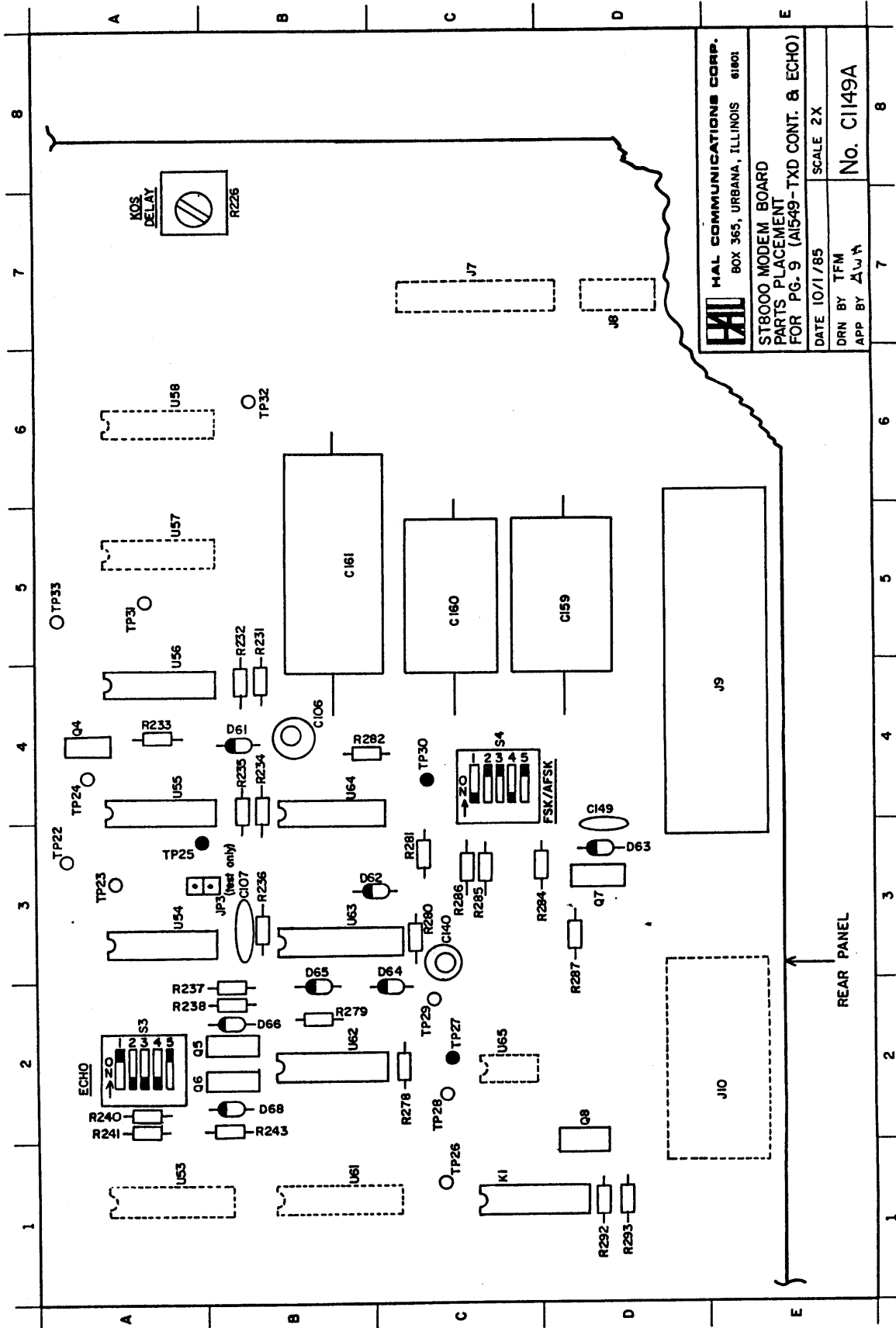
**MAIL COMMUNICATIONS CORP.**  
BOX 365, URBANA, ILLINOIS 61801

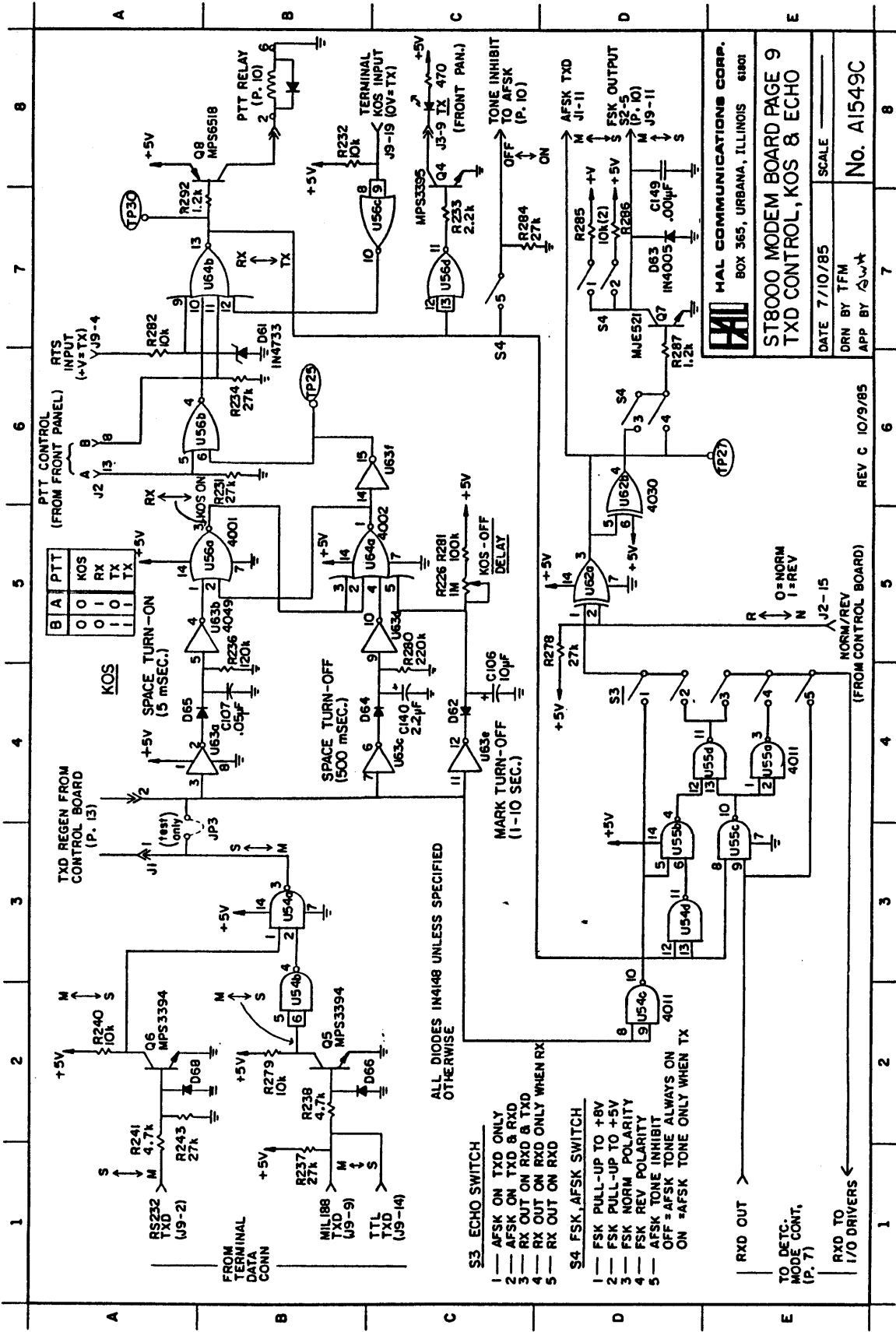
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**ST8000 MODEM BOARD PAGE 8**  
**DIVERSITY AND AGC SQUELCH**

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DATE 7/10/85      SCALE \_\_\_\_\_  
DRN BY TFM      APP BY AJJA      No. A1548C





|   |   |     |
|---|---|-----|
| B | A | PTT |
| 0 | 0 | KOS |
| 0 | 1 | RX  |
| 1 | 1 | TX  |

**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801

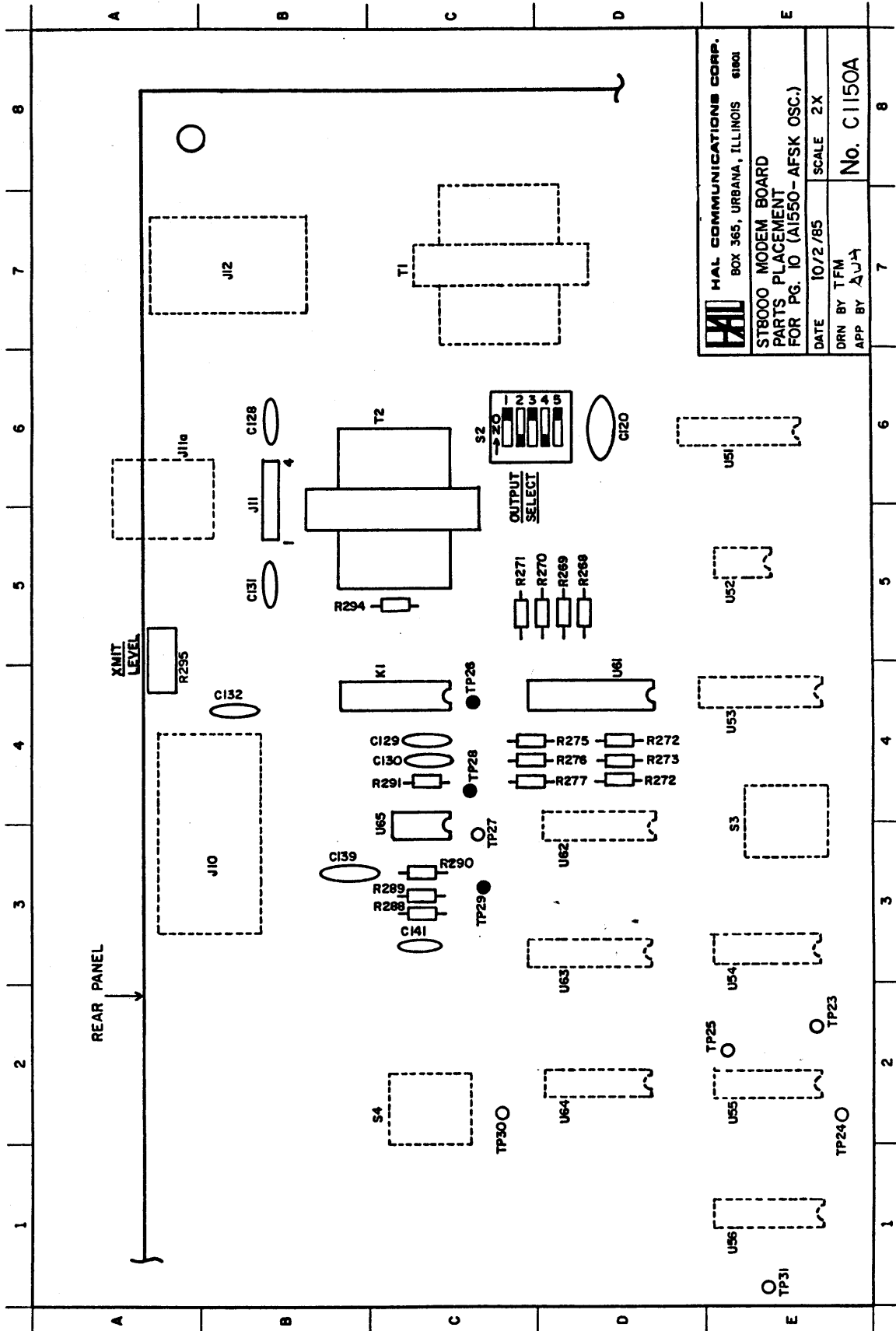
**ST8000 MODEM BOARD PAGE 9**  
**TXD CONTROL, KOS & ECHO**

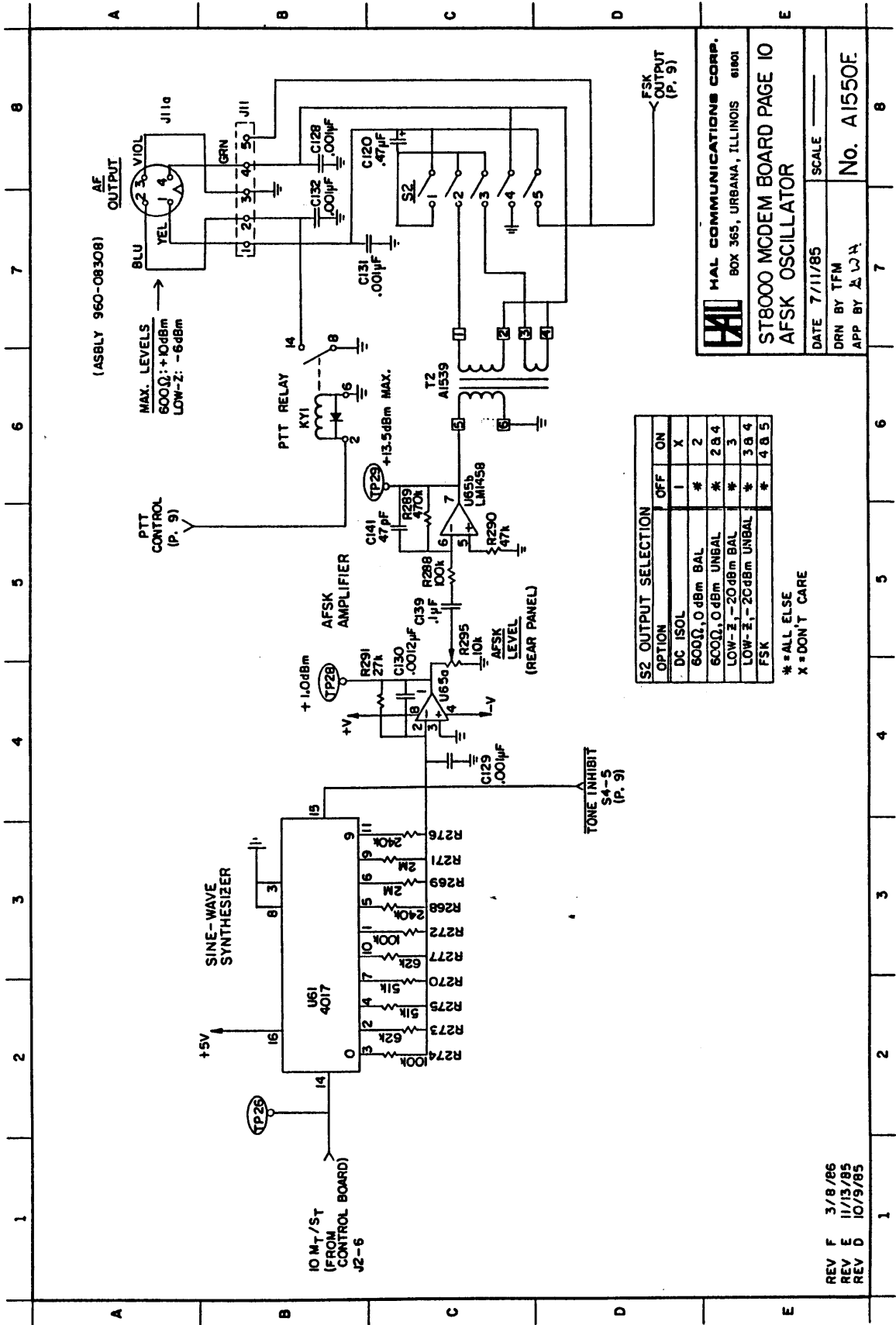
DATE 7/10/85 SCALE \_\_\_\_\_  
 DRN BY TFM  
 APP BY [Signature]

No. A1549C

- S3 ECHO SWITCH**
- 1 - AFSK ON TXD ONLY
  - 2 - AFSK ON TXD & RXD
  - 3 - RX OUT ON RXD & TXD
  - 4 - RX OUT ON RXD ONLY WHEN RX
  - 5 - RX OUT ON RXD
- S4 FSK AFSK SWITCH**
- 1 - FSK PULL-UP TO +5V
  - 2 - FSK NORM POLARITY
  - 3 - FSK REV POLARITY
  - 4 - AFSK TONE INHIBIT
  - 5 - ON = AFSK TONE ALWAYS ON TX
  - OFF = AFSK TONE ONLY WHEN TX

ALL DIODES IN4148 UNLESS SPECIFIED OTHERWISE





| S2 OUTPUT SELECTION  |     |       |
|----------------------|-----|-------|
| OPTION               | OFF | ON    |
| DC ISOL              | 1   | X     |
| 600Ω, 0 dBm BAL      | *   | 2     |
| 600Ω, 0 dBm UNBAL    | *   | 2 B 4 |
| LOW-Z, -20 dBm BAL   | *   | 3     |
| LOW-Z, -20 dBm UNBAL | *   | 3 B 4 |
| FSK                  | *   | 4 B 5 |

