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# 1. Main Characteristic of the Pulse IV System

## **1.1 General Specifications**

|                                     | AM3111   | AM3121          |  |
|-------------------------------------|--|-----------------|--|
| OPERATING RANGE                     |  |                 |  |
| Switched voltage level              | 2  | 1               |  |
| Voltage                             | ±25V   | +120V           |  |
| Pulsed current                      | ±200mA   | +30A            |  |
| DC & RMS Current                    | 100mA  | 5A              |  |
| DC power                            | 1W   | 220W            |  |
| Pulsed power                        | 3W   | 3000W           |  |
| SOURCE PERFORMANCES                 |  |                 |  |
| Voltage setting resolution          | 16-bit 0.7mV   | 16-bit 2mV      |  |
| Max Pulse length & Voltage drop     |  | 1ms & 1V@10A    |  |
| Output impedances                   | 50Ω  | 0.1Ω            |  |
| Pulse Resolution                    | Resolution: 20ns ; Width: 1.1µs/10s ; Freq: 0.1Hz/200KHz                             |                 |  |
| Setting time to 95%                 | 100ns  | 100ns           |  |
| Programmable current breaker limits | Pulsed current a   | nd pulsed power |  |
| Non-programmable safety stops       | DC power ; Temperature   |                 |  |
| MEASUREMENTS PERFORMANCES           |  |                 |  |
| Sampling time delay resolution      | 20ns   |                 |  |
| 8 Measurement channels              | 2 user-defined sampling positions (M1,M2) * 2 parameters * 2 pulse SMU (Gate, Drain) |                 |  |
| Measurement range                   | Single range, according to operating range   |                 |  |
| ADC resolution 16-bit               |  | bit             |  |
| Settling time                       | 500ns  |                 |  |

## **1.2 General Description**

The AM3100 is a standalone Pulsed IV system for Load Pull and general-purpose test applications. PIV systems are used to bias transistors or circuits in pulsed conditions to avoid self-heating and ensure quasi-isothermal conditions during the measurements.

Power amplifiers are often driven by pulsed RF signal combined with continuous or pulsed DC bias conditions. This brings some complexity to the bench configuration. Indeed, even when continuous DC voltages supplies are used, the pulsed RF signal magnitude will drive the transistor consumption in pulsed mode also, if the PA operates in saturated area. As the need is then to measure peak current to evaluate the peak efficiency, a need for synchronized DC multimeters operating in pulsed mode or an external oscilloscope is needed to run pulsed measurements, in addition with the DC supplies.

The AM3100 Pulsed IV system has been designed to replace DC supplies, multimeters and oscilloscope, and to provide the same measurement capabilities in a compact form factor and a cost-effective budget. The high-resolution SMUs capabilities associated with the advanced triggering functionalities make this system ideal for pulsed DUT characterization.

The storage capacitance on the channel 2 pulse head probe enables delivering high peak current (up to 30A) as close as possible of the DUT. Finally, this dual channel source can deliver pulsed voltage (from -25V to 25V) with a non-zero quiescent bias level on channel 1 and a synchronized pulsed high voltage (up to 120V) on channel 2 from 0V.

The PIV system consists of a Control Unit and a Pulse Head Probe (PHP).

The control unit (AM3103) drives an internal (Gate Pulse SMU) and external remote unit (AM3121) to supply and measure voltage and current at the input and output of a DUT. The main control unit includes:



Figure 1 AM3100 PIV System

- 250W AC/DC bloc which supplies all the internal parts and gate pulse modules (inside AM3103).
- 120V/5A 240 W power supply necessary to drive the AM3121 Remote unit.
- Commercial µPC board with a USB hub
- Triggering interface.

AM3100 supports either LAN or USB connection to the PC and can be controlled using IVCAD or IQSTAR software's or through direct commands for user defined applications.

The remote unit is referred to as the drain pulse unit (AM3121) and combines the following hardware:

- Power switches
- Power drivers
- Overload protection devices
- Complete measurement and Analog to Digital conversion system
- Complete pulse and delay generation system



Figure 2 AM3100 system schematic

## **1.3 Main features**

The system's main features are:

- Reliable pulse units with long lasting performances (thermal, SOA and DUT breakdown protections)
- Pulse or DC operation with pulse width down to 1us from the generator and for measurements.
- Internal and external synchronization
- Extended stop conditions and built-in protection
- Direct hardware programmability (SCPI commands)
- Embedded measurement units providing wide bandwidth and high accuracy for simultaneous current and voltage measurements
- Embedded fast short-circuit current breaker, performing the protection of the external pulse unit as well as external components such as Bias Tees.
- Remote control through LAN or USB.

## **1.4 System configuration**

The configuration of the AM3100 consists of the main unit and one external pulse generator for the output of the device under test. The input is biased directly from the main unit using a BNC cable.



Figure 3 AM3100 system configuration

# 2. Control Unit (AM3103)

The control unit includes a gate pulse module and drives an external drain pulse unit. LAN and USB connections are supported for the remote control.

## 2.1 Connection and display

#### Front Panel

Pressing the ON/OFF button on the AM3100 will turn on the hardware. Blue LED blinks during the initialization (No communication is possible with the instrument while the operating system is starting). The system is ready when the LED light is steady.

The Front Panel is composed of:

- DSUB 15 connector for the Remote pulse unit and a powered LED
- BNC output 500hms for the input bias and a powered LED.
- SMA Interlock



Figure 4 AM3103 Control unit front panel

#### **Rear Panel**

The AM3103 rear panel is composed of:

- LAN/RJ45 connection with 3 digits displaying the IP address.
- USB2 type A connection used for firmware update
- USB2 type B connection can be used for the connection with a PC
- AC 100V/240V 50 H 60 Hz source connection
- 7 coaxial SMB connectors



Figure 5 AM3103 Control unit rear panel

The Pulse IV system works with several programmable signals, which can give it the role of trigger box (like an Arbitrary Waveform Generator) in your setup.

The PIV system has 7 trigger connections (SMB connection) on the rear panel:

- **Pulse Trig in:** The input signal "**Ptrig-in**" is used to trigger the Pulse IV generator by an external device.
- **Pulse Trig out:** The output trigger signal "**Ptrig-out"** is generated by the Pulse IV with fixed duration (>2us), this one can be used to synchronize an external device such as an oscilloscope or a Digital Multi Meter.
- Meas Trig in: This signal is not available on the AM 3100 PIV system.
- **Meas Trig out:** The output signal "**Mtrig-out**" is an output periodic TTL signal that corresponds to the measurement window defined for the IV measurements.
- **Synchronization Trig in:** The input signal "**Strig-in**" (a periodic TTL signal) can be used to synchronize & protect two control unit (AM3103) in cascaded mode.
- **Synchronization Trig out:** The output signal "**Strig-out**" is an output periodic TTL signal can be used to synchronize & protect two control unit (AM3103) in cascaded mode.
- **RF trig out:** The output signal "**RFtrig-out**" can be used to drive an external RF modulator that will require an output periodic TTL signal drive (application can be pulsed IV and pulsed Load Pull measurement for example)

## 2.2 Cables and connectors

One cable **AM3905** is provided with the system to connect the control unit to the AM3121 drain probe. See wiring configuration below:

- Three fast differential signals: USB, STRIG, PTRIG
- Two simple logic signals: MTRIG, ALARM



Figure 6 AM3905 Connection cable

# 3. Gate Pulse SMU AM3111 (Embedded inside the AM3103 box)

## 3.1 Main features

- 4-quadrant DC or Pulse voltage source.
- Down to 1µs pulse width, 20ns time resolution.
- Simultaneous voltage and current sampling.
- Pulse and Quiescent level sampling time points can be chosen automatically by the source or manually by the user.



