iPack® Series
Model 2202

High Density Switch Pack - Flasher Unit
Operations Manual

THIS MANUAL CONTAINS TECHNICAL INFORMATION FOR THE iPack® 2202 SERIES HDSP-FU.

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THE iPack® 2202 SERIES HIGH DENSITY SWITCH PACK – FLASHER UNIT IS DESIGNED AND MANUFACTURED IN THE USA BY EBERLE DESIGN INC., PHOENIX, ARIZONA

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Section 1
GENERAL

1.1 OVERVIEW
The iPack® 2202 series High Density Switch Pack – Flasher Unit (HDSP-FU) is a modular
PCB-based plug-in load switch device providing six solid-state switches configured as two
RYG channels to drive LED field signal loads in an Advanced Transportation Controller
(ATC) Cabinet. When installed into a flasher location the Model 2202 provides four outputs
configured as two channels of dual output wig-wag flasher operation.

The EDI iPack® series Model 2202 is available in High Voltage AC output (2202-HV), Very
High Voltage AC output (2202-VHV) and Low Voltage DC output (2202-LV) versions.
Unless otherwise specified, all information applies to all versions.

The model CMUip-2212 Cabinet Monitor Unit (CMU) is the principle part of the ATC Traffic
Control Cabinet Monitoring System. It is resident in the Output Assembly and
communicates with each HDSP located in the Output Assembly via Serial Bus #3. The role
of the CMU is to query various cabinet conditions and, if the application requires action, the
CMU will transfer control from the Advanced Traffic Controller (ATC) to a flashing control
mode. The role of the HDSP is to drive the field signal heads and to collect voltage and
load current data for each HDSP output and report this data to the CMU via Serial Bus #3.
The role of the HDFU is to provide flashing outputs that drive the signals via Flash Transfer
Relays during a cabinet flash mode. For further information concerning the CMU, see the

![Diagram of the system components](image)

Figure 1

1.2 CHANNEL CONFIGURATION
In the HDSP mode, the Model 2202 will provide six outputs organized as two channels of
Red, Yellow, and Green. In the HDFU mode, the Model 2202 will provide four outputs
organized as two channels of flasher wig-wag outputs.
1.3 HDSP ADDRESSING

The address select input pins ADDRESS 4:0 define the Serial Bus #3 address of the HDSP as shown in Table 1. The pins are left open for a logical False, and are connected to ADDRESS COMMON for a logical True. The Serial Bus address is the binary value of the ADDRESS 4:0 inputs plus 1. The ADDRESS COMMON pin should be connected only to other ADDRESS 4:0 inputs in the assembly.

<table>
<thead>
<tr>
<th>ADDR 4</th>
<th>ADDR 3</th>
<th>ADDR 2</th>
<th>ADDR 1</th>
<th>ADDR 0</th>
<th>SB #3 Address</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>False</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>0x01</td>
<td>Slot #1 Ch 1,2</td>
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<tr>
<td>False</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>True</td>
<td>0x02</td>
<td>Slot #2 Ch 3,4</td>
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<tr>
<td>False</td>
<td>False</td>
<td>False</td>
<td>True</td>
<td>False</td>
<td>0x03</td>
<td>Slot #3 Ch 5,6</td>
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<td>False</td>
<td>True</td>
<td>False</td>
<td>True</td>
<td>0x04</td>
<td>Slot #4 Ch 7,8</td>
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<tr>
<td>False</td>
<td>True</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>0x05</td>
<td>Slot #5 Ch 9,10</td>
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<tr>
<td>False</td>
<td>True</td>
<td>False</td>
<td>True</td>
<td>False</td>
<td>0x06</td>
<td>Slot #6 Ch 11,12</td>
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<td>True</td>
<td>True</td>
<td>False</td>
<td>False</td>
<td>0x07</td>
<td>Slot #7 Ch 13,14</td>
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<td>True</td>
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<td>0x09</td>
<td>Slot #9 Ch 17,18</td>
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<td>False</td>
<td>True</td>
<td>0x0A</td>
<td>Slot #10 Ch 19,20</td>
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<td>False</td>
<td>True</td>
<td>False</td>
<td>True</td>
<td>False</td>
<td>0x0B</td>
<td>Slot #11 Ch 21,22</td>
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<td>False</td>
<td>True</td>
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<td>True</td>
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<td>Slot #12 Ch 23,24</td>
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<td>True</td>
<td>True</td>
<td>False</td>
<td>False</td>
<td>0x0D</td>
<td>Slot #13 Ch 25,26</td>
</tr>
<tr>
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<td>True</td>
<td>True</td>
<td>False</td>
<td>True</td>
<td>0x0E</td>
<td>Slot #14 Ch 27,28</td>
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<tr>
<td>False</td>
<td>True</td>
<td>True</td>
<td>True</td>
<td>False</td>
<td>0x0F</td>
<td>Slot #15 Ch 29,30</td>
</tr>
<tr>
<td>False</td>
<td>True</td>
<td>True</td>
<td>True</td>
<td>True</td>
<td>0x10</td>
<td>Slot #16 Ch 31,32</td>
</tr>
</tbody>
</table>