\* = ALL ELSE  
X = DON'T CARE

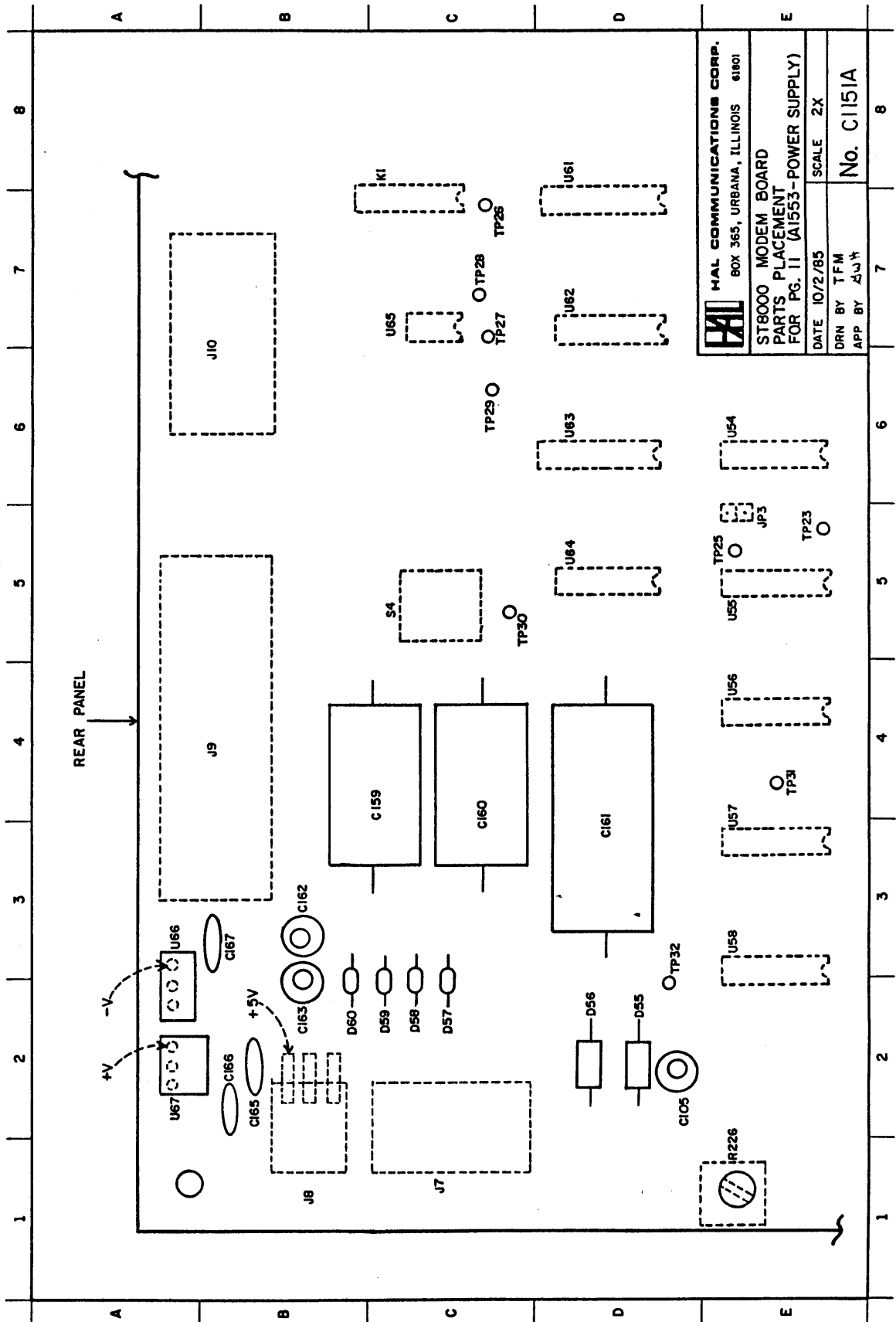
**HAL COMMUNICATIONS CORP.**  
BOX 365, URBANA, ILLINOIS 61801


