Accel-RF

Accel-RF Corporation

PCU Calibration Techniques
for the
AARTS System

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Accel-RF Corporation specializes in the design, development, manufacture, and sales of accelerated life-test/burn-in test systems for RF and Microwave semiconductor devices. This white paper describes technical information related to the AARTS Hardware. For more information contact:

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1 Overview

The AARTS station utilizes several custom boxes manufactured by Accel-RF Corporation, including the Power Control Unit (PCU), Heater Control Unit (HCU), and RF Control Unit (RFU). All of these boxes employ circuitry that must be calibrated. Some calibration factors, such as voltage and current gain values, should be calibrated at the use conditions for maximum accuracy. Other factors, such as DAC transfer curves are done at the factory and only need to be performed rarely as needed to improve system performance. The software manual describes the techniques for such calibrations.

2 General Calibration Approach

This document describes the easiest way to perform a full calibration of a new PCU card set, or box. It assumes the operator either has an Accel-RF approved load box that can be connected the to back D-Sub connectors of the PCU, or a simulated load that can be place at the DUT fixture. Note that certain calibration factors (such as current offsets) are parameters that depend upon completion other factors; hence, if calibration has never been performed, it is important to calibrate the various factors in the proper order. The recommended order and methodology is as follows:

2.1 Measurement Calibration Factors

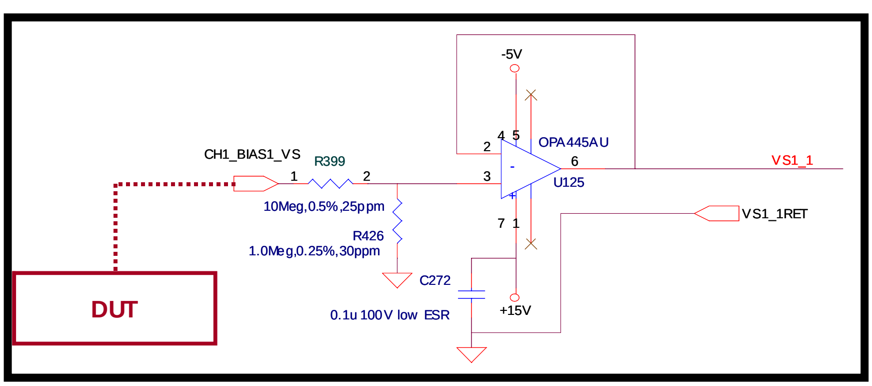
Cal factors are used primarily for voltage and current measurements. Theses are fixed gain values that related DVM measurements to actual values as measured at the DUT. They allow calibration of the system to external reference standards.

2.1.1 Calibrate Voltage Gain Factors

Two voltage factors exist: 1) the Pre-Switch factor (taken as the divider ratio between the power supply output and the measured voltage at the DVM); and 2) the DUT or Post-Switch factor (taken as the divider ratio of the sense line feedback from the DUT and the measured voltage at the DVM). Figure 2-1 shows schematically the circuit employed for the DUT sense line feedback, which is similar to the pre-switch measurement circuit. Precision low-TCR resistors have been incorporated to minimize circuit drift effects.

Use the {V/I Calibration} routines to calibrate this factor. The DUT fixture (with no devices connected) is required to calibrate the voltage gain factors. No load should be used when calibrating these values. Since there is no current to create an IR voltage drop, the Pre-Switch and DUT voltages should be identical.