Table 1

- WARNING -

The ATC must verify that all channels being driven by a Serial Interface Unit (SIU) are being monitored by an enabled HDSP, and that each HDSP is enabled by the programming in the CMU datakey.

Failure to provide this check may result in unmonitored load switch outputs. This could occur as a result of improper configuration of the cabinet, improper address assignment for one or more HDSP units, improper address assignment for one or more SIU units, or improper programming of the ATC.

1.4 HDFU ADDRESSING

The address select input pins ADDRESS 4:0 define the Serial Bus #3 address of the HDFU as shown in Table 2. The pins are left open for a logical False, and are connected to ADDRESS COMMON for a logical True. The Serial Bus address is the binary value of the
ADDRESS 4:0 inputs plus 1. The ADDRESS COMMON pin should be connected only to other ADDRESS 4:0 inputs in the assembly.

Flasher #2 is optional. If installed then it must be enabled in the CMU datakey programming.

<table>
<thead>
<tr>
<th>ADDR 4</th>
<th>ADDR 3</th>
<th>ADDR 2</th>
<th>ADDR 1</th>
<th>ADDR 0</th>
<th>SB #3 Address</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>Reserved</td>
<td>--</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>True</td>
<td>Reserved</td>
<td>--</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>False</td>
<td>True</td>
<td>False</td>
<td>Reserved</td>
<td>--</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>True</td>
<td>True</td>
<td>True</td>
<td>Reserved</td>
<td>--</td>
</tr>
<tr>
<td>True</td>
<td>False</td>
<td>True</td>
<td>False</td>
<td>False</td>
<td>Reserved</td>
<td>--</td>
</tr>
<tr>
<td>True</td>
<td>True</td>
<td>False</td>
<td>False</td>
<td>True</td>
<td>Reserved</td>
<td>--</td>
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<tr>
<td>True</td>
<td>True</td>
<td>False</td>
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<td>False</td>
<td>Reserved</td>
<td>--</td>
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<tr>
<td>True</td>
<td>True</td>
<td>False</td>
<td>False</td>
<td>False</td>
<td>Reserved</td>
<td>--</td>
</tr>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
<td>False</td>
<td>True</td>
<td>0x1E HDFU #1</td>
<td></td>
</tr>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
<td>False</td>
<td>False</td>
<td>0x1F HDFU #2</td>
<td></td>
</tr>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
<td>True</td>
<td>True</td>
<td>Reserved</td>
<td>--</td>
</tr>
</tbody>
</table>

Table 2
Section 2
HDSP FUNCTIONS

2.1 VOLTAGE SENSING
All field RMS voltage measurements are made over an RMS period of 33.3 milliseconds. A True RMS voltage measurement is made regardless of phase or wave-shape, including both positive and negative half wave sinusoids, over the voltage range of 0 to 135 (270) Vrms.

2.1.1 FIELD SIGNAL SENSING
The SENSE inputs provide the RMS voltages that are sent to the CMU. These pins should be connected to the Field Terminals of the cabinet such that they present the actual voltages being applied to the field wires and field LED signals. This sense point should be on the load side of any Flash Transfer Relay or fuse or other device.

The HDSP is designed such that unloaded Green, Yellow, or Red signal inputs are sensed as non-active signals.

2.1.2 FLASHER INPUT SENSING
Four inputs are provided for sensing of voltages at the FLASHER #1-1, FLASHER #1-2, FLASHER #2-1, and FLASHER #2-2 signal output terminals. This sense point should be on the input side of the Flash Transfer Relays.

