# INSTRUCTION MANUAL

**KEPCO** An ISO 9001 Company.

## BOP 1KW-MG RETROFIT KIT 219-0621

## BOP 1KW-MG
## FIRMWARE RETROFIT KIT

## 1. DESCRIPTION

Kepco KIT 219-0621-(n) contains the parts used to upgrade the firmware for BOP 1KW MG power supplies where (n) is a number which indicates the number of units that can be retrofitted by a single kit. E.g., KIT 219-0621-2 includes two PROMs and two Serial Interface Connectors, allowing two units to be retrofitted.

The upgraded firmware resolves front panel entry differences between color and monochrome displays, corrects application of power up limit settings, adds waveform functionality from front panel, adds protection menu support, corrects serial port operation on revision 6.67 units, improves startup reliability of multiple unit configurations using three or more power supplies, and allows upload of future serial firmware changes.

## 2. APPLICABILITY

This KIT applies only to BOP 1KW-MG units that have a color display and either firmware revision 6.66 or 6.67.

## 3. INSTALLATION INSTRUCTIONS

**3.1 MATERIAL REQUIRED** (See Table 1.)

**TABLE 1. MATERIAL REQUIRED**

| MATERIAL | LOCATION | QUANTITY |
|---|---|---|
| AC-DC Power Converter, Kepco P/N 257-0013; universal input (90 - 264 V a-c), 12V s-c output, with five a-c input adapters - used to power the front panel during update process | Provided in this Kit | 1 |
| PROM, Kepco P/N 250-0967; replaces U24 on Digital Board A1 | Provided in this Kit | See NOTE |
| PROM, Kepco P/N 250-0921; replaces U2 on Digital Board A1 | Provided in this Kit | See NOTE |
| PICKit Programmer, Kepco P/N 219-0617; with micro USB to USB cable, used to update firmware | Provided in this Kit | 1 |
| 5-pin Header, Kepco P/N 143-1029; Allows connection of PICKit to A6A1 board. | Provided in this Kit | 1 |
| ESD (Electrostatic Discharge) wrist strap (Kepco P/N 114-0080) | Provided in this Kit | 1 |
| Serial Interface Connector, P/N 118-1379 | Provided in this Kit | See NOTE |
| Phillips Screw Driver | Not Supplied | N/A |
| Chip Puller P/N 118-0080 | Provided in this Kit | 1 |
| Instruction Manual Kepco P/N 228-1909 | Provided in this Kit | 1 |
| Return Material Authorization (RMA) Used to return Kit components to Kepco to receive credit. | Provided in this Kit | 1 |
| NOTE: Quantity determined by dash number at the end of the KIT part number. E.g., for KIT 219-0616-4, quantity supplied is 4. | | |

### 3.2 DISASSEMBLY PROCEDURE

1. Turn power off, disconnect the unit from source power and remove line cord.

2. Remove the two mounting ears from the chassis by removing three screws from each.

3. Remove the top cover of the unit by removing 14 screws as follows: two at top of the front panel, four at each side, (one towards the rear, three at the bottom) and four at the top of the rear panel.

4. Disconnect ribbon cable attached to Distribution board A6A1 going to Digital board A1J2.

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5. Disconnect one 4-pin and one 6-pin connector) (J12, J15, Figure 1). If necessary a screw driver can be used to apply pressure to the front panel to separate the mating connectors.

6. Refer to Figure 1 to locate the programming connection for the serial processor firmware update (PAR. 3.7) at either Location "D" or "E" (depending on PWB revision) It is five holes in the Printed Wiring Board that are not in line but slightly joggled. If the programming connection is found at Location "D", skip all remaining steps and proceed to PAR. 3.3.

7. Remove 5-pin connector (J14, Figure 1) from Distribution board A6A1. A screwdriver can be used to apply pressure as needed to separate the mating connectors.

   CAUTION: Failure to pull connector J10 straight back, or pulling by the wires, can damage the connector.

