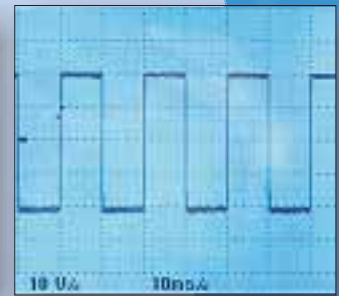
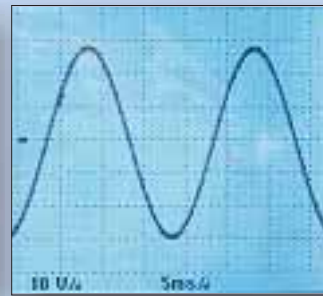
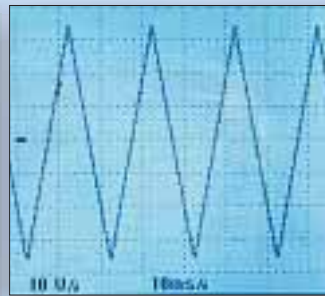
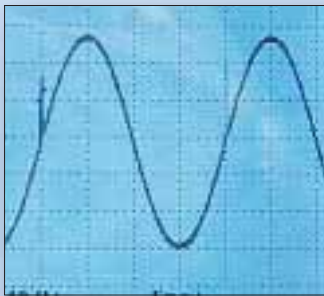


PWRDDS



DIRECT DIGITAL SYNTHESIS POWER CALIBRATION OPTION

FOR 3041 / 3010 CALIBRATORS



OPERATION MANUAL

PWRDDS

DIRECT DIGITAL SYNTHESIS POWER OPTION

Operation Manual

Guarantee and service

Transmille Ltd. guarantees this instrument to be free from defects under normal use and service for a period of 3 years from purchase. This guarantee applies only to the original purchaser and does not cover fuses, or any instrument which, in Transmille's opinion, has been modified, misused or subjected to abnormal handling or operating conditions.

Transmille's obligation under this guarantee is limited to replacement or repair of an instrument which is returned to Transmille within the warranty period. If Transmille determines that the fault has been caused by the purchaser, Transmille will contact the purchaser before proceeding with any repair.

To obtain repair under this guarantee the purchaser must send the instrument in its original packaging (carriage prepaid) and a description of the fault to Transmille at the address shown below. The instrument will be repaired at the factory and returned to the purchaser, carriage prepaid.

Note :

TRANSMILLE ASSUMES NO RESPONSIBILITY FOR DAMAGE IN TRANSIT

THIS GUARANTEE IS THE PURCHASER'S SOLE AND EXCLUSIVE GUARANTEE AND IS IN LEIU OF ANY OTHER GUARANTEE, EXPRESSED OR IMPLIED. TRANSMILLE SHALL NOT BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR LOSS.



Transmille Ltd.
Unit 4, Select Business Centre
Lodge Road
Staplehurst
Kent
TN12 0QW
United Kingdom

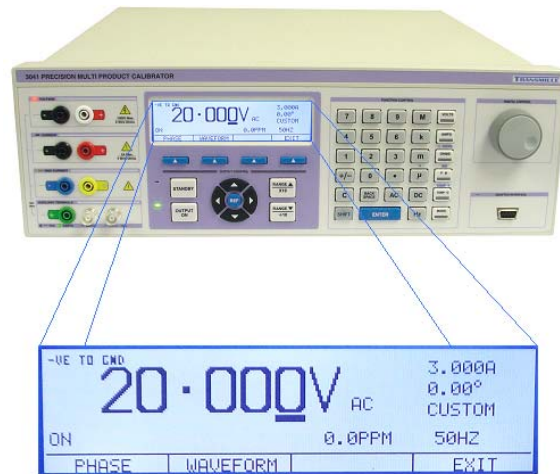
Tel : +44 0 1580 890700
Fax : +44 0 1580 890711

EEmail : sales@transmille.com
Web : www.transmille.com

TABLE OF CONTENTS

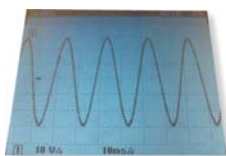
GUARANTEE AND SERVICE	2
PWRDDS DIRECT DIGITAL SYNTHESIS POWER OPTION.....	4
MAIN FEATURES	5
DUAL DDS ARBITRARY WAVEFORM GENERATION FOR VOLTAGE AND CURRENT	5
SELECTING AC POWER CALIBRATION OUTPUT.....	6
SELECTING DC POWER CALIBRATION OUTPUT	8
USING PROWAVE CUSTOM WAVEFORM UPLOAD SOFTWARE	9
<i>Installing the Software.....</i>	<i>9</i>
<i>Selecting a COM Port</i>	<i>9</i>
<i>Operation of the utility.....</i>	<i>10</i>
Harmonic Function	11
Transient Function	12
Drop-Out Function	13
Selecting the USER WAVE and USER+SINE waveforms on the 3000 Series calibrator	14
Available Waveforms.....	15
APPENDIX A.....	16
SPECIFICATIONS.....	16

PWRDDS DIRECT DIGITAL SYNTHESIS POWER OPTION

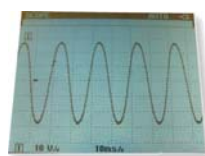


The PWRDDS option uses direct digital synthesis technology to generate stable jitter-free wideband AC waveforms for custom waveforms used in harmonics calibration.