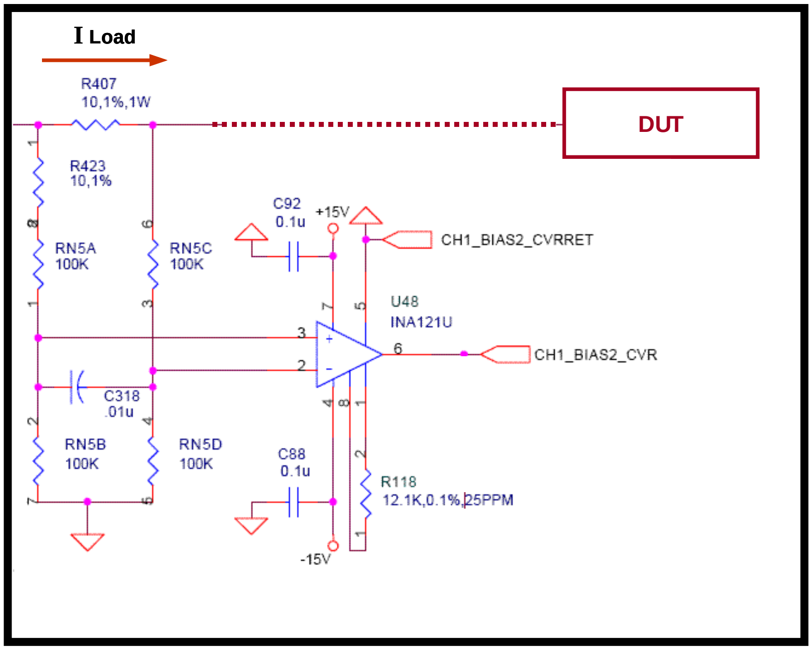
Figure 2-1: Voltage Measurement Circuit



2.1.2 Calibrate Current Offsets

When measuring currents, the circuit of Figure 2-2 is employed. Note that the divider resistors are precision and matched to provide best performance; however, they are never exactly balanced. Hence, a small offset exists as a function of output voltage, which is amplified in the differential amplifier. To improve measurement accuracy, the offset amount should be subtracted from the measured value before the gain factor is applied.

Figure 2-2: Current Measurement Circuit



If the PCU cards have never been calibrated, or the cal factors have been cleared for a fresh calibration, it is necessary to use the {PCU Calibration} Form to perform this calibration. If an array of cal offsets already exists (from a previous calibration), then the {V/I Calibration} Form may be used to re-measure either the current voltage setting's offset by clicking the "Measure Offsets" command button, or the entire range of voltages by CTRL-clicking the "Measure Offsets" command button.

No DUT fixture is required to calibrate these factors. The output switch is intentionally opened when this factor is calibrated. Hence, the full range of voltages may be calibrated without concern to any existing devices mounted in the DUT fixture.

2.1.3 Calibrate Current Gain Factor

The current delivered to the DUT must flow through the current viewing resistor (CVR) as shown in Figure 2-2. The voltage created across the CVR is amplified by the R118 gain-setting resistor in the differential amplifier. The generates a voltage that is proportional to the current. The gain factor may be calibrated using the {V/I Calibration} Form.

These factors require resistive loads to be mounted at the fixture. For best overall accuracy, these should be resistive loads of $\leq 3.3\,\Omega$ for Bias1 and $\leq 50\Omega$ for Bias2. However, for better point performance the operator could select resistors that match the expected device loads.

2.2 DAC Calibration Factors

All voltage and current settings, including trip levels, in the power supplies are controlled via Digital-to-Analog Converters (DACs). When the system sets compliance levels, these factors are applied directly to the DAC and presumed correct. When setting the target values, the system uses an iterative approach to fine tune the goal as set by the operator. For instance, if the load draws 3 A of current, an IR drop to the device exists. The computer reads the values at the DUT and adjusts the supplies accordingly to achieve the requested bias condition (see the software manual for iterator operational details).

To facilitate accurate and fast settings for the supply targets, a calibration table of DAC value vs. parameter is created. These factors are all accessed and modified using the {PCU Calibration} Form.

2.2.1 Calibrate Target Voltages

The Bias1 and Bias2 target voltages should be calibrated before their associated trip levels. These are used by the trip levels calibration routines to set the initial target values. If these factors are very far off the system will not cease to function, but will appear sluggish as the iterator will have to work harder than necessary to achieve the defined targets. No DUT fixtures are required to calibrate these factors.

