

**APPENDIX J**

**WJ-8607A/HPIL INTERFACE OPTION**

**P/N 181184-001, Revision D**

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June 2001

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**WJ-8607A/HPIL INTERFACE INSTRUCTION MANUAL****REVISION RECORD**

| Revision | Description  | Date  |
|----------|--|-------|
| A        | Initial issue.   | 7/94  |
| B        | Errata corrected   | 5/95  |
| C        | Added WJ part number to the title page. Incorporated a List of Effective Pages. Added page numbers to section cover pages and their back pages. Removed "intentionally left blank" pages and replaced with "Notes" pages that are formatted with headers and page numbers. | 8/97  |
| D        | Incorporated ECO 041393.   | 06/01 |

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**APPENDIX J**

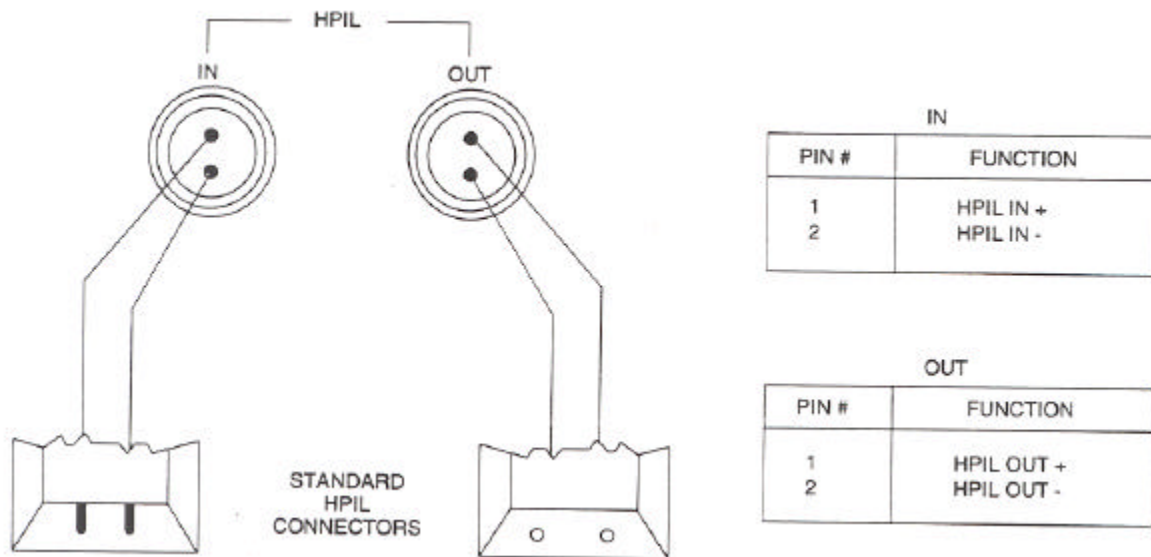
**TYPE WJ-8607A/HPIL INTERFACE OPTION**

**J.1 GENERAL DESCRIPTION**

The HPIL (Hewlett-Packard Interface Loop) interface is a medium speed, medium distance, low power serial interface loop. This interface offers an addressing scheme that allows multiple receivers to share a single bus. A service request capability is also included as part of HPIL. An application level communication format similar to that of IEEE-488.2 is provided. HPIL is supported with commercial interface translators, controllers, and-PC interfaces. When the HPIL interface is selected as the remote interface, the standard Serial I and Serial 2 interfaces of the WJ-8607A are disabled.

**J.2 HARDWARE CONFIGURATION**

HPIL data is input and output at AIJ5 and AIJ6, respectively, located at the Miniceptor's front panel. The HPIL option utilizes a twisted-pair cable arrangement at lengths up to 100 meters. HPIL data transfers are enabled when the unit is powered up, causing a logic high pulse to be applied to the line from the Microprocessor and Memory section. This allows the HPIL IN data to be transformer coupled to the HPIL-RX lines. If power is interrupted to the receiver, a logic low pulse is applied to the line from the Power Supply section, which switches the HPIL IN data at J5 to the HPIL OUT connector J6. This allows the connected HPIL interface loop to remain intact if the WJ-8607A is part of a multiple receiver/unit configuration. **Figure J-1** shows the HPIL-IN and HPIL OUT connectors and their pin functions.



**Figure J-1. HPIL Interface Connector**

### J.3 **RECEIVER CONFIGURATION**

When the WJ-8607A is shipped with the HPIL option installed, only the HPIL address needs to be configured on the receiver. The address is configured by the setting of DIP switch AIS2 in the WJ-8607A Receiver. Refer to the WJ-8607A Installation and Operation Manual for details regarding the setting of this switch. The receiver supports transfer rates as high as 20 k bytes per second. The WJ-8607A outputs data at approximately 3 k bytes per second and supports the following functions of the HPIL interface standard.

|     |   |
|-----|---|
| R   | Receiver interface                      |
| D   | Driver interface                        |
| AH1 | Acceptor handshake                      |
| SH1 | Source handshake                        |
| CO  | No controller capability                |
| T1  | Talker, send data                       |
| T2  | Talker, send status                     |
| T3  | Talker, send accessory ID               |
| L1  | Basic listener                          |
| SR2 | Service request, basic and asynchronous |
| RLO | No local operation                      |
| AA1 | Basic auto address                      |
| PDO | No power down                           |
| PPO | No parallel poll capability             |
| DC2 | Device clear, universal and addressed   |
| DTO | No device trigger capability            |
| DD0 | No device dependent commands            |

### J.4 **HPIL INTERFACE I/O OPERATION PROTOCOL**

The following paragraphs provide further details of Miniceptor remote operations when the HPIL interface is used and applies only to HPIL I/O operations. For additional information on the HPIL interface, see the HPIL Interface Specification.

