

## **TRACKING ACCEPTANCE TEST PROCEDURE**

This test procedure is developed during the final testing of two Injection Kicker power supplies. The goal is to have one simple standard set of methods of measuring the tracking performance of the power supplies and taking of the relevant data.

### **SYSTEM CALIBRATION**

Before doing the tracking test, the Yokogawa test system should be calibrated as follows:

#### **1. REFERENCE CHECK**

Waveform Generator CH1 output to Digitizer CH1 Input.

Waveform Generator CH2 output to Digitizer CH2 Input.

Check that the error between Digitized waveform is within \_\_\_\_\_ %.

#### **2. DIGITIZER FILTER CHECK**

WFG CH1 output to 10 KHz filter to DG CH1 Input.

WFG CH2 output to 10 KHz filter to DG CH2 Input.

Check that the error between Digitized waveforms is the same as above.

Note that whenever the Yokogawa test system has not been used for a while, redo this system calibration before doing the tracking test. Hence, if any module in the test system developed a problem, you can catch it early.

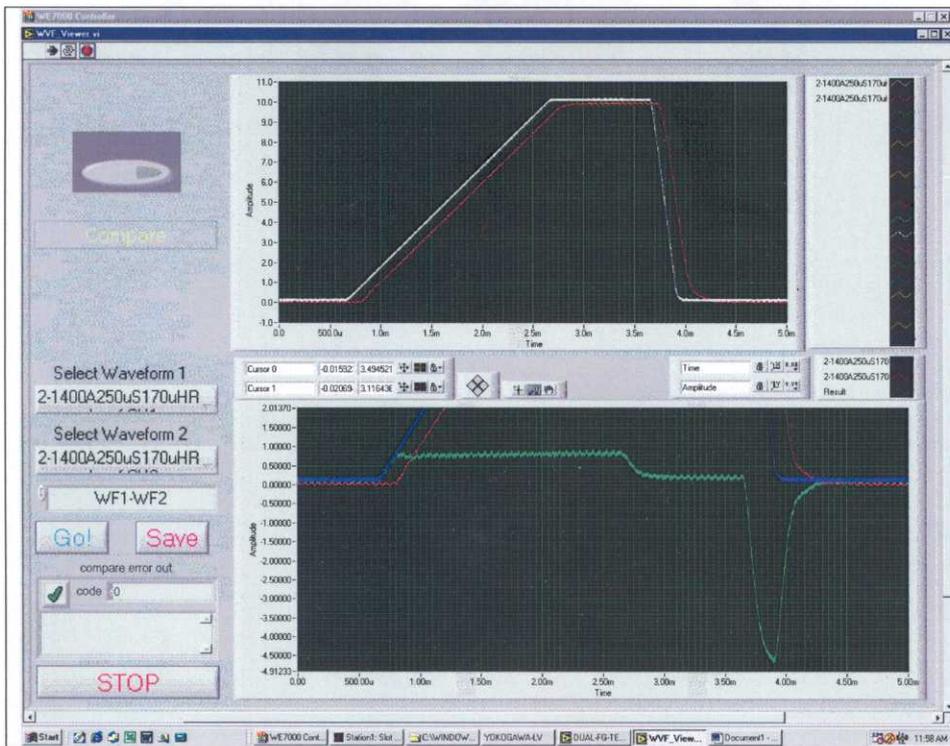
### **REFERENCE POWER SUPPLY CALIBRATION**

For the reference power supply, take calibration measurements as follows:

#### **1. POWER SUPPLY REFERENCE GENERATION**

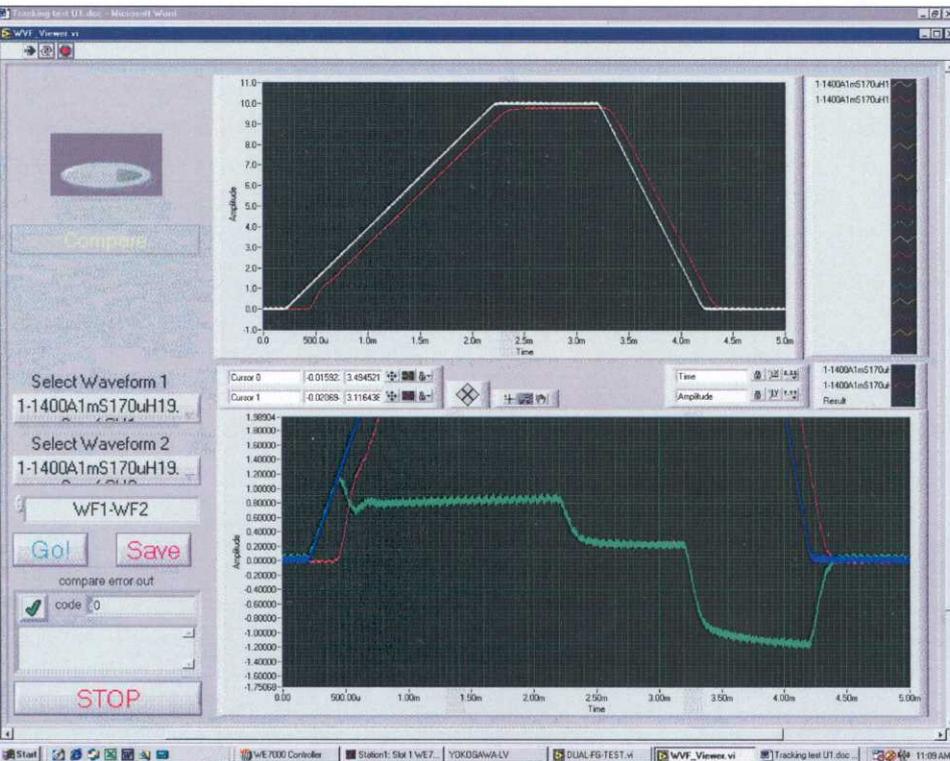
1a. From the digitized reference input Ref (250 us fall) and power supply output waveforms Iload (ref), generate an error Ierr (Ref) waveform. Keep a record of all three waveforms.