**ST8000 MCEM BOARD PAGE 10**  
**AFSK OSCILLATOR**

DATE 7/11/85 SCALE \_\_\_\_\_  
DRN BY TFM  
APP BY AWH

No. A1550E

REV F 3/8/86  
REV E 11/13/85  
REV D 10/9/85



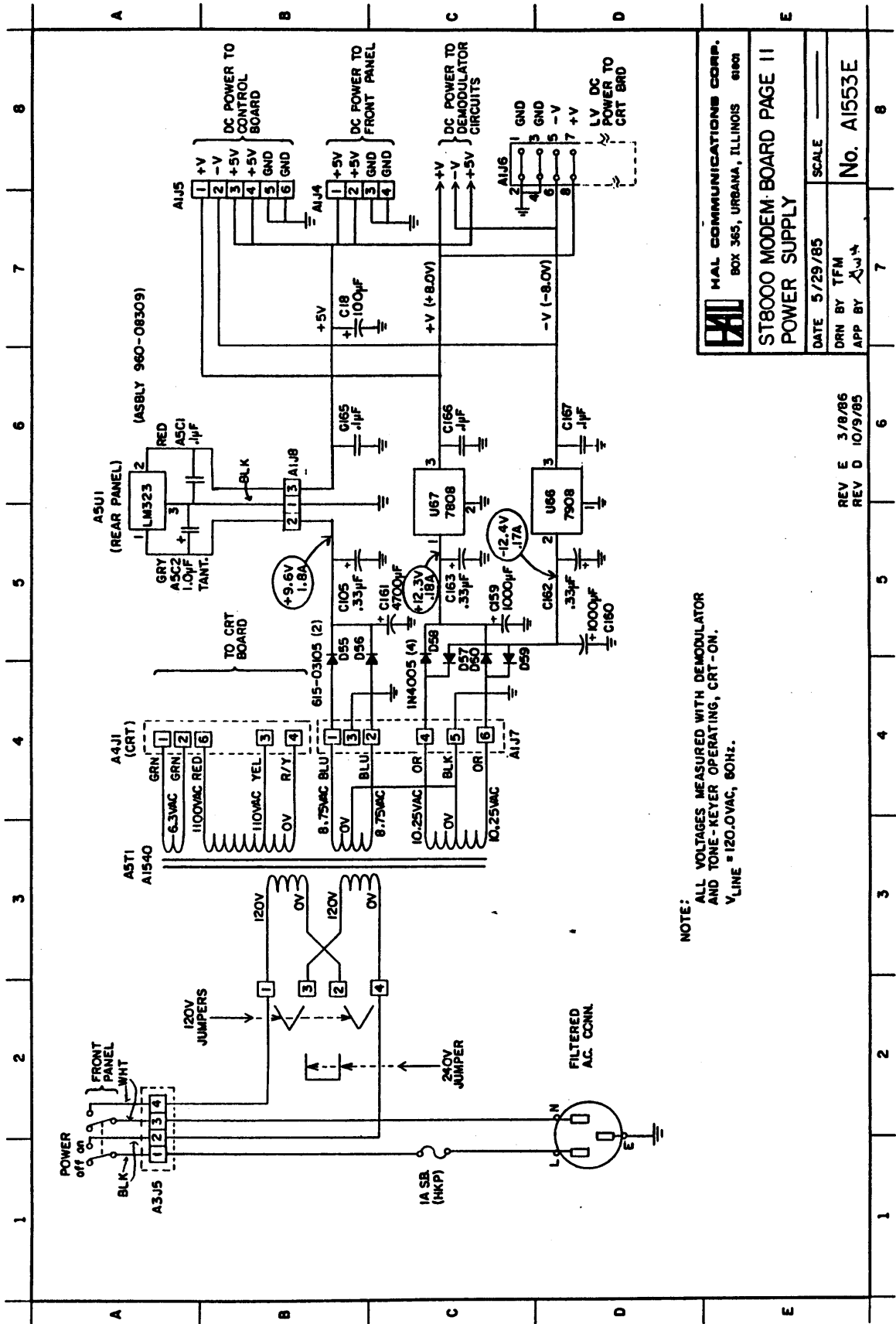

**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801

**ST8000 MODEM BOARD**  
**PARTS PLACEMENT**  
**FOR PG. II (AI553-POWER SUPPLY)**

DATE 10/2/85 SCALE 2X  
 DRN BY TFM  
 APP BY *[Signature]*

**No. C1151A**

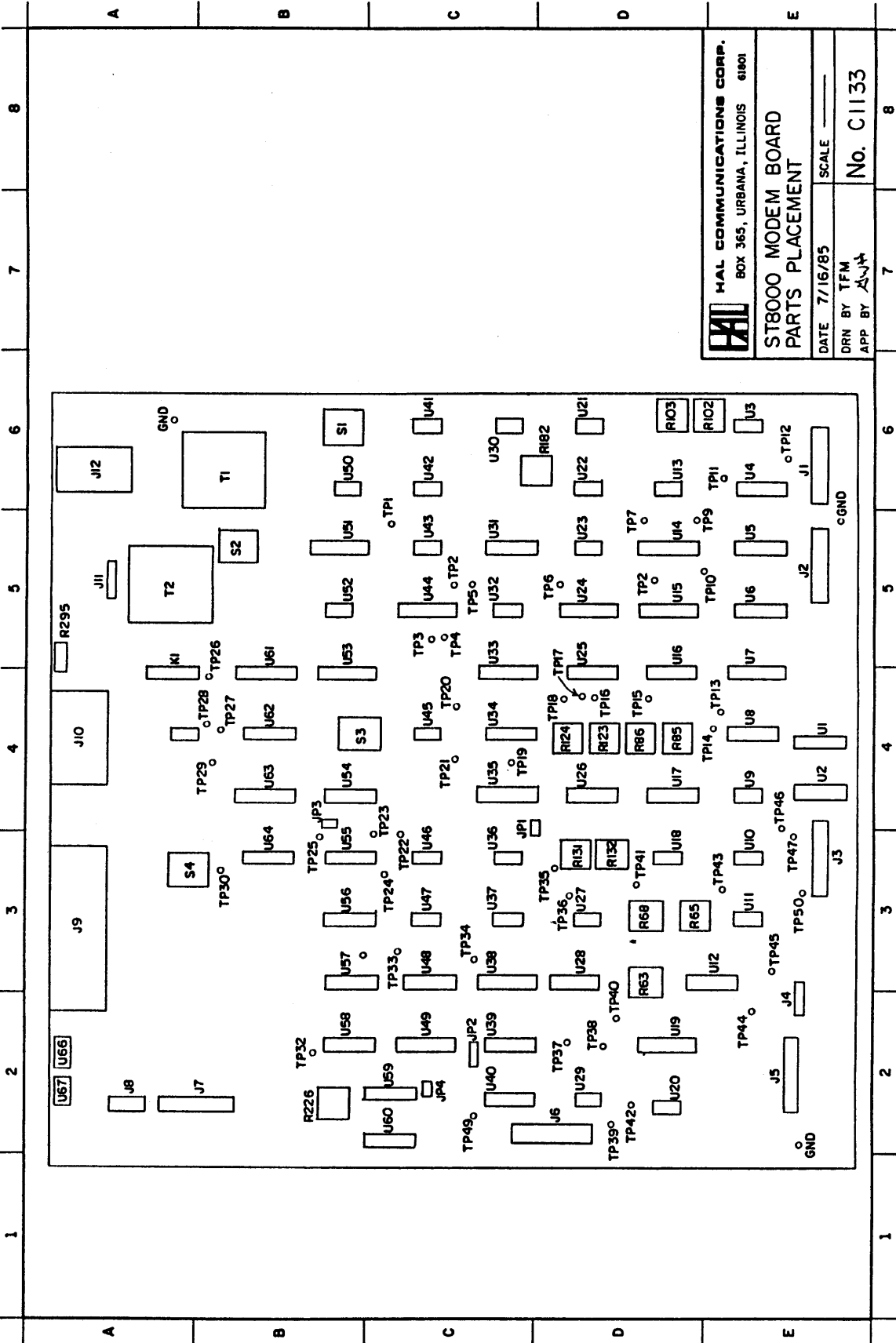


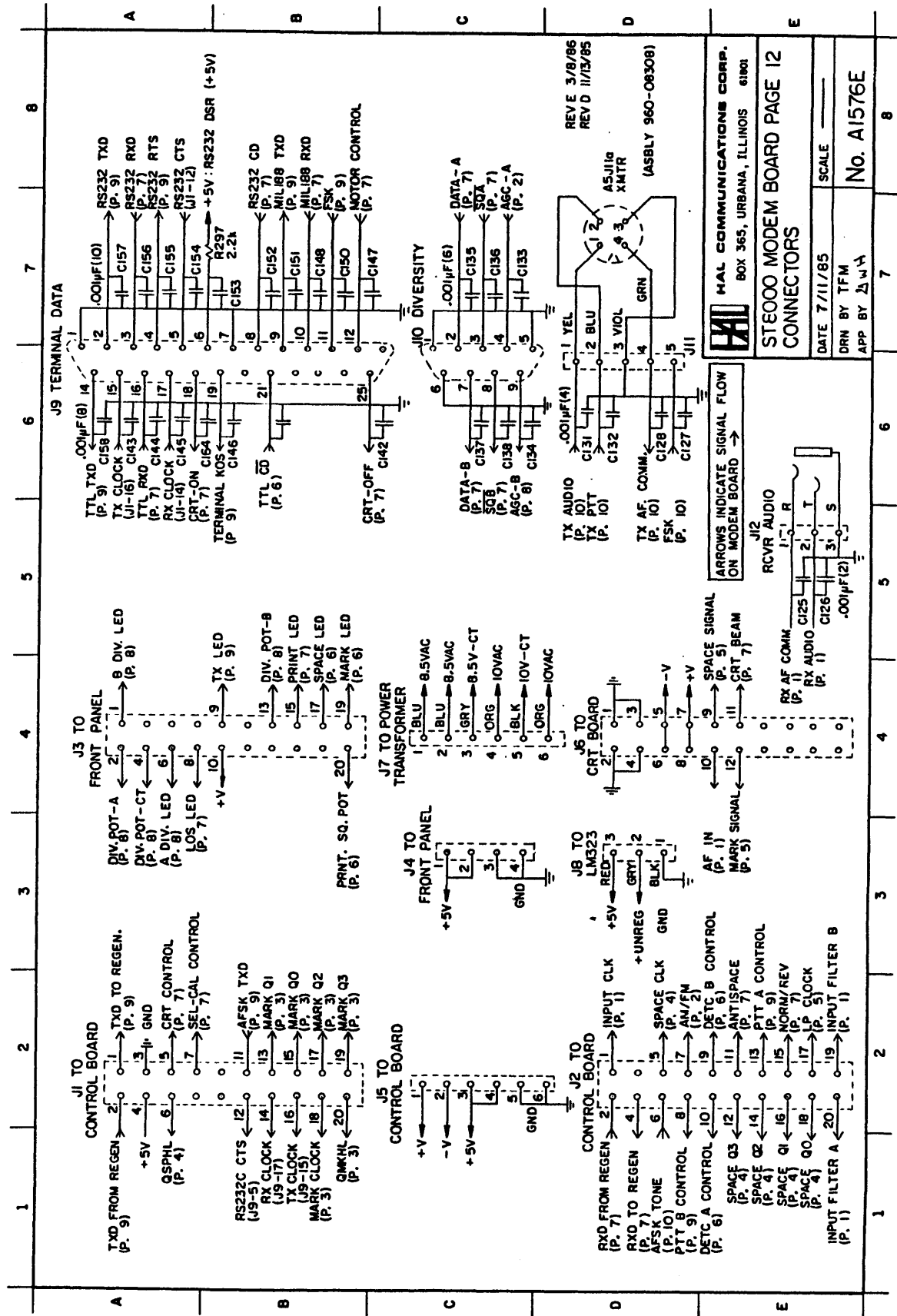


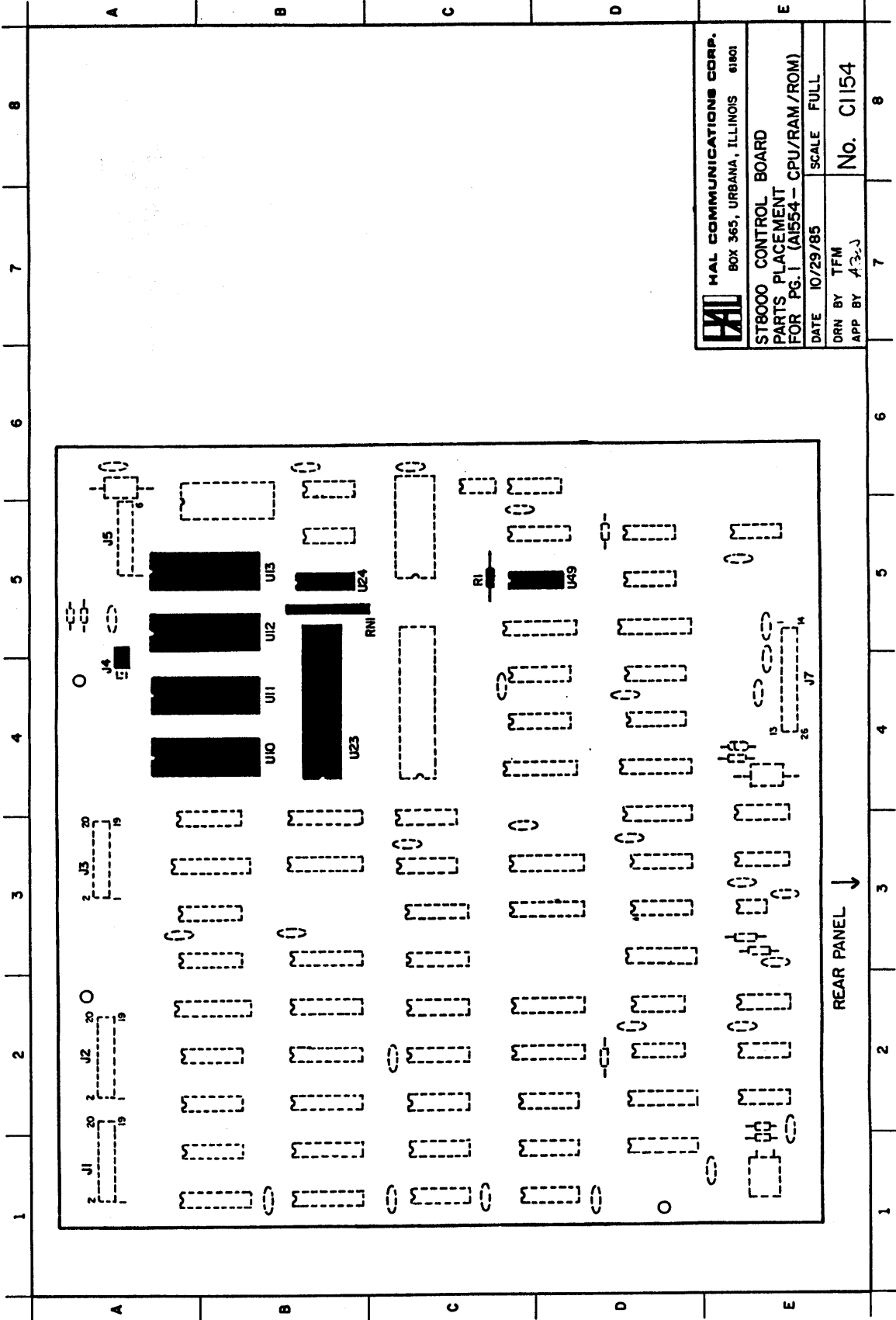
|   |            |
|---|------------|
| <b>HA</b> MAL COMMUNICATIONS CORP.<br>BOX 365, URBANA, ILLINOIS 61801 |            |
| <b>ST8000 MODEM BOARD PAGE 11</b><br><b>POWER SUPPLY</b>              |            |
| DATE 5/29/85  | SCALE      |
| DRN BY TFM  |            |
| APP BY A3J5   | No. A1533E |

REV E 3/8/85  
REV D 10/9/85

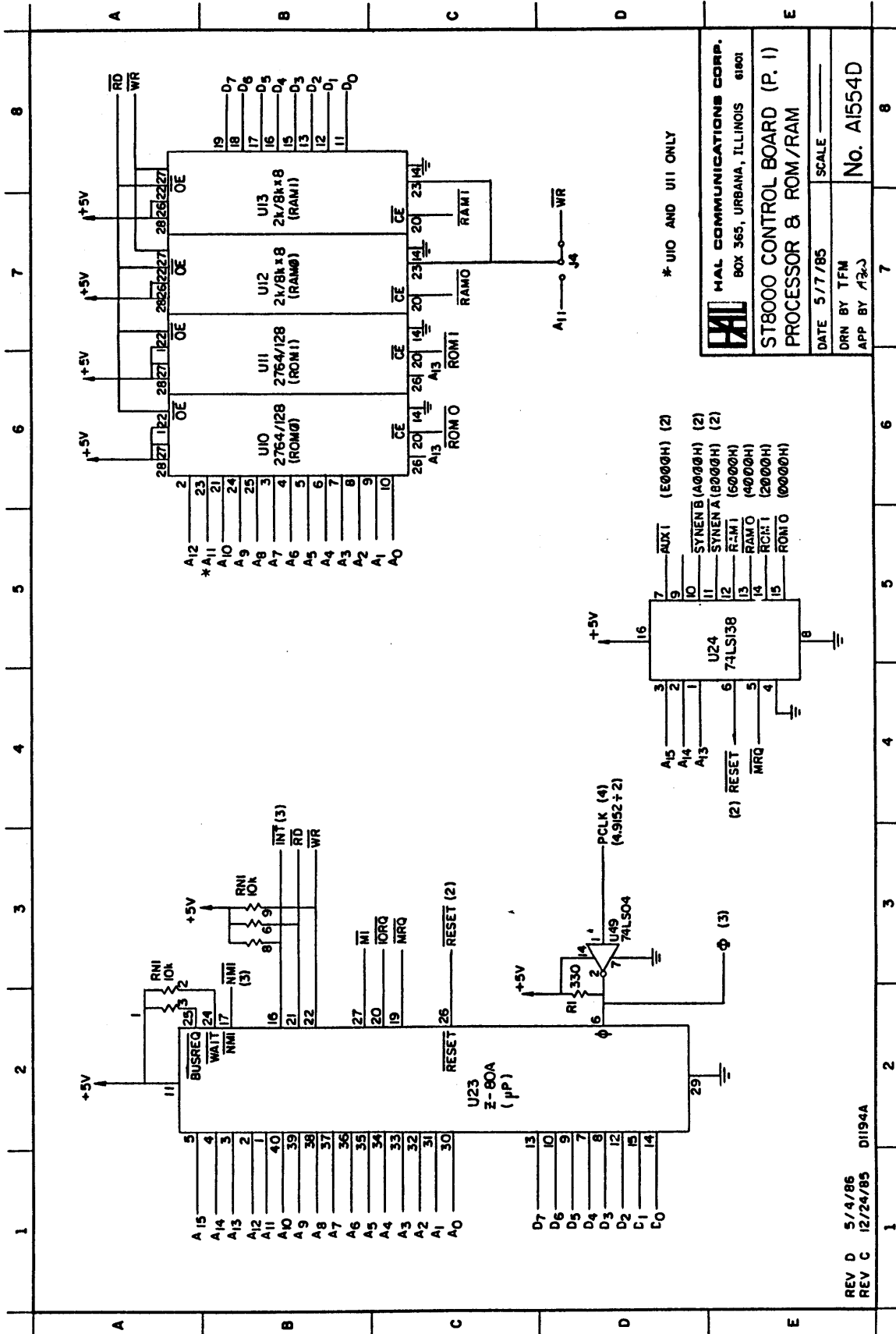
NOTE: ALL VOLTAGES MEASURED WITH DEMODULATOR AND TONE-KEYER OPERATING, CRT-ON.  
V<sub>LINE</sub> = 120.0VAC, 60Hz.

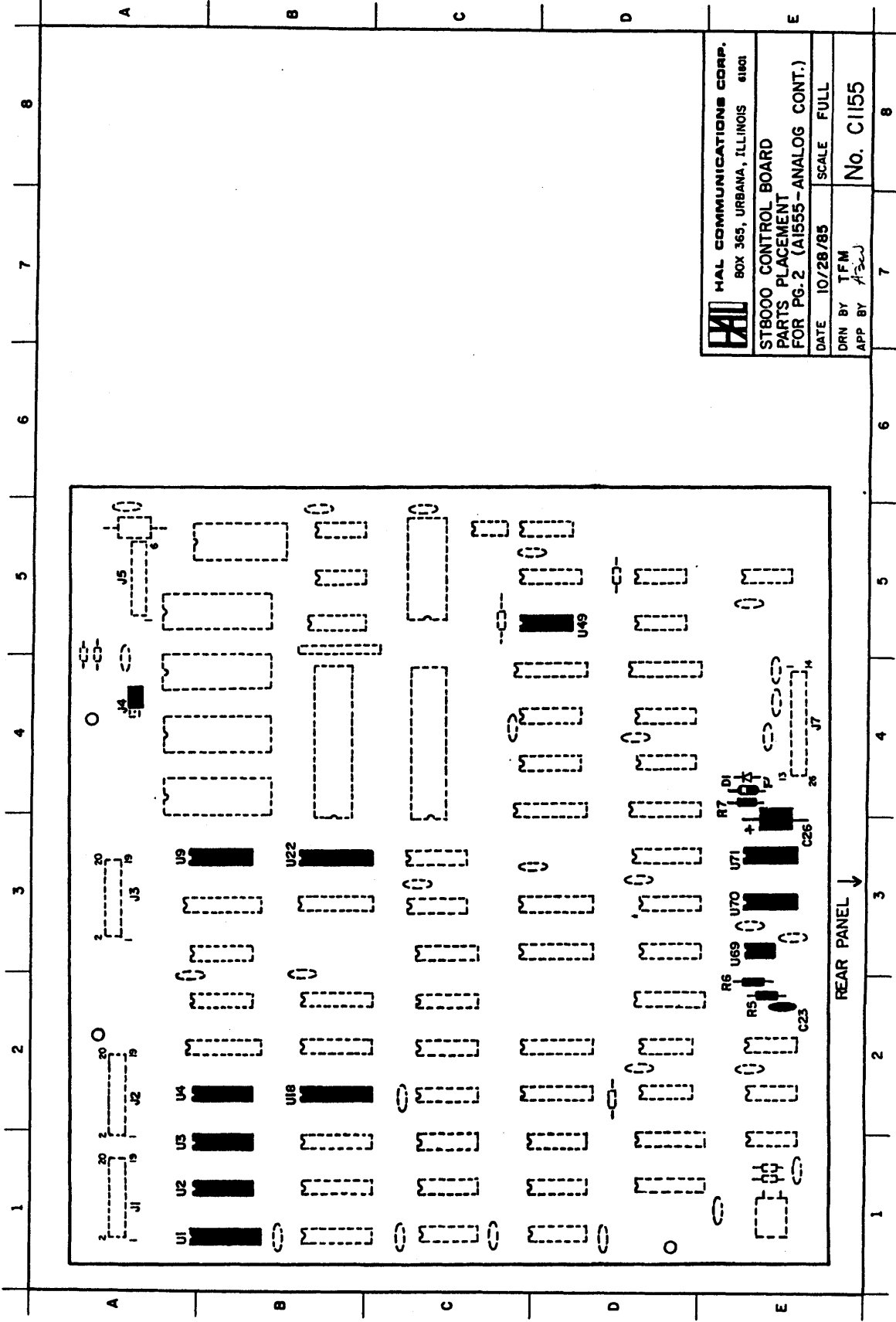


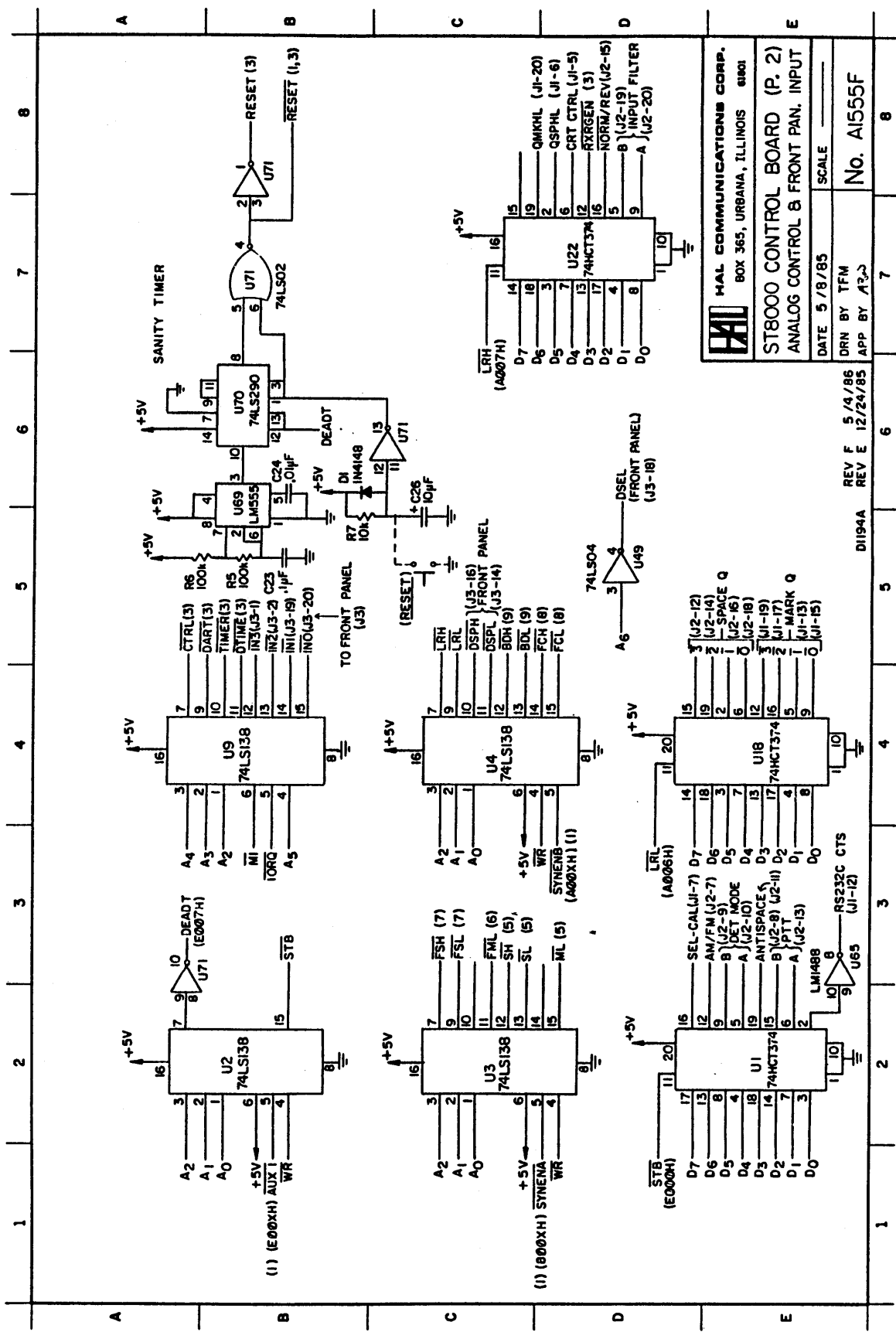




**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801  
**ST8000 CONTROL BOARD**  
**PARTS PLACEMENT**  
**FOR PG.1 (A1554--CPU/RAM/ROM)**  
 DATE 10/29/85 SCALE FULL  
 DRN BY TFM  
 APP BY A3-J  
**No. C1154**