Figure 7 Gate waveform Sampling

- 1 voltage range: ±25V
- 2 current ranges: ±5mA and ±200mA
- No transient when powering on/off or switching on/off
- Output on isolated BNC connector
- Operating range:
  - DC: Gray area, Pulse: Gray + Lilas areas





## 3.2 Operating Area

| Parameters  | Conditions/Comments                                       | Min    | Max    |
|---|---|--------|--------|
| Voltage programming range   |   | -25V   | 25V    |
| Pulse amplitude   | Difference between pulse and quiescent levels             | -30V   | 30V    |
| Output current         Guaranteed: source stops if +/-260mA is exceeded |   | -200mA | 200mA  |
| Output power  | Source, DC  |        | 3W     |
|   | Sink, DC  |        | 0.5W   |
| Pulse   | Width   | 1.1µs  | 10s    |
|   | Frequency   | 0.1Hz  | 200kHz |
|   | Duty cycle  | 0%     | 100%   |
| Temperature   | Ambient temperature in front of the chassis rear openings | 10°C   | 30°C   |

## 3.3 Electrical Specification

| Parameters                       | Conditions/Comments   | Value       |  |
|----------------------------------|---|-------------|--|
| Voltage programming resolution   | 16-bit  | 1mV         |  |
| Voltage programming accuracy     | 2-year accuracy, no load  | 50mV+0.2%   |  |
| Voltage noise                    | 0.1Hz-10kHz, peak to peak noise, no load<br>0.1Hz-5MHz, peak to peak noise, no load | 1mV<br>3mV  |  |
| Voltage cross-talk Vq/Vp setting | Vq voltage drop for any Vp setting modification                                     | 0.5mV/V     |  |
| Voltage settling time            | Pulse, 0% to 95%, no load   | 100ns       |  |
|                                  | DC, 0 to 95%  | 100ms       |  |
| Time resolution                  | Pulse and measurement time resolution   | 20ns        |  |
| Overload response time           | Source stops if +/-260mA is exceeded  | 60ns        |  |
| Output impedance                 | Source ON   | 50Ω+/-1%    |  |
|                                  | Source OFF, between both outputs; max. allowed current: 1A                          | 50mΩ        |  |
| Output capacitance               | Internal output capacitance   | 20pF        |  |
| Earth isolation                  | Isolation voltage   | +/-50V max. |  |
|                                  | Isolation resistance  | ~50kΩ       |  |
|                                  | Capacitance between any output terminal and the earth                               | 100nF       |  |

## 3.4 Measurement

| Parameters        | Conditions/Comments           | 25V range    | 200mA range  | 5mA range   |
|-------------------|-------------------------------|--------------|--------------|-------------|
| ADC resolution    | 16-bit                        | 0.9mV        | 7μΑ          | 170nA       |
| Noise             |                               | +/-2mV       | +/-30µA      | +/-5µA      |
| Settling time     | To 95%<br>To ADC resolution   | 0.5μs<br>2μs | 0.5μs<br>2μs | 1μs<br>4us  |
| Absolute accuracy | Offset + % of reading, 2-year | 7.5mV + 0.1% | 100µA + 0.2% | 10μA + 0.2% |

## 4. Drain Pulse SMU AM3121

## 4.1 Description

The AM3121 Pulse SMU is a power probe dedicated to bias the transistor drain (Positive voltages). Optimized for high power pulsed measurements applications (120V, 30A), this probe head can be used either for Load Pull applications or general-purpose pulsed SMU.

The output connector is a BNC. The AM3121 does not have sense connection.

The DSUB 15 connector is for power and control.



Figure 9 AM3121 Drain Pulse unit

## 4.2 Voltage specification

| Parameters  | Conditions | Max   |
|---|------------|-------|
| Maximum input voltage   |            | 120V  |
| Storage capacitor   |            | 6.8mF |
| Overall ESR from capacitor to output contacts                 |            | 50mΩ  |
| Voltage drop during pulse, related to internal ESR            | 30A        | 1.5V  |
| Voltage drop rate during pulse, related to internal capacitor | 30A        | 4V/ms |

## 4.3 Operating area

| Parameters      | Conditions                   | Value      |
|-----------------|------------------------------|------------|
| Pulsed current  |                              | 30A        |
| Average current |                              | 5A         |
| RMS current     |                              | 10A        |
| Pulsed current  |                              | 3000W      |
| DC power        |                              | 220W       |
| Earth isolation | Between power gnd. and earth | 220kΩ 120V |

## 4.4 Pulse specification

| Parameters          | Conditions/Comments  | Min   | Max    |
|---------------------|----------------------|-------|--------|
| Duty cycle          | Any level, according | 0%    | 100%   |
| Frequency           |                      | 0.1Hz | 100kHz |
| Pulse width         | Imax = 30A           | 1.1µs | 10s    |
| Timing resolution   |                      | 20n   | S      |
| Pulse settling time | 0% to 95%, no load   |       | 50ns   |

## 4.5 Measurement specification

| Parameters        | Conditions/Comments | Voltage     | Current     |
|-------------------|---------------------|-------------|-------------|
| Measurement range |                     | 125V        | 33A         |
| ADC resolution    | 16 bits             | 2.1mV       | 550μΑ       |
| Settling time     | То 95%              | 0.5µs       | 0.5µs       |
|                   | To ADC resolution   | 2µs         | 2µs         |
| Noise             |                     | +/-15mV     | +/-2mA      |
| Absolute accuracy | Offset + gain       | 20mV + 0.1% | 20mA + 0.3% |

## 4.6 Current breaker specification

| Parameters                   | Conditions                      | Value        |
|------------------------------|---------------------------------|--------------|
| Threshold setting range      |                                 | 1A / 33A     |
| Threshold setting resolution |                                 | 12 bit, 10mA |
| Threshold setting accuracy   | Offset + % of current           | 200mA + 0.5% |
| Response time                | Current step / threshold + 20 % | 100ns        |

The **Strig** signal performs overall synchronization of start, stop, and emergency stop.

Using either constant level or pulsed mode, the Ptrig signal performs overall synchronization of the power pulse, the measurement sampling time and the transient mask.

The transient mask allows the user to define a larger current breaker level at the time the voltage and/or the current is switched on. Then, the current breaker level after complete settling can be set closer to the expected level.