2.2.2 Calibrate Voltage Trip Levels

The trip levels are defined as the point at which the power supply output switches will deactivate, hopefully at a rate that prevents device damage. Note that the DUT fixtures with no loads are required to calibrate these factors as the trip level comparators are tied to the DUT sense lines.

2.2.3 Calibrate Target Currents

The Bias1 and Bias2 target currents should be calibrated before the associated trip levels. These are used by the trip levels calibration routines to set the initial target values. If these factors are very far off the system will not cease to function, but will appear sluggish as the iterator will have to work harder than necessary to achieve the defined targets. DUT fixtures with the resistive loads of ≤3.3 Ω for Bias1 and ≤50Ω for Bias2 (for standard range PCUs) are required to calibrate these factors over the full operating range.

2.2.4 Calibrate Current Trip Levels

The trip levels are defined as the point at which the power supply output switches will deactivate, hopefully at a rate that prevents device damage. DUT fixtures with the resistive loads of ≤3.3 Ω for Bias1 and ≤50Ω for Bias2 (for standard range PCUs) are required to calibrate these factors over the full operating range.

3 Specific Calibration Instructions

The AARTS software manual contains specific instructions on how to use the two main PCU calibration forms. The {V/I Calibration} Form is designed as a simple aid to quickly calibrate the primary voltage and current factors. Use the {PCU Control} or {Edit Levels} Forms to set up a target supply condition. Then, use {V/I Calibration} to calibrate the factors. This should be performed periodically per the recommended calibration cycle (see the AARTS_Calibration_Schedule app note for Accel-RF recommendations).

The {PCU Calibration} Form is primarily used to calibrate DAC transfer curves. This should only need to be performed if the system experiences abnormal or sluggish behavior. If the initial target values are too far from expectations, recalibrating the DAC factors may significantly improve performance.

The following sections are reprinted from the software manual. Check the latest released software manual documentation for further updates.

3.1 Voltage/Current Calibration

To meet the most stringent of accuracy requirements, the voltage and current calibration factors may be determined using a metrology-grade meter connected at the DUT fixture. This technique requires connecting a load equal to the expected DUT load, measuring the voltage and/or current at the DUT fixture, and recalculating the factors using those values.

A special calibration Form, launched from the main menu {Cal{V/I Calibration}} supports this function. Figure 3-1 presents a screen shot of the V/I Calibration Form. Note that each of the 8 factors presented in Section 5.3.1 may be calibrated more accurately using this Form.

The Form is divided into Bias1 and Bias2 sections, each having VPRE (pre-switch voltage), VDUT, and IDUT factors. The operator selects a channel of interest from the list on the left. As with other calibration Forms, this one provides two columns to easily track which channels have been calibrated. Once a channel is selected, the “Update” checkbox is used to cause the system to continuously read that parameter. It should be noted that the operator must set up the desired bias condition using either the “PCU Control” Form or the “Edit Levels” Form. Check the “Active Switch” checkbox to engage, or disengage, the power to the DUT.

External meters should be connected at the DUT, which provide the metrology-grade readings. For current readings the meter should be in series with the simulated load (e.g. a resistor tied to the fixture case ground). For voltage readings the meter should be tied in parallel with the load (e.g. across the resistive load tied between the supply terminal and the fixture case ground).