Fig. 1a



1b. Repeat the above for a reference input with a 1 ms fall.

Fig. 1b



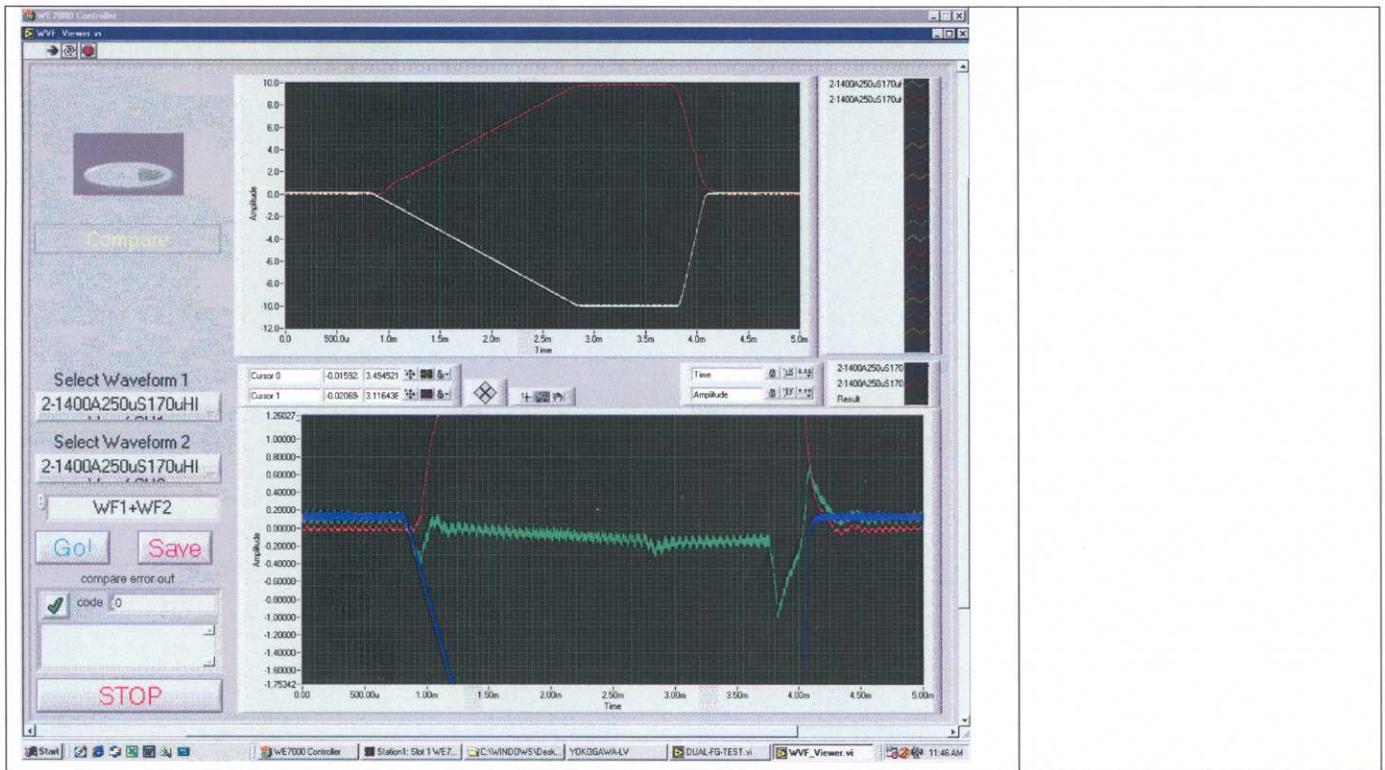
**2. REFERENCE INPUT AND POWER SUPPLY OUTPUT TRACKING CHECK**

Whenever the reference power supply has not been used for a while or some work has been done to it, check the tracking performance of the reference power supply against the standard waveforms taken in section 1.