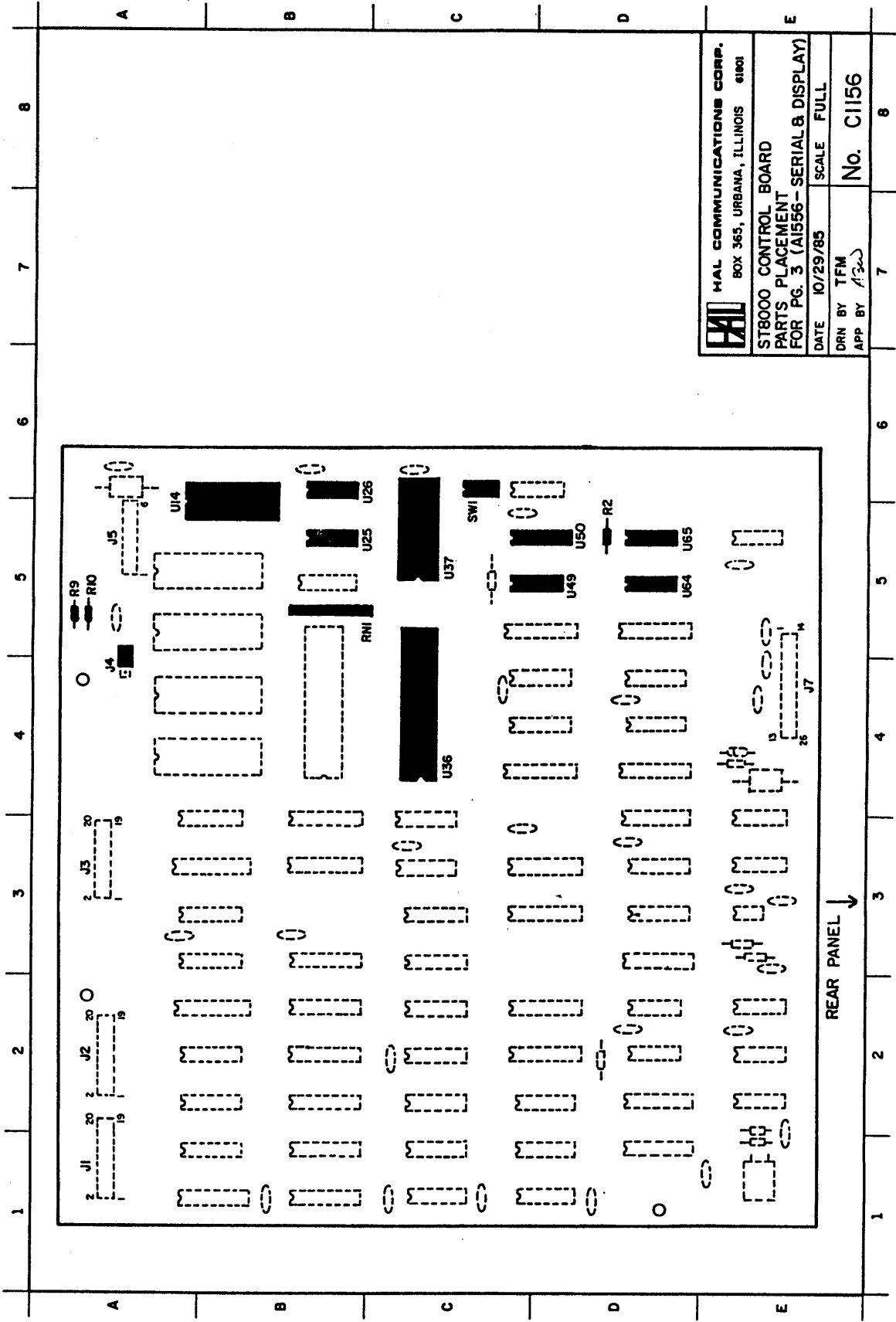


**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801

**ST8000 CONTROL BOARD (P. 2)**  
 ANALOG CONTROL B FRONT PAN. INPUT

DATE 5/8/85  
 DRN BY TFM  
 REV E 12/24/85  
 APP BY ARJ

SCALE  
**No. A1555F**



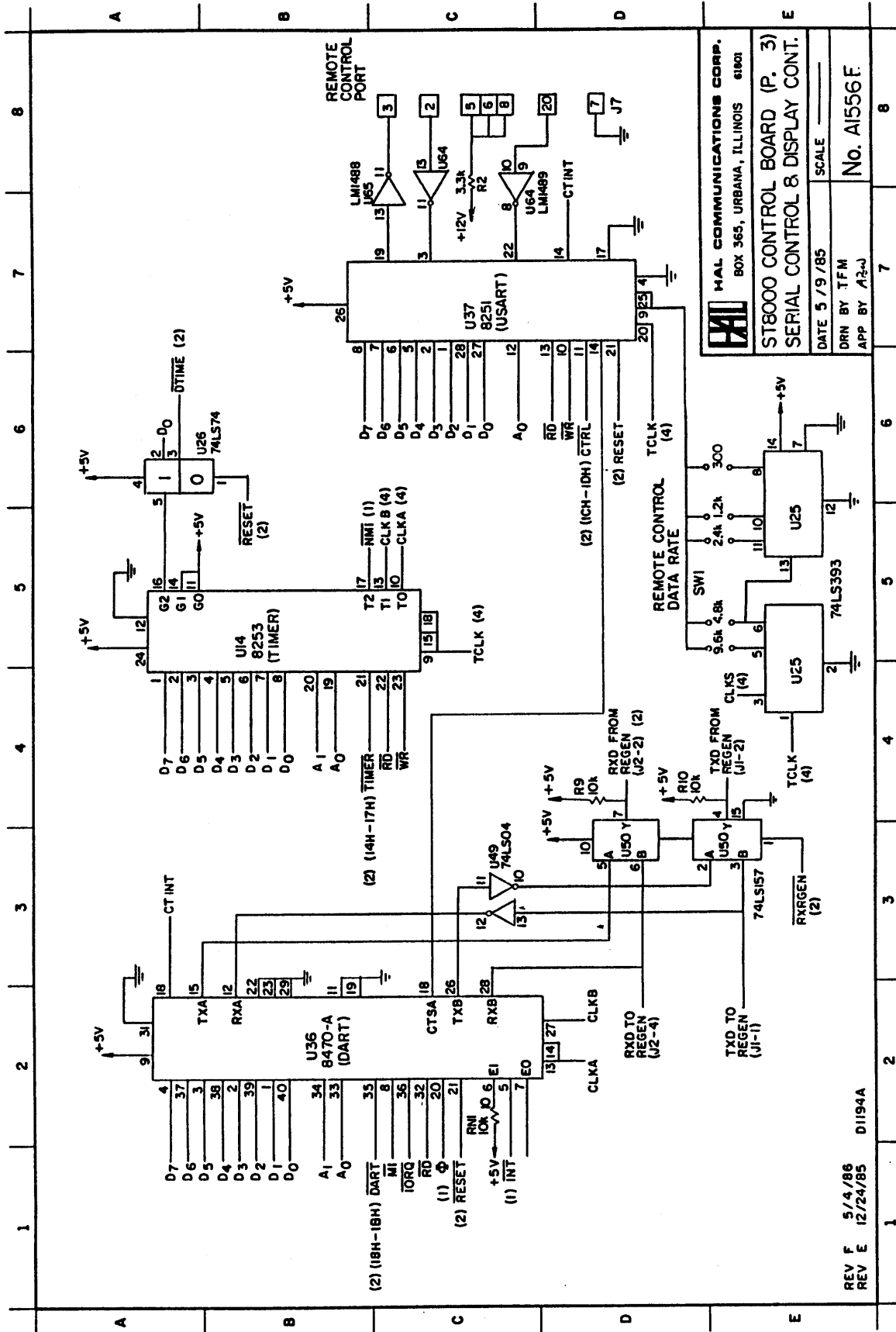
**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801

