



17692 Fitch

Irvine, California, USA 92614

1 800 854-2433

Tel: 949 251 1800 Fax: 949 756 0756

## *UPC Programmable Output Impedance (Prog-Z Option)*

Programmable Output Impedance provides the operator with the ability to dynamically control the output impedance of the AC Power Source. Using the output current term as conditioned feedback signal to the output voltage circuits, positive or negative impedance may be programmed. The purpose of this control is to simulate the effects of or compensate for high peak current, distribution, or transformer losses of up to  $\pm 10\%$  of the output voltage.

Prog-Z is programmable,  $Z_{\text{output max}}$  in 0.1% steps. The  $Z_{\text{output}}$  value is displayed in milliohms. Range varies with the different models but usually results in a  $\pm 10\%$  change in output voltage at maximum rated load current.

Operation of this function in the UPC software is as follows.

1. An initial calibration routine must be performed to determine the characteristic output impedance ( $Z_{\text{char}}$ ) before the user can enter a requested output impedance value ( $Z_{\text{output}}$ ). This routine is called **MEASURE OUTPUT IMPEDANCE** and must be performed once for each output power form, coupling, XFMR ratio, AMPS to VOLTS ratio or SENSE POINT setting. As ( $Z_{\text{char}}$ ) values will be lost if UPC RAM is cleared, these values should be permanently recorded in the power source manual or other secure location.

This calibration routine measures No-Load vs. Full-Load RMS voltage and divides this difference by the Full-Load RMS current (with 0% impedance correction applied). The result is called  $Z_{\text{char}}$ . This routine may be accomplished in the field, however, the operator must have the loads necessary for each condition noted in the paragraph above. An alternative to producing Full-Load output current is to produce Partial-Load current but accuracy of the result may suffer.

After  $Z_{\text{char}}$  is measured, the UPC programs the oscillator for maximum output impedance, measures the max  $Z_{\text{output}}$ , then the UPC calculates the values needed to program a requested  $Z_{\text{output}}$  based on the two measurements.

2. Now the user can enter a  $Z_{\text{output}}$  through the use of a setup menu in the UPC. If a value entered is beyond the available range, the UPC will indicate an error and remain at the current setting. Available ranges may vary for different Output (XFMR) ratios. Software limits will also be placed on the available ranges to limit compensation to  $\pm 10\%$ .

## *UPC Programmable Output Impedance (Prog-Z Option)*

The following pages from the UPC operators manual discuss Prog-Z setup and calibration methods.

### **4.5.3.1.1 PROGRAMMABLE OUTPUT IMPEDANCE SETUP MENUS**

Programmable Output Impedance (Prog. Zo) is used to compensate for regulation loss due to transformer outputs or to control the Output Impedance of the power source. Press **EDIT** while the display cursor is located in the PROG. Zo field in the UPC SETUP menu to access the PROG. Zo menu, as shown below.

PROG. Zo SETUP: PRESS EXECUTE TO SAVE.  
PROG. Zo = **OFF**: PROG. Zo OHMS = 0.000  
MAX=2.516 MIN=-2.484  
(PRESS EDIT TO CALIBRATE, THEN EXECUTE)

Pressing the +/- key while the cursor is in the ON/OFF field will enable/disable the Prog. Zo function. When disabled, no output compensation occurs and the inherent output impedance of the power source and wiring will remain uncompensated. When enabled, the UPC will attempt to provide an output impedance at the load equal to the value set in the PROG. Zo OHMS field.

Min and max impedance values are shown on the display as this range dynamically changes based upon current operating parameters such as Form, Coupling and XFMR ratio. Press EXECUTE to exit the screen.

**--- CAUTION ---**

**CARELESS OR IMPROPER USE  
OF THE  
PROGRAMMABLE OUTPUT IMPEDANCE FUNCTION  
MAY RESULT IN OVER-VOLTAGE OR UNDER-VOLTAGE BEING PRESENTED  
TO THE LOAD, AND CAUSE DAMAGE TO THE LOAD.**

**REACTIVE LOADS MAY CAUSE THE OUTPUT POWER TO BECOME UNSTABLE (OSCILLATE)  
AND CAUSE DAMAGE TO THE LOAD  
IF EXCESSIVE NEGATIVE IMPEDANCE IS USED!**

**USE THIS FUNCTION WITH CARE**

**--- CAUTION ---**

## UPC Programmable Output Impedance (Prog-Z Option)

### 4.5.3.1.1 PROGRAMMABLE OUTPUT IMPEDANCE SETUP MENUS (cont)

Press **EDIT** again to access the following screen.

```
PRESS ENTER TO LOAD PROG. Zo CALIBRATION
VALUES
PRESS 0 TO RESET CALIBRATION VALUES TO
FACTORY DEFAULTS.
```

Press **ENTER** to access the following screen to enter special calibration values for the Prog. Zo function.

$\phi$	Z direct	XFMR ratio	Z xfmr
1	0.006	1.5	0.450
2	0.032	2.0	1.400
3	0.016	2.5	2.970

**NOTE:** The unit is pre-calibrated at the factory, but if re-calibration of this function is desired, or if the RAM (memory) in the UPC has been lost or erased, use this screen to enter new calibration values. A calibration procedure is listed below.

**The  $\phi$  column** indicates the Power Form of operation (1,2 or 3 phase).

**The Z direct column** accepts the Direct coupled impedance of the power source (per phase) for the given Power Form listed on the far left. During DIRECT coupled operation, the proper Z direct value is used to calibrate the PROG. Zo function based upon the Power Form selected in the Program being executed.

**The XFMR ratio column** accepts up to 3 separate XFMR ratios. Typically only one will be entered.

**The Z xfmr column** accepts the impedances of the XFMR listed in the XFMR ratio column. During XFMR coupled operation, the proper Z xfmr value is used to calibrate the PROG. Zo function based upon the XFMR ratio selected in the Program being executed.

## *UPC Programmable Output Impedance (Prog-Z Option)*

### **4.5.3.1.1 PROGRAMMABLE OUTPUT IMPEDANCE SETUP MENUS (cont)**

Calibration values for Direct coupled operation may be established via the following procedure.

1. Turn CSC OFF. Disable PROG. Zo. Execute a program in Direct coupled mode.
  - A. Establish the difference in output voltage between no-load and full-load voltage.
  - B. Divide the Voltage difference by the full-load current. The net result is the inherent direct coupled impedance of the power source.

$$Z = \frac{V_{\text{no\_load}} - V_{\text{full\_load}}}{I_{\text{full\_load}}}$$

Use the result to enter in as Z-Direct for the power form used to perform this test.

2. Calibration values for XFMR coupled operation may be established via the above procedure, except the Z direct value must be subtracted from the Z XFMR calculation prior to entering the Z XFMR value into the UPC. The DC resistance of each XFMR secondary tap may also be entered in for Z XFMR as an alternative to using the above procedure for measuring XFMR impedance. NOTE: XFMR impedances may vary greatly with temperature.