

Closed Loop Verification

ProCal can provide the facility to perform closed loop readback of instruments being calibrated. This allows, for example, a multimeter with a GPIB interface to be calibrated with the signal (e.g. 10V) being automatically input to the instrument, and the reading readback directly over the GPIB interface.

ProCal allows this closed loop functionality to be easily achieved by using specific commands which are entered into the Pre-Test command window within a test.

This Pre-Test command can allow the instrument under test (UUT) to be set to the correct function and range, then for a reading to be triggered and then readback into ProCal with no user interaction required.

Readback from the UUT

As an example, a 1V DC range measurement at 1V on an Agilent 34401A Multimeter can be achieved with the following commands :

UUT CONF:VOLT:DC 1

Sets the UUT to DC Voltage function, 1V range

UUT VOLT:DC:NPLC MAX>LF

Sets the UUT sample rate to maximum

>READBACK

*Commands set after this **marker** will be used as part of the continuous readback loop*

UUT READ?

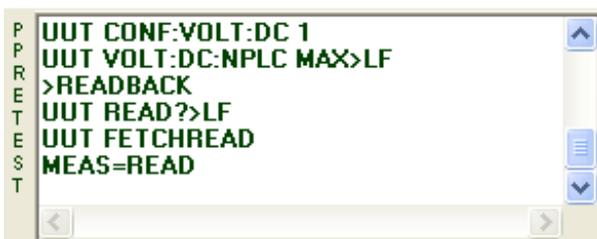
*Triggers a reading
(READ? Command part of the 34401A GPIB command set)*

UUT FETCHREAD

ProCal command to obtain reading from the UUT GPIB address

MEAS=READ

Assign the reading obtained from the UUT GPIB address as reading for the test being performed



```

P UUT CONF:VOLT:DC 1
P UUT VOLT:DC:NPLC MAX>LF
R >READBACK
E UUT READ?>LF
S UUT FETCHREAD
T MEAS=READ
  
```

This command structure can also be used to readback from any instrument on any GPIB address, by simply directing the commands to the correct GPIB address, e.g. instead of using 'UUT' to direct the commands to the UUT GPIB address, simply use '16', for example, to readback from address 16.

Assigning a NOMINAL value from a readback value

In the same way a reading can be automatically readback from an instrument and used as the test reading, the test nominal value can also be changed to match a readback value.

This is useful where, for example, a resistance standard is used for a certain test and the nominal value is required to be set to the actual value of this standard resistor.

As an example, a 10kOhm range measurement at 10kOhms :

24 CONF:RES 10E3

Sets a meter to DC resistance function, 10kOhm range

24 READ?

*Triggers a reading
(READ? Command part of the 34401A GPIB command set)*

24 FETCHREAD

ProCal command to obtain reading from the meter on GPIB address 24

NOM=READ

Assign the reading obtained from the meter on GPIB address 24 as the nominal value for the test being performed

After the nominal value for the test has been set, the UUT readback can still be achieved automatically using the commands below :

UUT CONF:VOLT:DC 10

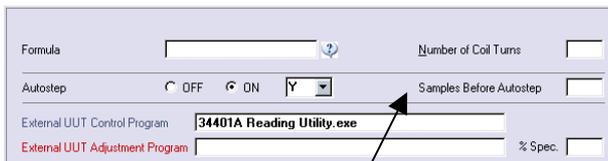
UUT READ?

UUT FETCHREAD

MEAS=READ

Controlling the number of samples when reading back from UUT

When a test is configured to autostep, the number of samples can be pre-determined to ensure an acceptable number of samples is taken (e.g. an A.C. test may require many samples to ensure the reading has settled.)



The screenshot shows a software configuration window with several fields. The 'External UUT Control Program' field is set to '34401A Reading Utility.exe'. The 'Samples Before Autostep' field is highlighted with a black arrow pointing from a text box below. Other fields include 'Formula', 'Number of Coil Turns', 'Autostep' (with radio buttons for OFF and ON), and 'External UUT Adjustment Program' with a '% Spec' field.

Samples before autostep

Readback Command Summary

x FETCHREAD

Where x is the UUT GPIB address
or use UUT
or use @0x to use address of traceable instrument

MEAS=READ

Assign the reading obtained using **FETCHREAD** as reading for the test being performed

NOM=READ

Assign the reading obtained using **FETCHREAD** as the nominal value for the test being performed