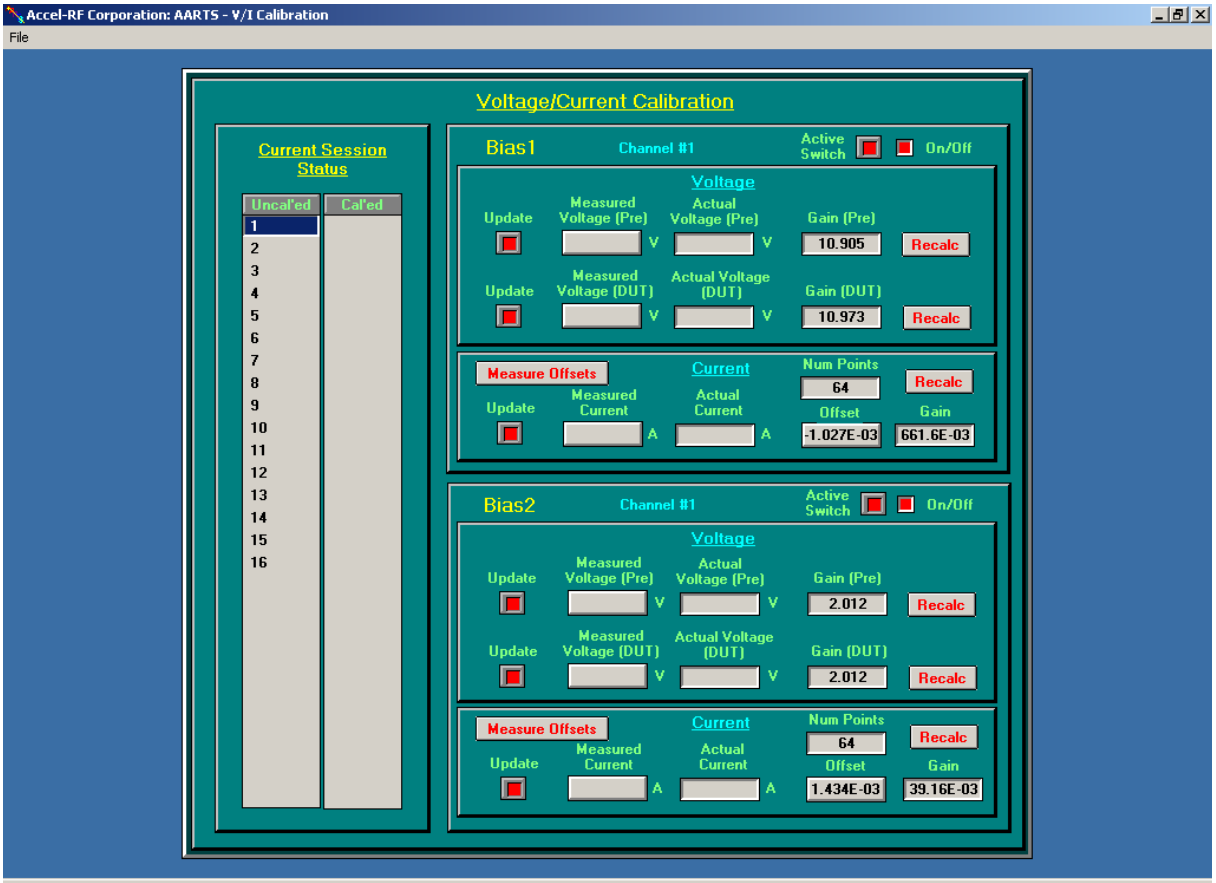
The measured voltage (or current) is displayed in the “Measured” display boxes. Likewise, the current cal factors for that parameter are displayed (either Gain for voltage, or Offset and Gain for current).

To recalibrate the channel, the operator enters the values detected by the external metrology meter into the “Actual” entry boxes. Finally, clicking on the “Recalc” command button causes the system to take the user entered values and recomputed the correct Gain factors. After clicking on Recalc the displayed reading should change to read the correct value as displayed on the external meters.

For PCU version 1 hardware, the current factors include two parameters: Offset and Gain. The Offset factor represents the internal measured value when the output switch is open (i.e. no bias, and hence no current, being delivered to the DUT). The software automatically opens the switch to make the measurement, then closes the switch and measures current, calibrating the value to match that defined by the operator for the external readings. Note that if the current is very small (10’s of mA for Bias1; 100’s of μA for Bias2) the Gain calculation may be less accurate than when measuring at larger values. Hence, for small current accuracy it is recommended that the Gain value be re-entered manually by hand after the Recalc process (tip: use the clipboard to store the starting value prior to recalculating, then paste the value back in afterward). This process maximizes the Offset accuracy while maintaining the Gain accuracy.