**3. REFERENCE ERROR GENERATION**

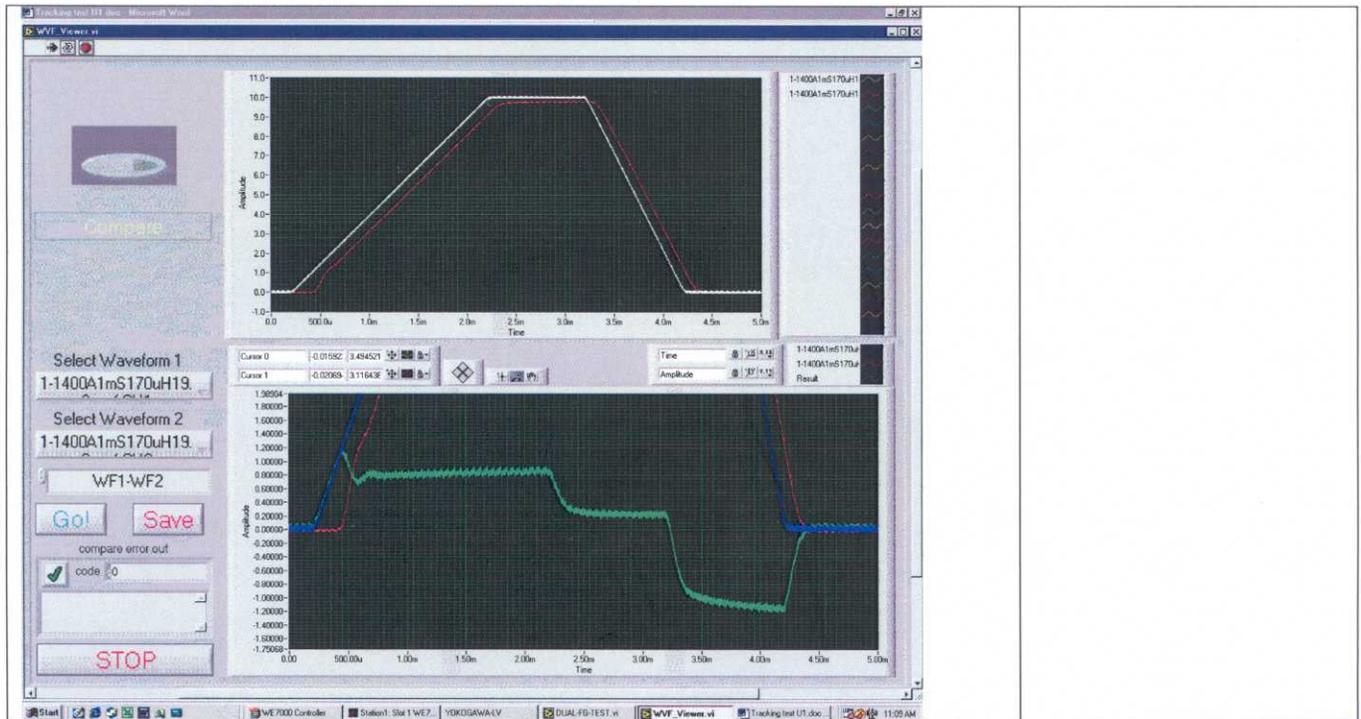
3a. Derive a inverted delay reference (250 us fall) from Waveform Editor and use it to null the load current,  $I_{load}$  (ref). Keep a record of all three waveforms.

Fig. 3a



3b. Repeat 3a. for a reference input with a 1ms fall.