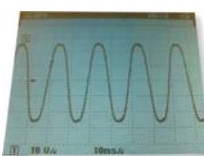
A set of six fixed waveforms are available including transient simulation, with an additional custom waveform uploaded to the calibrator using the ProWave waveform generation software (supplied with the calibrator). The facility to include transient simulation is included in the ProWave software.



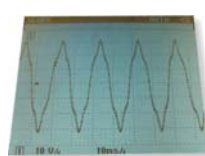
SINE



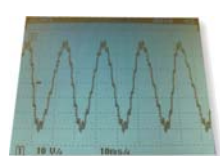
3rd Harmonic 5%



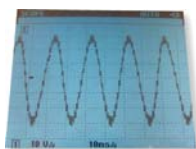
3rd Harmonic 10%



5TH Harmonic 10%



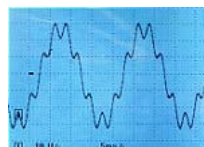
12TH Harmonic 10%



21ST Harmonic 10%



USER&SINE



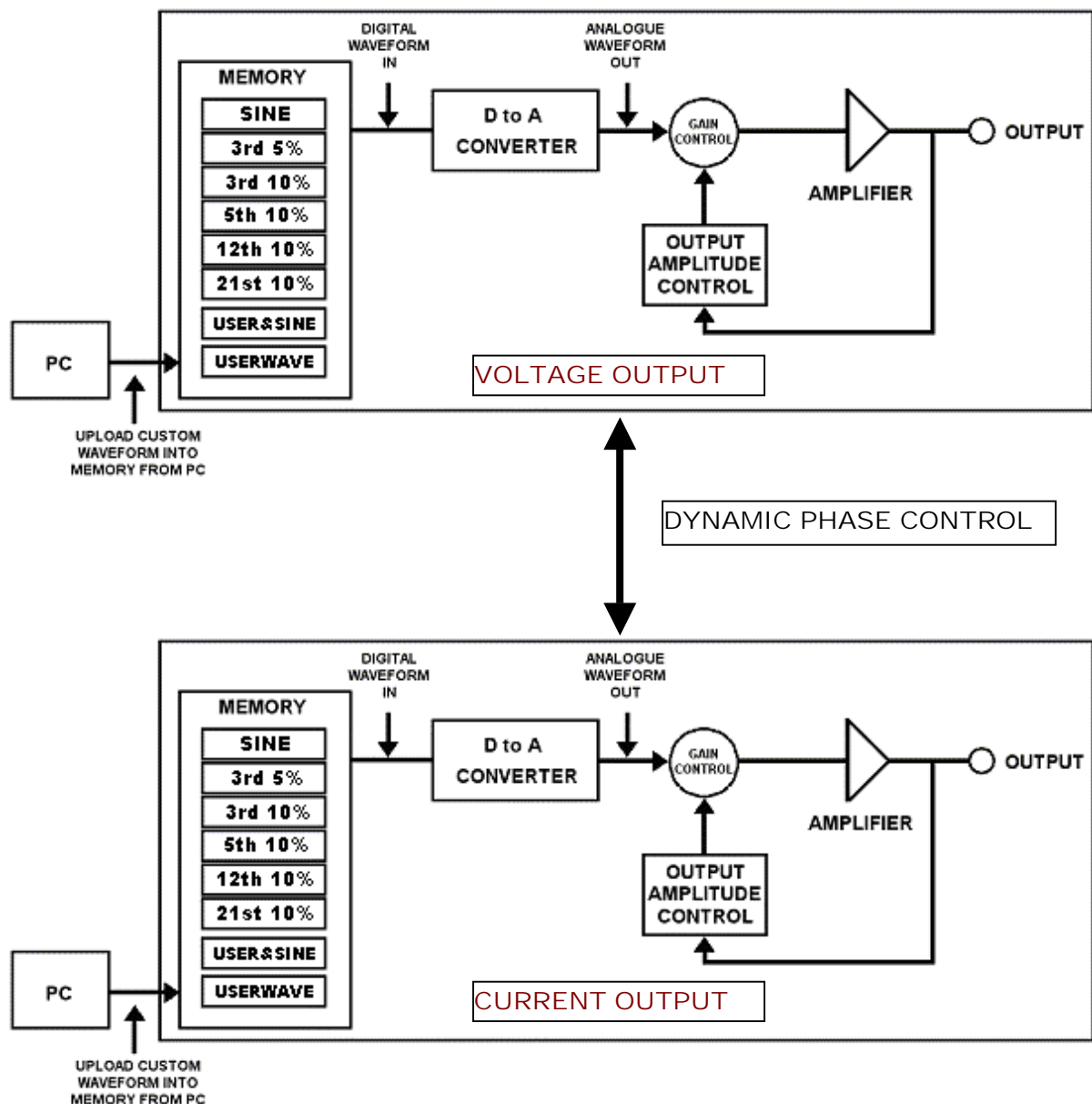
USERWAVE

Main Features

- Six pre programmed waveforms
- Custom user defined waveform function including transient simulation
- ProWave software for custom waveform generation

Dual DDS arbitrary waveform generation for voltage and current

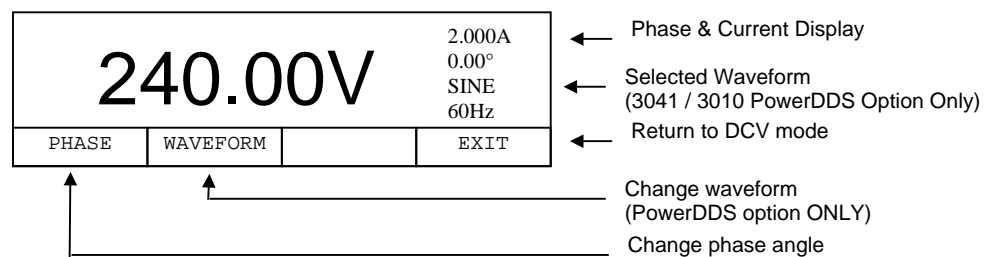