8. Carefully remove the hot melt glue securing connector (J10, Figure 1). Once the glue is removed pull the connector body (not the wires) straight back. A screwdriver can be used to apply pressure as needed to separate the mating connectors.

   CAUTION: Removing the outer screws first can result in damage to the front panel.

9. At the bottom of the chassis, first remove the two inner screws, then the two outer screws securing front panel to chassis.
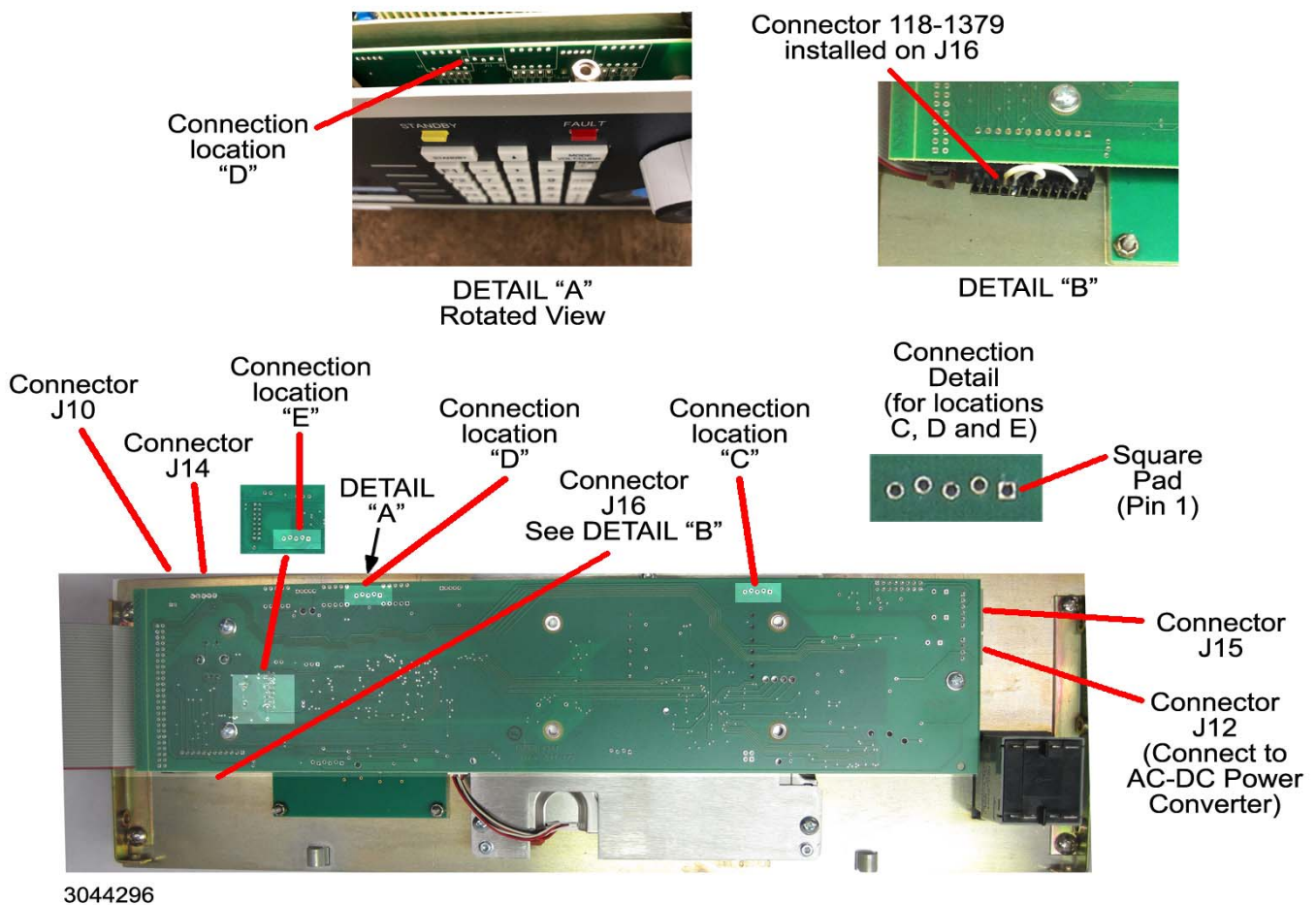