Fig. 3b

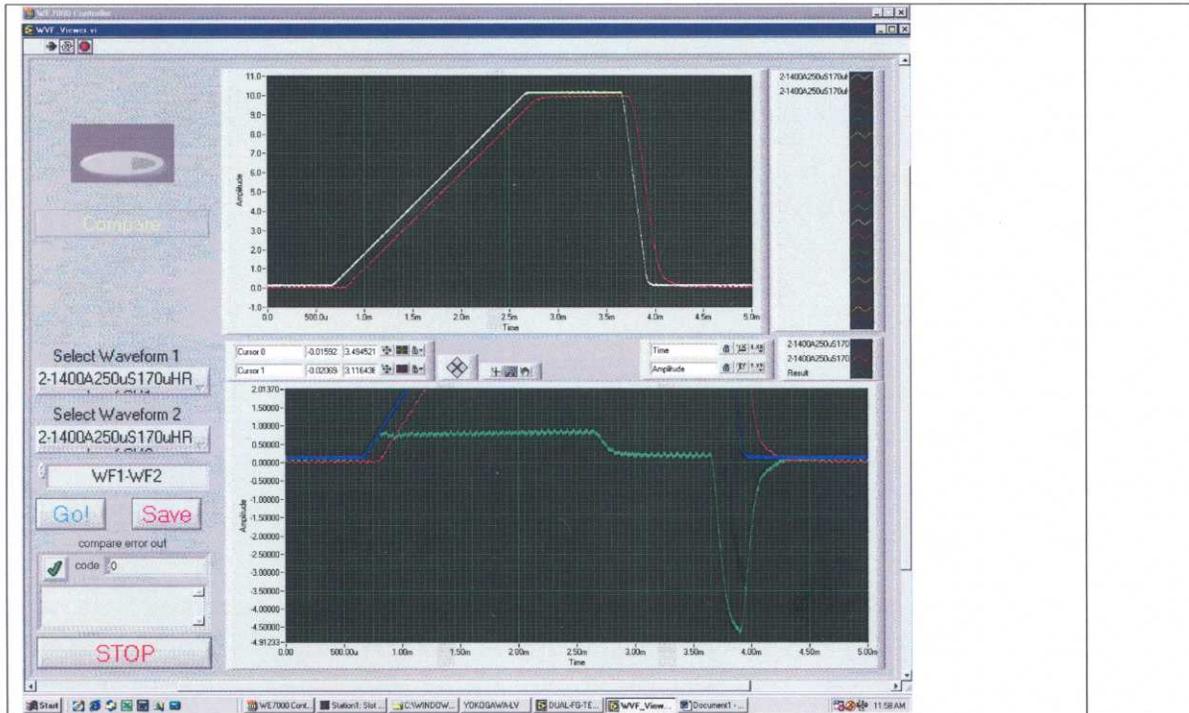


## TRACKING DATA GENERATION FOR UNIT 1

### 4. POWER SUPPLY REFERENCE GENERATION

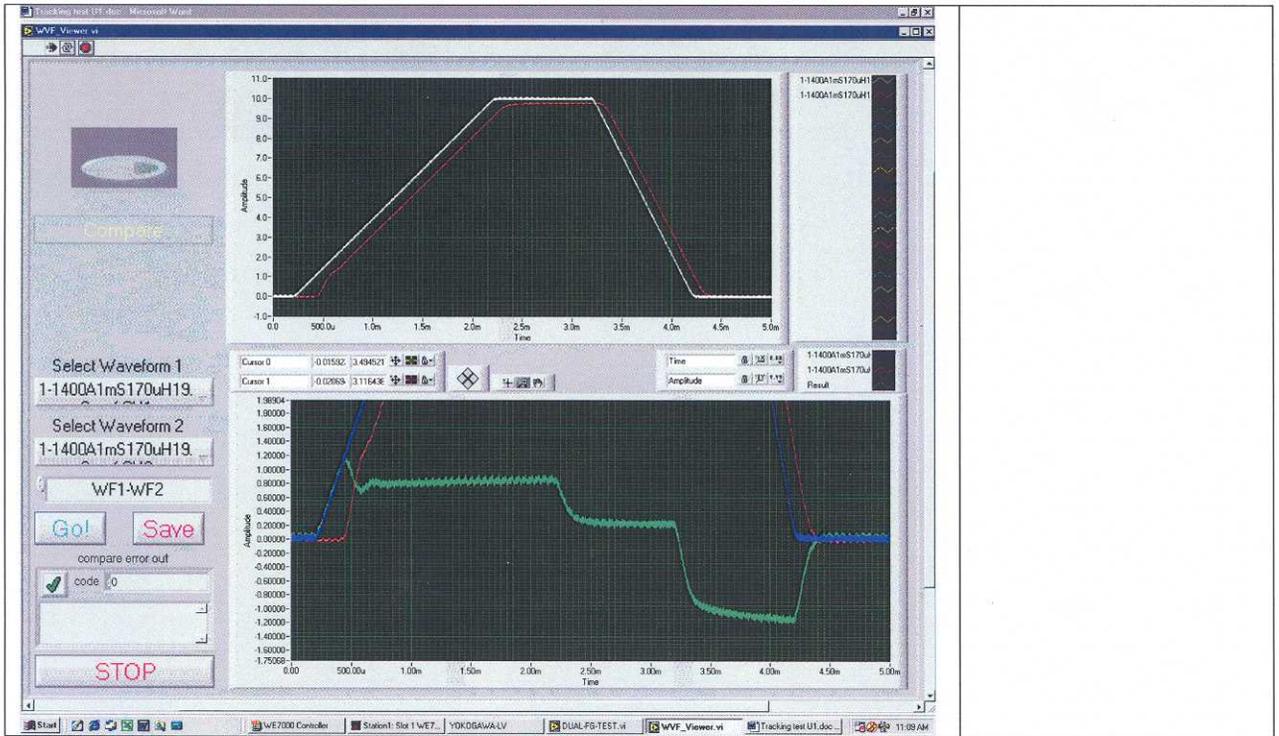
4a. From the digitized reference input Ref (250 us fall) and power supply output waveforms Iload (ref), generate an error Ierr (Ref) waveform. Keep a record of all three waveforms.

Fig. 4a



4b. Repeat the above for a reference input with a 1 ms fall.