The DDS (Direct Digital Synthesis) Option uses two arbitrary waveform generators, one for voltage and one for current to provide an almost limitless number of waveforms required for accurate calibration of power meters etc.



PWRDDS Control Using the 3000 Series Front Panel

Selecting AC Power Calibration Output

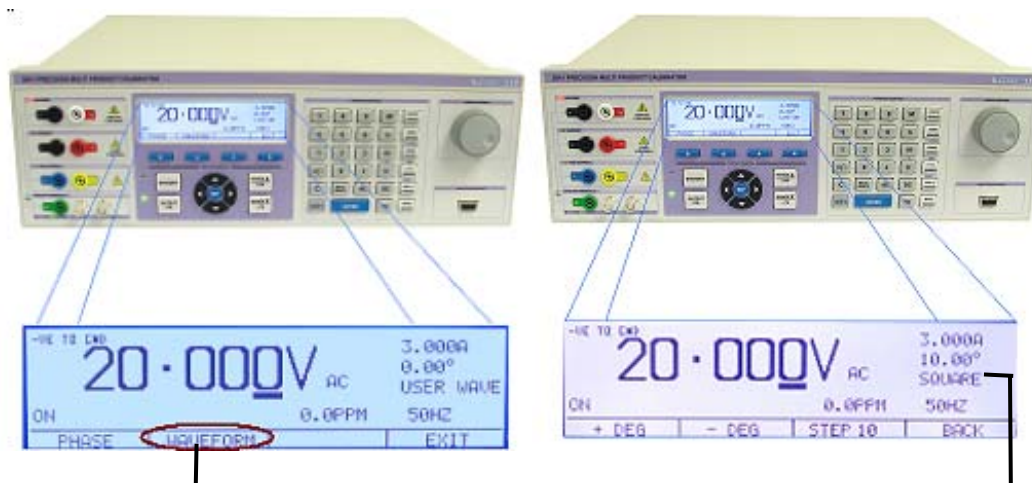
The Calibrator can simulate power by simultaneously outputting AC voltage and AC current with a phase relationship.



To configure power calibration mode :

Select the POWER softkey menu item from the main calibrator display

Initial power screen shown below, with voltage output shown in main display, and current, phase angle and waveform shown at the left hand side.



Pressing the waveform softkey cycles through available waveforms as shown above.

- 1) Select 'POWER' function from the soft menu's
- 2) Enter a voltage by keying in a number followed by V, then press ENTER, eg.

2 0 0 V ENTER

- 3) Enter a current in amps by keying in the value, followed by A

Note : When entering a current, pressing ENTER after the value is not Required, e.g.