**ST8000 CONTROL BOARD**  
**PARTS PLACEMENT**  
**FOR PG. 3 (A1556 - SERIAL & DISPLAY)**

DATE 10/29/85 SCALE FULL  
 DRN BY TFM  
 APP BY A300

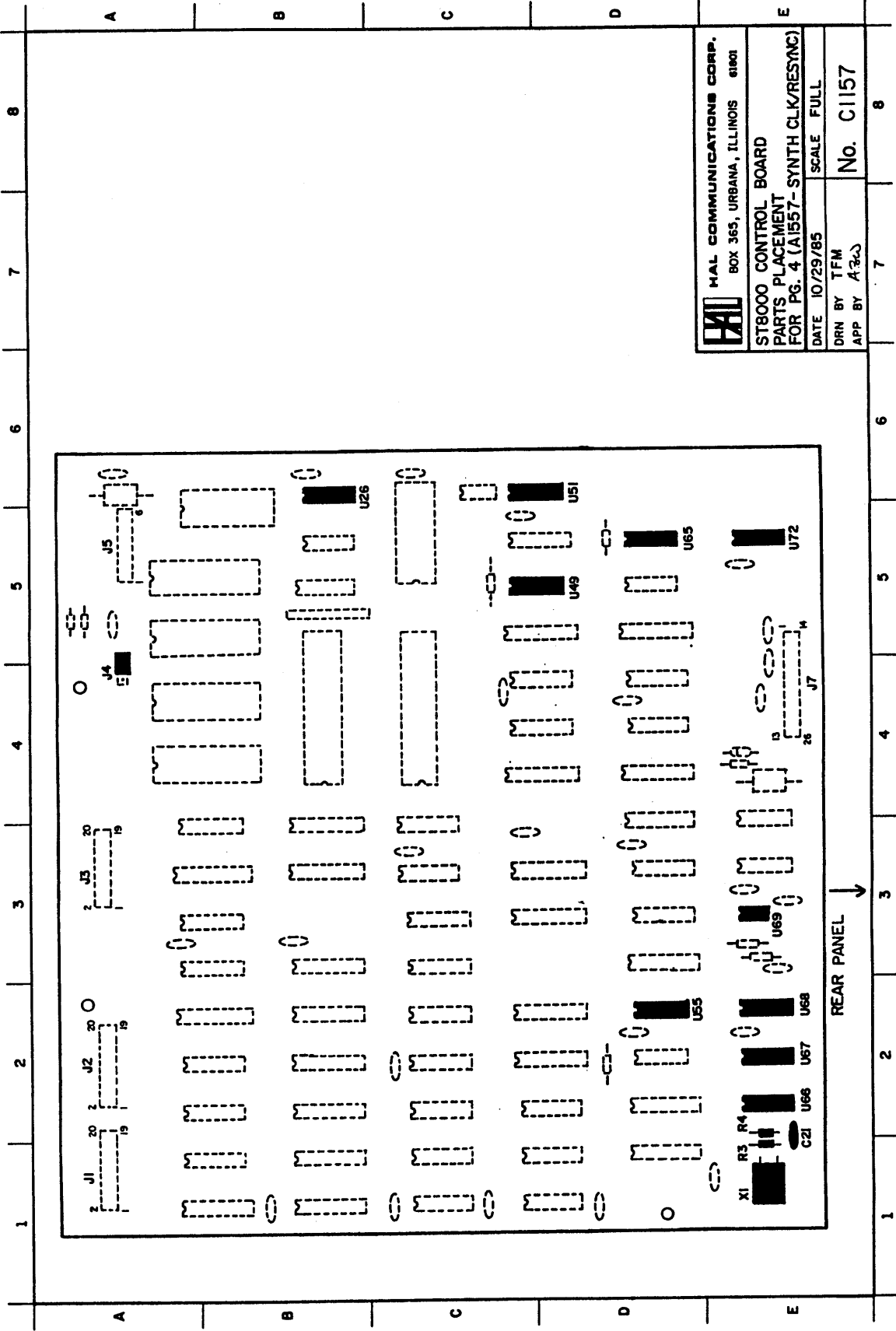
No. C1156

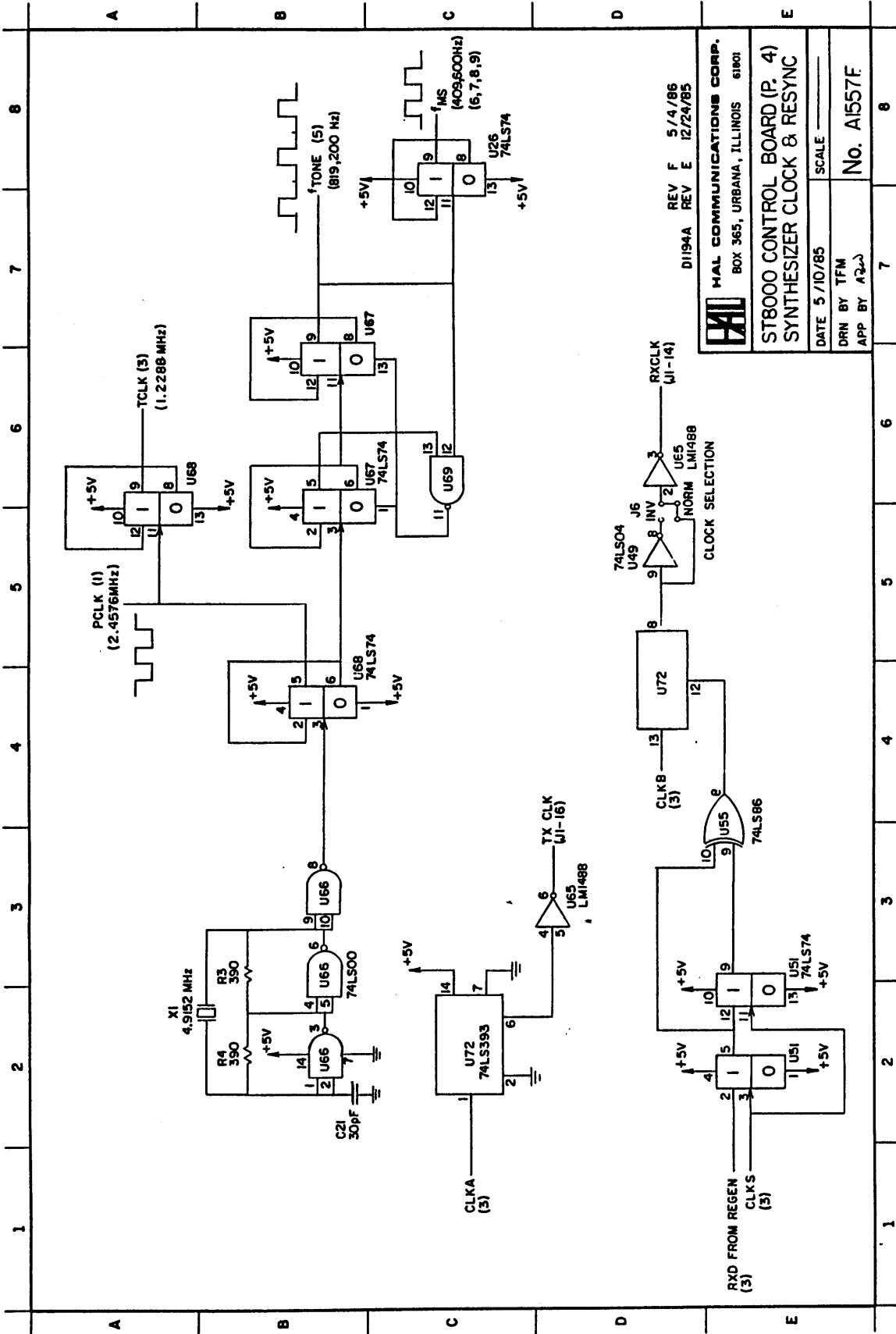


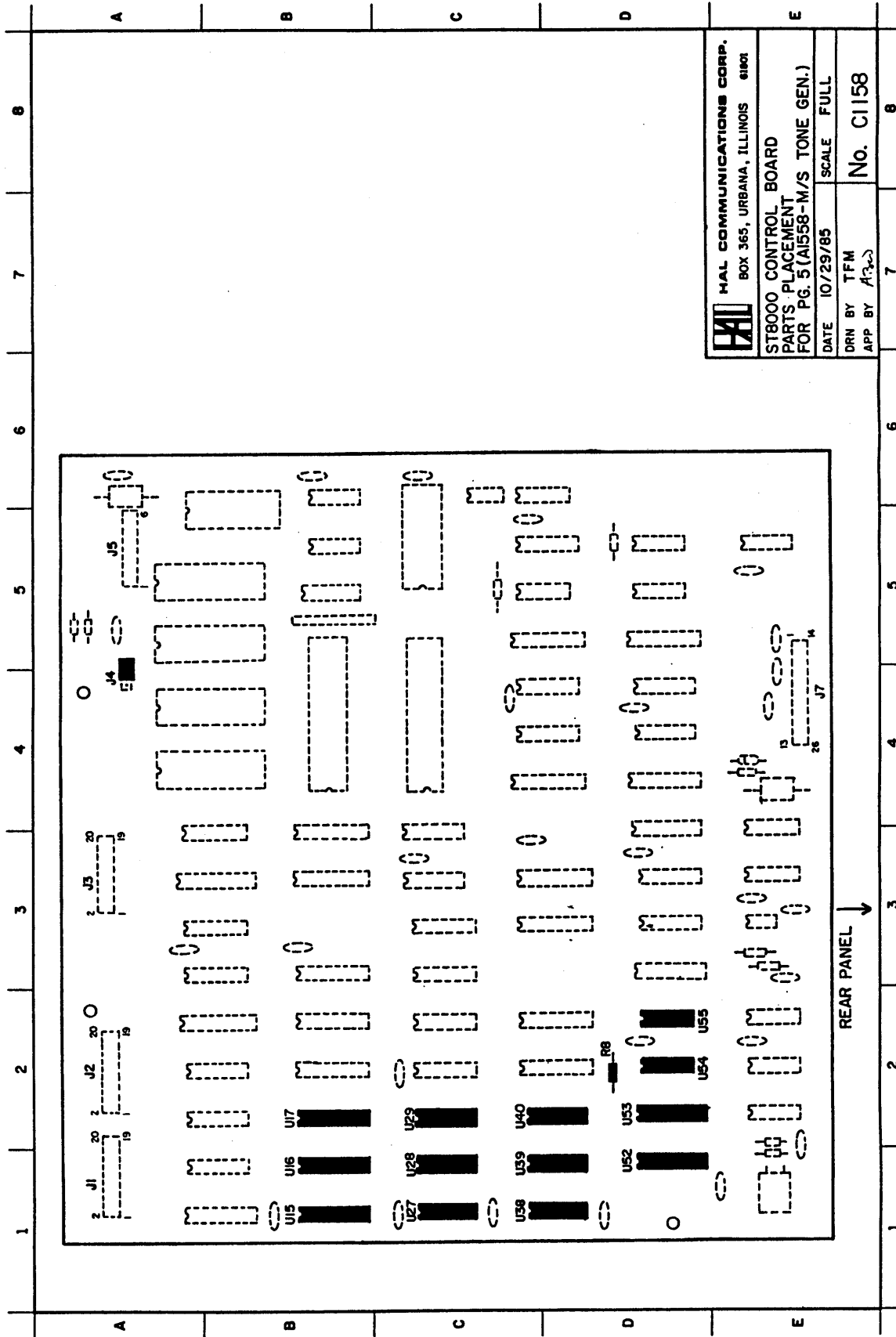


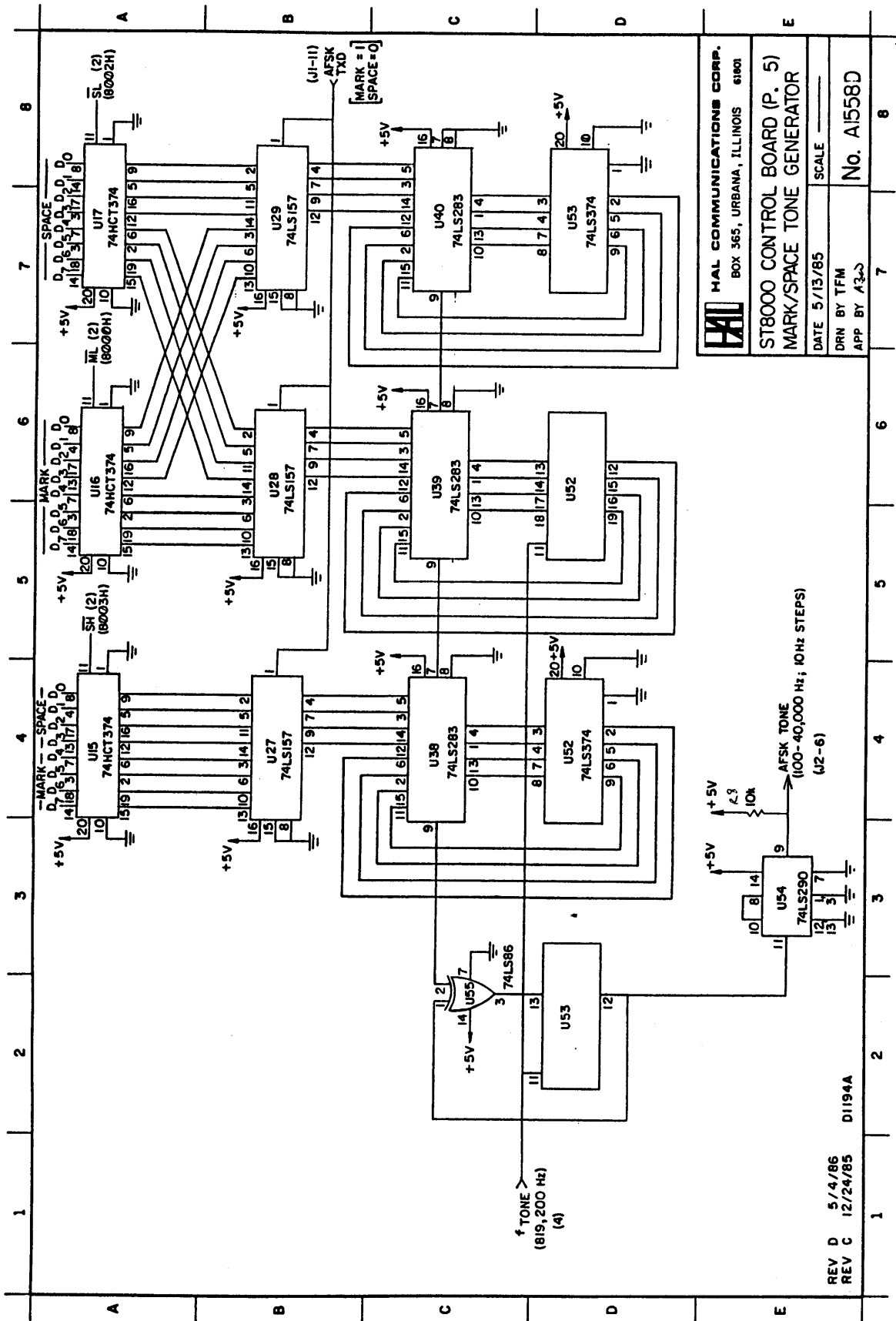
|  |            |
|--|------------|
| <b>HAI</b> HAL COMMUNICATIONS CORP.<br>BOX 365, URBANA, ILLINOIS 61801 |            |
| ST8000 CONTROL BOARD (P. 3)<br>SERIAL CONTROL & DISPLAY CONT.          |            |
| DATE 5/9/85  | SCALE      |
| DRN BY TFM   |            |
| APP BY A2-J  | No. AI556F |

REV F 5/4/86  
REV E 12/24/85  
D1194A









**HAI** HAL COMMUNICATIONS CORP.  
 BOX 365, URBANA, ILLINOIS 61801

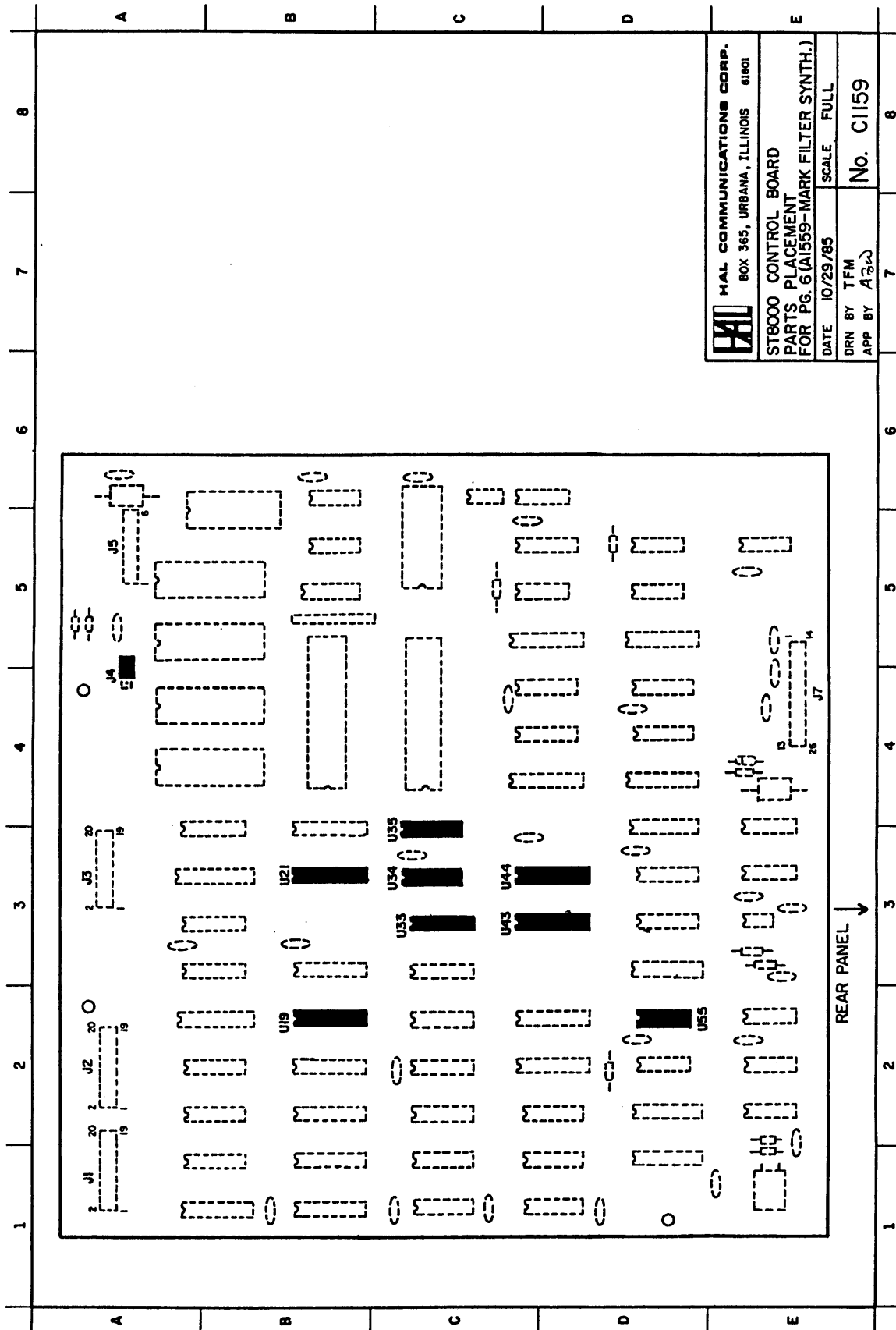
**ST8000 CONTROL BOARD (P. 5)**  
**MARK/SPACE TONE GENERATOR**

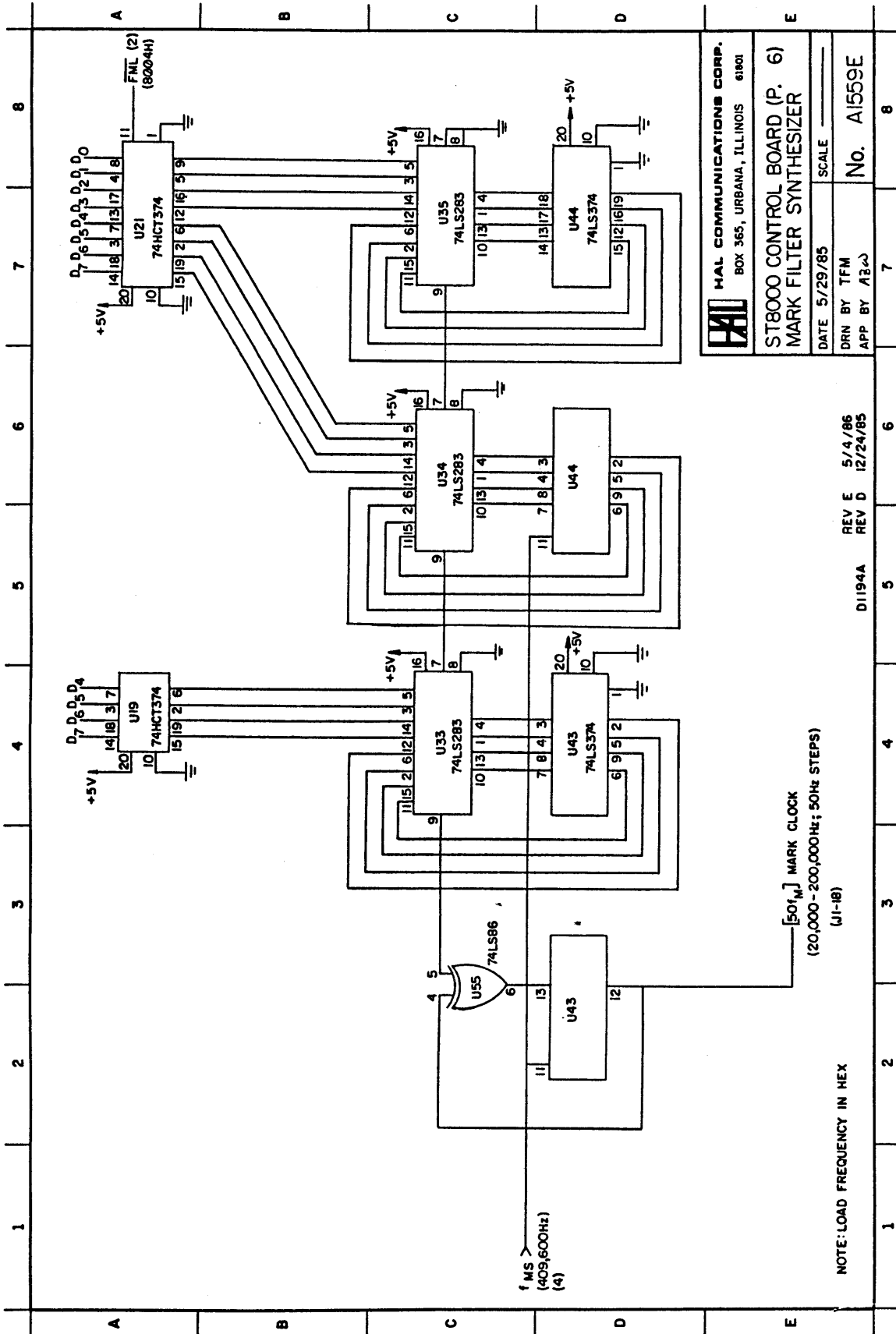
DATE 5/13/85  
 DRN BY TFM  
 APP BY A3-J