Fig. 4b



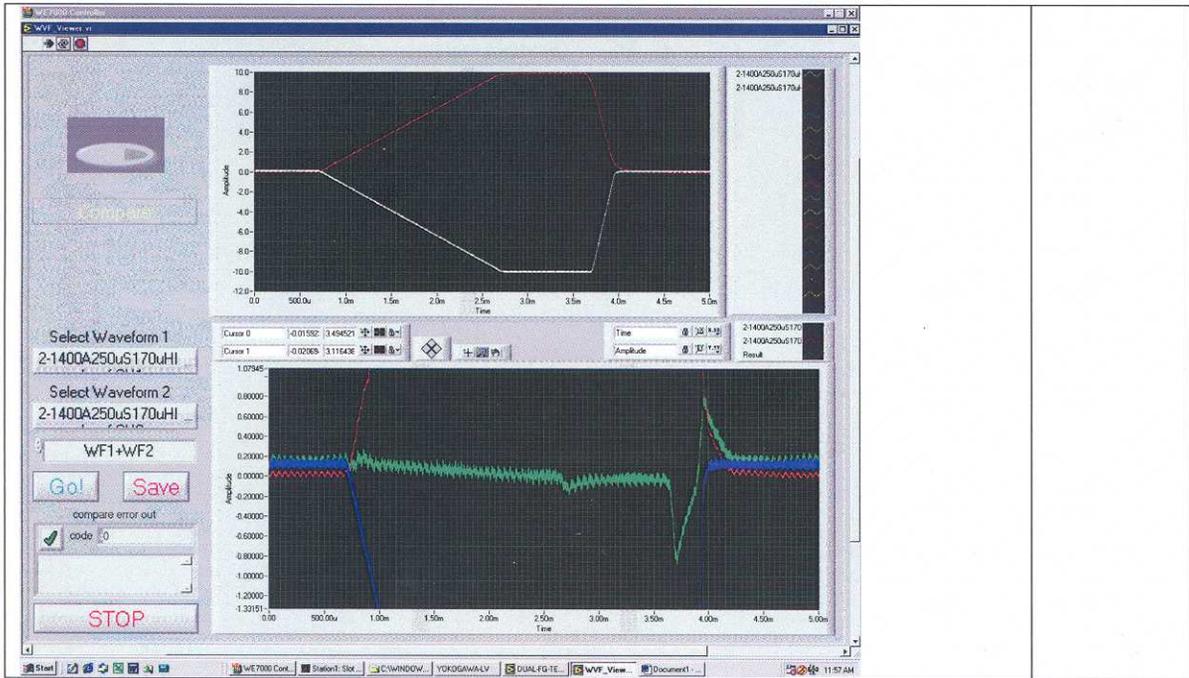
## 5. REFERENCE INPUT AND POWER SUPPLY OUTPUT TRACKING CHECK

Whenever the reference power supply has not been used for a while or some work has been done to it, check the tracking performance of the reference power supply against the standard waveforms taken in section 1.

## 6. REFERENCE ERROR GENERATION

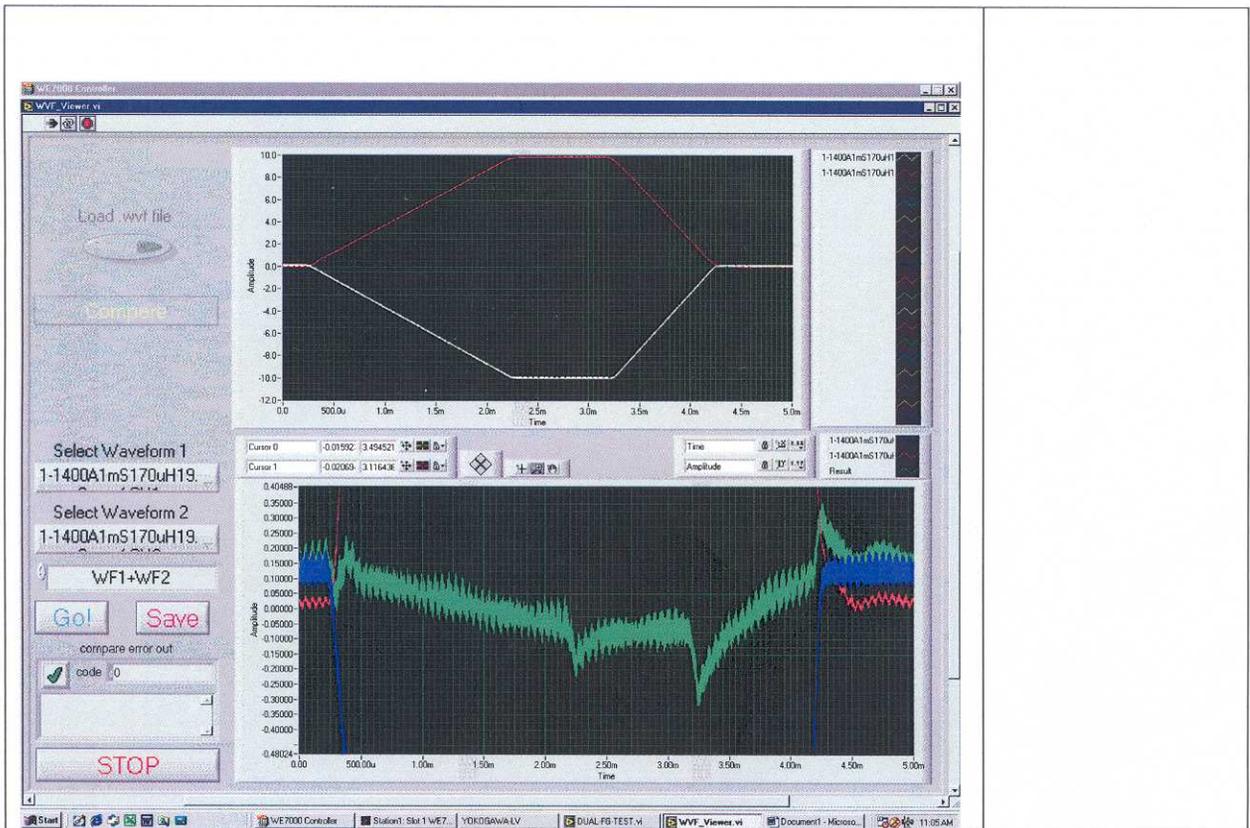
6a. Derive a inverted delay reference (250 us fall) from Waveform Editor and use it to null the load current,  $I_{load}$  (ref). Keep a record of all three waveforms.