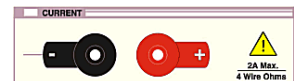


4) Enter a frequency in Hz by keying in the value, followed by Hz

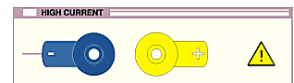


Note : Current output in power mode follows the same convention as normal current operation –

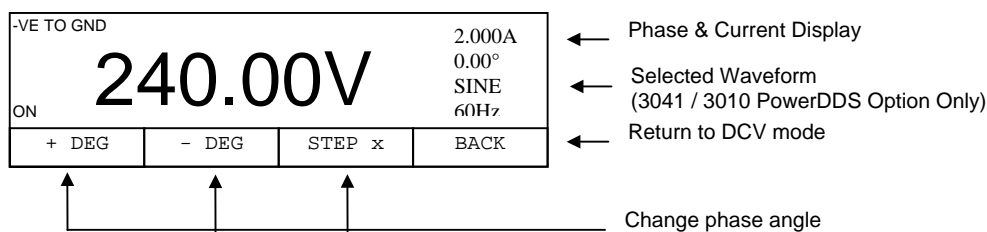
Up to 2A is output from the low current terminals



2.02 – 30A (20A for 3050) output from the high current terminals



5) To change phase, select the phase menu item as shown previously

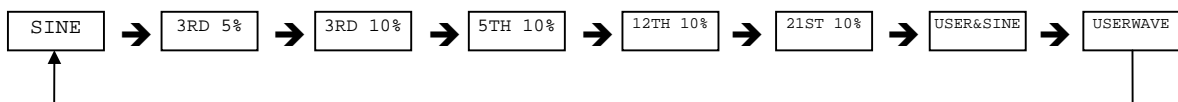


Use **+ Deg** or **– Deg** to adjust the phase by the step size as indicated.

Use the **STEP** button to preset the phase adjust step size (0.1°, 1°, 10° & 100° step sizes available)


6) FOR POWER DDS Option ONLY

Use the **Waveform** button to select alternative waveforms – the waveforms available will cycle through on each push of the waveform button, as shown below. The CUSTOM waveform item is user programmable using the ProWave software supplied with the calibrator. See the ProWave documentation for more details on setting the custom waveform.



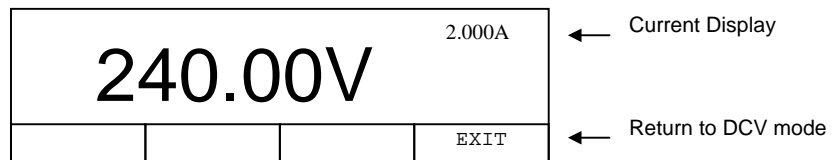
Use the Output On / Standby buttons to control the output



Note : When the hourglass  is shown in display, phase correction is in progress - calibrator will not respond until hourglass disappears.

Selecting DC Power Calibration Output

The Calibrator can simulate DC power by simultaneously outputting DC voltage and DC current.



To configure power calibration mode :

- 1) Select **DC** function from the calibrator function control section
- 2) Select 'POWER' function from the soft menu
- 3) Enter a voltage by keying in a number followed by V, then press ENTER, eg.

2 **0** **0** **V** **ENTER**

- 4) Enter a current in amps by keying in the value, followed by A

Note : *When entering a current, pressing ENTER after the value is not Required, eg.*

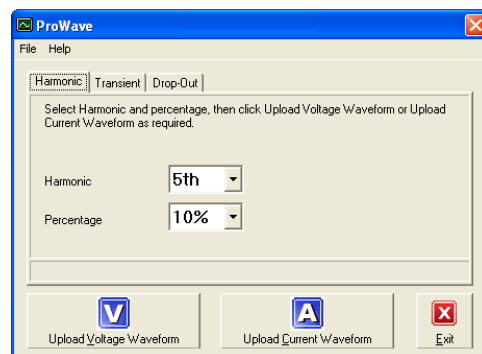
2 **A**

Using ProWave Custom waveform upload Software

Installing the Software

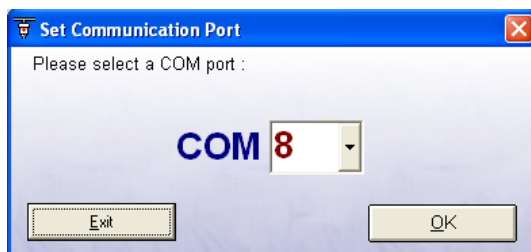
Insert the ProWave CD supplied – this should auto run. If it does not auto run, click START -> Run then run x:\Set.exe where x is the drive letter of your CD drive.

Once installation is complete choose START -> ALL PROGRAMS -> ProWave



Before running the ProWave software, ensure the 3000 Series calibrator is connected to the PC using the supplied serial cable (grey).