For PCU version 2 hardware, the current factors also include two parameters: Offset and Gain; however, here the offset is a function of voltage. Hence, a number of factors are measured over the full voltage range. These factors represent the internal measured value when the output switch is open (i.e. no bias, and hence no current, being delivered to the DUT). The software automatically opens the switch and measures the offset when the "Measure Offsets" command button is selected (note: the full range of voltages will be measured if CTRL-Click is used). The operator should then enter the measured current. By clicking on the "Recalc" button the cal factor is recalibrated to cause the measured values to match the external readings. Note that if the current is very small (10's of mA for Bias1; 100's of µA for Bias2) the Gain calculation may be less accurate than when measuring at larger values. Hence, it is recommended that the Gain value be calibrated at sufficiently high current to minimize error.

Figure 3-1: V/I Calibration (PCU Version 2 only)



Remember that, when attempting to close the output switch to deliver power to the DUT, the sequencing information is still in force. Hence, if the channel sequence is defined as "2,1,1,2" (Bias2 on first, followed by Bias1, etc…), Bias2 will have to be turned on before Bias1 will activate.

Use the right-click mouse button over the channel number to move it to the "calibrated" column. This is not required, but makes the process easier to track. Finally, once the calibration is complete, select File->Save and Exit to store the new calibration factors. File->Quit causes the Form to exit without saving the new values.

3.2 PCU Calibration

Two PCU calibration factors are needed to effectively operate the system. The first category of factors are single values that represent the relationship between the actual voltages or currents sourced by the various supplies as compared to their internally measured values. The system only has one DMM that measures voltage. Analog multiplexers route the voltage of interest to the DMM. These multiplexers have maximum voltage limits that are lower than the voltages the PCU bias supplies are capable of generating. Hence, resistive dividers are employed to lower the voltage being measured to values commensurate with proper multiplexer operation. Hall effect transducers are used to translate current into a measurable voltage, proportional to current. These transducers also require use of cal factors to estimate the actual current flowing to the DUT. These bias calibration factors are extremely important as they directly relate to system accuracy.

The second type of calibration factor relates to target values in the DACs that drive the analog circuits, such as are used in the setting of output voltage or current compliance. These factors do not affect system accuracy directly, but do affect the error at which the supplies begin the iterative process of setting levels.

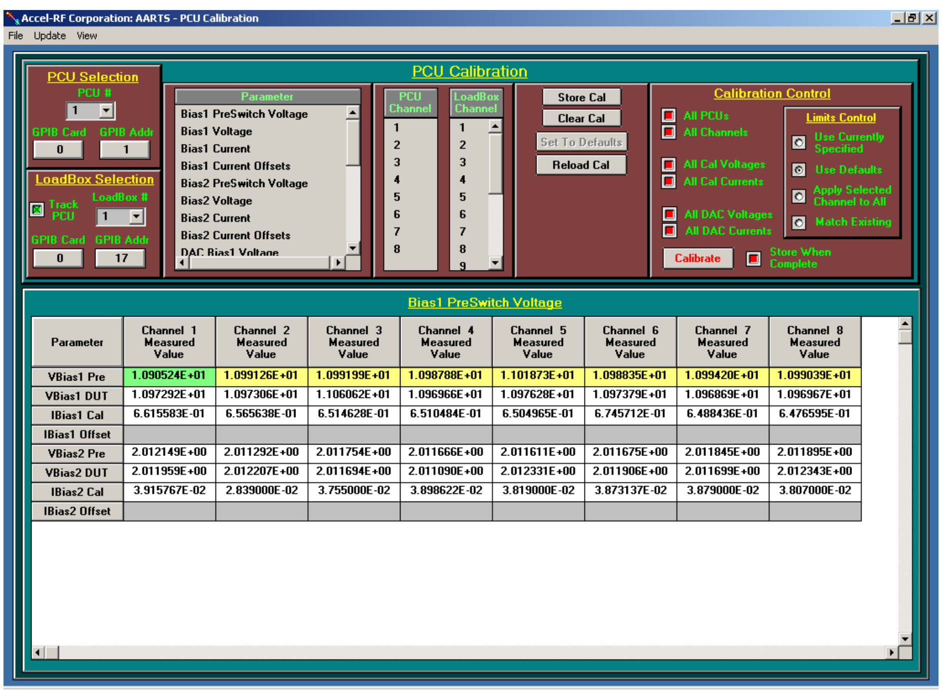
Note that a separate box, called the LoadBox, is required to perform these calibrations. This is available as a supplemental component. The LoadBox is connected to the PCU through the PCU's rear panel connectors. The system must be disconnected and the LoadBox attached prior to performing these tests. Further, an external DMM, identical to that used in the system is required to measure actual voltages and currents through which the cal factors will be generated.

