The Model 1200A is a frequency shift tone demodulator designed specifically for use in radio teleprinter applications. Due to the use of the patented * "Decision Threshold Computer" (DTC) technique, outstanding performance is realized for signals derived from the HF radio band.

This technique has been designed to combat the undesirable effects of frequency selection fading which normally plagues HF radio reception, and provides the equivalent of diversity performance (as realized with a ratio detector system) with a single antenna/receiver/demodulator set-up. No separate diversity combiner or comparator unit is required. The "DTC" principle has been widely used in other FEC demodulator designs and has a long history of highly successful operation.

Conventional FSK Demodulators are subject to errors during selective fading on either the mark or space frequencies because of a fixed decision threshold. The Model 1200A, utilizing the DTC, compensates for selective fading by varying its decision threshold to provide optimum detection. The Demodulator provides diversity performance with a single antenna/receiver combination, making it ideally suited to military, commercial, and amateur RTTY applications where large diversity installations are not possible.

The plug-in mark and space bandpass filters are optimized for the particular frequency shift, tone frequencies, and keying speeds utilized. Plug-in filters not only increase the adaptability of the Demodulator to a variety of signal requirements, but also reduce in-the-field changeover time. As an added feature, the bandpass filter outputs can be used for remote AGC with compatible receivers.

The Model 1200A is of modular, solid-state construction with all components mounted on printed circuit cards. All parts and modules are easily accessed by removing the top cover. Frequency determining networks are mounted on small plug-in subassemblies so that operating parameters may be easily changed.

For more information regarding this, or any other FEC product, please contact any authorized FEC marketing representative.

*Manufactured under U.S. Pat. No. 2,999,925.
OPTIONAL FEATURES

Diversity Demod Board – A plug-in PC board, which accepts a separate audio input, and provides additional diversity operation. Assembly D3770.

Filters - Available filter range covers input signals from 400 Hz to 3500 Hz with shifts from 85 to 1000 Hz and mark/space filter bandwidths from 50 Hz to 500 Hz. Input rates available up to 300 baud.

Loop Supply - A plug-in module supplies up to 60 mA/130 Vdc for neutral loops or up to 60 mA/+65 Vdc for polar loops. Assembly C2324. (External current limiting is required.)

Neutral/Polar Keyer - A keyer board provides dry contacts for keying up to 60 ma/130 Vdc neutral or polar telegraph loops. Assembly C3240 (two required for polar).

SPECIFICATIONS

ELECTRICAL

Input Impedance - Balanced and isolated, 600 ohms; balanced and isolated, 10K ohms; high input Z.

Input Signal - 0 dBm on/off keyed (CW) or audio FSK tones. Available in range of 400 to 3500 Hz.

Linear Operation - 0 to -60 dBm in “normal” mode; 0 to -55 dBm in “mark” or “space” only modes.

Saturation - Signals over +4 dBm will cause clipping. Unit will accept up to +20 dBm without damage.

Baud Rate - Standard TTY rates up to 300 baud, depending upon frequency shift and mark/space filter bandwidth.

Mark/Space Filters - Tone frequencies, 400 to 3500 Hz; bandwidth, 50 to 500 Hz; frequency shifts, 85 to 1000 Hz.

Output Circuit - Detected digital waveform in accordance with EIA Standard RS-232-C. Detected digital waveform compatible with the low level interface requirements of MIL-STD-188C. Tie points for diversity operation in conjunction with another 1200A (low impedance).

Output Keying - See Optional Features.

Power Requirements - 115/230 Vac, +10%, 50-400 Hz; 10 watts (w/o options).

MECHANICAL

Dimensions - 19 inches wide (48.3 cm), 1⅛ inches high (4.4 cm), 17 inches deep (43.2 cm).

Finish - Chassis is clear anodized. Front panel is painted light gray, engraved and filled.

Mounting - Mounts in a standard 19-inch equipment rack (with or without optional slides).

Weight - Approximately 7 ½ pounds (3.4 kg), w/o options.

Servicing - The top cover of the unit is removable to permit maintenance.

ENVIRONMENTAL

Temperature Range - -10° to +60° C, operating.