Figure 10 Transient mask principle

# 5. Drain Power Supply (Embedded inside AM3103 box)

## 5.1 Main features

- isolated DC voltage source
- Fast toggling current and power limitation
- 2-quadrant, source & sink operating area:
- 18-bit voltage programming, no missing code
- Safe charging and discharging of any load capacitor
- Programmable voltage slope
- No transient when powering on/off





## 5.2 Operating area

| Parameters                | Conditions/Comments                                 |        | Тур.      | Max.  |
|---------------------------|---|--------|-----------|-------|
| Voltage programming range |   | 0      |           | +120V |
| Current compliance range  | Programmable maximum sourcing current limit         | +250mA |           | 5A    |
| Source output power       | DC or transient operation, fast toggling limitation |        | 240W      |       |
| Sink output power         | DC or transient operation, fast toggling limitation |        | 24W       |       |
| Operating temperature     | Ambient temperature, 80% RH non-condensing          | +15°C  |           | +30°C |
| Earth isolation           | Between power gnd and earth                         | 220    | )kΩ & 300 | )nF   |

## 5.3 Accuracy

| Parameters      | Voltage programming |  |
|-----------------|---------------------|--|
| Range           | 0V / +120V          |  |
| Resolution      | 18bit / 0.5mV       |  |
| 2-year accuracy | +/- 40mV +/- 0.1%   |  |

Accuracy specified on an +18°C/ +28°C ambient temperature range, after a 1-hour warm-up.

## 5.4 Dynamic performances

| Parameters                       | Conditions/Comments                                   | Min.   | Тур.  | Max.    |
|----------------------------------|---|--------|-------|---------|
| User external output capacitor   | Safe and stable whatever the capacitor                | 0      | 10mF  | 100mF   |
| Internal output capacitor        | Equivalent total value of the output filter           |        | 100µF |         |
| Current step response time       | Switching load, 0A to 5A or 0W to 240W                |        | 50µs  |         |
| Small voltage step settling time | 1V step, no load, step mode, to 95%                   |        | 12ms  |         |
| Full range rise time & fall time | 0 to 120V, no load, step mode, current limit = 5.1A   |        | 30ms  |         |
| Large capacitor charging time    | 0 to 120V, 10mF load, step mode, current limit = 5.1A |        | 400ms |         |
| Large capacitor discharging time | 120V to 0, 10mF load, step mode                       |        | 2.7s  |         |
| Voltage slope programming        | voltage slope generated by 1ms sampling rate          | 1mV/ms |       | 120V/ms |

## 6. System Operation

## 6.1 Start and stop process

#### START process:

1. Switching on the power supply, waiting for the requested levels.

2. When the rising edge of "Strig" is detected, the output gate pulse unit is set to its associated quiescent level.

3. After a  $1\mu$ s fixed delay, the output drain pulse unit is set to the OV quiescent level.

4. When the second valid "Ptrig" after the rising edge of "Strig" is detected, the pulse levels are reached for the gate, drain and "RFtrig" with a phase compliant to the requested chronograms.

## STOP process:

1. When the first falling edge of "Strig" is detected, the output drain pulse unit (OV) & "Rftrig" (Low level) are disabled asynchronously with Ptrig.

2. After a 1µs fixed delay, the gate is set to 0V asynchronously with Ptrig.

3. Switching off the power supply



Figure 12 Start and Stop process chronogram

Note: the 1µs fixed delay is meant to cover the maximum rise/fall time of the pulse units.

## 6.2 Pulse definition

The pulse timing is computed inside each pulse unit, using a 50MHz clock which is synchronized by the "Ptrig" pulse. The internal time reference of each pulse unit exhibits a calibrated minimum delay of 200ns and a maximum time jitter of +/-2.5ns.



Figure 13 AM3100 pulse timing definition

| Parameters                       | Conditions/Comments                        | Spec.   | Min.          | Max.         |
|----------------------------------|--|---------|---------------|--------------|
| Time jitter                      | Ptrig to any output                        |         |               | +/-2.5ns     |
| Minimum time delay from Ptrig    | Fixed delay from Ptrig to any output       | 200ns   | 190ns         | 210ns        |
| Time delay calibration error     | Parameter inside each pulse                | +/-10ns |               |              |
| Time resolution                  | Delay and duration counting                | 20ns    |               |              |
| Pulses duration setting range    | 31 bits counting                           |         | 1µs           | 10s          |
| Pulses delay setting range       | 31 bits counting                           |         | 1µs           | 10s          |
| Sample clock delay setting range | 31 bits counting                           |         | -1µs          | 10s          |
| Internal Ptrig range             | Period (timer resolution 1µs)<br>Frequency |         | 5μs<br>200kHz | 10s<br>0.1Hz |

## 6.3 Measurement definition

### **General measurement performances**

| Parameters                                | Spec.   |
|---|---------|
| ADC sampler aperture time                 | 0.6ns   |
| Programmable measurement delay resolution | 20ns    |
| Measurement settling time                 | 500ns   |
| ADC resolution                            | 16 bits |
| Update rate between two measurements      | >>15ms  |
| Jitter between 2 measurements             | 50ms    |

## Automatic range

The automatic range allows to switch automatically to the appropriated range during the measurement, in order to keep the maximum measurement accuracy.

### **Measurement principle**

- The software offers the user Only 2 measurement times (M1 & M2). These two measurement instants have a free position before, during or after the Ptrig pulse.
- The conditions on M1 and M2 locations are:
  - $\circ M2 > M1,$
  - $\circ \quad M2-M1\!>\!2\mu s$
  - $M2 \leq Period 2\mu s$
- The measurement system does not have a buffer.



Figure 14 Measurement principle

# 7. Parts List

| Basic setup                              |   |  |  |  |  |
|--|---|--|--|--|--|
| AM3103                                   | Control box including Drain power supply and Gate pulse SMU |  |  |  |  |
| AM3121                                   | Remote Drain pulse SMU +120V 30A                            |  |  |  |  |
| Cable set supplied with the basic system |   |  |  |  |  |
| AM3103 set                               | 1 DSUB15 cable AM3905, for remote Drain SMU                 |  |  |  |  |
|  | 1 USB cable   |  |  |  |  |
|  | 1 RJ45 cable  |  |  |  |  |
|  | 1 European IEC C13 mains cable                              |  |  |  |  |
|  | 1 US IEC C13 mains cable                                    |  |  |  |  |

## 8. Mechanical Characteristics

AM3103 (Control box) + AM3111(Embedded inside the Control box)

- Weight: 4.58kg (10.097 lb)
- Length:355.6 mm (14")
- Width:220.98mm (8.7")
- Height: 85.09mm (3.35")

AM3121 (Drain Probe)

- Weight: 1.58kg (3.483 lb)
- Length:190.5mm (7.5")
- Width:139.7mm (5.5")
- Height: 76.2mm (3") without legs

## 9. Configuration of the AM3100 PIV System in IVCAD

Before starting IVCAD, the AM3100 needs to be added in the VISA layer. As shown below in the example, "Keysight Connection Expert" or "National Instruments NI Max" free software add the AM3100 as a LAN device.