#### J.4.1 **TERMINATOR**

The input buffer is processed on the receipt of a LF character. The Miniceptor outputs messages terminated with CR, LF.

#### J.4.2 **DEVICE CLEAR**

Receipt of the Device Clear (DCL) or Selected Device Clear (SDC) HPIL commands causes the Miniceptor to clear both input and output buffers of any data.

**J.4.3 SERVICE REQUEST (SRQ)**

The Miniceptor may set the SRQ condition based on an enabled requesting condition. The serial poll operation clears the SRQ. The SRQ is sent synchronously or can be sent asynchronously if enabled by the Enable Asynchronous Request (EAR) HPIL command. The data byte returned from the serial poll action defines the cause of the SRQ. This byte is bit mapped the same as the response to the \*STB? query. The transmitting of SRQ is enabled via the \*SRE, \*ESE, and RSE commands.

**J.4.4 BUFFER HANDLING**

The HPIL buffers are handled in a linear fashion. When a terminator has been received, the Miniceptor will accept no further data until all data in the input buffer has been processed. Data in the output buffer is made available upon the completion of processing of all queries in the input buffer. Upon reading the data from the output buffer, it becomes empty. The unit flushes the output buffer of any remaining unread data upon processing of a new query. In response to either SDC or DCL commands, the Miniceptor empties both the input and output buffers. The HPIL input buffer holds up to 512 bytes of data. The HPIL output buffer holds up to 1024 bytes of data.

**J.5 UNIT NUMBERING METHOD**

The method of numbering used throughout the unit is assigning reference designations (electrical symbol numbers) to identify: assemblies, subassemblies, modules within a subassembly, and discrete components. An example of the unit numbering method used is as follows:

| <u>Subassembly Designation A1</u> | <u>R1 Class and No. of Item</u>                        |
|-----------------------------------|--|
| Identify from right to left as:   | First (1) resistor (R) of<br>first (1) subassembly (A) |

On the main chassis schematic, components which are an integral part of the main chassis have no subassembly designations.

**J.6 REFERENCE DESIGNATION PREFIX**

The use of partial reference designations are used on the equipment and on the manual illustrations. This partial reference designation consists of the component type letter(s) and the identifying component number. The complete reference designation may be obtained by placing the proper prefix before the partial reference designation. Reference designation prefixes are included on the drawings and illustrations in the figure titles (in parenthesis).

J.7 **LIST OF MANUFACTURERS**

| <u>Mfr.<br/>Code</u> | <u>Name and Address</u>  | <u>Mfr.<br/>Code</u> | <u>Name and Address</u>   |
|----------------------|--|----------------------|---|
| OAKZ5                | Crane Electronics, Inc.<br>4700 Smith Road Suite R<br>Cincinnati, OH 45212                           | 2P953                | Lemo USA, Incorporated<br><br>Santa Rosa, CA 95406  |
| OEXD1                | Inductor Supply Company<br>1849 W. Sequoia Avenue<br>Orange, CA 92668-1017                           | 2X491                | Rockwell International Corp.<br>Filter Products<br>2990 Airway Avenue<br>Costa Mesa, CA 92626 |
| 00779                | AMP, Incorporated<br>P.O. Box 3608<br>Harrisburg, PA 17150   | 61441                | Saronix<br>4010 Transport Street<br>Palo Alto, CA 94303-4913                                  |
| 04713                | Motorola Incorporated<br>Semiconductor Products Div.<br>5005 East McDowell Road<br>Phoenix, AZ 85005 | 61722                | Epson America Incorporated<br>3415 Kashiwa Street<br>Torrance, CA 90505-4024                  |
| 11532                | Teledyne Relays<br>3155 W. El Segundo Blvd.<br>Hawthorne, CA 90250                                   | 61935                | Schurter Incorporated<br>1016 Clegg Court<br>Peraluma, CA 94952-1152                          |
| 18324                | Signetics Corporation<br>811 East Arques Avenue<br>Sunnyvale, CA 94086                               | 71468                | ITT Corporation<br>ITT Canyon Division<br>666 E. Dyer Road<br>Santa Ana, CA 92702             |
| 20462                | PREM Magnetics, Incorporated<br>3519 N. Chapel Hill<br>McHenry, IL 60050-2504                        | 91802                | Industrial Devices, Inc.<br>982 River Road<br>Edgewater, NJ 92705                             |
| 27014                | National Semi-Conductor Corp.<br>2950 San Ysidro Way<br>Santa Clara, CA 95091                        | 9J979                | Hitachi America, Ltd.<br>950 Benicia Avenue<br>Sunnyvale, CA 94086-2804                       |
| 28480                | Hewlett-Packard Company<br>Corporate Headquarters<br>1501 Page Mill Road<br>Palo Alto, CA 94304      |                      |   |