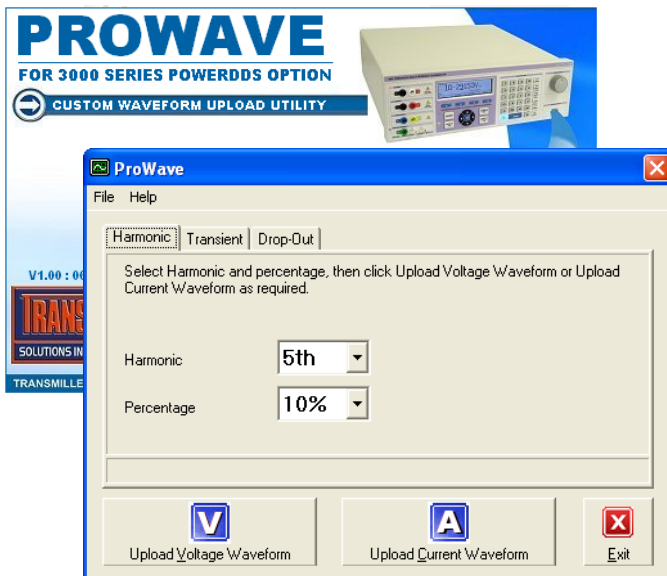
Selecting a COM Port



On starting the virtual front panel for the first time, a COM port selection screen will be displayed. Click on the COM port which is connected to your 3000 Series calibrator to continue.

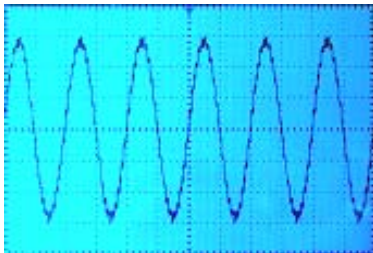


If you are using a laptop to connect to the calibrator, the COM port will usually be COM 1. A desktop computer will usually be COM 2

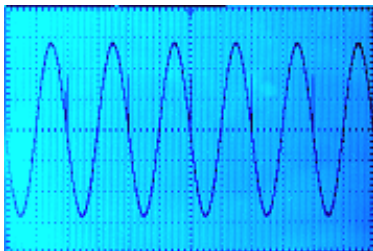


The ProWave software has 3 modes of operation :

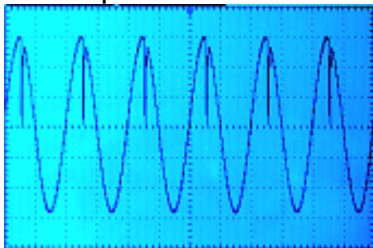
□ Harmonic simulation



□ Transient simulation



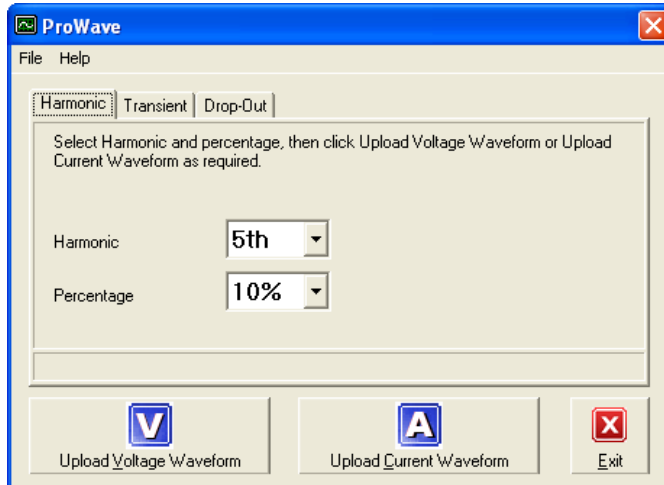
□ Drop-Out simulation



Each of these functions allows a separate waveform to be programmed for Voltage and Current independently.

Harmonic Function

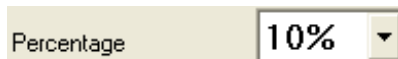
- ❑ Distortion to the 49th harmonic
- ❑ Distortion to 20%
- ❑ Independent voltage & current waveform upload



To set up a harmonic waveform, select parameters from the drop down lists :



Set the required harmonic order to be simulated from the drop down list.

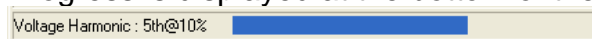


The percentage can also be user defined.