| Keysight Connection Expert                        |  | ?     | _ 6    | F × |
|---|--|-------|--------|-----|
| Instruments PXI/AXIe Chassis                      | Manual Configuration Settings                                |       |        |     |
| Add New Instruments/Interfaces                    | Edit Existing Instruments/Interfaces                         |       |        |     |
| LAN instrument                                    | Add a LAN device   |       |        |     |
| GPIB instrument Serial instrument on ASRL1        | Set LAN Address:   |       |        |     |
| Remote USB interface                              | Hostname or IP Address: 192.168.150.230                      |       |        |     |
| Remote serial instrument<br>Remote GPIB interface | TCPIP Interface ID: TCPIP0 •                                 |       |        |     |
|   | Set Protocol:  |       |        |     |
|   | Instrument Remote Name: inst0                                |       |        |     |
|   | Socket Port Number: 5025                                     |       |        |     |
|   | HiSLIP Remote Name: hislip0                                  |       |        |     |
|   | Verify Connection:   |       |        |     |
|   | Allow *IDN Query   |       |        |     |
|   | Test This VISA Address TCPIP0::192.168.150.230::5025::50CKET |       |        |     |
|   | Verified   |       |        |     |
|   | amcad engineering,am3203c,01-006                             |       |        |     |
|   | View Web Page:   |       |        |     |
|   | Instrument Web Interface                                     |       |        |     |
|   | A  | ccept | Cancel | I   |

Figure 15 AM3100 added as instrument using Keysight Connection Expert software

| 🔀 Créer un nouvel objet   | ? ×   | Créer un nouvel objet   | ? ×   |
|---|---|---|---|
| Choose the type of LAN resource you want to add.  |   | Enter the LAN resource details.   |   |
| Choose the type of TCP/IP tesource you<br>Auto-detect of LAN Instrument<br>Use this option to select from a lit of<br>instruments detected on your local is<br>Manual Entity of LAN Instrument<br>Use this option to your VX-11 LANL<br>another network.<br>() Manual Entity of Raw Socket<br>Use this option to communicate with<br>over a specific port number. | with to add.<br>V04-11 LAN/LXI<br>abret.<br>XI instrument is on<br>an Ethernet device | Enter the TCP/IP address of your VISA network<br>form of xics cost, occuse, the hostname of the de<br>compute@come.domain<br>Hostname or IP address<br>I <u>122163107023</u><br>Port Number<br>5025 | rk resource in the<br>rvice, or a<br>Validate |
| < Précédent. Suiva  | nt > Terminer Annuler   | < Précédent Suivant >   | Terminer Annuler                              |

Figure 16 AM3100 added as instrument using NImax software

After launching IVCAD, the first step is to choose the measurement setup by clicking on "New" in "Measurement system-> Measurement->Setup & Measurement". Then, three measurement setups are proposed as depicted below:

- IV measurement
- Load Pull measurement
- Traditional Load Pull measurement



Figure 17 New setup in IVCAD

In this section, two configuration methods are presented to drive the PIV 3100 using IVCAD software.

## 9.1 AMCAD PIV Easy Configuration (IVCAD 3.8)

In order to help users set the AMCAD PIV system (AM200 series & AM3000 series), IVCAD embeds an easy configurator (since IVCAD 3.7). This feature allows to easily configure your IVCAD I-V and VNA based Load-Pull setups.



Figure 18 AMCAD PIV Easy configuration access

## I-V setup

This part proposes to set an I-V measurement setup using "AMCAD PIV Easy Configuration".

| 🌽 AMCAD PIV Easy ( | Configuration     |                                      |                |          |        | ×      |
|--------------------|-------------------|--------------------------------------|----------------|----------|--------|--------|
| General            |                   |                                      |                |          |        |        |
| RF needs to be m   | easured [s-parame | eters, etc.] (only synchronous measu | urements are a | allowed) |        |        |
| Measurement Mode:  | Synchronous       | O Asynchronous (pulsed & PIV 32)     | xx only)       |          |        |        |
| Mode:              | ODC               | Pulsed                               |                |          |        |        |
| Trigger Master:    | Power Supply      | ○ VNA                                |                |          |        |        |
| Trigger Mode:      | Positive Edge     | Negative Edge                        |                |          |        |        |
| Power Supply       |                   |                                      |                |          |        |        |
| System:            | AMCAD PIV 30      | 00 serie 🔘 AMCAD PIV 200 serie       |                |          |        |        |
| Address:           | TCPIP0::192.168   | .150.121:5025::SOCKET                | Q              | Default  | ~      | Test   |
| Period:            | 1                 | ms                                   |                |          |        |        |
| Duty Cycle:        | 0.01              | %                                    |                |          |        |        |
| Priority:          | Input Outp        | out 🔾 None                           |                |          |        |        |
|                    |                   |                                      |                |          |        |        |
| Sustant            | Kausiaht Canasia  | VALA                                 |                |          |        |        |
| System:            | Keysight Generic  | VINA                                 |                |          |        | ~      |
| Address:           | TCPIP0::192.168   | .150.123::5025::SOCKET               | Q              | Default  | $\sim$ | Test   |
| Input port:        | Channel 1 🔍 🗸     |                                      |                |          |        |        |
| Output port:       | Channel 2 🔍 🧹     |                                      |                |          |        |        |
| Filter Mode:       | NBF gated $\sim$  |                                      |                |          |        |        |
| IF Bandwidth:      | 10                | Hz                                   |                |          |        |        |
|                    |                   |                                      |                |          | ОК     | Cancel |



The configuration begins by selecting some general parameters:

-Activate or not the RF measurement (S-parameters...)

-Choose the "Mode": DC or Pulsed.

Then, the PIV system (power supply) must be set:

- Choose the system "AMCAD PIV 3000 series".
- Enter the VISA address, clicking on the magnifying glass and choosing the PIV system.

- If the PIV system is in Pulsed mode, the "Period" and the "Duty Cycle" must be set.

- The bias can be applied firstly on the "Input" or the "Output" thanks to the "Priority" field. If the user selects "None" both biases ("Input" and "output") are applied at the same time.

Then the last part is dedicated to the VNA configuration. If the "RF needs to be measured" box is selected.

- Choose your VNA in the "System" list.
- Enter the VISA address, clicking on the magnifying glass.
- Select the Input and the output ports.
- Select the IF bandwidth and the Filter mode.

Then clicking on OK, IVCAD will fill automatically all the parameters needed to "Initialize" the bench directly.

The AM 3100 PIV System measures **ONLY** 2 points in the pulse (see section 6.3):

-The first measurement instant is M1. It corresponds to the quiescent level measured at the beginning of the I-V trace window. **This window must start at 1µs or greater**.

-The second measurement instant is M2. It corresponds to the left cursor of the measurement window.



Figure 20 Example of Chronogram defined with the AMCAD PIV easy configurator

The right cursor (M3) will be used by other equipment (Multimeter, SMU). In this case, the measurements will be done in the window [M2-M3] and the software will define the number of points needed. The length of the measurement window and the number of points in the pulse are defined by IVCAD to ensure a good trade-off between speed and accuracy. The proposed pulse timing can be modified directly in the Chronogram tab (refer to 'IVCAD MT930JK OM PIV' documentation).