## J.8 **PARTS LIST**

The following parts lists contain all the electrical components used in the unit, along with mechanical parts which may be subject to unusual wear or damage. When ordering replacement parts from the BAE SYSTEMS, specify the unit type, the serial number, and the option configuration. Also include the reference designation and the description of each item ordered. The list of manufacturers, provided in **paragraph J.7**, and the manufacturer's part number, provided in **paragraph J.9**, are supplied as a guide to aid the user of the equipment while in the field. The parts listed may not necessarily be identical with the parts installed in the unit. The parts listed in **paragraph J.9** will provide for satisfactory unit operation.

Replacement parts may be obtained from any manufacturer provided that the physical characteristics and electrical parameters of the replacement item are compatible with the original part. In the case where components are defined by a military or industrial specification, a vendor which can provide the necessary component is suggested as a convenience to the user.

### **NOTE**

As improvements in semiconductors are made, it is the policy of BAE SYSTEMS to incorporate them in proprietary products. As a result, some transistors, diodes and integrated circuits which are installed in the unit may not agree with the parts lists or schematic diagrams of this manual. However, semiconductor devices listed in this manual may be substituted with satisfactory results.

### J.8.1 **PROVISIONING NOTE - INCONSISTENCIES IN PART NUMBERING CONVENTIONS**

The internal computer applications at BAE SYSTEMS Gaithersburg Operations have undergone upgrades to better serve our customers. With this upgrade came alterations to the numbering scheme for parts reporting to an end item. Due to these alterations, minor inconsistencies may exist between identifying parts numbers found on drawings, piece parts, or other documentation. No form fit and function specifications have been altered due to this change in the numbering scheme.

The inconsistencies take two forms. New part number conventions mandate the use of three-digit suffixes for part numbers used within computer applications. Part numbers having single-digit suffixes have been altered by the addition of leading zeroes. Therefore, a piece part with an identifying number having a suffix of "-2" may be represented in a computer-generated document with a part number having a suffix of "-002". Also the new part numbering convention requires that the base portion of a part number be made up of six digits. Part numbers with base portions with less than six digits are expressed with leading zeroes to meet this requirement. Accordingly, a part number having a base of "34456" may appear as "034456". If you have questions or concerns regarding the configuration identification of piece parts, contact the plant for additional information at 1-800-954-3577.

| REF<br>DESIG | DESCRIPTION                                  | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR |
|--------------|--|--------------------|---------------------------|--------------|----------------|
| J.9          | <u>TYPE WJ-8607A/HPIL INTERFACE</u>          |                    |                           |              | MAIN CHASSIS   |
| A1           | Revision A<br>Digital Controller PC Assembly | 1                  | 797136-2                  | 14632        |                |

| REF<br>DESIG | DESCRIPTION   | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR      |
|--------------|---|--------------------|---------------------------|--------------|---------------------|
| J.10         | <b><u>TYPE 797136-2 DIGITAL CONTROL PC ASSEMBLY</u></b> |                    |                           |              | REF DESIG PREFIX AI |
|              | Revision C1   |                    |                           |              |                     |
| BTI          | Battery, Lithium, 3V                                    | 1                  | VL2330-IHF                | 4J627        |                     |
| C1           | Capacitor, Ceramic,.047μF, 10%, 50V                     | 69                 | 841415-023                | 14632        |                     |
| C2           |   |                    |                           |              |                     |
| Thru         | Same as C1  |                    |                           |              |                     |
| C11          |   |                    |                           |              |                     |
| C12          | Capacitor, Tantalum, 47pF, 20%,16V                      | 7                  | 841293-30                 | 14632        |                     |
| C13          | Same as C12   |                    |                           |              |                     |
| C14          | Capacitor, Tantalum, μF, 20%,16V                        | 7                  | 841293-36                 | 14632        |                     |
| C15          | Same as C14   |                    |                           |              |                     |
| C16          | Same as C1  |                    |                           |              |                     |
| C17          | Capacitor, Ceramic, 22pF, 2%, 50V                       | 5                  | 841416-033                | 14632        |                     |
| C18          | Same as C17   |                    |                           |              |                     |
| C19          | Same as C1  |                    |                           |              |                     |
| C20          | Same as C1  |                    |                           |              |                     |
| C21          | Same as C14   |                    |                           |              |                     |
| C22          | Same as C14   |                    |                           |              |                     |
| C23          | Same as C1  |                    |                           |              |                     |
| C24          | Capacitor, Ceramic, 100pF, 5%, 50V                      | 160                | 841415-007                | 14632        |                     |
| C25          | Same as C24   |                    |                           |              |                     |
| C26          | Same as C1  |                    |                           |              |                     |
| C27          | Same as C14   |                    |                           |              |                     |
| C28          | Same as C1  |                    |                           |              |                     |
| C29          | Same as C1  |                    |                           |              |                     |
| C30          | Same as C1  |                    |                           |              |                     |
| C31          | Not in Circuit  |                    |                           |              |                     |
| C32          |   |                    |                           |              |                     |
| Thru         | Same as C1  |                    |                           |              |                     |
| C40          |   |                    |                           |              |                     |
| C41          |   |                    |                           |              |                     |
| Thru         | Same as C24   |                    |                           |              |                     |
| C70          |   |                    |                           |              |                     |
| C71          | Same as C1  |                    |                           |              |                     |
| C72          | Same as C1  |                    |                           |              |                     |
| C73          |   |                    |                           |              |                     |
| Thru         | Same as C24   |                    |                           |              |                     |
| C107         |   |                    |                           |              |                     |
| C108         | Capacitor, Tantalum, 6.8pF, 20%, 16V                    | 4                  | 841293-26                 | 14632        |                     |
| C109         | Same as C1  |                    |                           |              |                     |
| C110         | Same as C1  |                    |                           |              |                     |
| C111         | Same as C108  |                    |                           |              |                     |
| C112         | Same as C108  |                    |                           |              |                     |
| C113         | Same as C1  |                    |                           |              |                     |
| C114         | Same as C1  |                    |                           |              |                     |