Relative Humidity - 0 to 95% (non-condensing).

Atmospheric Pressure - To 15,000 feet.

Shock - 10 G’s along any of the mutually perpendicular axes.

Vibration - Exceeds the requirements for MIL-STD-167, Type I.

ORDERING INFORMATION

When placing an order for a Model 1200A, it is necessary to specify the following:

• Mark/Space Tones
• Operating Speeds
• Optional Features

Mark/Space filters are available from 400 Hz to 3500 Hz. Some of the more popular filters and baud rates are shown in the tables to the right. Many other filters are available on request.

Parameters must be reviewed by an authorized FCC marketing representative.

TYPICAL TONE FILTERS

<table>
<thead>
<tr>
<th>Frequency</th>
<th>1000 Hz</th>
<th>1275 Hz</th>
<th>1575 Hz</th>
<th>1700 Hz</th>
<th>1850 Hz</th>
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<tbody>
<tr>
<td><strong>50 Hz</strong></td>
<td>1000 Hz</td>
<td>1275 Hz</td>
<td>1575 Hz</td>
<td>1700 Hz</td>
<td>1850 Hz</td>
</tr>
</tbody>
</table>

TYPICAL BAUD RATES

<table>
<thead>
<tr>
<th>Baud Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>45</strong></td>
</tr>
<tr>
<td><strong>50</strong></td>
</tr>
<tr>
<td><strong>75</strong></td>
</tr>
</tbody>
</table>

ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTIFICATION

FREDERICK ELECTRONICS CORPORATION
Hayward Road/Post Office Box 502/Frederick, Maryland 21701
Telephone: (301) 662-5901 / Cable FREDCO / Telex: 893438

Date: 5/78
NOTES:
1. NET W/O 00018
2. STENCIL REAR COMP
Optional per customer requirements.
3. BEZEL SUPPLIED W/HT LED.
4. ITEM 54 SUPERSEDES ITEM 24.

Revision C not incorporated in this configuration.

Figure 7-1. Model 1200A Assembly
D3064D
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RES, 120k</td>
<td>B545</td>
</tr>
<tr>
<td>2</td>
<td>RES, 80k</td>
<td>B546</td>
</tr>
<tr>
<td>3</td>
<td>RES, 47k</td>
<td>B547</td>
</tr>
<tr>
<td>4</td>
<td>RES, 4.7k</td>
<td>B548</td>
</tr>
<tr>
<td>5</td>
<td>CAP, 10µF</td>
<td>B549</td>
</tr>
<tr>
<td>6</td>
<td>CAP, 4.7µF</td>
<td>B550</td>
</tr>
<tr>
<td>7</td>
<td>CAP, 0.1µF</td>
<td>B551</td>
</tr>
<tr>
<td>8</td>
<td>CAP, 0.01µF</td>
<td>B552</td>
</tr>
<tr>
<td>9</td>
<td>TRANSFORMER</td>
<td>B553</td>
</tr>
<tr>
<td>10</td>
<td>TRANSFORMER</td>
<td>B554</td>
</tr>
<tr>
<td>11</td>
<td>TRANSFORMER</td>
<td>B555</td>
</tr>
</tbody>
</table>

Figure 7-1. Parts List
DM.4.3 AUTO MARK-HOLD CIRCUITS

The auto mark-hold circuits do not function in an AMH2 mode. Refer to Sheet 2 of the schematic diagram. A LLO applied to J12-19, when the AMH1 pushbutton is depressed, enables NAND gates Z27-C and Z22-C. Thus, the mark-hold condition is obtained when either (or both) mark and/or space outputs of the DTC circuit fall below threshold condition. In linear operation the threshold is at approximately -10 dbm; in limiter operation the threshold is at approximately -50 dbm.

DM.4.4 SCHMITT TRIGGER/SELECTOR CIRCUITS

The Schmitt trigger/selector circuits differ from those of the NO1309 board in the biasing arrangement and the control of the DTC circuit. Refer to Sheet 2 of the schematic diagram. Since mark and space circuits are identical, only the mark circuit is described.