**NOTE**: as M3 will always be visible in the Chronogram, it will be simply ignored when using AM3100.

## VNA based Load Pull setup

This part proposes to set a Load Pull measurement setup using "AMCAD PIV Easy Configuration". For the VNA based Load-Pull, the AMCAD PIV Easy Configuration window is similar to the "AMCAD PIV Easy Configuration" of the IV setup, adding the power meter setting. Clicking on OK, all the parameters and chronogram are automatically set, only the source and load tuning station remains unset. When your source and load tuning setting has been manually configured, the calibration can be directly performed.

| 🌽 AMCAD PIV E   | asy Configuratio | n                              |   |         |        | ×      |
|-----------------|------------------|--------------------------------|---|---------|--------|--------|
| General         |                  |                                |   |         |        |        |
| Mode:           | ODC              | Pulsed                         |   |         |        |        |
| Trigger Master: | Power Supply     | <sup>Ŏ</sup> VNA               |   |         |        |        |
| Trigger Mode:   | Positive Edge    | O Negative Edge                |   |         |        |        |
| Power Supply —  |                  |                                |   |         |        |        |
| System:         | AMCAD PIV 30     | 00 serie 🔘 AMCAD PIV 200 serie |   |         |        |        |
| Address:        | TCPI0::192.168.  | 150.121::5025::SOCKET          | Q | Default | ~      | Test   |
| Period:         | 0.01             | ms                             |   |         |        |        |
| Duty Cycle:     | 1                | %                              |   |         |        |        |
| Priority:       | Input Outp       | out 🔘 None                     |   |         |        |        |
|                 |                  |                                |   |         |        |        |
| System:         | Keysight Generic | VNΔ                            |   |         |        | ~      |
| o youchin       | neysigne benene  |                                |   |         |        | ¥      |
| Address:        | TCPI0::192.168.  | 150.122::5025::SOCKET          | Q | Default | $\sim$ | Test   |
| Input port:     | Channel 1 $\sim$ |                                |   |         |        |        |
| Output port:    | Channel 2 $\sim$ |                                |   |         |        |        |
| Filter Mode:    | NBF gated $\sim$ |                                |   |         |        |        |
| IF Bandwidth:   | 10               | Hz                             |   |         |        |        |
| Power Meter —   |                  |                                |   |         |        |        |
| System:         | Keysight Generic | PowerMeter                     |   |         |        | ~      |
| Address:        | TCPI0::192.168.  | 150.120::5025::SOCKET          | Q | Default | ~      | Test   |
| Port:           | Channel 1 $\sim$ |                                |   |         |        |        |
|                 |                  |                                |   |         | OK     | Cancel |

Figure 21 Example of AMCAD PIV Easy configuration for an LP setup

## 9.2 Manual configuration

The AM3100 system has to be set and defined in the 'DC Power supplies' block of the IVCAD schematic.

| IV Power |
|----------|
| Counting |
| Supplies |
| ourrino  |

Figure 22 IVCAD IV Power Supplies block

The 'DC or Power Supplies' setup window is common with the 'I-V Measurement units. It is divided into four configuration settings:

| Power supply                    | used to define the power supplies                          |
|---------------------------------|--|
| Resistive network               | used to define the resistive networks                      |
| Voltage measurement             | used to define the instruments for the voltage measurement |
| Current measurement             | used to define the instruments for the current measurement |
| When clicking on 'DC or Pulse P | ower Supplies', the following window appears:              |

| Setup > IV po | wer supplies             |                       |   |                            |                                     | x |
|---------------|--------------------------|-----------------------|---|----------------------------|-------------------------------------|---|
| Tenabled      |                          |                       |   |                            |                                     | I |
|               | IV power supply          | Resistive network     | Measu   | irement                    |                                     | f |
| V Input:      | AMCAD PIV System         | Edit                  | AMCAD F   | PIV System                 |                                     | • |
| V Output:     | AMCAD PIV System         | Edit                  | ( <b>.</b>  |                            |                                     |   |
| Aux 1:        | <undefined></undefined>  | Edit                  | <under< th=""><th>efined &gt;</th><th>√ Link I-V</th><th></th></under<> | efined >                   | √ Link I-V                          |   |
| Aux 2:        | <undefined></undefined>  | Edit                  | <under< th=""><th>efined &gt;</th><th>✓ Link I-V</th><th></th></under<> | efined >                   | ✓ Link I-V                          |   |
| Aux 3:        | <undefined></undefined>  | Edit                  | <under< th=""><th>efined &gt;</th><th>√ Link I-V</th><th></th></under<> | efined >                   | √ Link I-V                          |   |
| Aux 4:        | <undefined></undefined>  | Edit                  | <under< th=""><th>efined &gt;</th><th>✓ Link I-V</th><th></th></under<> | efined >                   | ✓ Link I-V                          |   |
| 🗸 Same inpu   | it and output measuremer | nt instrument         |   | Power ON se                | quence (nower OFF is the opposite): |   |
| Power off     | after measurement        |                       |   | Input                      |                                     |   |
| 😺 Wait betw   | een IV power supplies sw | itch, wait time: 100. | 0 ms  | Output<br>Auxiliary 1      |                                     |   |
|               |                          |                       |   | Auxiliary 2                |                                     |   |
|               |                          |                       |   | Auxiliary 3<br>Auxiliary 4 |                                     |   |
|               |                          |                       |   |                            |                                     |   |
|               |                          |                       |   |                            | Close                               | » |

Figure 23 IVCAD IV power supplies & IV measurement window

## Input DC supplies (AM3111) configuration

The input power supply is generally used to bias the gate access of a transistor. For AM3100 systems, the input DC supply corresponds to the AM3111 gate probe head.

By clicking on an 'Input Power supply', the following window is displayed:

| Setup > IV po | wer supplies             |                 | Setup > IV p          | ower su            | pplies > I | nput ge   | nerator 📃         | _           |             |
|---------------|--------------------------|-----------------|-----------------------|--------------------|------------|-----------|-------------------|-------------|-------------|
| Enabled       |                          |                 | ✓ Enabled<br>Mode: DC |                    | •          | 1         |                   | l<br>r<br>f | l<br>n<br>f |
|               | IV power supply          | Resistive r     |                       |                    |            | 1         |                   |             | 0           |
| 🔽 Input:      | AMCAD PIV System         |                 | Hardware              | Setup              |            |           |                   | _           |             |
| Output:       | AMCAD PIV System         | Edit            | Driver                |                    |            |           |                   |             |             |
| Aux 1:        | <undefined></undefined>  | Edit            | Driver:               |                    | AMCAD P    | IV 3000 S | System 🔻 💽        |             |             |
| Aux 2:        | <undefined></undefined>  | ] Edit          | Address:              |                    | CPIP0::19  | 2.168.15  | 0.197::5025::SOCK |             |             |
| Aux 3:        | <undefined></undefined>  | ] Edit          | Options:              |                    |            |           | <i>[</i>          |             |             |
| Aux 4:        | <undefined></undefined>  | ] Edit          | VISA librar           | v:                 | Default    |           | ▼                 |             |             |
| 🔽 Same inpu   | it and output measuremen | nt instrument   | Command               | timeout:           | 10000      | ms        |                   |             |             |
| Power off     | after measurement        |                 | Command               | delay:             | 0          | ms        |                   |             |             |
| 🔽 Wait betw   | een IV power supplies sw | vitch, wait tim |                       |                    |            |           | Test connection   |             |             |
|               |                          |                 | Output:<br>Command:   | Channel<br>Voltage | 1 ▼<br>▼   |           |                   |             |             |
|               |                          |                 |                       |                    |            |           | Close             |             | »           |