| REF<br>DESIG | DESCRIPTION | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR |
|--------------|-------------|--------------------|---------------------------|--------------|----------------|
|--------------|-------------|--------------------|---------------------------|--------------|----------------|

REF DESIG PREFIX AI

|      |                                      |   |                |       |  |
|------|--------------------------------------|---|----------------|-------|--|
| C115 |                                      |   |                |       |  |
| Thru | Same as C24                          |   |                |       |  |
| C120 |                                      |   |                |       |  |
| C121 | Not in Circuit                       |   |                |       |  |
| C122 | Not in Circuit                       |   |                |       |  |
| C123 |                                      |   |                |       |  |
| Thru | Same as C24                          |   |                |       |  |
| C146 |                                      |   |                |       |  |
| C147 | Same as C1                           |   |                |       |  |
| C148 | Not in Circuit                       |   |                |       |  |
| C149 | Same as C14                          |   |                |       |  |
| C150 |                                      |   |                |       |  |
| Thru | Same as C1                           |   |                |       |  |
| C162 |                                      |   |                |       |  |
| C163 | Same as C12                          |   |                |       |  |
| C164 | Capacitor, Ceramic, 100pF, 5%, 50V   | 3 | 841415-007     | 14632 |  |
| C165 | Same as C12                          |   |                |       |  |
| C166 | Capacitor, Ceramic,.047 μF, 10%, 50V | 2 | 841415-023CI66 | 14632 |  |
| C167 | Not in Circuit                       |   |                |       |  |
| C168 | Same as C17                          |   |                |       |  |
| C169 | Same as C17                          |   |                |       |  |
| C170 |                                      |   |                |       |  |
| Thru | Same as C24                          |   |                |       |  |
| C195 |                                      |   |                |       |  |
| C196 | Same as C1                           |   |                |       |  |
| C197 | Same as C1                           |   |                |       |  |
| C198 | Same as C1                           |   |                |       |  |
| C199 |                                      |   |                |       |  |
| Thru | Same as C24                          |   |                |       |  |
| C204 |                                      |   |                |       |  |
| C205 | Same as C1                           |   |                |       |  |
| C206 | Same as C24                          |   |                |       |  |
| C207 | Same as C24                          |   |                |       |  |
| C208 | Same as C164                         |   |                |       |  |
| C209 | Same as C164                         |   |                |       |  |
| C210 | Capacitor, Ceramic, 330pF, 5%, 50V   | 2 | 841415-010     | 14632 |  |
| C211 | Same as C210                         |   |                |       |  |
| C212 | Capacitor, Tantalum, 47pF, 20%, 16V  | 1 | 841293-30      | 14632 |  |
| C213 | Same as C166                         |   |                |       |  |
| C214 | Same as C24                          |   |                |       |  |
| C215 | Same as C24                          |   |                |       |  |
| C216 | Same as C1                           |   |                |       |  |
| C217 | Same as C24                          |   |                |       |  |



| REF<br>DESIG | DESCRIPTION | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR |
|--------------|-------------|--------------------|---------------------------|--------------|----------------|
|--------------|-------------|--------------------|---------------------------|--------------|----------------|