Use the multiple selection technique to select which parameters and channels to calibrate, then click on "Calibrate" to perform the calibration. If "Store When Complete" is checked each set of cal factors are stored when performed.

3.2.1 Bias Calibration Factors

Figure 3-2 presents the Form displayed for PCU Cal Factor calibrations. Note that 8 factors apply to each channel, 4 for Bias1 and 4 for Bias2. In the example shown, the factors are defined as follows:

Figure 3-2: PCU Bias Calibration Factors



Parameter	Channel 1 Measured Value	Channel 2 Measured Value	Channel 3 Measured Value	Channel 4 Measured Value	Channel 5 Measured Value	Channel 6 Measured Value	Channel 7 Measured Value	Channel 8 Measured Value
VBias1 Pre	1.090524E+01	1.099126E+01	1.099199E+01	1.098788E+01	1.101873E+01	1.098835E+01	1.099420E+01	1.099039E+01
VBias1 DUT	1.097292E+01	1.097306E+01	1.106062E+01	1.096966E+01	1.097628E+01	1.097379E+01	1.096869E+01	1.096967E+01
IBias1 Cal	6.615583E-01	6.565638E-01	6.514628E-01	6.510484E-01	6.504965E-01	6.745712E-01	6.488436E-01	6.476595E-01
IBias1 Offset								
VBias2 Pre	2.012149E+00	2.011292E+00	2.011754E+00	2.011666E+00	2.011611E+00	2.011675E+00	2.011845E+00	2.011895E+00
VBias2 DUT	2.011959E+00	2.012207E+00	2.011694E+00	2.011090E+00	2.012331E+00	2.011906E+00	2.011699E+00	2.012343E+00
IBias2 Cal	3.915767E-02	2.839000E-02	3.755000E-02	3.898622E-02	3.819000E-02	3.873137E-02	3.879000E-02	3.807000E-02
IBias2 Offset								

1) VBias1 Pre – The Bias1 Pre voltage is measured internally prior to the output On/Off switch. This factor is directly related to the resistive divider ratio that lowers the voltage to a level commensurate with the analog multiplexers. In this example the ratio is ~11. In normal system operation, the measured

voltage at the multiplexer output is multiplied by this factor to yield the correct voltage generated at the source.

2) VBias1 DUT – The Bias1 DUT voltage is measured at the DUT as the returned to the PCU through the sense return line. This factor is directly related to the resistive divider ratio that lowers the voltage to a level commensurate with the analog multiplexers. In this example the ratio is ~11. In normal system operation, the measured voltage at the multiplexer output is multiplied by this factor to yield the correct voltage sensed at the DUT input.

3) IBias1 Offset – In PCU version 1 hardware, DUT Bias1 Current is measured through the use of a Hall Effect sensor. This part generates a voltage proportional to the amount of current flowing through an inductive coil. Its output follows a linear slope from 0 to ~5V, with 2.5V representing 0 A. An op-amp circuit offsets the 2.5V to 0V so that positive and negative currents are represented by positive and negative voltages, respectively. A scaling factor represents the relationship of the current to voltage transfer gain. This offset can never be set perfectly to 0V @ 0A, so the residual offset is measured during calibration. This value is subtracted from the measured voltage prior to applying the scaling factor, hence mathematically removing the residual offset.