2.1.3 SIGNAL POWER SENSING
The HDSP-FU monitors and reports the Signal Power voltage applied to SIGNAL (LV+ or HV+) input.

2.2 OUTPUT CURRENT SENSING
All field RMS current measurements are made over a period of 33.3 milliseconds. A True RMS current measurement is made regardless of phase or wave-shape, including both positive and negative half wave sinusoids, over the current range of 0 to 2 Arms.

2.3 +24VDC MONITOR SENSING
The HDSP senses the state of the +24VDC input. The +24VDC circuitry is with respect to DC (LOGIC) GROUND and electrically isolated from the MAINS and SIGNAL referenced circuitry.

2.4 HDSP OUTPUT OVERRIDE
The HDSP will force all outputs to the Off state if no SB #3 communications is received from the CMU for 1.75 seconds. This override is removed when SB #3 communications is resumed. The HDSP will also force all outputs to the Off state if the CMU has detected a fault state.

Note that the HDFU mode does not override the outputs.

2.5 DIAGNOSTIC ERROR
The HDSP is provided with a resident series of self-check diagnostic capabilities. When a Diagnostic Error is detected the HDSP will illuminate or flash the DIAGNOSTIC indicator on the front panel. All Diagnostic states below indicate a failure of the HDSP hardware or firmware and the unit should be removed from service for repair.
### Flashes Function

<table>
<thead>
<tr>
<th>Solid</th>
<th>Failed State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3911 Error</td>
</tr>
<tr>
<td>2</td>
<td>Calibration Flash Error</td>
</tr>
<tr>
<td>3</td>
<td>3911 DR</td>
</tr>
<tr>
<td>4</td>
<td>3911 Offset</td>
</tr>
<tr>
<td>5</td>
<td>Calibration Data Error</td>
</tr>
<tr>
<td>6</td>
<td>Voltage Zero Offset</td>
</tr>
</tbody>
</table>

2.6 SERIAL BUS #3

2.6.1 ELECTRICAL

The SB #3 TX+, SB #3 TX- and SB #3 RX+, SB #3 RX- circuit pairs consist of two interface links conforming to the requirements of the Electronic Industries Association EIA-485, Standard for Electrical Characteristics of Generators and Receivers for use in Balanced Digital Multipoint Systems, dated April 1983.

All voltage potentials on the SB #3 interface links are referenced to the NEUTRAL pin. If provided, shields shall be terminated to Equipment Ground.

2.6.2 FRAME TYPES

The HDSP-FU is configured to respond to frame Types 01, 02, and 60. For details on frame definitions and protocol, refer to the documents referenced in Section 1.1.
Section 3
FRONT PANEL DESCRIPTION

3.1 INDICATORS

3.1.1 POWER INDICATOR
A green POWER indicator will illuminate to indicate the HV+ or LV+ MAINS input voltage is proper.

3.1.2 SB #3 RX & TX INDICATOR
A yellow SB #3 RX and TX LED indicator will pulse On each time the HDSP correctly receives or transmits a frame on Serial Bus #3. See Section 2.5

3.1.3 DIAGNOSTIC INDICATOR
A red DIAGNOSTIC indicator will illuminate or flash when the HDSP has detected an internal Diagnostic fault. This indicates a failure of the HDSP hardware or firmware and the unit should be removed from service for maintenance. See Section 2.4.

3.1.4 ID / FLASHER INDICATOR

3.1.5 ID INDICATOR
When the unit is operating as an HDSP, a blue LED (ID) will illuminate when the CMU wants to direct attention to that particular HDSP channel. The meaning of the active ID indicator is dependent on the context of the CMU.

3.1.6 FLASHER 1, 2 INDICATORS
When the unit is operating as an HDFU, two blue LEDs (FLASHER 1, 2) for each channel will illuminate to indicate an active Flasher output. The voltage level of the FL#x-x SENSE input is used to determine the active status of the LEDs such that they reflect actual flasher status to the field.

3.1.7 CHANNEL INPUT INDICATORS
A Red, Yellow, and Green LED indicator is provided for each channel input control. These inputs are driven by the SIU-2218 and are referenced to 24VDC and DC GROUND.