REF DESIG PREFIX A1

|      |                                      |   |               |       |  |
|------|--------------------------------------|---|---------------|-------|--|
| C218 |                                      |   |               |       |  |
| Thru | Same as C1                           |   |               |       |  |
| C223 |                                      |   |               |       |  |
| C224 | Same as C12                          |   |               |       |  |
| C225 | Same as C1                           |   |               |       |  |
| C226 | Same as C1                           |   |               |       |  |
| C227 | Not in Circuit                       |   |               |       |  |
| C228 | Not in Circuit                       |   |               |       |  |
| C229 | Same as C24                          |   |               |       |  |
| C230 | Same as C24                          |   |               |       |  |
| C231 | Same as C24                          |   |               |       |  |
| C232 | Same as C1                           |   |               |       |  |
| C233 | Same as C1                           |   |               |       |  |
| C234 | Same as C1                           |   |               |       |  |
| C235 | Capacitor, Electrolytic              | 2 | ECE-A1HFS470  | 54473 |  |
| C236 | Same as C235                         |   |               |       |  |
| C237 |                                      |   |               |       |  |
| Thru | Same as C24                          |   |               |       |  |
| C254 |                                      |   |               |       |  |
| C255 | Capacitor, Tantalum, 3.3pF, 20%, 35V | 1 | 841293-11     | 14632 |  |
| C256 | Same as C108                         |   |               |       |  |
| C257 | Same as C1                           |   |               |       |  |
| C258 | Same as C1                           |   |               |       |  |
| C259 | Same as C17                          |   |               |       |  |
| C260 | Same as C 12                         |   |               |       |  |
| C261 | Capacitor, Tantalum, 1.0μF, 20%, 35V | 1 | 841293-05     | 14632 |  |
| C262 | Same as C12                          |   |               |       |  |
| 0263 | Same as C14                          |   |               |       |  |
| C264 | Same as C1                           |   |               |       |  |
| C265 |                                      |   |               |       |  |
| Thru | Same as C24                          |   |               |       |  |
| C269 |                                      |   |               |       |  |
| C270 | Same as C1                           |   |               |       |  |
| CR1  | Diode, Switching                     | 6 | MMBD7000LT1   | 04713 |  |
| CR2  | Diode, Schottky Barrier              | 5 | HSMS-2812-T31 | 28480 |  |
| CR3  | Same as CRI                          |   |               |       |  |
| CR4  | Same as CRI                          |   |               |       |  |
| CR5  | Same as CR2                          |   |               |       |  |
| CH6  | Same as CR2                          |   |               |       |  |
| CR7  | Same as CRI                          |   |               |       |  |
| CR8  | Same as CHI                          |   |               |       |  |
| CR9  | Diode                                | 2 | HSMS-2812-T31 | 28480 |  |
| CR10 | Same as CR9                          |   |               |       |  |

| REF<br>DESIG | DESCRIPTION                      | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR |
|--------------|----------------------------------|--------------------|---------------------------|--------------|----------------|
| CR11         | Same as CRI                      |                    |                           |              |                |
| CR12         | Same as CR2                      |                    |                           |              |                |
| CR13         | Not in Circuit                   |                    |                           |              |                |
| CR14         | Diode Rectifier 200PRV 1.0A      | 1                  | 1N4003                    | 80131        |                |
| CR15         | Same as CR2                      |                    |                           |              |                |
| DS1          | LED, Lamp Assembly, Red          | 2                  | 5600FI                    | 91802        |                |
| DS2          | LED, Lamp Assembly, Green        | 1                  | 5600F5                    | 91802        |                |
| DS3          | LED, Lamp Assembly, Yellow       | 1                  | 5600F7                    | 91802        |                |
| DS4          | Same as DS1                      |                    |                           |              |                |
| F1           | Fuse, 5A, 63V                    | 1                  | 3402.0017.11              | 61935        |                |
| FB1          | Ferrite, Bead                    | 1                  | LCB1210/A                 | 0EXD1        |                |
| FB2          | Ferrite, Bead                    | 1                  | 2743021446                | 34899        |                |
| J1           | Connector, 15-Pin                | 1                  | MDSM-15PE-Z10             | 71468        |                |
| J2           | Connector, 17 Position           | 2                  | M80-8761722               | KQ536        |                |
| J3           | Same as J2                       |                    |                           |              |                |
| J4           | Socket                           | 15                 | 645952-2                  | 00779        |                |
| J5           | Connector, 2 Position            | 2                  | EPG.OB.302.HLN            | 2P953        |                |
| J6           | Same as J5                       |                    |                           |              |                |
| J7           | Connector, 6-Position            | 2                  | EPG.IB.306.HLN            | 2P953        |                |
| J8           | Same as J7                       |                    |                           |              |                |
| J9           | Not in Circuit                   |                    |                           |              |                |
| J10          | Not in Circuit                   |                    |                           |              |                |
| J11          | Connector, Header, 26 Position   | 1                  | SPGM-30DS-GO633           | 0AKZ5        |                |
| J12          | Connector, Header, 36 Position   | 1                  | SPGM-40DS-GO633           | 0AKZ5        |                |
| J13          | Connector, Header, 12 Position   | 1                  | SPGM-16DS-GO533           | 0AKZ5        |                |
| J14          | Connector, 3-Position            | 1                  | EPG.OB.303.HLN            | 2P953        |                |
| K1           | Relay, DPDT                      | 1                  | 722-5                     | 11532        |                |
| L1           | Inductor, 4.7 $\mu$ H, $\pm$ 20% | 3                  | B82422-AI472-M            | 25088        |                |
| L2           | Same as L1                       |                    |                           |              |                |
| L3           | Same as L1                       |                    |                           |              |                |
| LA           | Inductor, 28 $\mu$ H             | 2                  | SPS-207                   | 20462        |                |
| L5           | Same as L4                       |                    |                           |              |                |
| PS1          | Power Supply, DC                 | 1                  | 766019-1 (SEP PL)         |              |                |
| Q1           | Transistor                       | 2                  | MMBT2222ALTI              | 04713        |                |
| Q2           | Same as Q1                       |                    |                           |              |                |
| Q3           | Transistor                       | 3                  | MMBT2222ALTI              | 04713        |                |
| Q4           | Transistor                       | 4                  | S1943ODY                  | 17856        |                |
| Q5           | Same as Q4                       |                    |                           |              |                |
| Q6           | Same as Q4                       |                    |                           |              |                |
| Q7           | Same as Q4                       |                    |                           |              |                |