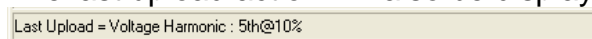
Once these parameters are set, the harmonic waveform can be uploaded to either the Voltage output and/or the current output using the independent upload buttons :



Progress is displayed at the bottom of the screen



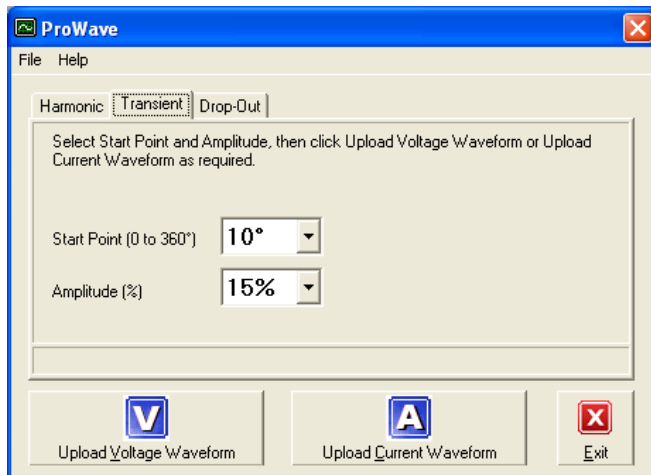
The last upload action will also be displayed once the upload is complete :



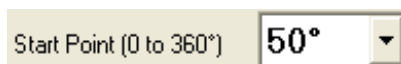
The **harmonic simulation** waveform will be available via the **USERWAVE** waveform using the 3000 Series DDS Power function after upload.

Transient Function

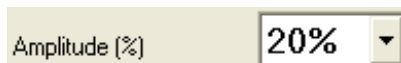
- ❑ User definable start point 0 to 360°
- ❑ User definable amplitude 0 to 100%
- ❑ Independent voltage & current waveform upload



To set up a transient waveform, select parameters from the drop down lists :

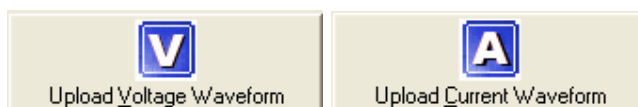


Set the start point of the transient anywhere across the waveform.

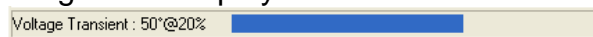


Define the size of the transient in terms of percentage of amplitude.

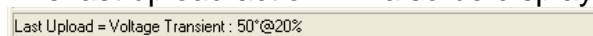
Once these parameters are set, the transient waveform can be uploaded to either the Voltage output and/or the current output using the independent upload buttons :



Progress is displayed at the bottom of the screen



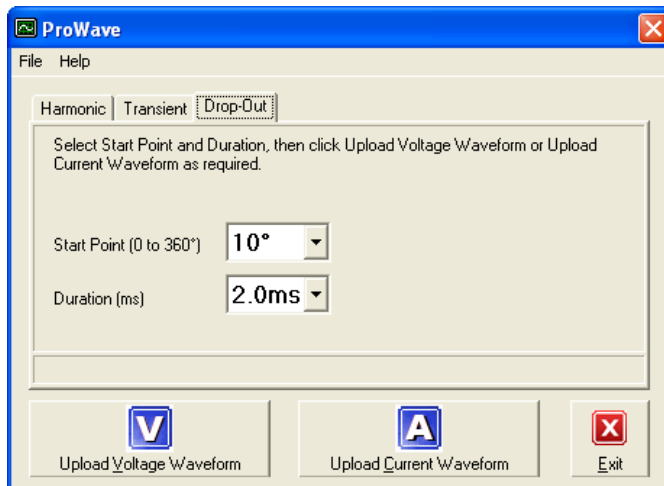
The last upload action will also be displayed once the upload is complete :



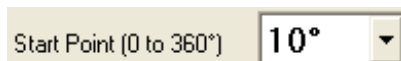
The **transient simulation** waveform will be available via the **USER&SINE** waveform using the 3000 Series DDS Power function after upload.

Drop-Out Function

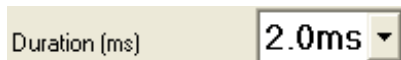
- ❑ User definable start point 0 to 360°
- ❑ User definable duration 0.5ms to 5ms
- ❑ Independent voltage & current waveform upload



To set up a drop-out waveform, select parameters from the drop down lists :



Set the start point of the transient anywhere across the waveform.



Define the size of the transient in terms of percentage of amplitude.

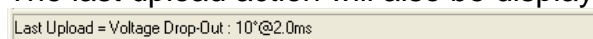
Once these parameters are set, the drop-out waveform can be uploaded to either the Voltage output and/or the current output using the independent upload buttons :



Progress is displayed at the bottom of the screen



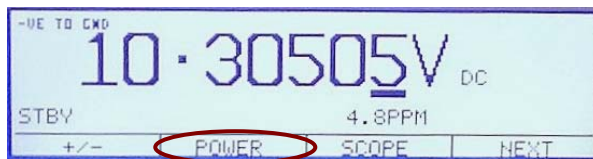
The last upload action will also be displayed once the upload is complete :



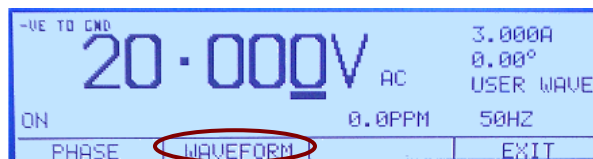
The **drop-out simulation** waveform will be available via the **USER&SINE** waveform using the 3000 Series DDS Power function after upload.