3.2 RESET BUTTON
Depressing the RESET button resets the HDSP-FU. When the RESET button is depressed all front panel indicators will be illuminated for 300 milliseconds.

3.2.1 SB #3 ADDRESS ASSIGNMENT REPORT
Continuously depressing the Reset button will provide a mode to display the SB #3 address. This count sequence will repeat as long as the RESET button is held depressed. The HDSP-FU will continue to operate normally in this mode.

- The Tx indicator will pulse to indicate the tens digit count.
- The Rx indicator will pulse to indicate the ones digit count.

For example, one pulse on Tx followed by five pulses on Rx is displayed for slot #15.
Section 4
SPECIFICATIONS

4.1 ELECTRICAL

Power Requirements (2202-HV)
HV+ MAINS Input Voltage ................................................................. 60 Vac Minimum
HV+ MAINS Input Voltage .............................................................. 135 Vac Maximum
HV+ MAINS Input Frequency ......................................................... 47 to 63 Hz
Power Consumption (MAINS only) ............................................ 2 Watt Maximum

Power Requirements (2202-LV)
LV+ MAINS Input Voltage ................................................................. 30 Vdc Minimum
LV+ MAINS Input Voltage .............................................................. 60 Vdc Maximum
Power Consumption (MAINS only) ............................................ 1 Watt Maximum

Power Requirements (2202-VHV)
HV+ MAINS Input Voltage ................................................................. 120 Vac Minimum
HV+ MAINS Input Voltage .............................................................. 270 Vac Maximum
HV+ MAINS Input Frequency ......................................................... 47 to 63 Hz
Power Consumption (MAINS only) ............................................ 2 Watt Maximum

Field Outputs (2202-HV)
Output Drive (HDSP mode) ............................................................. 1 Amp
Output Drive (HDFU mode) ............................................................ 2 Amp
HV+ Signal Voltage ................................................................. 135 Vrms Maximum

Field Outputs (2202-LV)
Output Drive (HDSP mode) ............................................................. 2 Amp
Output Drive (HDFU mode) ............................................................ 3 Amp
LV+ Signal Voltage ................................................................. 60 Vdc Maximum

Field Outputs (2202-VHV)
Output Drive (HDSP mode) ............................................................. 1 Amp
Output Drive (HDFU mode) ............................................................ 2 Amp
HV+ Signal Voltage ................................................................. 270 Vrms Maximum

AC Voltage Monitors (2202-HV)
Field SENSE Inputs ................................................................. 135 Vrms Maximum
Flasher SENSE Inputs ................................................................. 135 Vrms Maximum
Flasher LED Active ................................................................. greater than 70 Vrms
Flasher LED Not Active ............................................................ less than 50 Vrms
Accuracy ................................................................................... ± 2% 

DC Voltage Monitors (2202-LV)
Field SENSE Inputs ................................................................. 60 Vdc Maximum
Flasher SENSE Inputs ................................................................. 60 Vdc Maximum
Flasher LED Active ................................................................. greater than 43 Vrms
Flasher LED Not Active ............................................................ less than 41 Vrms
Accuracy ................................................................................... ± 2% 

AC Voltage Monitors (2202-VHV)
Field SENSE Inputs ................................................................. 270 Vrms Maximum
Flasher SENSE Inputs ................................................................. 270 Vrms Maximum
Flasher LED Active ................................................................. greater than 140 Vrms
Flasher LED Not Active ............................................................ less than 100 Vrms
Accuracy ................................................................................... ± 2% 

AC Current Monitors
Field Signal Input Range (2202-HV) ................................................ 2 Arms Maximum
Field Signal Input Range (2202-LV) ................................................ 3 Arms Maximum
Field Signal Input Range (2202-VHV) ............................................. 2 Arms Maximum
Accuracy ........................................................................................................... ± 2%

DC Input Control
   Active (True) ...................................................................................... less than 6 Vdc
   Not Active .................................................................................... greater than 16 Vdc

+24VDC Monitor
   Fault ................................................................................................. less than 18Vdc
   No Fault ............................................................................................ greater than 22Vdc

Logic Inputs
   Address 0:4 (Reference Address Common)
   Active (True) ...................................................................................... less than 6 Vdc
   Not Active (False) ........................................................................ greater than 16 Vdc

4.2 MECHANICAL
   Height ............................................................................................................... 4.50 inches
   Width ................................................................................................................. 1.12 inches
   Depth ................................................................................................................ 6.50 inches

4.3 ENVIRONMENTAL
   Storage Temperature Range ........................................................................ -45 to +85 °C
   Operating Temperature Range ...................................................................... -34 to +74 °C
   Humidity (non-condensing) ............................................................................ 0 to 95% Relative
Section 5
CONNECTOR ASSIGNMENTS

5.1 MAIN DIN CONNECTOR
The connector is a male DIN 41612 Type E series, 48-pin connector. The Rx and Tx signal names are with respect to the HDSP-FU.