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| REF<br>DESIG | DESCRIPTION | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR |
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| Q8   | Same as Q3                       |    |              |       |  |
| Q9   | Same as Q3                       |    |              |       |  |
| Q10  | Transistor                       | 1  | MMBT2907ALT1 | 04713 |  |
| R1   | Resistor, Fixed, 330 kΩ, 5%, .1W | 1  | 841414-133   | 14632 |  |
| R2   | Resistor, Fixed, 10MΩ, 5%, .1 W  | 2  | 841414-169   | 14632 |  |
| R3   | Resistor, Fixed, 2.7kΩ, 5%, .1W  | 2  | 841414-083   | 14632 |  |
| R4   | Resistor, Fixed, 33K 0.5%, .1W   | 7  | 841752-109   | 14632 |  |
| R5   | Resistor, Fixed, 4.7kΩ, 5%, .1W  | 17 | 841414-089   | 14632 |  |
| R6   | Ssme as R5                       |    |              |       |  |
| R7   | Same as R5                       |    |              |       |  |
| R8   | Not in Circuit                   |    |              |       |  |
| R9   | Not in Circuit                   |    |              |       |  |
| R10  | Ssme as R5                       |    |              |       |  |
| R11  | Same as R6                       |    |              |       |  |
| R12  | Resistor, Fixed, 10K 0.5%, .1W   | 20 | 841752-097   | 14632 |  |
| R13  | Resistor, Fixed, 100kΩ, 5%, .1W  | 76 | 841414-121   | 14632 |  |
| R14  | Same as R13                      |    |              |       |  |
| R15  | Resistor, Fixed, 47K 0.5%, .1 W  | 3  | 841752-113   | 14632 |  |
| R16  | Same as R5                       |    |              |       |  |
| R17  | Resistor, Fixed, 1.0kΩ, 5%, .1 W | 13 | 841414-073   | 14632 |  |
| R18  | Same as R5                       |    |              |       |  |
| R19  | Same as R5                       |    |              |       |  |
| R20  | Same as R4                       |    |              |       |  |
| R21  |                                  |    |              |       |  |
| Thru | Same as R5                       |    |              |       |  |
| R24  |                                  |    |              |       |  |
| R25  | Same as R12                      |    |              |       |  |
| R26  | Same as R13                      |    |              |       |  |
| R27  | Same as R4                       |    |              |       |  |
| R28  | Same as R13                      |    |              |       |  |
| R29  | Same as R13                      |    |              |       |  |
| R30  | Same as R13                      |    |              |       |  |
| R31  | Same as R4                       |    |              |       |  |
| R32  | Same as R4                       |    |              |       |  |
| R33  | Same as R17                      |    |              |       |  |
| R34  | Same as R17                      |    |              |       |  |
| R35  | Same as R17                      |    |              |       |  |
| R36  | Resistor, Fixed, 6.8Ω, 5%, .1 W  | 22 | 841414-021   | 14632 |  |
| R37  | Same as R36                      |    |              |       |  |
| R38  | Same as R36                      |    |              |       |  |

| REF<br>DESIG | DESCRIPTION | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR |
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|------|----------------------------------|---|--|------------|-------|
| R39  |                                  |   |  |            |       |
| Thru | Same as R13                      |   |  |            |       |
| R72  |                                  |   |  |            |       |
| R73  | Not in Circuit                   |   |  |            |       |
| R74  |                                  |   |  |            |       |
| Thru | Same as R13                      |   |  |            |       |
| R78  |                                  |   |  |            |       |
| R79  | Same as R17                      |   |  |            |       |
| R80  | Same as R13                      |   |  |            |       |
| R81  | Same as R12                      |   |  |            |       |
| R82  | Same as R5                       |   |  |            |       |
| R83  | Same as R17                      |   |  |            |       |
| R84  | Resistor, Fixed, 470kΩ, 5%, .1 W | 1 |  | 841414-137 | 14632 |
| R85  | Resistor, Fixed, 47Ω, 5%, .1 W   | 4 |  | 841414-041 | 14632 |
| R86  | Same as R17                      |   |  |            |       |
| R87  |                                  |   |  |            |       |
| Thru | Same as R36                      |   |  |            |       |
| R90  |                                  |   |  |            |       |
| R91  | Same as R5                       |   |  |            |       |
| R92  | Same as R12                      |   |  |            |       |
| R93  | Resistor, Fixed, 22kΩ, 5%, .1 W  | 6 |  | 841414-105 | 14632 |
| R94  | Same as R12                      |   |  |            |       |
| R95  | Same as R93                      |   |  |            |       |
| R96  | Same as R12                      |   |  |            |       |
| R97  | Same as R93                      |   |  |            |       |
| H98  | Same as R12                      |   |  |            |       |
| R99  | Same as R93                      |   |  |            |       |
| R100 | Same as R12                      |   |  |            |       |
| R101 | Same as R93                      |   |  |            |       |
| R102 | Same as R36                      |   |  |            |       |
| R103 | Same as R36                      |   |  |            |       |
| R104 | Same as R12                      |   |  |            |       |
| R105 | Same as R93                      |   |  |            |       |
| R106 | Same as R85                      |   |  |            |       |
| R107 | Same as R2                       |   |  |            |       |
| R108 | Same as R13                      |   |  |            |       |
| R109 | Same as R36                      |   |  |            |       |
| R110 | Resistor, Fixed, 27K 0.5%, .1 W  | 6 |  | 841752-107 | 14632 |
| R111 | Same as R36                      |   |  |            |       |
| R112 | Same as R110                     |   |  |            |       |
| R113 | Same as R36                      |   |  |            |       |
| R114 | Same as R110                     |   |  |            |       |
| R115 | Same as R36                      |   |  |            |       |
| R116 | Same as R110                     |   |  |            |       |