SCALE \_\_\_\_\_

No. A1558D

REV D 5/4/86  
 REV C 12/24/85  
 D1194A



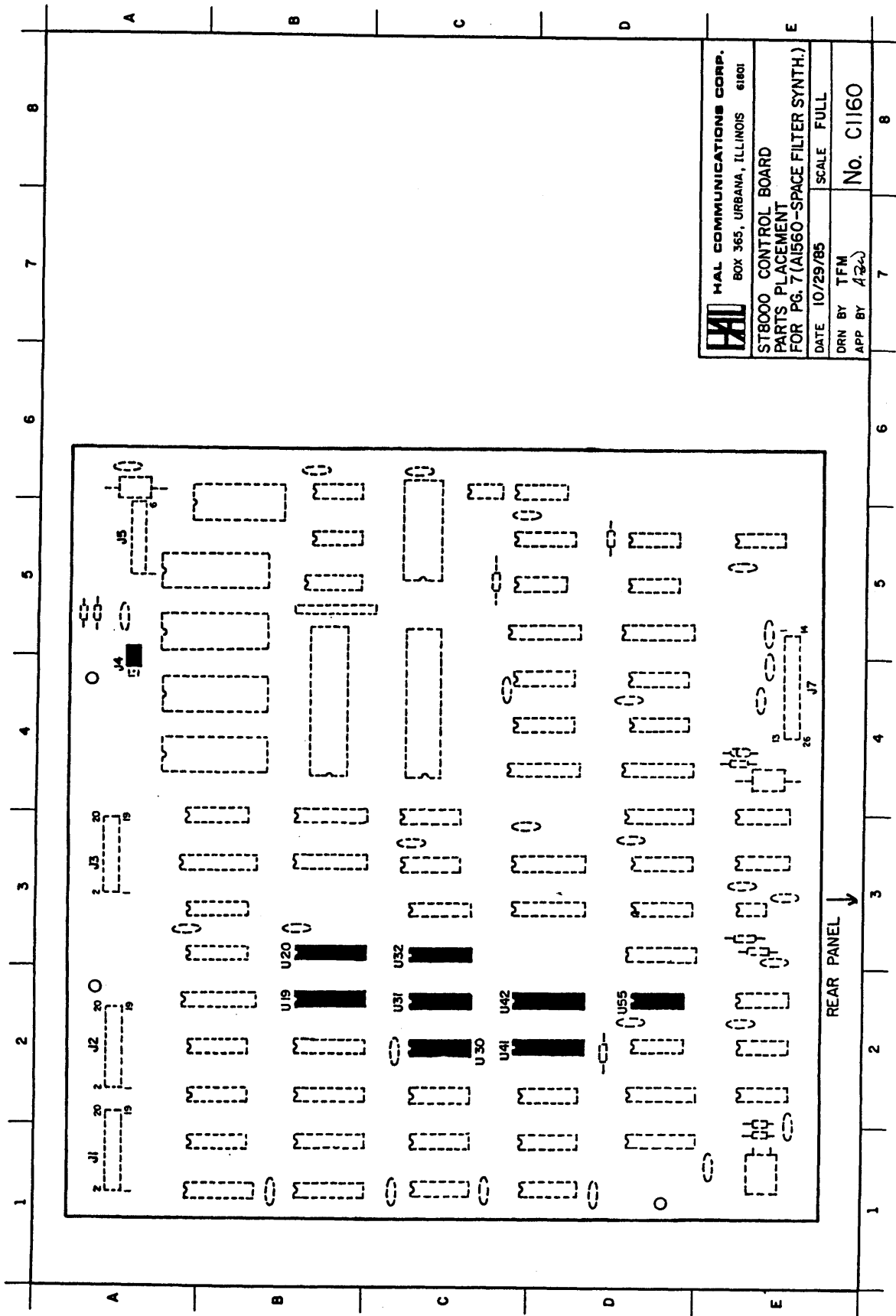


**HAI** HAL COMMUNICATIONS CORP.  
BOX 365, URBANA, ILLINOIS 61801

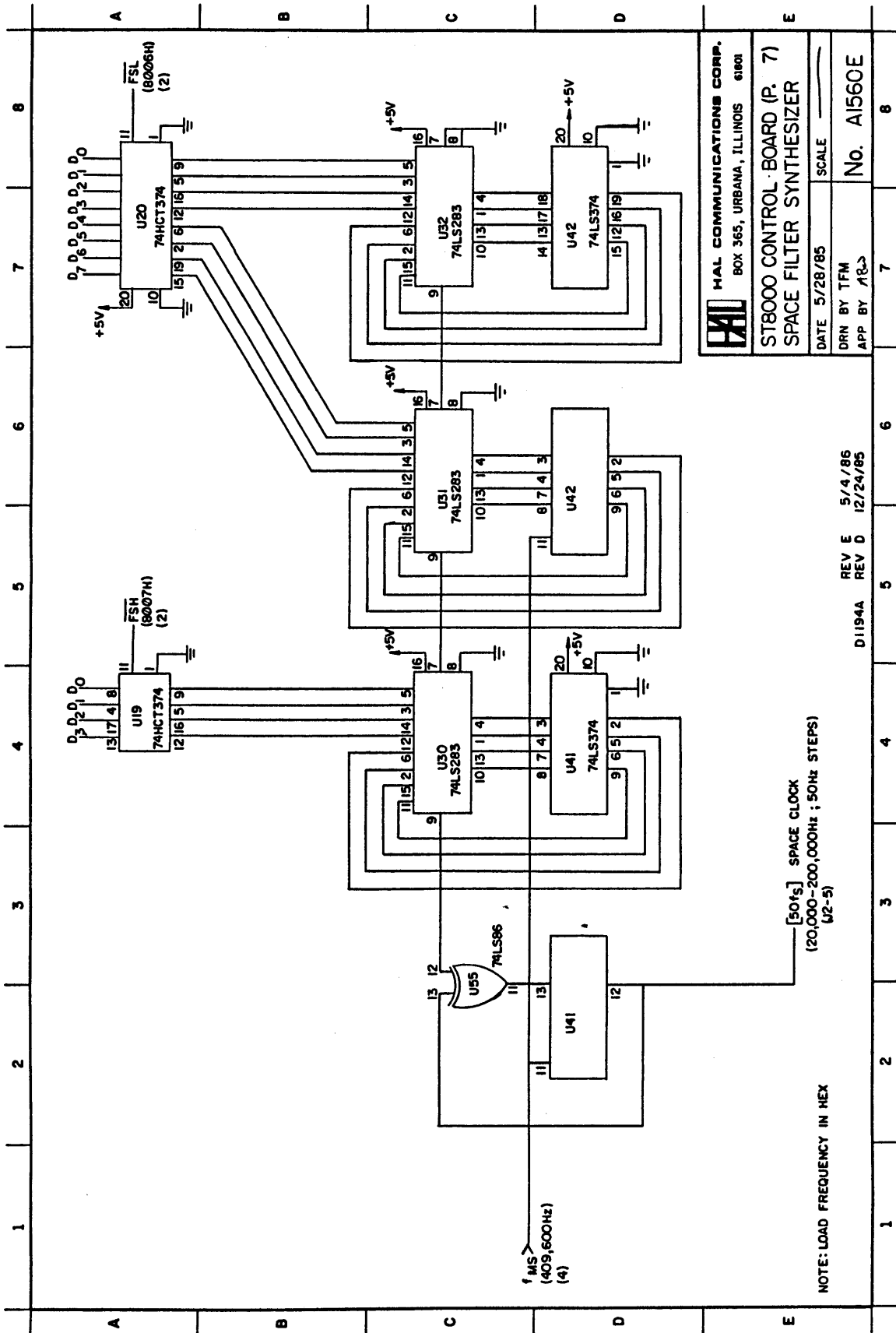
**ST8000 CONTROL BOARD (P. 6)  
MARK FILTER SYNTHESIZER**

REV E 5/4/86  
REV D 12/24/85

D1194A







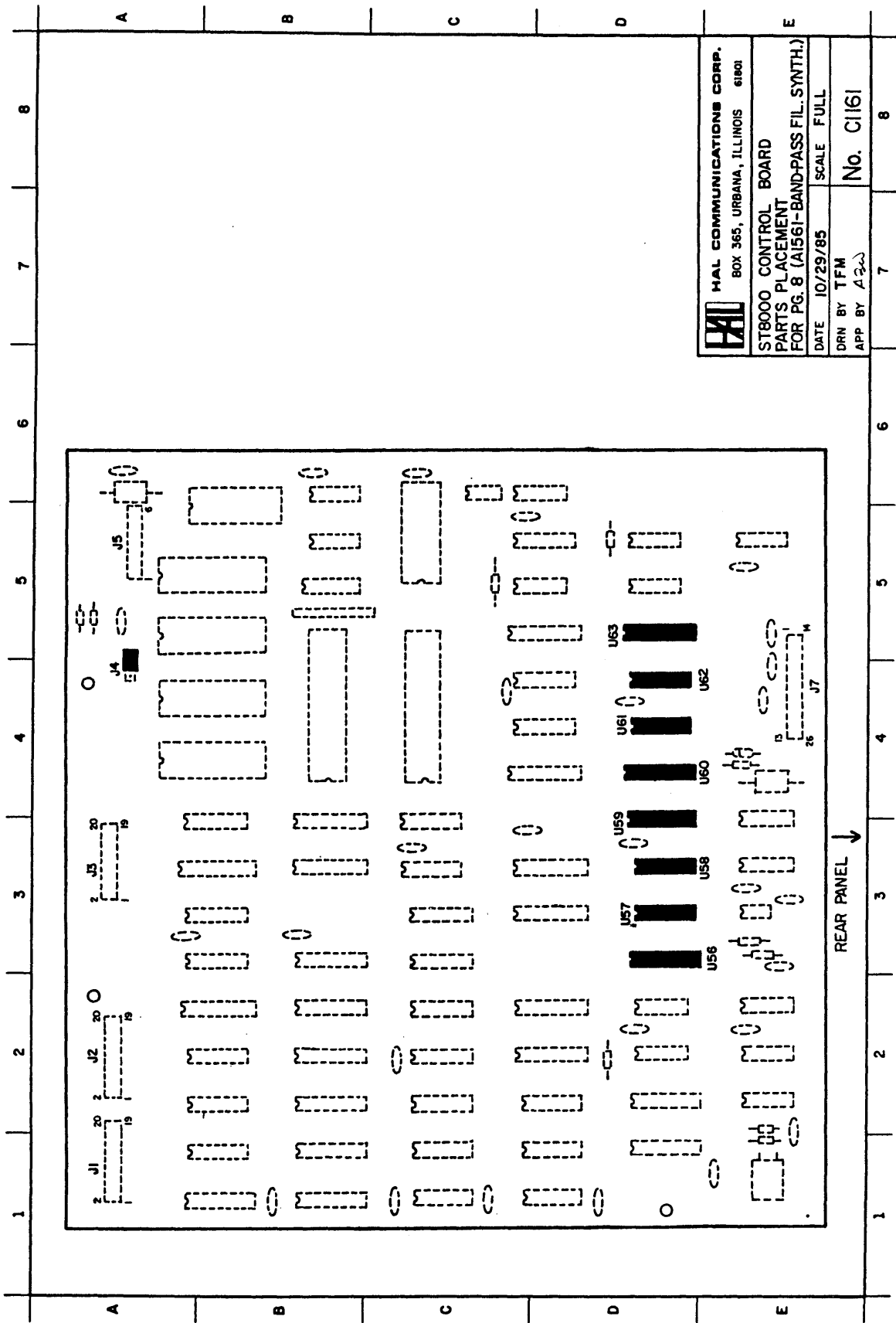
**HAL** HAL COMMUNICATIONS CORP.  
 BOX 365, URBANA, ILLINOIS 61801

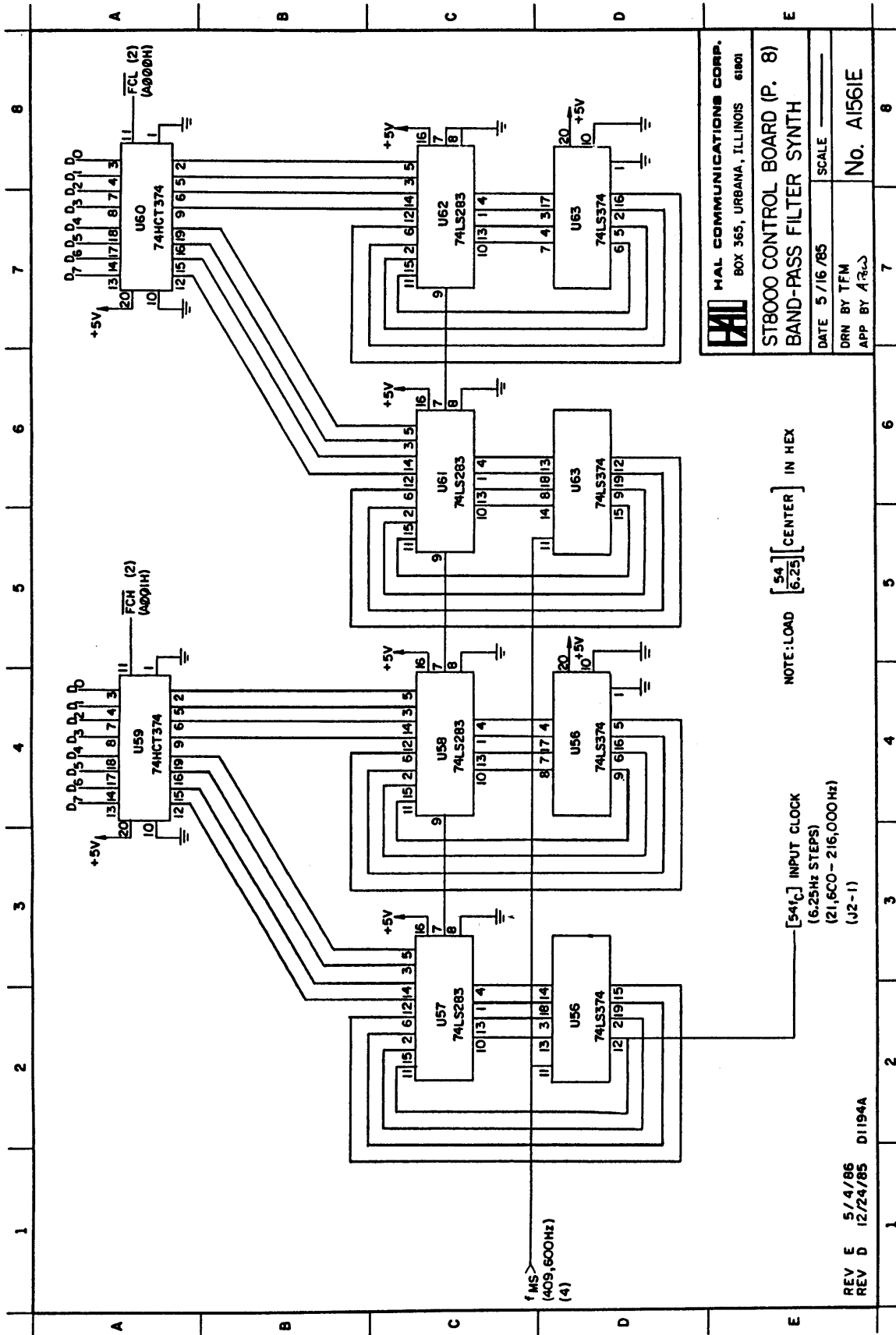
**ST8000 CONTROL BOARD (P. 7)**  
 SPACE FILTER SYNTHESIZER

DATE 5/28/85 SCALE \_\_\_\_\_  
 DRN BY TFM  
 APP BY ARJ No. A1560E

[50fs] SPACE CLOCK  
 (20,000-200,000Hz ; 50Hz STEPS)  
 (2-5)

NOTE: LOAD FREQUENCY IN HEX





**HAI** HAL COMMUNICATIONS CORP.  
 BOX 365, URBANA, ILLINOIS 61801

ST8000 CONTROL BOARD (P. 8)  
 BAND-PASS FILTER SYNTH

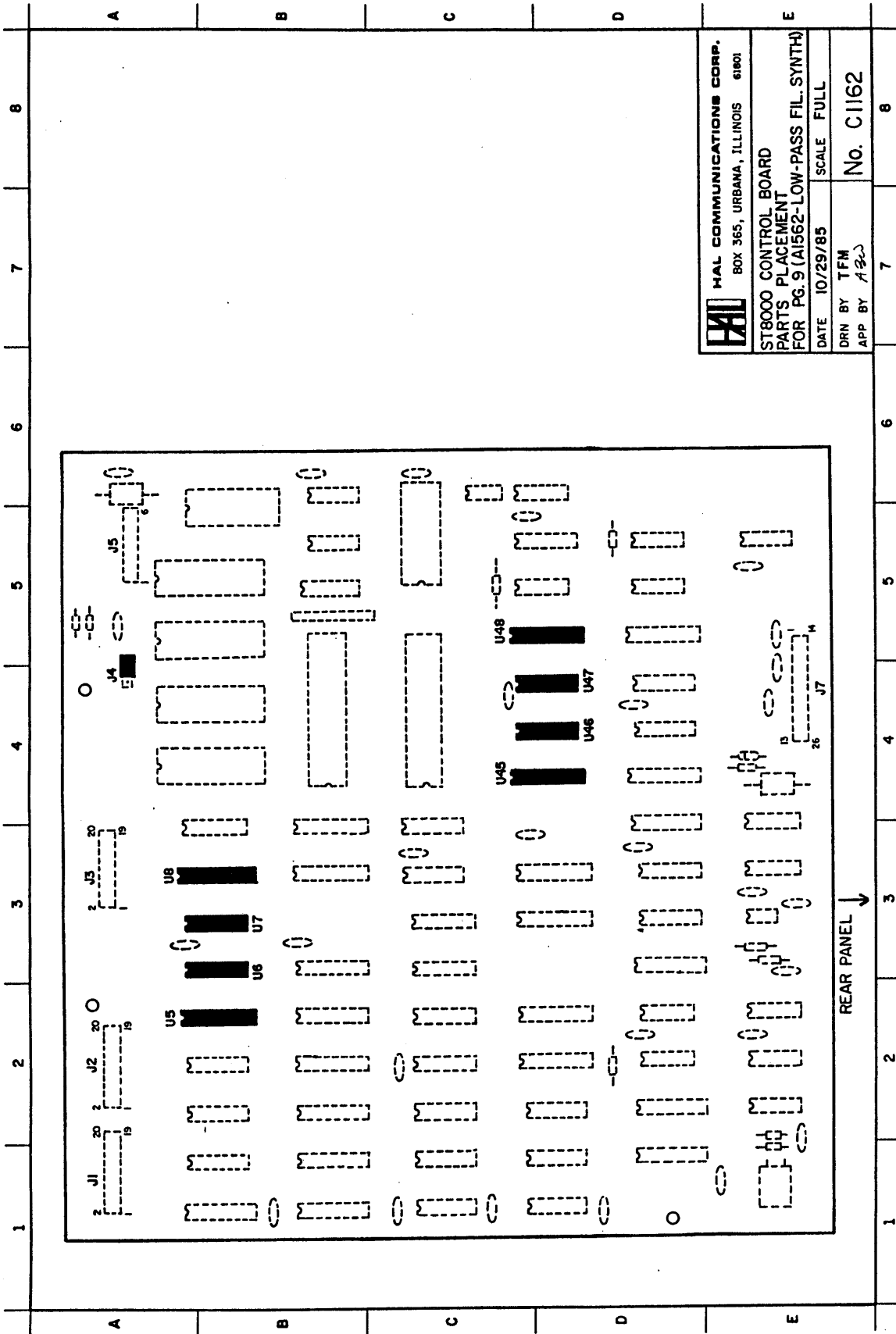
DATE 5/16/85 SCALE \_\_\_\_\_  
 DRN BY TFM  
 APP BY ARJ