5.1.1 HDSP PIN FUNCTIONS

<table>
<thead>
<tr>
<th>Pin</th>
<th>A (Bottom Row)</th>
<th>C (Middle Row)</th>
<th>E (Top Row)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ch 1 Red In</td>
<td>Ch 1 Yellow In</td>
<td>Ch 1 Green In</td>
</tr>
<tr>
<td>4</td>
<td>Ch 2 Red In</td>
<td>Ch 2 Yellow In</td>
<td>Ch 2 Green In</td>
</tr>
<tr>
<td>6</td>
<td>+24VDC</td>
<td>DC Ground</td>
<td>Address 4</td>
</tr>
<tr>
<td>8</td>
<td>Equipment Ground</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>10</td>
<td>SB #3 Rx+</td>
<td>SB #3 Tx+</td>
<td>Address Common</td>
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<tr>
<td>12</td>
<td>SB #3 Rx-</td>
<td>SB #3 Tx-</td>
<td>Address 3</td>
</tr>
<tr>
<td>14</td>
<td>Address 0</td>
<td>Address 1</td>
<td>Address 2</td>
</tr>
<tr>
<td>16</td>
<td>Ch 1 Red Sense</td>
<td>Ch 1 Red Out</td>
<td>Ch 1 Red Out</td>
</tr>
<tr>
<td>18</td>
<td>Ch 1 Yellow Sense</td>
<td>Ch 1 Yellow Out</td>
<td>Ch 1 Yellow Out</td>
</tr>
<tr>
<td>20</td>
<td>Ch 1 Green Sense</td>
<td>Ch 1 Green Out</td>
<td>Ch 1 Green Out</td>
</tr>
<tr>
<td>22</td>
<td>Ch 2 Red Sense</td>
<td>Ch 2 Red Out</td>
<td>Ch 2 Red Out</td>
</tr>
<tr>
<td>24</td>
<td>Ch 2 Yellow Sense</td>
<td>Ch 2 Yellow Out</td>
<td>Ch 2 Yellow Out</td>
</tr>
<tr>
<td>26</td>
<td>Ch 2 Green Sense</td>
<td>Ch 2 Green Out</td>
<td>Ch 2 Green Out</td>
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<tr>
<td>28</td>
<td>LV+ Signal</td>
<td>LV+ Signal</td>
<td>LV+ Signal</td>
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<tr>
<td>30</td>
<td>HV+ Signal</td>
<td>HV+ Signal</td>
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<tr>
<td>32</td>
<td>LV+ MAINS</td>
<td>Neutral</td>
<td>HV+ MAINS</td>
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5.1.2 HDFU PIN FUNCTIONS

<table>
<thead>
<tr>
<th>Pin</th>
<th>A (Bottom Row)</th>
<th>C (Middle Row)</th>
<th>E (Top Row)</th>
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<tbody>
<tr>
<td>2</td>
<td>Reserved</td>
<td>Reserved</td>
<td>Ch 1 Aux In</td>
</tr>
<tr>
<td>4</td>
<td>Ch 2 Aux In</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
<tr>
<td>6</td>
<td>+24VDC</td>
<td>DC Ground</td>
<td>Address 4</td>
</tr>
<tr>
<td>8</td>
<td>Equipment Ground</td>
<td>Neutral</td>
<td>Neutral</td>
</tr>
<tr>
<td>10</td>
<td>SB #3 Rx+</td>
<td>SB #3 Tx+</td>
<td>Address Common</td>
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<tr>
<td>12</td>
<td>SB #3 Rx-</td>
<td>SB #3 Tx-</td>
<td>Address 3</td>
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<tr>
<td>14</td>
<td>Address 0</td>
<td>Address 1</td>
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