| REF<br>DESIG | DESCRIPTION | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR |
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|      |                                  |   |            |         |  |
|------|----------------------------------|---|------------|---------|--|
| R117 | Same as R110                     |   |            |         |  |
| R118 | Same as R110                     |   |            |         |  |
| R119 | Same as R4                       |   |            |         |  |
| R120 | Same as R15                      |   |            |         |  |
| R121 | Same as R5                       |   |            |         |  |
| R122 | Same as R12                      |   |            |         |  |
| R123 | Same as R13                      |   |            |         |  |
| R124 | Same as R12                      |   |            |         |  |
| R125 | Same as R13                      |   |            |         |  |
| R126 | Same as R12                      |   |            |         |  |
| R127 | Same as R13                      |   |            |         |  |
| R128 | Same as R12                      |   |            |         |  |
| R129 | Same as R12                      |   |            |         |  |
| R130 | Same as R12                      |   |            |         |  |
| R131 |                                  |   |            |         |  |
| Thru | Same as R36                      |   |            |         |  |
| R134 |                                  |   |            |         |  |
| R135 | Same as R12                      |   |            |         |  |
| R136 | Same as R12                      |   |            |         |  |
| R137 | Same as R36                      |   |            |         |  |
| R138 | Same as R36                      |   |            |         |  |
| R139 | Same as R85                      |   |            |         |  |
| R140 |                                  |   |            |         |  |
| Thru | Same as R13                      |   |            |         |  |
| R161 |                                  |   |            |         |  |
| R162 | Resistor, Fixed, 100Ω, 5%, .1 W  | 4 | 841414-049 | 14632   |  |
| R163 | Same as R17                      |   |            |         |  |
| R164 | Same as R162                     |   |            |         |  |
| R165 | Same as R162                     |   |            |         |  |
| R166 | Same as R17                      |   |            |         |  |
| R167 | Same as R17                      |   |            |         |  |
| R168 | Same as R36                      |   |            |         |  |
| R169 | Resistor, Fixed, 150K 0.5%, .1 W | 1 | 841752-125 | 14632   |  |
| R170 | Same as R85                      |   |            |         |  |
| R171 | Same as R15                      |   |            |         |  |
| R172 | Same as R17                      |   |            |         |  |
| R173 | Same as R17                      |   |            |         |  |
| R174 | Resistor, Fixed, 3300,5%, .1 W   | 2 | 841414-061 | 14632   |  |
| R175 | Same as R174                     |   |            |         |  |
| R176 | Resistor, Fixed, 15K 0.5%, .1 W  | 2 | 841752-101 | 14632   |  |
| R177 | Same as R176                     |   |            |         |  |
| R178 | Resistor, Fixed, 6.8Ω, 5%, .1 W  | 1 | 841414-021 | 14632   |  |
| R179 | Resistor, Fixed, 1.0kΩ, 5%,.1 W  | 2 | 841414-073 | 14632 1 |  |