Selecting the USER WAVE and USER+SINE waveforms on the 3000 Series calibrator

Select the POWER softkey menu item from the main calibrator display



Initial power screen shown below, with voltage output shown in main display, and current, phase angle and waveform shown at the left hand side.



Using the waveform softkey, the available waveforms can be selected

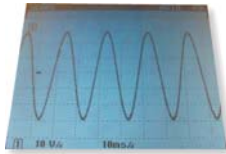


The available waveforms are :

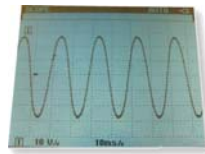
WaveForm	Description
SINE	Preset sine waveform
3rd 5%	Preset harmonic 3 rd order 5%
3rd 10%	Preset harmonic 3 rd order 10%
5th 10%	Preset harmonic 5 th order 10%
12th 10%	Preset harmonic 12 th order 10%
21st 10%	Preset harmonic 21 st order 10%
USER&SINE	User defined waveform as uploaded from ProWave software alternating every 256 cycles with a sine wave, ie. USER waveform for 1 cycle, SINE waveform for 255 cycles.
USER WAVE	User defined waveform as uploaded from ProWave software

 **Note :** The custom waveforms are stored in short term memory, and will be lost if the calibrator is switched off. The waveform can easily be reloaded when the calibrator is powered up again.

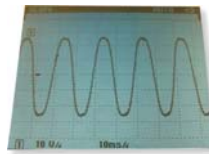
Available Waveforms



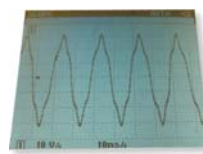
SINE



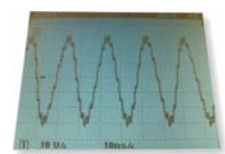
3rd Harmonic 5%



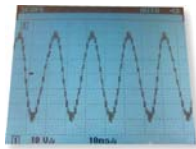
3rd Harmonic 10%



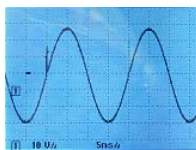
5TH Harmonic 10%



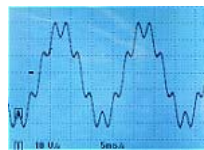
12TH Harmonic 10%



21ST Harmonic 10%



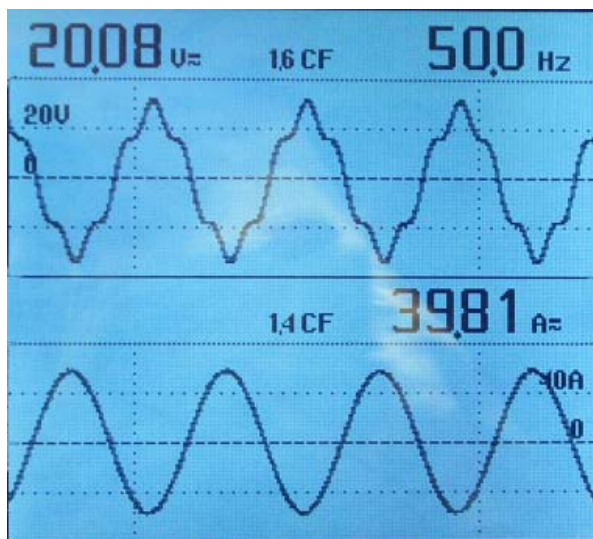
USER&SINE



USERWAVE



Note : The custom waveforms are stored in short term memory, and will be lost if the calibrator is switched off. The waveform can easily be reloaded when the calibrator is powered up again.



Screen shot of power analyser with different voltage and current waveforms. To exit from power mode simply press the BACK button on the calibrator.

PWRDDS

DIRECT DIGITAL SYNTHESIS POWER OPTION

Appendix A

Specifications

General Specifications	
Voltage Range	1V to 1000V DC
Current Range	0.3A to 30A DC
Output Terminals	Voltage output from top (Black & White) terminals 300mA to 2A current output from middle 2A (Black & Red) terminals 2.01A to 30A current output from bottom 30A (Blue & Yellow) terminals Note : Indicator LEDs for both sets of terminals will illuminate to indicate DC Power mode

1 Year Accuracy Relative to Calibration standards

Current Range	Resolution	Setting	Zero
0.3A to 2A	200uA	0.025%	600uA
2.01A to 30A	2mA	0.04%	6mA

1 Year Accuracy Relative to Calibration standards

Voltage Range	Resolution	Setting	Zero
20V	1uV	0.0025%	40uV
200V	10uV	0.0030%	400uV
1000V	100uV	0.0030%	4000uV

High Voltage Safety

High voltage output is ramped to allow instruments to auto range
Standby is automatically activated when setting voltages greater than 20V or 200V from a lower voltage
Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting
High voltage (> 20V) output is indicated to user through an audible warning beep
An external high voltage output/standby control switch is available as an option

30A available as standard - external amplifier **not** required

Specifications apply at TCal \pm 5°C.