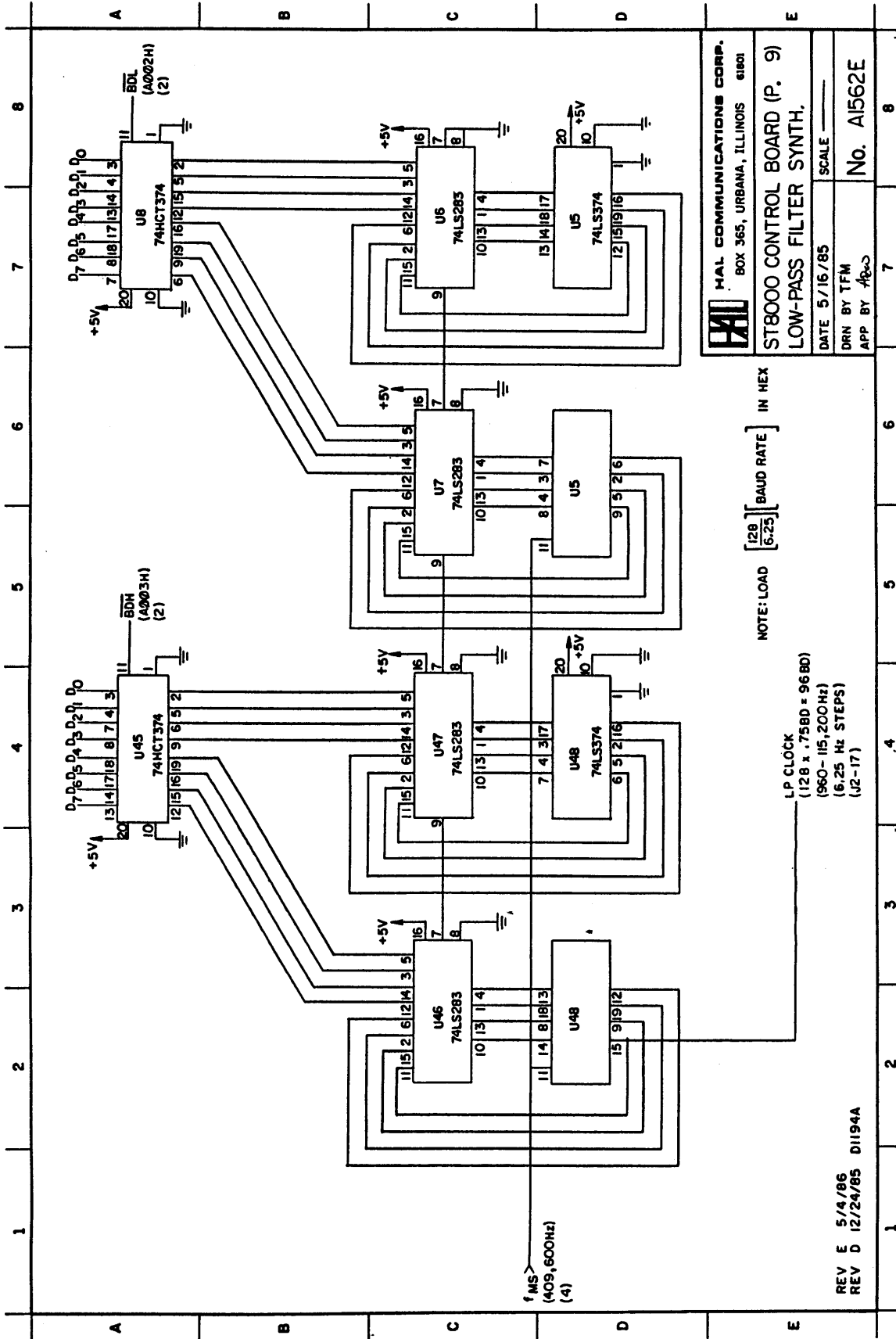
No. AI561E

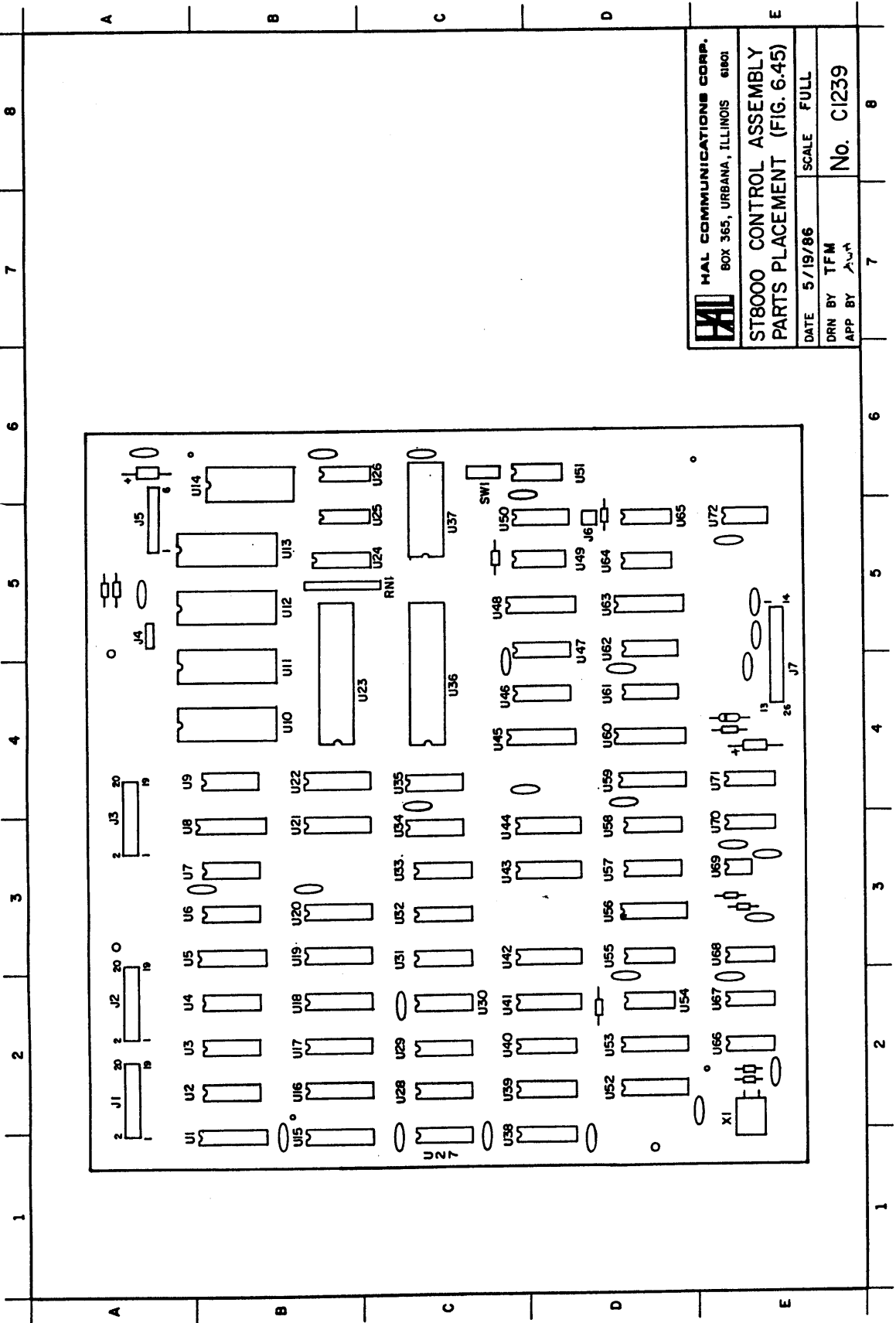
NOTE: LOAD [54] [CENTER] IN HEX [6.25]

[54fc] INPUT CLOCK  
 (6.25Hz STEPS)  
 (21,600 - 216,000 Hz)  
 (J2-1)