Figure 24 Input IV Power Supplies configuration

| Mode                | choose the measurement mode (CW or Pulsed)                              |
|---------------------|---|
| Driver              | select AMCAD PIV 3000 System  |
| URL                 | set the TCP/IP Address  |
| Options             | additional driver options (depends of selected driver)                  |
| VISA implementation | set the VISA DLL which will be used to communicate with this instrument |
| Command timeout     | elapsed time before returning an error message if no response           |
| Command delay       | delay before sending a command  |
| Test connection     | send a command to the GPIB bus to test the instrument connection        |
| Output              | select the Channel 1  |
| Command             | select Voltage or Current   |
|                     |   |

The fields to fill in the 'Setup' tab depend on the selected mode:

• DC mode

| Setup > IV power supplies > Input generator |        |
|---|--------|
| C Enabled                                   | 1      |
| Mode: DC                                    | n<br>f |
| Hardware Setup                              | 0      |
| Voltage limit: -25.0 V to 25.0 V            |        |
| Absolute current limit: 0.26 A              |        |
| Invert polarity                             |        |
|   |        |
|   |        |
|   |        |
|   |        |
|   |        |
|   |        |
|   |        |
|   |        |
|   |        |
| Close                                       | »      |
|   |        |

Figure 25 Input IV Power Supplies in DC mode configuration

Bias Voltage limit set the minimum and the maximum voltage limits of the probe (-25V to +25V for the AM3111)

**Bias Absolute current** set the maximum transient current limit achievable by the AM3111 (0.26A).

• Pulsed mode

|   | Setup > IV power supplies > Input generator |          |    |    |      |     |        |  |  |
|---|---|----------|----|----|------|-----|--------|--|--|
|   | ✓ Enabled                                   |          |    |    |      |     | Т      |  |  |
| l | Mode: Pulsed 🔹                              |          |    |    |      |     | n<br>f |  |  |
|   | Hardware Setup                              |          |    |    |      |     | 0      |  |  |
|   | Quiescent voltage limit:                    | -25.0    | v  | to | 25.0 | v   |        |  |  |
|   | Quiescent absolute current limit:           | 0.26     | Α  |    |      |     |        |  |  |
|   | Pulse voltage limit:                        | -25.0    | V  | to | 25.0 | V   |        |  |  |
|   | Pulse absolute current limit:               | 0.26     | А  |    |      |     |        |  |  |
|   | Invert polarity                             |          |    |    |      |     |        |  |  |
| 1 | Pulse delay:                                | 3.0      | μs |    |      |     |        |  |  |
| 1 | Pulse width:                                | 10.0     | μs |    |      |     |        |  |  |
| 1 | Pulse period:                               | 0.1      | ms |    |      |     |        |  |  |
|   | Trigger:                                    | Internal |    |    | •    |     |        |  |  |
|   | Transition:                                 | Medium   |    |    |      |     |        |  |  |
|   |   |          |    |    |      |     |        |  |  |
|   |   |          |    |    | Clo  | ose | »      |  |  |

## Figure 26 Input IV Power Supplies in Pulsed mode configuration

| Bias Voltage limit           | set the minimum and the maximum voltage limits of the probe (-25V   |
|------------------------------|---|
|                              | to +25V for the AM3111)   |
| Bias Absolute current        | set the maximum transient current limit achievable by the AM3211  |
|                              | (0.26A)   |
| Pulse Voltage limit          | set the minimum and maximum voltage limits of the probe (-25V to  |
|                              | +25V for the AM3211)  |
| Pulse absolute current limit | set the maximum transient current limit achievable by the AM3111  |
|                              | (0.26A)   |
| Pulse delay                  | set the pulse delay <sup>1</sup>  |
| Pulse width                  | set the pulse width   |
| Pulse period                 | set the pulse period  |
| Trigger                      | select internal or external trigger. The internal trigger signal comes from the PIV system, whereas an external trigger signal comes from another instrument.   |
| Transition                   | select the transition mode. The transition mode will modify the rise<br>time of the pulsed signal, which depends on the characteristics of the<br>PIV system as well as the operating conditions (DUT characteristics,<br>bias tees). For the AM3111 gate probe the transition: 'Smooth',<br>'Medium' and 'Hard' are available. |

<sup>&</sup>lt;sup>1</sup> These timings can be re-adjusted in the « Chronograms » tab

## **Output DC supplies (AM3121) configuration**

The output power supply is generally used to bias the drain access of a transistor. Select **Channel 2** as Output, as illustrated below:

The fields to fill in the 'Setup' tab depend on the selected mode:

• DC mode

**Bias Voltage limit** set the minimum and the maximum voltage limits of the probe (0 to +120V for the AM3121)

Bias Absolute current set the maximum transient current limit achievable by the AM3121 (30A)

| Setup > IV power supplies > Output generator |        |
|--|--------|
| ✓ Enabled                                    | Т      |
| Mode: DC                                     | n<br>f |
| Hardware Setup                               | 0      |
| Voltage limit: 0.0 V to 120.0 V              |        |
| Absolute current limit: 30.0 A               |        |
| Invert polarity                              |        |
|  |        |
|  |        |
|  |        |
|  |        |
|  |        |
|  |        |
|  |        |
|  |        |
|  |        |
| Close  | »      |

Figure 27 Output IV Power Supplies in DC mode configuration (AM3121)

• Pulsed mode

| Bias Voltage limit           | set the minimum and the maximum voltage limits of the probe (0V     |
|------------------------------|---|
|                              | for the AM3121)   |
| Bias Absolute current        | set the maximum transient current limit achievable by the AM3121 $$ |
|                              | (30A)   |
| Pulse Voltage limit          | set the minimum and maximum voltage limits of the probe (OV to      |
|                              | +120V for the AM3121)   |
| Pulse absolute current limit | set the maximum transient current limit achievable by the AM3211    |
|                              | (30A)   |
| Pulse delay                  | set the pulse delay2  |
| Pulse width                  | set the pulse width   |