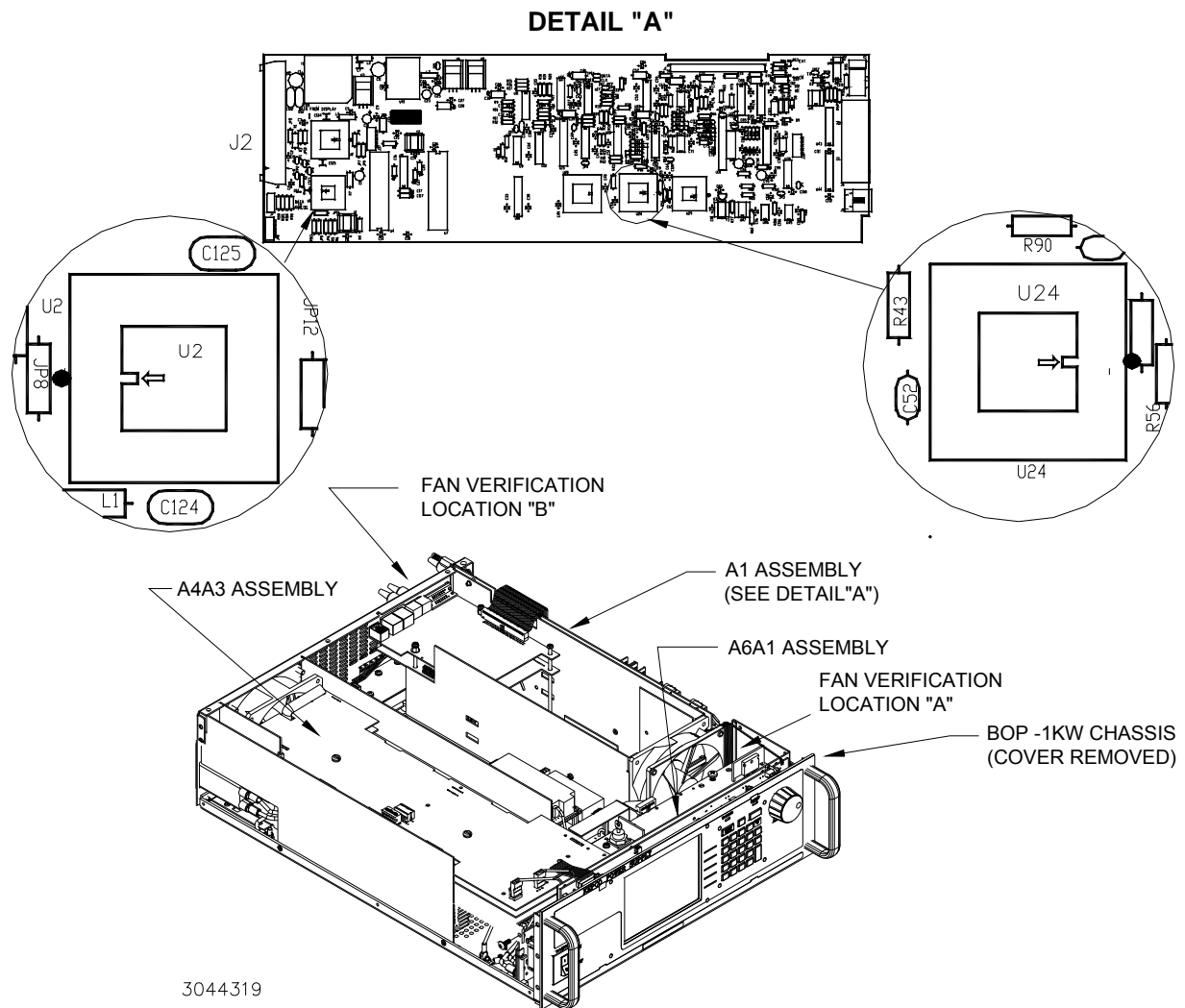**FIGURE 1. A6A1 BOARD (ATTACHED TO FRONT PANEL), COMPONENT LOCATIONS**