Fig. 6a



6b. Repeat 6a. for a reference input with a 1ms fall.

Fig. 6b



## SIGNAL PROCESSING IN EXCEL

The tracking error between the reference power supply and Unit 1 can be derived inside Microsoft EXCEL using the previously recorded data files. These two files have the following information:

Delayed Ref, Iload Ref, Ierr ref

Delayed u1, Iload u1, Ierr u1

The charts generated by EXCEL are as follows:

Fig. 7

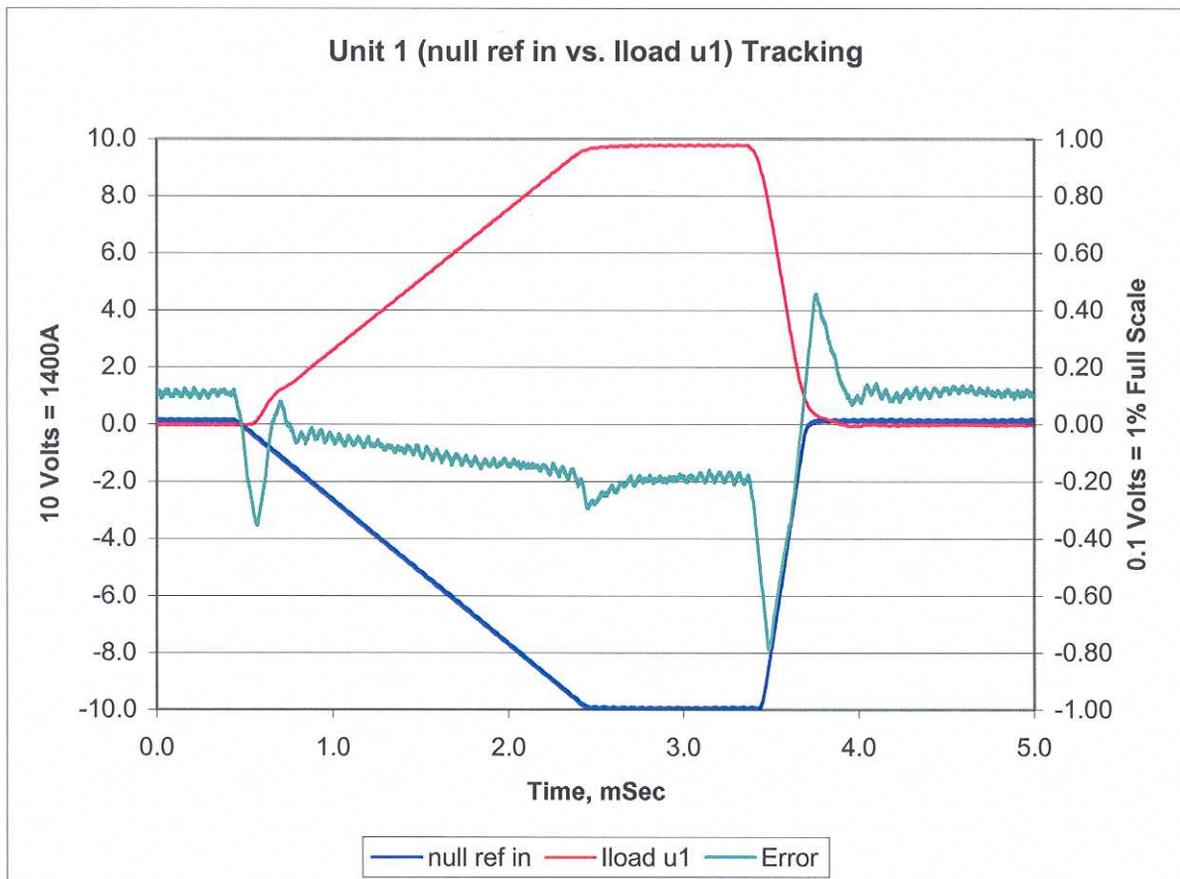


Fig 8

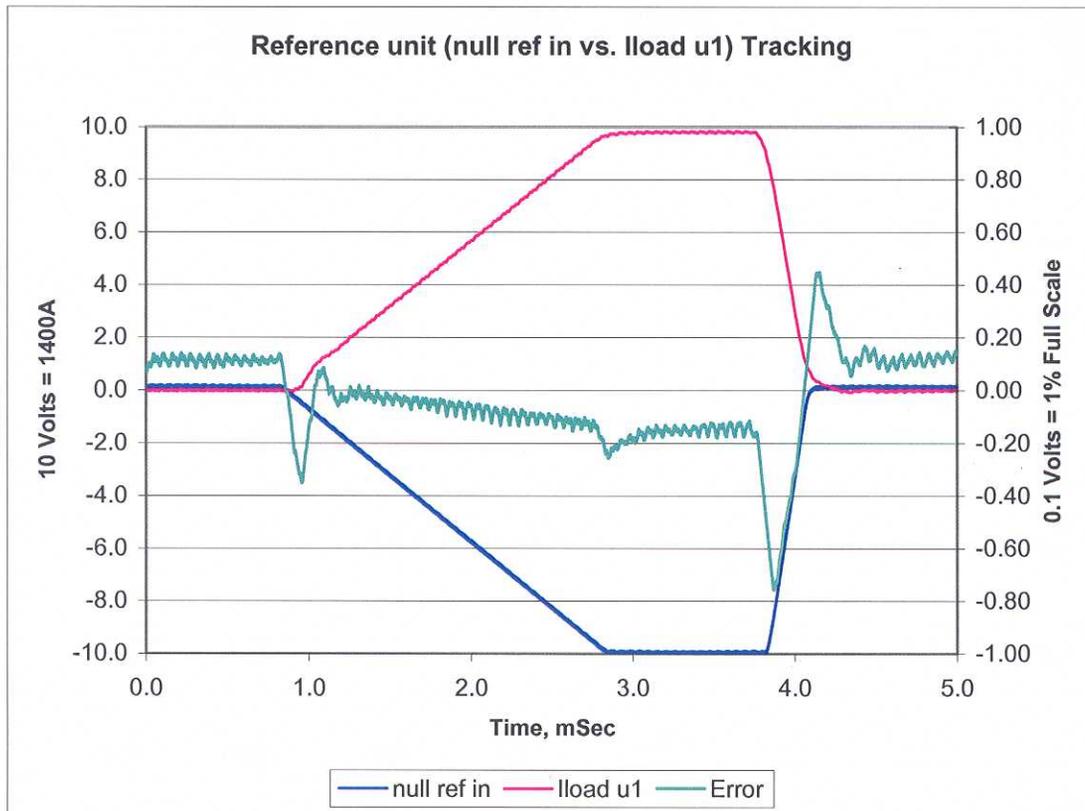


Fig.