The biasing arrangement for JFET switch transistor Q8 and switch transistor Q7 is such to assure proper turn-ON of Q8.

When the MARK pushbutton switch is depressed, a LLO applied to J12-20, turns Q5, Q6, and Q4 OFF. This prevents application of space signals to the operational amplifier and inhibits operation of the continuous-level input detector portion of the mark DTC circuit as described in Paragraph DM.4.2.

DM.5 ALIGNMENT AND ADJUSTMENT PROCEDURES

DM.5.1 REQUIRED TEST EQUIPMENT

The following test equipment (or equivalent) is required in addition to that listed in Table 5-1 of the Model 1200A/1273 Instruction Manual:

1. Digital Distortion Analyzer, Digitech Model 2683-01.

2. Message Generator, Frederick Electronics Model 1306A.

DM.5.2 MARK CHANNEL GAIN ADJUSTMENT

Proceed as follows:

1. Set up the equipment as shown in Figure 5-1 of the Model 1200A (or 1273) Instruction Manual, with the signal generator connected to pins 10 and 11 of TBl and the VTVM connected as shown by the dotted line (the LIMIT MODE pushbutton should be in the out position).

2. Apply a space tone at -10 dbm.
3. Reconnect the VTVM between pins 1 and 10 of J17; measure and note space filter output level.

4. With the VTVM connected as indicated by the dotted line in Figure 5-1, apply a mark tone at -10 dbm.

5. Reconnect the VTVM between pins 4 and 10 of J17 and measure the mark filter output level.

6. Adjust MARK LEVEL potentiometer R29 to obtain the same level as noted in Step 3.

7. If a diversity board is used in the 1200A unit, perform Steps 1 through 6 on the diversity board with the signal generator connected to pins 7 and 8 of TB1.

DM.5.3 MARK AND SPACE RECTIFIER OFFSET

Proceed as follows:

1. Electrically disconnect diversity board (NO1490), if used, from its connector.

2. Disconnect connector J13 from the Demodulator board (NO1483).

3. Connect oscilloscope probe to pin 1 of J17 (select its most sensitive input) and oscilloscope ground to pin 10 of J17.


5. Reconnect oscilloscope probe to pin 4 of J17.


7. If diversity board NO1490 is used in the 1200A unit, adjust diversity channel mark and space rectifier offset as follows:
   a. Adjust Demodulator board NO1483 RECT OFFSET potentiometers prior to adjusting the diversity channel.
   b. Ensure that J11 is connected and that J15 is disconnected.
   c. Perform Steps 3 through 6 adjusting R4 for the mark offset and R2 for the space offset.
DM.5.4 MARK AND SPACE DTC OFFSET

Proceed as follows:

1. Connect the output of the message generator to the data input of the tone keyer.

2. Connect the FSK output of the tone keyer as illustrated in Figure 5-2 of the Model 1200A (or 1273) Instruction Manual, with the FSK signal connected to pins 10 and 11 of TB1.

3. Make certain that the message generator and tone keyer are set at the proper baud rate and mark and space frequencies.

4. Connect distortion analyzer between pin 7 and pin 10 (ground) of J17.

5. Set message generator for steady mark output.

6. Set the attenuator to zero and ensure that the input to the 1200A/1273 is 0 dbm; adjust the output level of the tone keyer, if necessary, to obtain 0 dbm.

7. Set the message generator to produce a reversals output.

8. Adjust attenuator to obtain a -30 dbm input to the 1200A/1273 unit.

9. Set distortion analyzer for polar input, bias distortion, filter control -- OUT, and for operation at appropriate baud rate (all equipment should be operating at the same baud rate).