## DETAIL "A"



**FIGURE 2. ASSEMBLIES A1 AND A6A1 LOCATIONS AND DIGITAL BOARD A1 PROM LOCATIONS**

### 3.3  DIGITAL BOARD A1 PROM U2 AND U24 REPLACEMENT (SEE FIGURE 2)

1. On Digital board A1, locate PROM, U24 (see Figure 2).

   **CAUTION:  FAILURE TO USE THE ESD WRIST STRAP MAY DAMAGE THE PROM!**

2. Take the ESD wrist strap from kit and use the peel and stick area to connect the wrist strap to the chassis of the BOP. Place the wrist strap on your arm as indicated by the instructions for the wrist strap.

3. Touch the IC tube to the chassis of the BOP. Open one end.

4. Pry out the PROM U2 using an IC extractor. Insert the hook, first into one slot and then the other, and gently pry out the PROM. Place the PROM in the tube and close the tube.

5. Open the other end of the IC tube and remove the replacement PROM U2 from the tube.

6. Insert the PROM into the socket, insuring the dot on the chip is oriented as shown in Figure 2.

7. Pry out the PROM U24 using an IC extractor. Insert the hook, first into one slot and then the other, and gently pry out the PROM. Place the PROM in the tube and close the tube.

8. Open the other end of the IC tube and remove the replacement PROM U24 from the tube.

9. Insert the PROM into the socket, insuring the dot on the chip is oriented as shown in Figure 2.

10. Reclose the IC tube and save for return to Kepco to receive credit for the cost of the kit (see PAR. 3.10). Remove wrist strap and disconnect it from the BOP chassis.

## 3.4  FIRMWARE UPDATE PREPARATION

1. Go to **www.microchip.com/mplab/mplab-x-ide**. Scroll down if necessary and click the Download tab, then download the appropriate Microchip IDE (Integrated Development Environment) file for either Windows, Linux or Mac. After downloading, install the IPE (Integrated Programming Environment. (It is not necessary to install the IDE to update the BOP 1KW.)

2. Connect the small PICKit cable micro-USB connector to the top of the PICKit. Connect other end of the PICKit cable to the computer USB port.

3. Install the 5-pin header (supplied) into the bottom of the PICKit, then install the other end of the PICKit into Location) "C" shown in Figure 1.

4. Start the IPE application. The IPE main screen is shown in Figure 3. Verify that the Tool drop-down, under Device and Tool Detection at the left reads:

.

| Tool: | PICkit4 S.No : BUR181416430 | ▼ |
|---|---|---|
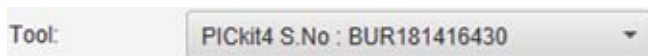
If the IPE does not start, or if the PICKit is not detected, use the help system to resolve the issue. Most times disconnecting and reconnecting the PICKit is all that is needed.
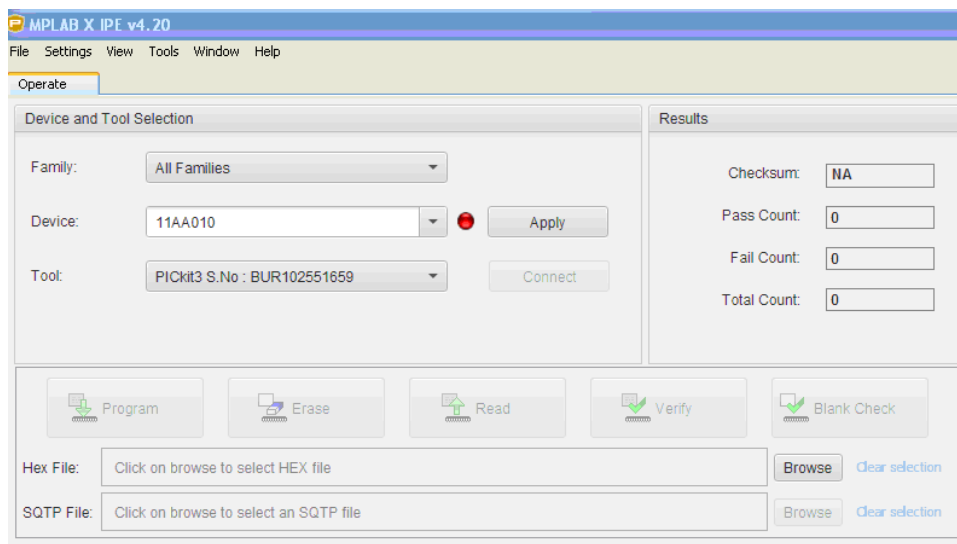