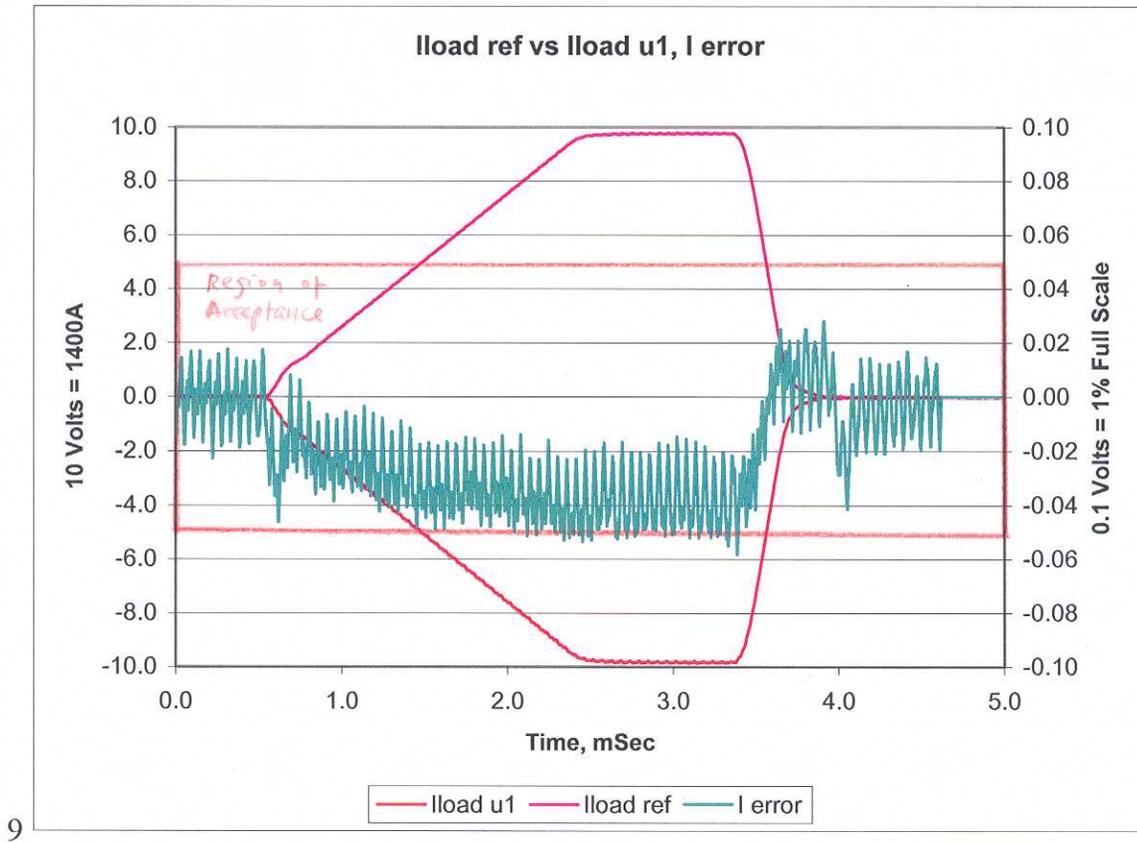
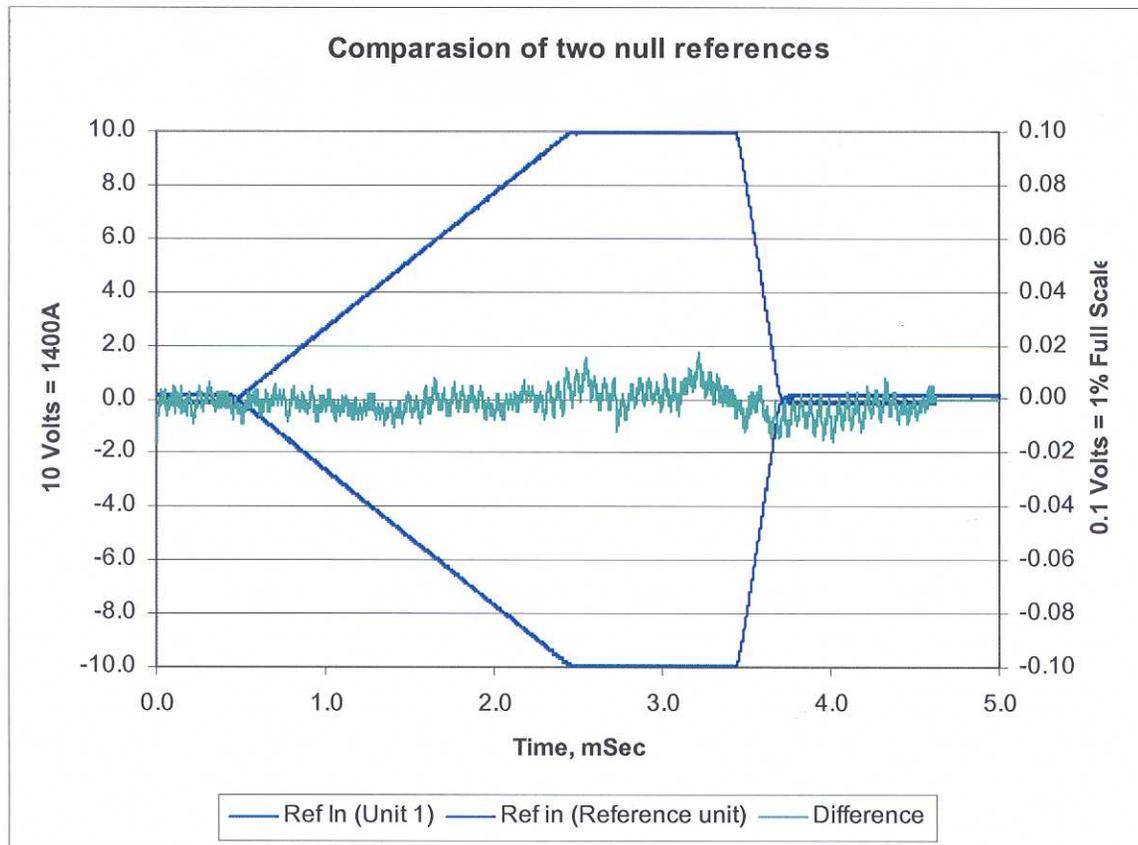


Fig. 10



## TEST REPORT GENERATION

Among the charts generated in EXCEL, the one depicting the error between Iload ref and Iload u1 is the one that determines the acceptance of the power supply.

The vertical scale of this chart shall be between +0.1V and -0.1V.

The region of acceptance shall be clearly marked.

The power supply shall not be shipped unless the error waveform is within the region of acceptance.

Since it takes a lot of waveform measurements before the above chart can be generated, waveform measurements and chart shown in figures 1 – 10 must also be included in the test report so that it is possible for some one to check for consistence.

## **TRACKING DATA BETWEEN POWER SUPPLIES WITH UNIDENTICAL LOAD**

Connect unit 1 to a load with 5% change in inductance.

Trim Unit1 to obtain best tracking between I load ref and Iload u1.

Repeat steps 4 – 6.

Verify that the error between Iload ref and Iload u1 is within 0.1V (1% total).