10. Depress the SP MODE pushbutton on the front panel of the 1200A/1273 unit.

11. Adjust SPACE DTC OFFSET potentiometer R83 for the lowest distortion indication on the distortion analyzer.

12. Release SP MODE pushbutton and depress MK MODE pushbutton.

13. Adjust MARK DTC OFFSET potentiometer R86 for the lowest distortion indication on the distortion analyzer.
Figure DM-5. Demodulator Board NO1483 Assembly
D3739
### Parts List

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>MFR</th>
<th>Cat. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>1/246.12 STANDOFF</td>
<td>CTC</td>
<td>683182</td>
</tr>
<tr>
<td>55</td>
<td>1</td>
<td>PC-50-21 TRANSFORMER</td>
<td>UTC</td>
</tr>
<tr>
<td>64</td>
<td>8</td>
<td>002400 PC BOARD</td>
<td>FFC</td>
</tr>
</tbody>
</table>

### Notes:
1. SCHEMATIC REFERENCE D373A.
2. UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE 1/4W.
3. WIRE MOLEX RECEPTACLE PIN FOR PIN WITH PC BOARD USING 1380T6L PINS. PIN 15 WILL BE 1381T AND REMAIN UNUSED.
4. UNLESS OTHERWISE SPECIFIED DRILL ALL HOLES.
   - NO. 55 (.052) DR & INSTALL 46410 GRIPLETS.
   - NO. 68 (.031) DR FOR I.C.'S.
   - NO. 55 (.052) DR - 18 PLACES & INSTALL EYELETS.
   - NO. 55 (.052) DR - 22 PLACES & INSTALL MINI-INSERTS.
   - NO. 52 (.063) DR - 10 PLACES & INSTALL ITEM 58.
   - NO. 43 (.089) DR - 3 PLACES & INSTALL ITEM 59.
   - NO. 30 (.128) DR - 17 PLACES & INSTALL ITEM 68.
   - NO. 11 (.191) DR - 5 PLACES & INSTALL ITEM 56.
   - NO. 49 (.073) DR - 8 PLACES & INSTALL ITEM 55.

### Resistor Values Required for Dwg No.
- NO. 22 1/4W WIRE MOLEX RECEPTACLE PIN FOR PIN WITH 1381T EYELET
- NO. 24 1/4W WIRE MOLEX RECEPTACLE PIN FOR PIN WITH 1381T EYELET

### Items 69 & 71 Used in Accordance with Customer Requirements and/or Specifications.
Figure DM-3. Demodulator Board N01483, Schematic Diagram
D3738, Sheet 1
Figure DM-3. Demodulator Board NO1483, Schematic Diagram
D3738, Sheet 2
Figure DM-4. Optional Diversity Demodulator Board NO1490, Schematic Diagram

D3771
NOTES:
1. SCHEMATIC REFERENCE D2817.
2. UNLESS OTHERWISE NOTED DRILL ALL HOLES NO. 55 (.052) DIAMETER AND INSTALL 46410 SCREWS.
3. INSTALL STANDOFFS ON COMPONENT SIDE OF BOARD AND BANANA PLUGS FOR USE ON 120VAC.
THE VALUE OF R7 A REV OF PC BOARD
THE VALUE OF R7 B REV OF PC BOARD
NO. 55 (0.052) DRILL - 2 PLACES FOR NO. 2188-U STANDOFF.
THE VALUE OF R7 A REV OF PC BOARD
THE VALUE OF R7 B REV OF PC BOARD

Figure 7-3. Mark-Space Bandpass Filter Assembly
Sheet 1, D2818
Figure 7-3. Mark-Space Bandpass Filter Assembly
Sheet 2, D2818
Figure 7-3. Mark-Space Bandpass Filter Assembly
D2818, Sheet 3
<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
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<tbody>
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</tr>
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<tr>
<td>2800</td>
<td>296</td>
</tr>
<tr>
<td>3000</td>
<td>297</td>
</tr>
</tbody>
</table>

- The value of R7 for A Rev of PC Board
- The value of R7 for B Rev of PC Board
- R35 used on both Revs of PC Board only

---

**Figure 7-3. Mark-Space Bandpass Filter Assembly**

Sheet 4, D2818
**Figure 7-3. Mark-Space Bandpass Filter Assembly**

Sheet 5, D2818
### Figure 7-3. Mark-Space Bandpass Filter Assembly

Sheet 6, D2818
Figure 7-3. Mark-Space Bandpass Filter Assembly
Sheet 7, D2818
Figure 7-3. Mark-Space Bandpass Filter Schematic Diagram
Sheet 8, D2818