**FIGURE 3.  IPE APPLICATION, MAIN WINDOW**

5. Go to the Kepco website at **www.kepcopower.com/drivers/drivers-dl3.htm#bop1k** and download the BOP 1KW Display/Serial Interface Update zip file. Then extract the two hex files to your desktop.

### 3.5  APPLY POWER TO FRONT PANEL

1.  Snap the a-c input adapter that matches your a-c mains into the AC-DC Power Converter (supplied).

2.  Connect the AC-DC Power Converter d-c cable to the 4-pin connector the 4 pin connector as shown in Figure 1. [closest to the circuit breaker mounted on the display panel].

3.  Connect the AC-DC Power Converter to a-c mains. The front panel display should light and show the display and serial interface firmware revisions.

### 3.6  UPDATE DISPLAY FIRMWARE

1.  Install the 5-pin header (supplied) into the bottom of the PICKit Programmer (supplied).

2.  Locate the programming connection at Location "C" as shown in Figure 1. It is five holes in the Printed Wiring Board that are not in line but slightly joggled. This allows the male pins of the PICKit Programmer to be firmly retained in the socket.

3.  The hole with the square pad is pin 1 of the programming connection. Install the PICKit Programmer such that the triangle on the Programmer is connected to the square pin on the PWB as shown in Figure 4. An alternative is to install the 5-pin header at location "C" first (without the PICKit Pr ogrammer), and then install the PICKit Programmer on the header. NOTE: The audible alarm sounds while the display processor is updating.

4.  At the IPE main screen, under Device and Tool Detection, at the Family drop down menu select **32-bit MCUs (PIC32)** processors. At the Device drop down menu select **PIC32MZ2048EFH100**. as shown below.
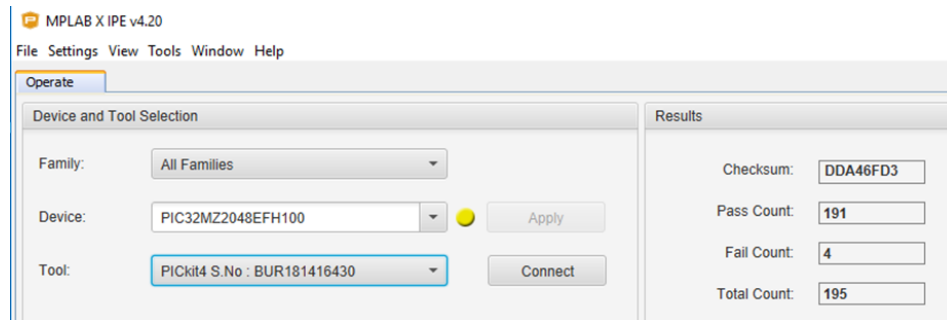