In PCU version 2 hardware, DUT Bias1 Current is measured through the use of a Current Viewing Resistor (CVR). This resistor is in series with the load and thus generates a voltage proportional to load current, based on it resistance value (~0.1 Ω). Because of the large magnitude of voltages generated by Bias1, a resistive divider network is employed to attenuate the absolute voltage levels to less than 10 V. A differential amplifier generates a voltage proportional to the current. A scaling factor represents the relationship of the current to voltage transfer gain. Because of common mode differences in the resistive dividers and nonlinearities in the differential amplifier, an offset exists even at 0 Amps. The residual offset is measured during calibration over a range of voltage levels. These values are subtracted from the measured voltage prior to applying the scaling factor, hence mathematically removing the common-mode offsets.

4) IBias1 Cal – This represents the current to voltage transfer gain used to calculate the Bias1 output current. The measured voltage at the multiplexer output is multiplied by this factor to yield the correct current flowing through the Hall effect sensor.

5) VBias2 Pre – The Bias2 Pre voltage is measured internally prior to the output On/Off switch. This factor is directly related to the resistive divider ratio that lowers the voltage to a level commensurate with the analog multiplexers. In this example the ratio is ~2.0. In normal system operation, the measured voltage at the multiplexer output is multiplied by this factor to yield the correct voltage generated at the source.

6) VBias2 DUT – The Bias2 DUT voltage is measured at the DUT as the returned to the PCU through the sense return line. This factor is directly related to the resistive divider ratio that lowers the voltage to a level commensurate with the analog multiplexers. In this example the ratio is ~2.0. In normal system operation, the measured voltage at the multiplexer output is multiplied by this factor to yield the correct voltage sensed at the DUT input.

7) IBias2 Offset – DUT Bias2 Current is measured through the use of a Hall Effect sensor. This part generates a voltage proportional to the amount of current flowing through an inductive coil. Its output follows a linear slope from 0 to ~5V, with 2.5V representing 0 A. An op-amp circuit offsets the 2.5V to 0V so that positive and negative currents are represented by positive and negative voltages, respectively. A scaling factor represents the relationship of the current to voltage transfer gain. This offset can never be set perfectly to 0V @ 0A, so the residual offset is measured during calibration. This value is subtracted from the measured voltage prior to applying the scaling factor, hence mathematically removing the residual offset.

7) Ibias2 Offset – In PCU version 1 hardware, DUT Bias2 Current is measured through the use of a Hall Effect sensor. This part generates a voltage proportional to the amount of current flowing through an inductive coil. Its output follows a linear slope from 0 to ~5V, with 2.5V representing 0 A. An op-amp circuit offsets the 2.5V to 0V so that positive and negative currents are represented by positive and negative voltages, respectively. A scaling factor represents the relationship of the current to voltage transfer gain. This offset can never be set perfectly to 0V @ 0A, so the residual offset is measured during calibration. This value is subtracted from the measured voltage prior to applying the scaling factor, hence mathematically removing the residual offset.

In PCU version 2 hardware, DUT Bias2 Current is measured through the use of a Current Viewing Resistor (CVR). This resistor is in series with the load and thus generates a voltage proportional to load current, based on it resistance value (~10 Ω). Because of the large magnitude of voltages generated by Bias1, a resistive divider network is employed to attenuate the absolute voltage levels to less than 10 V. A differential amplifier generates a voltage proportional to the current. A scaling factor represents the relationship of the current to voltage transfer gain. Because of common mode differences in the resistive dividers and nonlinearities in the differential amplifier, an offset exists even at 0 Amps. The residual offset is measured during calibration over a range of voltage levels. These values are subtracted from the measured voltage prior to applying the scaling factor, hence mathematically removing the common-mode offsets.