<sup>&</sup>lt;sup>2</sup> These timings can be re-adjusted in the « Chronograms » tab

| Pulse period | set the pulse period   |
|--------------|--|
| Trigger      | select internal or external trigger. The internal trigger signal comes from the PIV system, whereas an external trigger signal comes from another instrument.  |
| Transition   | select the transition mode. The transition mode will modify the rise<br>time of the pulsed signal, which depends on the characteristics of the<br>PIV system as well as the operating conditions (DUT characteristics,<br>bias tees). For the AM3121 drain probe only the "Medium"<br>transition is available. |

| 2  | Setup > IV power supplies > O     | utput ger | nerat | tor |       |       | x        |  |
|----|-----------------------------------|-----------|-------|-----|-------|-------|----------|--|
|    | ✓ Enabled                         |           |       |     |       |       | 1        |  |
|    | Mode: Pulsed                      |           |       |     |       |       | f        |  |
|    | Hardware Setup                    |           |       |     |       |       | •        |  |
|    |                                   |           |       |     |       |       |          |  |
|    | Quiescent voltage limit:          | 0.0       | v     | to  | 0.0   | v     |          |  |
|    | Quiescent absolute current limit: | 30.0      | A     |     |       |       |          |  |
|    | Pulse voltage limit:              | 0.0       | v     | to  | 120.0 | v     |          |  |
|    | Pulse absolute current limit:     | 30.0      | Α     |     |       |       |          |  |
|    | Invert polarity                   |           |       |     |       |       |          |  |
|    | Pulse delay:                      | 3.0       | μs    |     |       |       |          |  |
| L  | Pulse width:                      | 10.0      | μs    |     |       |       |          |  |
| ł. | Pulse period:                     | 0.1       | ms    |     |       |       |          |  |
|    | Trigger:                          | Internal  |       |     | •     |       |          |  |
|    | Transition:                       | Medium    |       |     | •     |       |          |  |
|    |                                   |           |       |     |       |       |          |  |
|    |                                   |           |       |     | C     | Close | <b>»</b> |  |

Figure 28 Output IV Power Supplies in Pulsed mode configuration (AM3121)

## **Pulsed IV Measurement units**

AM3100 system uses a single instrument to measure both input and output (gate and drain) voltages and currents. Therefore the 'Same input and output measurement units' check box must be activated.

| Enabled          |                         |                   |                         |            |  |
|------------------|-------------------------|-------------------|-------------------------|------------|--|
|                  | IV power supply         | Resistive network | Measurement             |            |  |
| V Input:         | AMCAD PIV 3             | Edit              | AMCAD PTV 3             | 1          |  |
| <b>V</b> Output: | AMCAD PIV 3             | Edit              |                         |            |  |
| Aux 1:           | <undefined></undefined> | Edit              | <undefined></undefined> | 🗸 Link I-V |  |
| Aux 2:           | <undefined></undefined> | Edit              | <undefined></undefined> | Link I-V   |  |
| Aux 3:           | <undefined></undefined> | Edit              | <undefined></undefined> | Link I-V   |  |
| Aux 4:           | <undefined></undefined> | ] [Edit ]         | <undefined></undefined> | Link I-V   |  |
|                  |                         |                   |                         |            |  |

Figure 29 IV Measurement configuration for AM3100 system

Clicking on 'Input/Output Measurement', the following window is displayed:

| Setup > IV power sup              | plies | > Inpu   | ut/outp | ut me  | asurement     |           |        | × |
|-----------------------------------|-------|----------|---------|--------|---------------|-----------|--------|---|
| Enabled                           |       |          |         |        |               |           |        |   |
| Mode: DC                          |       |          | $\sim$  |        |               |           |        | f |
| Hardware Setup                    |       |          |         |        |               |           |        | 0 |
| Driver                            |       |          |         |        |               |           |        |   |
| Driver:                           | AMC   | AD PIV   | 3000 S  | ystem  |               |           | ~ 🕜    |   |
| Address:                          | TCPI  | P0::19   | 2.168.1 | 50.197 | 7::5025::SOCK | ET        | Q      |   |
| Options:                          | samp  | olingcnt | =10     |        |               |           | Ø      |   |
| VISA library:                     | Defa  | ult      |         |        |               |           | ~      |   |
| Command timeout:                  | 1000  | 0        | ms      |        |               |           |        |   |
| Command delay:                    | 0     |          | ms      |        |               |           |        |   |
|                                   |       |          |         |        |               | Test conn | ection |   |
| In. volt. channel/prol            | be:   | Chann    | el 1    | ~      | Auto-detecti  | on        | ~      |   |
| In. curr. channel/probe:          |       | Chann    | el 1    | ~      | Auto-detecti  | on        | ~      |   |
| Out. volt. channel/probe:         |       | Chann    | el 2    | $\sim$ | Auto-detecti  | on        | ~      |   |
| Out. curr. channel/probe: Channel |       |          | el 2    | $\sim$ | Auto-detecti  | on        | ~      |   |
|                                   |       |          |         |        |               |           | Close  | ; |

Figure 30 Input/Output Measurement configuration

chose the measurement mode (CW or Pulsed)

| Driver                            | select AMCAD PIV 3000 System                                     |
|-----------------------------------|--|
| URL                               | set the TCP/IP Address   |
| Options                           | additional driver options (depends of selected driver)           |
| VISA implementation<br>instrument | set the VISA DLL what will be used to communicate with this      |
| Command timeout                   | elapsed time before returning an error message if no response    |
| Command delay                     | delay before sending a command                                   |
| Test connection                   | send a command to the GPIB bus to test the instrument connection |
| In. volt. Channel/probe           | select the Channel 1 => Autodetection                            |
| In. curr. Channel/probe           | select the Channel 1 => Autodetection                            |
| Out. volt. Channel/probe          | select the Channel 2 => Autodetection                            |
| Out. curr. Channel/probe          | select the Channel 2 => Autodetection                            |

The fields to fill in the 'Setup' tab depend on the selected mode:

• DC mode

Averagingfor the AM3100 system averaging needs to be set at 1. The averaging is not<br/>possible on this instrument.Correction factorset correction factor, which multiplies the value of the measurementCorrection offsetset correction offset, which adds (or subtracts) a constant value

| Enabled       Mode:     DC     n       Hardware     Setup       Averaging:     1       Correction factor:     1.0       Correction offset:     0.0       Invert polarity  | Setup > IV power supplies > Input/output measurement | ×      |
|---|--|--------|
| Mode: DC r<br>Hardware Setup<br>Averaging: 1<br>Correction factor: 1.0<br>Correction offset: 0.0<br>Invert polarity   | C Enabled  | I<br>D |
| Hardware       Setup       O         Averaging:       1       Correction factor:       1.0         Correction offset:       0.0       O       O         Invert polarity       Invert polarity       Invert polarity       Invert polarity | Mode: DC   | f      |
| Averaging:       1         Correction factor:       1.0         Correction offset:       0.0         Invert polarity  | Hardware Setup                                       | 0      |
| Correction offset: 0.0  | Averaging: 1   |        |
| Correction offset: 0.0  | Correction factor: 1.0                               |        |
| Invert polanty  | Correction offset: 0.0                               |        |
|   | Invert polarity                                      |        |
|   |  |        |
|   |  |        |
|   |  |        |
|   |  |        |
|   |  |        |
|   |  |        |
|   |  |        |
|   |  |        |
| Close »   | Close  | »      |