5.  Click **Apply**, then click **Connect**. The firmware for the processors will be downloaded to the PICKit Programmer and then the Programmer will connect to the chip on the board. The output window shows the status (see Figure 5).   Note that DSVSN information is unique to each chip.
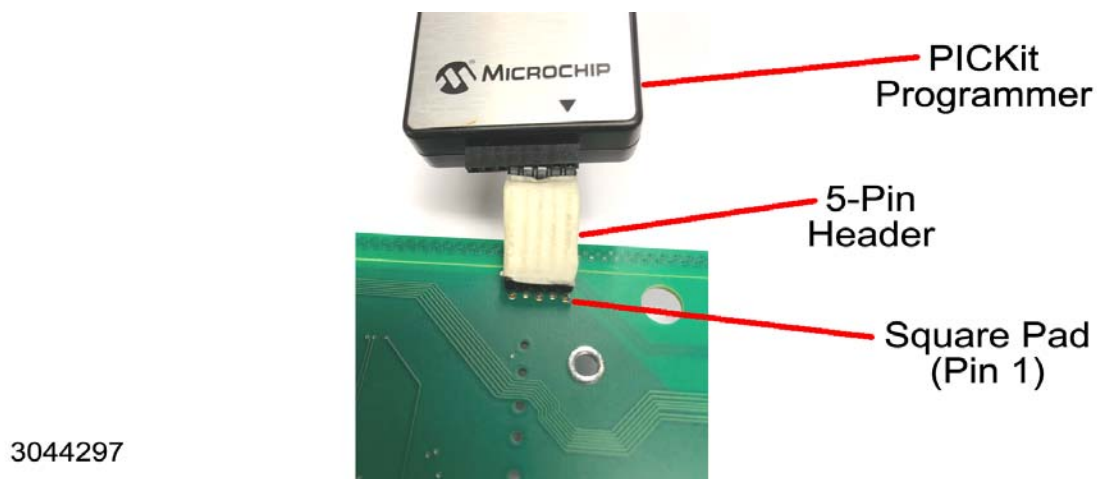


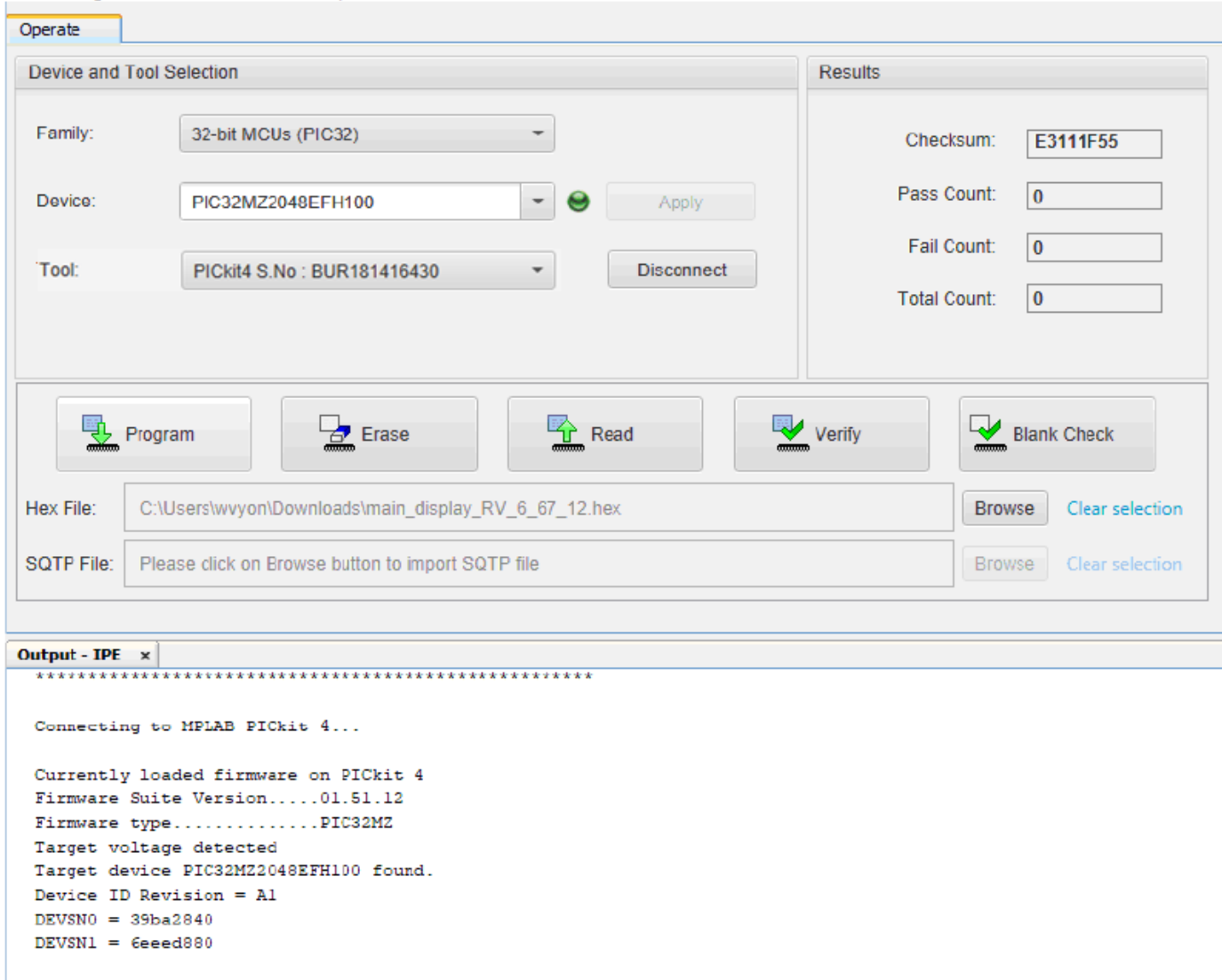**FIGURE 4.  PICKIT PROGRAMMER INSTALLED ON A6A1 BOARD**