REV E 5/4/85  
 REV D 12/24/85 D1194A



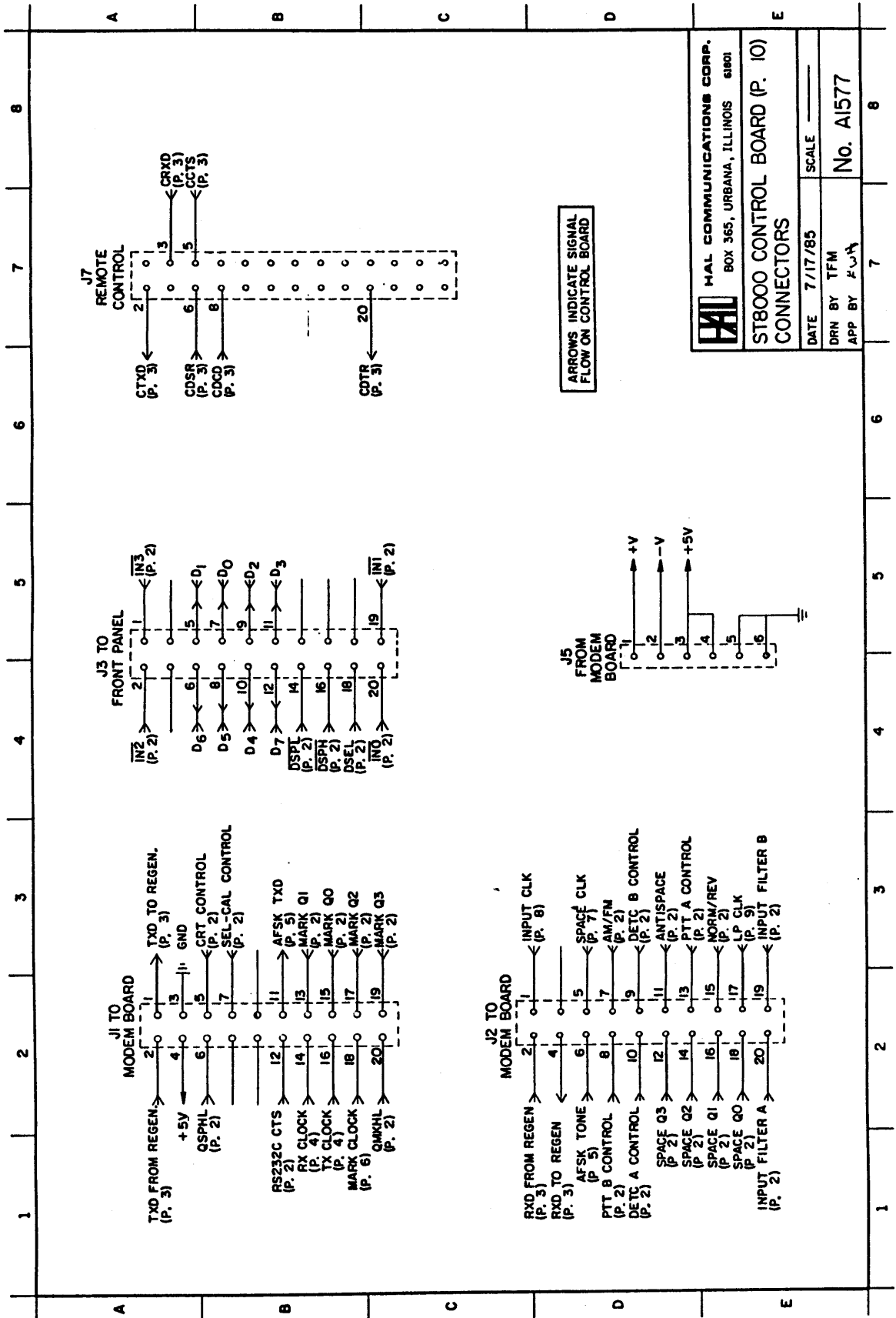


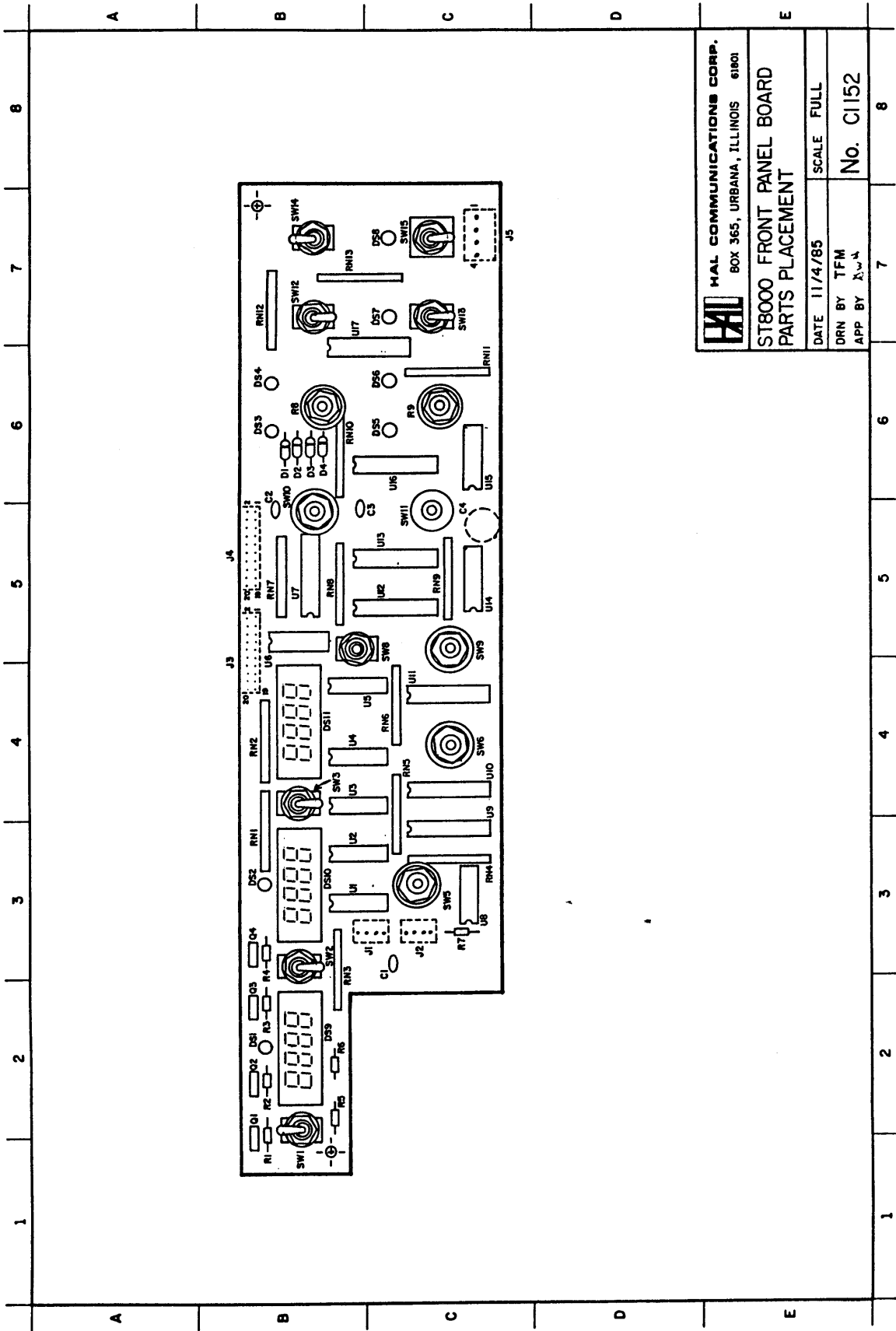


**HAI** HAL COMMUNICATIONS CORP.  
 BOX 365, URBANA, ILLINOIS 61801

**ST8000 CONTROL ASSEMBLY  
 PARTS PLACEMENT (FIG. 6.45)**

DATE 5/19/86 SCALE FULL  
 DRN BY TFM  
 APP BY A.S.A. No. C1239



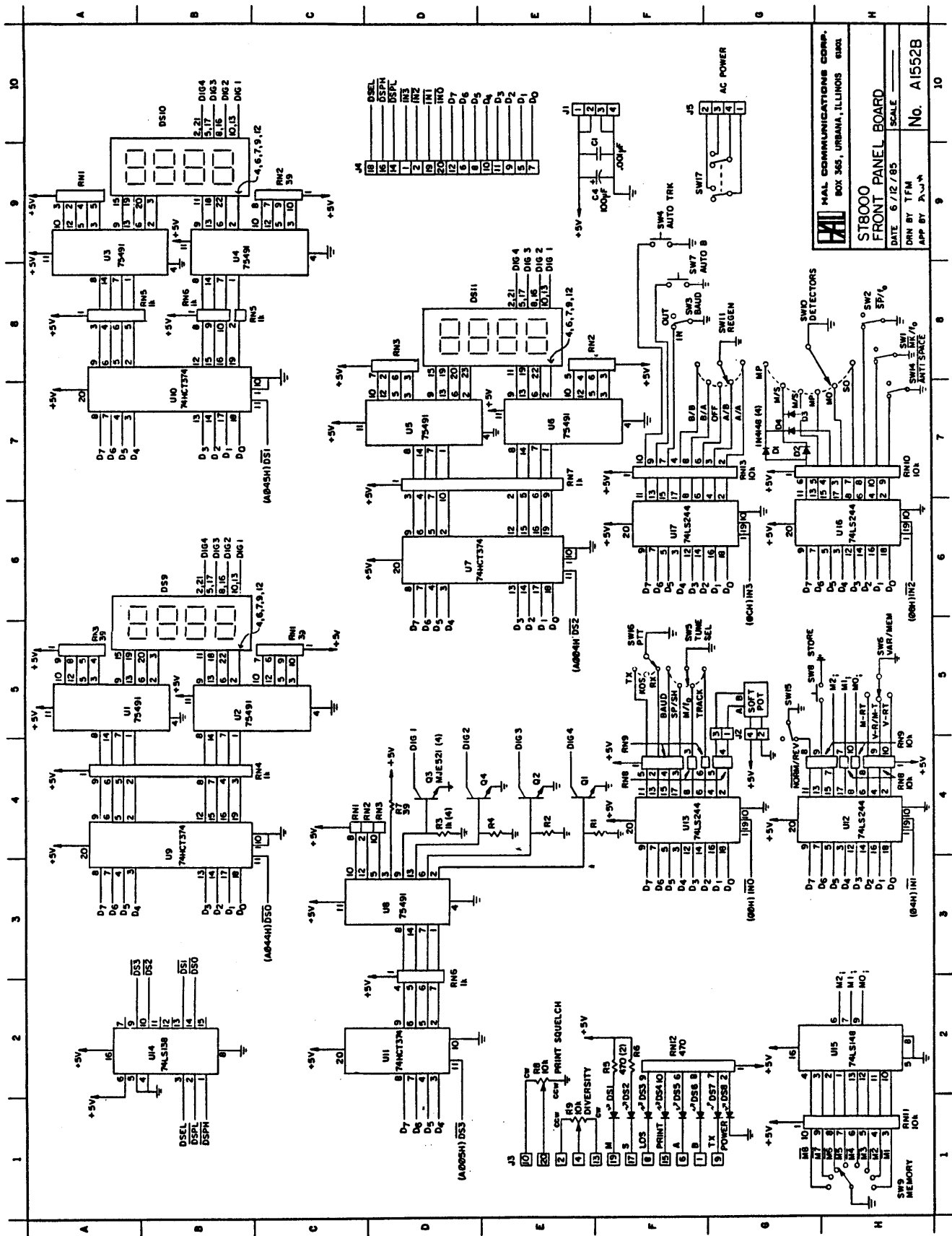


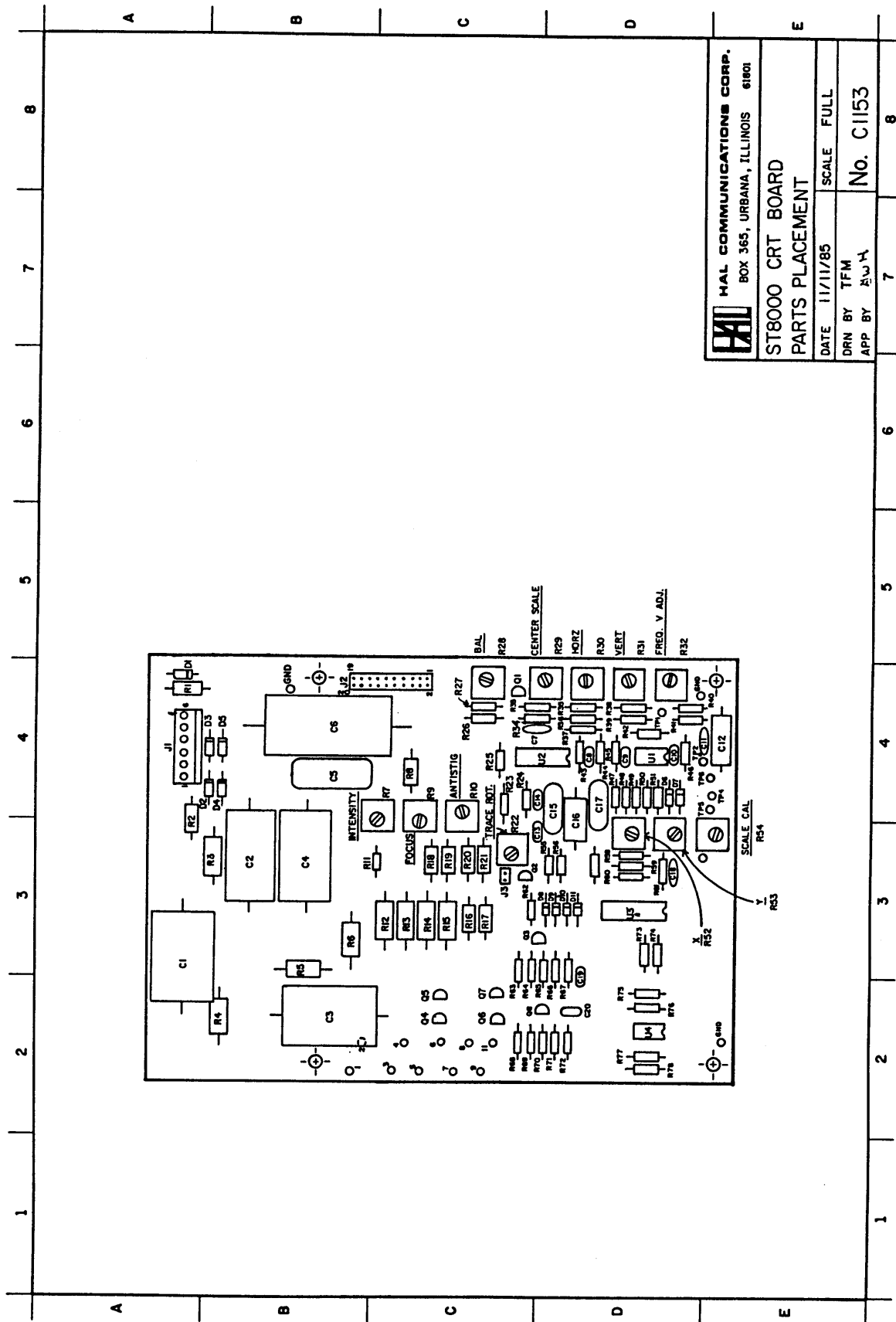
**HAL COMMUNICATIONS CORP.**  
 BOX 365, URBANA, ILLINOIS 61801

**ST8000 FRONT PANEL BOARD  
 PARTS PLACEMENT**

|              |            |
|--------------|------------|
| DATE 11/4/85 | SCALE FULL |
| DRN BY TFM   | No. C1152  |
| APP BY JWA   |            |







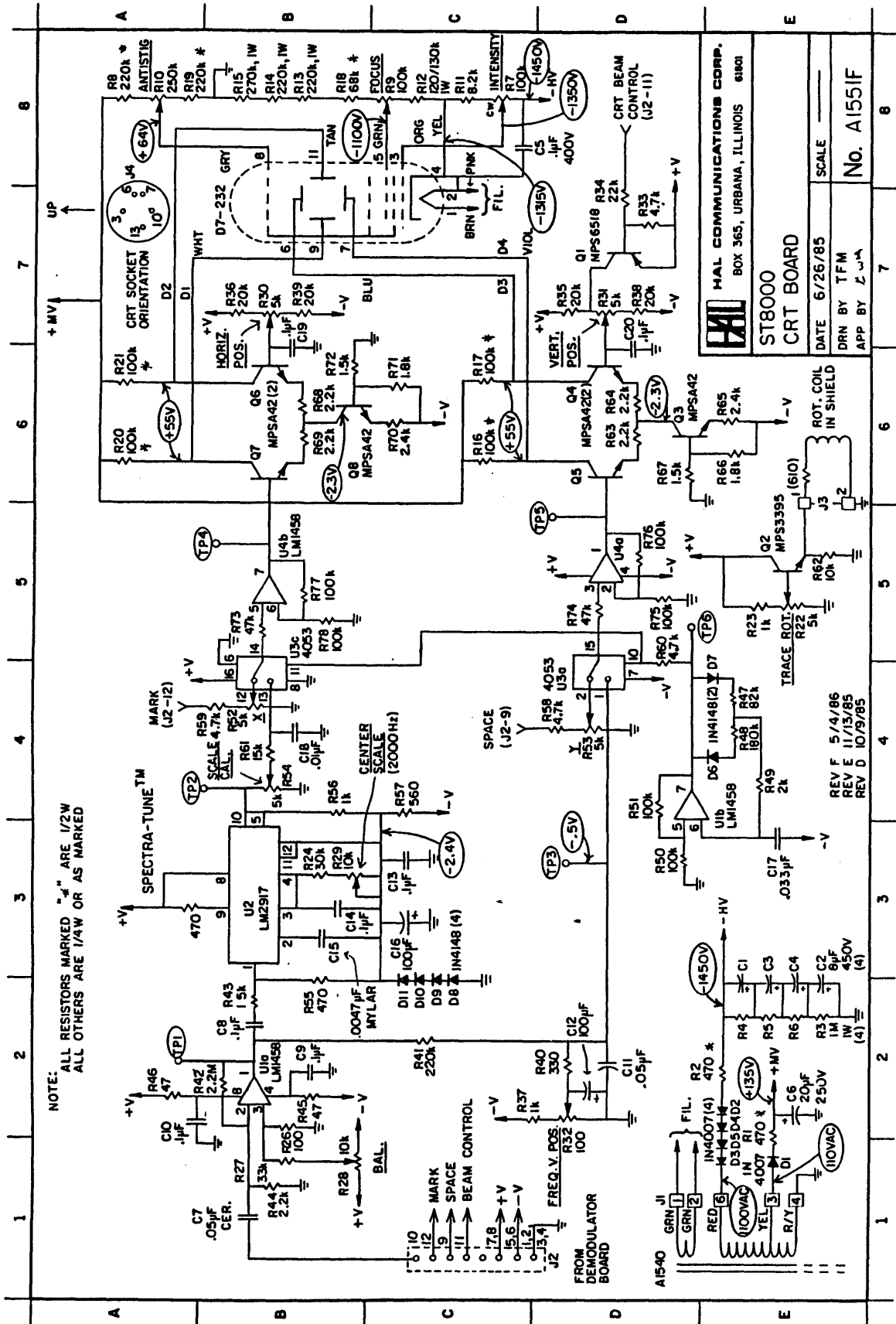
**HAI** HAL COMMUNICATIONS CORP.  
 BOX 365, URBANA, ILLINOIS 61801

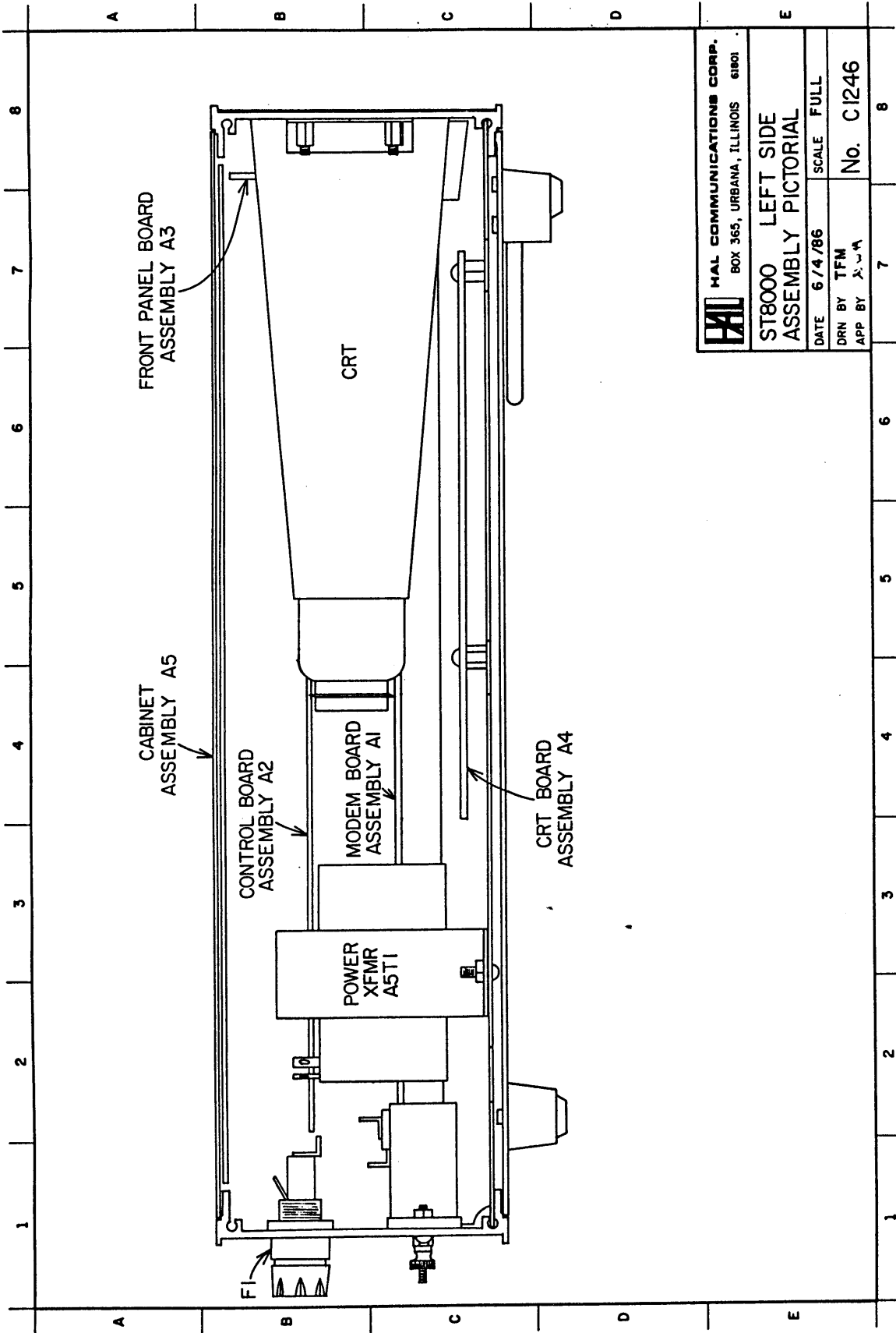
ST8000 CRT BOARD  
 PARTS PLACEMENT

DATE 11/11/85 SCALE FULL

DRN BY TFM  
 APP BY RJW

No. C1153





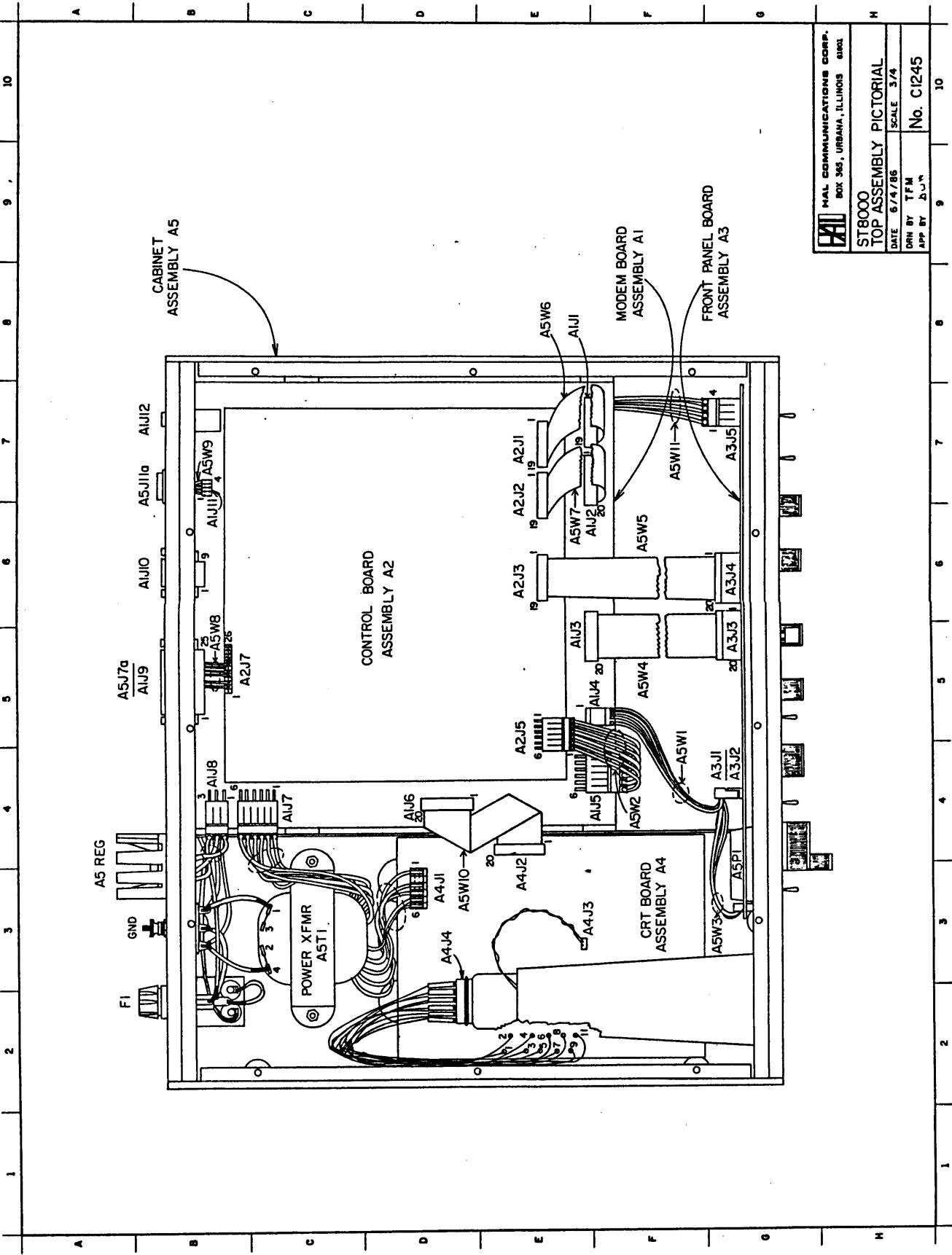
**HAI** HAL COMMUNICATIONS CORP.  
 BOX 365, URBANA, ILLINOIS 61801

ST8000 LEFT SIDE  
 ASSEMBLY PICTORIAL

DATE 6/4/86 SCALE FULL

DRN BY TFM  
 APP BY [Signature]

No. C1246



|   |           |
|---|-----------|
|   |           |
| MCI COMMUNICATIONS CORP.<br>BOX 345, URBANA, ILLINOIS 62901 |           |
| <b>ST8000</b><br><b>TOP ASSEMBLY PICTORIAL</b>              |           |
| DATE 6/4/86   | SCALE 3/4 |
| DRN BY TFM  |           |
| APP BY J.L.M.   | No. C1245 |