Figure 31 Input/Output measurement in DC mode configuration

• Pulsed mode

| Averaging         | for the AM3100 system <b>averaging</b> needs to be set at <b>1</b> . The averaging is not possible on this instrument.   |
|-------------------|--|
| Correction factor | set correction factor, which multiplies the value of the measurement   |
| Correction offset | set correction offset, which adds (or subtracts) a constant value  |
| Trigger           | select internal or external trigger. For the AM3100 <u>measurement units</u> , it is recommended to always set the trigger as an internal trigger even if the AM3100 generator is defined with an external trigger.  |
| Trace def         | Defines the window which contains the full pulse shape. When using the AM3100 system, the Trace def must start at 1 $\mu$ s or greater. The beginning of the Trace def also defines the moment of the quiescent level's measurement.   |
| Trace point.      | Defines the number of points which contains the full pulse shape. When using the AM3100 system, this parameter has no influence if Tracedef >2 because 2 points are acquired by the PIV measurement.   |
| Meas. window      | Defines the window where the measurements are performed to plot the IV network. The end of the measurement window defines the moment of the pulsed level's measurement. "Measurement window" lets to synchronize with the RF signal, with VNA measurement, or use a customized window. |

| Setup > IV power supplies > Input/output measurement |       | ×      |
|--|-------|--------|
| C Enabled  |       | I.     |
| Mode: DC ~   |       | n<br>f |
| Hardware Setup                                       |       | 0      |
| Averaging: 1   |       |        |
| Correction factor: 1.0                               |       |        |
| Correction offset: 0.0                               |       |        |
| Invert polarity                                      |       |        |
|  |       |        |
|  |       |        |
|  |       |        |
|  |       |        |
|  |       |        |
|  |       |        |
|  |       |        |
|  |       |        |
|  |       |        |
|  | Close |        |
|  |       | "      |

Figure 32 Input/Output measurement in Pulsed mode configuration

#### 9.3 Advanced options

The "Measurement range" option allows the user to define different measurement range modes.

| Setup > IV pov | ver supplies |             |  |  |                                       |                    |             |           | ×           |
|----------------|--------------|-------------|--|--|---------------------------------------|--------------------|-------------|-----------|-------------|
| Enabled        | IV power     | supply      | Resistive networ                             | k M  | easurement                            |                    |             |           | l<br>n<br>f |
| Input:         | AMCAD PI     | / 300       | Edit   | AMO  | AD PIV 300                            | ]                  |             |           |             |
| Output:        | AMCAD PI     | / 300       | Edit   |  |                                       |                    |             |           |             |
| Aux 1:         | Setup > IV   | power sup   | oplies > Input/out                           | tput meas  | urement                               |                    | ×           |           |             |
| Aux 2:         | Enabled      |             |  |  |                                       |                    | 1           |           |             |
| Aux 3:         | Mode: Put    | sed         | ~  |  |                                       |                    | f           |           |             |
| Aux 4:         | Hardware     | Setup       |  |  |                                       |                    | 0           |           |             |
| Same input     | Driver       |             |  |  |                                       |                    |             | oposite): |             |
| Power off      | Driver:      |             | AMCAD PIV 3000                               | System   |                                       | ~ 📀                |             |           | 1           |
| Wait betwe     | Address      | :           | TCPIP0::192.168                              | . 150. 197::   | 5025::SOCKET                          | Q                  |             |           |             |
|                | Options:     | :           | samplingcnt=10                               |  |                                       | 1                  |             |           |             |
|                | VISA libr    | ary:        | Default                                      |  |                                       |                    |             |           |             |
|                | Comman       | d timeout   | 10000 mc                                     |  |                                       | •                  |             |           |             |
|                | Comman       | Se PIV A    | dvanced Configura                            | ation  |                                       |                    |             | ×         |             |
|                |              | Acquisition | sampling count [1-1                          | 024] (32xx   | serie): 10                            |                    |             |           | <b>»</b>    |
|                |              | Measuren    | nent ranges                                  |  |                                       |                    |             |           |             |
|                | In. volt. c  | Range m     | ode: Automatic                               | ~  |                                       |                    |             |           |             |
|                | In. curr. o  | Channel     | 1: Automatic (one                            | ce)  |                                       |                    |             |           |             |
|                | Out. volt.   | Volt        | age: Manual                                  | BX<br>Z Max  |                                       |                    |             |           |             |
|                | Out. curr.   | clust       |  | MINGX  |                                       |                    |             |           |             |
|                |              | Volt        | z:<br>age: V                                 | Max  |                                       |                    |             |           |             |
|                |              | Curr        | ent: A                                       | Max  |                                       |                    |             |           |             |
|                |              |             |  |  |                                       |                    |             |           |             |
|                |              | Asynch      | se sate ranges in aut<br>pronous waveforms ( | for long pul   | e (and automatic<br>ses, replace porm | al waveforms, 32xx | (serie)     |           |             |
|                |              | Less s      | ampling (faster)                             | , and the second s |                                       | More Sam           | pling (slow | er)       |             |
|                |              |             |  |  |                                       |                    |             |           |             |
|                |              |             |  |  |                                       |                    | ОК          | Cancel    |             |
|                |              |             |  |  |                                       |                    |             |           |             |

Figure 33 AM3100 Advanced options access

There are three different range modes:

- Automaticset the appropriate range on each probes head. The range verification is done<br/>for each point of measurement.
- Automatic (once) set the appropriate range on each probes head. The range verification isn't systematically done for each point of measurement, it depends on the parameters change (e.g. change of voltage or timing). Can improve the measurement speed.
- Manualthis mode allows to set manually the range of each probe head. As shown in<br/>the example below, user set the maximum current and voltage achievable<br/>with the DUT, in order to set the higher measurement range needed.

| >>> PIV Advan   | ced Configuration   |
|-----------------|---|
| Acquisition sam | npling count [1-1024] (32xx serie): 10                        |
| Measurement     | ranges  |
| Range mode:     | Manual  |
| Channel 1:      |   |
| Voltage:        | 0 V Max   |
| Current:        | 0.01 A Max  |
| Channel 2:      |   |
| Voltage:        | 50 V Max  |
| Current:        | 2 A Max   |
| Only use sa     | fe ranges in automatic mode (and automatic once, 32xx serie)  |
| Asynchrono      | us waveforms (for long pulses, replace normal waveforms, 32xx |
| Less sampli     | ng (faster) 🛛 — More Sampling (slower)                        |
|                 | OK Cancel   |

Figure 34 AM3100 manual measurement range

## **Contact Information**

IVCAD is offered exclusively by Maury Microwave Corporation and is powered by AMCAD Engineering.

For Technical Assistance,

- Contact Maury Microwave Corp by sending an email to IVCAD.support@maurymw.com or calling +1 (909) 204-3283 (Monday to Friday, 8AM to 5PM PST).
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