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

General Specifications	
Voltage Range	1V to 1000V AC
Current Range	0.3A to 30A AC
Frequency Range	10Hz to 1kHz
Output Terminals	Voltage output from top (Black & White) terminals 300mA to 2A current output from middle 2A (Black & Red) terminals 2.01A to 30A current output from bottom 30A (Blue & Yellow) terminals Note : Indicator LEDs for both sets of terminals will illuminate to indicate AC Power mode

1 Year Accuracy Relative to Calibration standards

Current Range	Resolution	Setting	Zero
0.2A to 2A	200uA	0.1%	400uA
2.01A to 30A	2mA	0.05%	2.5mA

1 Year Accuracy Relative to Calibration standards

Voltage Range	Resolution	Setting	Zero
20V	1uV	0.035%	900uV
200V	10uV	0.04%	7.5mV
1000V	100uV	0.04%	75mV

Frequency range 45Hz to 400Hz

Power Factor = 1

Phase Specifications

Phase Angle	Resolution	Accuracy
0° to 359.9°	0.1°	0.1°

3041 calibrators **automatically correct for any errors in the phase** caused by inductive loading, for example when using the clamp coil adaptor.

High Voltage Safety

High voltage output is ramped to allow instruments to auto range
Standby is automatically activated when setting voltages greater than 20V or 200V from a lower voltage
Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting
High voltage (> 20V) output is indicated to user through an audible warning beep
An external high voltage output/standby control switch is available as an option

30A available as standard - external amplifier **not** required

Specifications apply at TCal \pm 5°C.

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

General Specifications	
Voltage Range	1V to 1000V DC
Current Range	0.3A to 30A DC
Output Terminals	Voltage output from top (Black & White) terminals 300mA to 2A current output from middle 2A (Black & Red) terminals 2.01A to 30A current output from bottom 30A (Blue & Yellow) terminals Note : Indicator LEDs for both sets of terminals will illuminate to indicate DC Power mode

1 Year Accuracy Relative to Calibration standards

Current Range	Resolution	Setting	Zero
0.3A to 2A	200uA	0.015%	35uA
2.01A to 30A	2mA	0.04%	350uA

1 Year Accuracy Relative to Calibration standards

Voltage Range	Resolution	Setting	Zero
20V	1uV	0.0025%	40uV
200V	10uV	0.0030%	400uV
1000V	100uV	0.0030%	4000uV

High Voltage Safety

High voltage output is ramped to allow instruments to auto range
Standby is automatically activated when setting voltages greater than 20V or 200V from a lower voltage
Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting
High voltage (> 20V) output is indicated to user through an audible warning beep
An external high voltage output/standby control switch is available as an option

30A available as standard - external amplifier **not** required

Specifications apply at TCal \pm 5°C.

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.

General Specifications	
Voltage Range	1V to 1000V AC
Current Range	0.3A to 30A AC
Frequency Range	40 to 400Hz
Output Terminals	Voltage output from top (Black & White) terminals 300mA to 2A current output from middle 2A (Black & Red) terminals 2.01A to 30A current output from bottom 30A (Blue & Yellow) terminals Note : Indicator LEDs for both sets of terminals will illuminate to indicate AC Power mode

1 Year Accuracy Relative to Calibration standards

Current Range	Resolution	Setting	Zero
0.2A to 2A	200uA	0.1%	400uA
2.01A to 30A	2mA	0.05%	2.5mA

1 Year Accuracy Relative to Calibration standards

Voltage Range	Resolution	Setting	Zero
20V	1uV	0.035%	900uV
200V	10uV	0.04%	7.5mV
1000V	100uV	0.04%	75mV

Frequency range 40Hz to 400Hz

Power Factor = 1

Phase Specifications

Phase Angle	Resolution	Accuracy
0° to 359.9°	0.1°	0.1°

3010 calibrators **automatically correct for any errors in the phase** caused by inductive loading, for example when using the clamp coil adaptor.

High Voltage Safety

High voltage output is ramped to allow instruments to auto range
Standby is automatically activated when setting voltages greater than 20V or 200V from a lower voltage
Standby is automatically selected for high voltage (>20V) after 20 minutes on the same setting
High voltage (> 20V) output is indicated to user through an audible warning beep
An external high voltage output/standby control switch is available as an option

30A available as standard - external amplifier **not** required

Specifications apply at TCal \pm 5°C.

Outside this range an allowance of 0.18 x 1 Year Spec. per °C should be added.