| REF<br>DESIG | DESCRIPTION                      | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR      |
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|              |                                  |                    |                           |              | REF DESIG PREFIX A1 |
| R180         | Same as R179                     |                    |                           |              |                     |
| R181         | Same as R13                      |                    |                           |              |                     |
| R182         | Same as R12                      |                    |                           |              |                     |
| R183         | Same as R13                      |                    |                           |              |                     |
| R184         | Same as R12                      |                    |                           |              |                     |
| R185         | Same as R162                     |                    |                           |              |                     |
| R186         | Not in Circuit                   |                    |                           |              |                     |
| R187         | Not in Circuit                   |                    |                           |              |                     |
| R188         | Same as R3                       |                    |                           |              |                     |
| R189         | Same as R13                      |                    |                           |              |                     |
| R190         | Same as R17                      |                    |                           |              |                     |
| R191         | Same as R4                       |                    |                           |              |                     |
| R192         | Resistor, Fixed, 56K 0.5%, .1 W  | 2                  | 841752-115                | 14632        |                     |
| R193         | Same as R12                      |                    |                           |              |                     |
| R194         | Same as R192                     |                    |                           |              |                     |
| R195         | Resistor, Fixed, 15K 0.5%, .1 W  | 1                  | 841752-101                | 14632        |                     |
| R196         | Resistor, Fixed, 6.8K 0.5%, .1 W | 1                  | 841752-093                | 14632        |                     |
| R197         | Resistor, Fixed, 3300Ω, 5%, .1 W | 1                  | 841414-061                | 14632        |                     |
| R198         | Same as R5                       |                    |                           |              |                     |
| R199         | Same as R5                       |                    |                           |              |                     |
| R200         | Same as R36                      |                    |                           |              |                     |
| R201         | Same as R36                      |                    |                           |              |                     |
| R202         | Same as R13                      |                    |                           |              |                     |
| S1           | Switch, SPDT                     | 1                  | ETOI-M-DI-SA-K-E          | 09353        |                     |
| S2           | Switch, 8-Position, Slide        | 2                  | CHS08A OR CHS08TA         | 9AA35        |                     |
| S3           | Same as S2                       |                    |                           |              |                     |
| T1           | Transformer                      | 1                  | 9100-4226                 | 28480        |                     |
| U1           | Integrated Circuit               | 1                  | MC68HCI6ZICFCI6           | 04713        |                     |
| U2           | Not in Circuit                   |                    |                           |              |                     |
| U3           | P/O U2                           |                    |                           |              |                     |
| U4           | Integrated Circuit               | 2                  | HM62832fiL.JP-35          | 9J979        |                     |
| U5           | Same as U4                       |                    |                           |              |                     |
| U6           | Integrated Circuit               | 1                  | BQ2203ASN                 | -TBD-        |                     |
| U7           | Integrated Circuit               | 1                  | AT28C16-25JC              | IFN41        |                     |
| U8           | Not in Circuit                   |                    |                           |              |                     |
| U9           | Integrated Circuit               | 1                  | 8674HC04SO14U             | 14632        |                     |
| U10          | Integrated Circuit               | 2                  | 867226DI20                | 14632        |                     |
| U11          | Same as U10                      |                    |                           |              |                     |
| U12          | Integrated Circuit               | 1                  | MAX516AEWG                | IES66        |                     |
| U13          | Integrated Circuit               | 1                  | 8674AC139SO16U            | 14632        |                     |
| U14          | Integrated Circuit               | 2                  | 8674HC174SO16U            | 14632        |                     |
| U15          | Integrated Circuit               | 5                  | 8674HC273SOL20U           | 14632        |                     |

| REF<br>DESIG | DESCRIPTION | QTY<br>PER<br>ASSY | MANUFACTURERS<br>PART NO. | MFR.<br>CODE | RECM<br>VENDOR |
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|-----|--------------------------|---|-------------------|-------|--|
| U16 | Same as U15              |   |                   |       |  |
| U17 | Same as U15              |   |                   |       |  |
| U18 | Same as U14              |   |                   |       |  |
| U19 | Same as U15              |   |                   |       |  |
| U20 | Same as U15              |   |                   |       |  |
| U21 | Integrated Circuit       | 3 | 8674HCOM14U       | 14632 |  |
| U22 | Same as U21              |   |                   |       |  |
| U23 | Integrated Circuit       | 1 | 864050SO16N       | 14632 |  |
| U24 | Integrated Circuit       | 1 | SC26C92CIA        | 18324 |  |
| U25 | Integrated Circuit       | 3 | LTC485CS8         | 64155 |  |
| U26 | Same as U25              |   |                   |       |  |
| U27 | Same as U25              |   |                   |       |  |
| U28 | Integrated Circuit       | 2 | DS3691 M          | 27014 |  |
| U29 | Same as U28              |   |                   |       |  |
| U30 | Amplifier                | 1 | 86064SO14U        | 14632 |  |
| U31 | Integrated Circuit       | 1 | 8674HC14SO14U     | 14632 |  |
| U32 | Integrated Circuit       | 1 | 8674HC74SO14U     | 14632 |  |
| U33 | Integrated Circuit       | 2 | 8674HC373SOL20U   | 14632 |  |
| U34 | Same as U33              |   |                   |       |  |
| U35 | Amplifier                | 1 | MC33171D          | 04713 |  |
| U36 | Integrated Circuit       | 1 | ILH4-0002         | 28480 |  |
| U37 | Same as U21              |   |                   |       |  |
| U38 | See Appropriate CPL      |   |                   |       |  |
| U39 | Integrated Circuit       | 1 | TIA31CD           | 04713 |  |
| U40 | Integrated Circuit       | 2 | TK I 15SOMT       | TOKOO |  |
| U41 | Same as U40              |   |                   |       |  |
| VR1 | Varistor                 | 1 | LM4040CIM3-5.0    | 27014 |  |
| VR2 | Diode, Zener, 7.5V, 20mA | 4 | MMBZ6236BLTI      | 04713 |  |
| VR3 | Same as VR2              |   |                   |       |  |
| VR4 | Same as VR2              |   |                   |       |  |
| VH5 | Same as VR2              |   |                   |       |  |
| XF1 | Fuseholder               | 1 | 0M1163V           | 61935 |  |
| Y1  | Crystal                  | 1 | MC-405 32.768KAAO | 61722 |  |
| Y2  | Crystal                  | 1 | NMS037-20         | 61441 |  |

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