**FIGURE 5. IPE SHOWING DISPLAY UPDATE IN PROGRESS**

6. Click the **Browse** button to locate the hex files downloaded from the Kepco web site (see PAR. 3.2, step 5). Select the main_display_xxxxx.hex file (where xxxxx identifies the firmware rev level) and click **OK**.

7. Click **Program**. The output window will show the steps being done and a line above the output window will change with each page being programmed. Once complete, the output window will show the following:

**2018-07-04 23:06:23 -0400 - Programming...**

**Device Erased...**

**Programming...**

**The following memory area(s) will be programmed:**
**program memory: start address = 0x1d000000, end address = 0x1d075fff**
**boot config memory**
**configuration memory**
**Programming/Verify complete**
**2018-07-04 23:07:12 -0400 - Programming complete**

8. Remove PICKit Programmer and header from A6A1 board. The BOP front panel display restarts and the beeping stops.

9. Close the IPE.

## 3.7 UPDATE SERIAL PROCESSOR FIRMWARE

1. Locate the programming connection at either Location "D" or "E" (depending on PWB revision) as shown in Figure 1. It is five holes in the Printed Wiring Board that are not in line but slightly joggled. This allows the male pins of the PICKit Programmer to be firmly retained in the socket.

2. The hole with the square pad is pin 1 of the programming connection. Install the PICKit Programmer such that the triangle on the Programmer is connected to the square pin on the PWB as shown in Figure 4.

3. At the IPE main screen, under Device and Tool Detection, at the Family drop down menu select **32-bit MCUs (PIC32)** processors. At the Device drop down menu select **PIC32MX775F512L**.as shown below:.
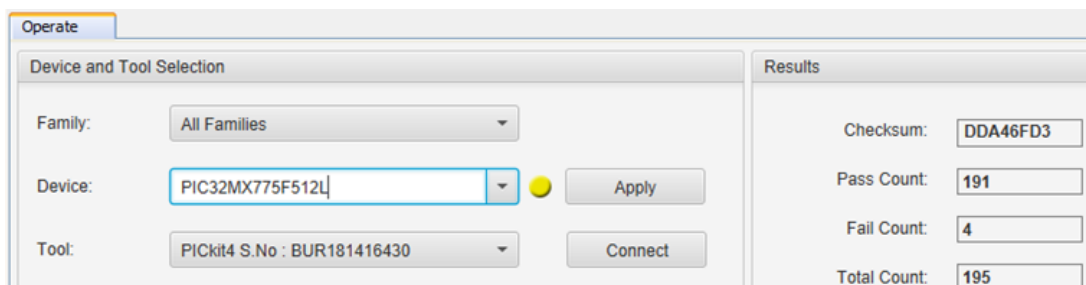


4. Click **Apply**, then click **Connect**.

5. When the program completes downloading the API (Application Programming Interface), Click the **Browse** button to locate the hex files downloaded from the Kepco web site. Select the main_serial_xxxxx.hex file (where xxxxx identifies the firmware rev level) and click **OK**.

6. Click **Program**. The output window will show the steps being done and a line above the output window will change with each page being programmed. Once complete, the output window will show programming complete:

7. Remove the 5-pin header and PICKit Programmer from A6A1 board.

8. Disconnect the AC-DC Power Converter from a-c mains and disconnect the d-c output cable from A6A1 board.

9. Close the IPE.

10. Install Connector P/N 118-1379 on J16 of A6A1 board (see Figure 1).

## 3.8  REASSEMBLY

1. Carefully line up circuit breaker pins with corresponding connectors on front panel and carefully mate front panel and chassis. It may be necessary to press the PCB onto the circuit breaker.

   CAUTION: Installing the inner screws first can result in damage to the front panel.

2. Attach front panel with Distribution board A6A1 to the chassis first using two outer screws at the bottom of the chassis, then two inner screws.

3. Connect two 4-pin connectors (or one 4-pin and one 6-pin connector), and one 5-pin connector attached to twisted pairs to connectors J12, J15 and J14, respectively on Distribution board A6A1 (see Figure 1). The 4-pin connectors can plug into either J12 or J15; holding the wires, line up the pins on an angle, then push until straight and press into place; if necessary a screwdriver can be used to apply enough pressure to front panel to slightly increase separation between front panel and Distribution board A6A1, enough for the connectors to be inserted.

4. Attach the fan connector (J10, Figure 1) by inserting the connector straight into the mating socket.

5. Connect ribbon cable from Distribution board A6A1 to Digital board connector A1J2.

6. Connect ribbon cable from A4A3 module to Distribution board A6A1 connector J11.

7. Attach the cover to the chassis using 14 screws.

8. Attach the two mounting ears to the chassis using three screws for each.

9. Install the power cord.

## 3.9  REASSEMBLY VERIFICATION

Following reassembly, perform the following steps to verify that the unit has been properly updated and reassembled.

1. Power up the unit and hold a piece of paper near the vent holes at the top cover near the front panel (see Figure 2, Fan Verification Location "A"). Verify that the paper is suctioned down towards the cover.

2. Hold a piece of paper to the rear panel (see Figure 2, Fan Verification Location "B") and verify the paper flutters indicating it is being expelled from the unit

3. Turn the unit off and then on again. Verify that the power up sequence is successful

4. Perform the Preliminary Checkout procedure found in Section V of the BOP 1kW MG Quick Start Guide which can be downloaded from the Kepco web site at **www.kepcopower.com/support/opmanls.htm#bop-1k**

## 3.10  RETURN OF PROGRAMMER KIT TO KEPCO

There will no charge for this kit if the KIT components are returned to Kepco once the upgrade is complete.

- AC-DC Power Converter, Kepco P/N 257-0013
- PROM, U24 removed from Digital Board A1 in protective tube
- PICKit Programmer, Kepco P/N 219-0617; with micro USB to USB cable
- 5-pin Header, Kepco P/N 143-1029
- Serial Interface Connector, P/N 118-1379

To receive credit, send the above listed components to Kepco per the instructions in the RMA supplied.