8) IBias2 Cal – This represents the current to voltage transfer gain used to calculate the Bias2 output current. The measured voltage at the multiplexer output is multiplied by this factor to yield the correct current flowing through the Hall effect sensor.

The PCU calibration factors may be permanently stored in the system variables by selecting {File{Save and Exit}}. To discard changes to the system variables, use the {File{Quit}} menu option to close the Form.

3.2.2 DAC Calibration Factors

DACs are used to set all voltages, currents, and trip levels in the PCU bias supplies. The target voltage or current, and their associated compliance current or voltage, are the most critical. The trip-level over and under voltage and current values are not as critical (see the PCU description in Section 2.1 for details of how these factors affect system performance). DAC transfer curve lookup tables are generated that provide starting points for automatically setting the supplies to their specified levels. If the target is off slightly, the system will iterate its value until the correct value is achieved. However, the system assumes that the values associated with the compliance and trip levels are correct and do not iterate them. Since these parameters are less critical, this does not present a problem in practical operation.

Figure 3-3 illustrates a typical PCU DAC Calibration Table. Similar values exist for each of the DAC transfer curves. The DAC calibration tables are defined as follows:

1) DAC Bias1 Voltage – DAC value vs. Bias1 output voltage, as measured at the pre-switch voltage point. Note that the DUT voltage may vary depending on current and line loss between the PCU source and DUT fixture. This parameter is used to set starting voltage in the voltage-source mode or for setting compliance voltage limit in the current-source mode.

2) DAC Bias1 Current – DAC value vs. Bias1 output current, as measured through the Hall effect device. This parameter is used to set starting current in the current-source mode or for setting compliance current limit in the voltage-source mode.

3) DAC Bias1 Current Offsets (PCU version 2 hardware only) - Offset voltages exist in the CVR circuitry. These values are a function of voltage and may be measured under a no-load condition and used to mathematically eliminate common-mode errors.

4) DAC Bias1 UnderVoltage – DAC value vs. Bias1 UnderVoltage trip level. This parameter is used to set the low-voltage fast shutdown trip point.

5) DAC Bias1 OverVoltage – DAC value vs. Bias1 OverVoltage trip level. This parameter is used to set the high-voltage fast shutdown trip point.

6) DAC Bias1 UnderCurrent – DAC value vs. Bias1 UnderCurrent trip level. This parameter is used to set the low-current fast shutdown trip point.

7) DAC Bias1 OverCurrent – DAC value vs. Bias1 OverVoltage trip level. This parameter is used to set the high-current fast shutdown trip point.

8) DAC Bias2 Voltage – DAC value vs. Bias2 output voltage, as measured at the pre-switch voltage point. Note that the DUT voltage may vary depending on current and line loss between the PCU source and DUT fixture. This parameter is used to set starting voltage in the voltage-source mode or for setting compliance voltage limit in the current-source mode.

9) DAC Bias2 MaxPositiveCurrent – DAC value vs. positive Bias2 output current, as measured through the Hall effect device. This parameter is used to set starting positive current in the current-source mode or for setting positive compliance current limit in the voltage-source mode.

10) DAC Bias2 MaxNegativeCurrent – DAC value vs. negative Bias2 output current, as measured through the Hall effect device. This parameter is used to set starting negative current in the current source mode or for setting negative compliance current limit in the voltage source mode.

11) DAC Bias2 Current Offsets (PCU version 2 hardware only) - Offset voltages exist in the CVR circuitry. These values are a function of voltage and may be measured under a no-load condition and used to mathematically eliminate common-mode errors.

12) DAC Bias2 UnderVoltage – DAC value vs. Bias2 UnderVoltage trip level. This parameter is used to set the low-voltage fast shutdown trip point.

13) DAC Bias2 OverVoltage – DAC value vs. Bias2 OverVoltage trip level. This parameter is used to set the high-voltage fast shutdown trip point.

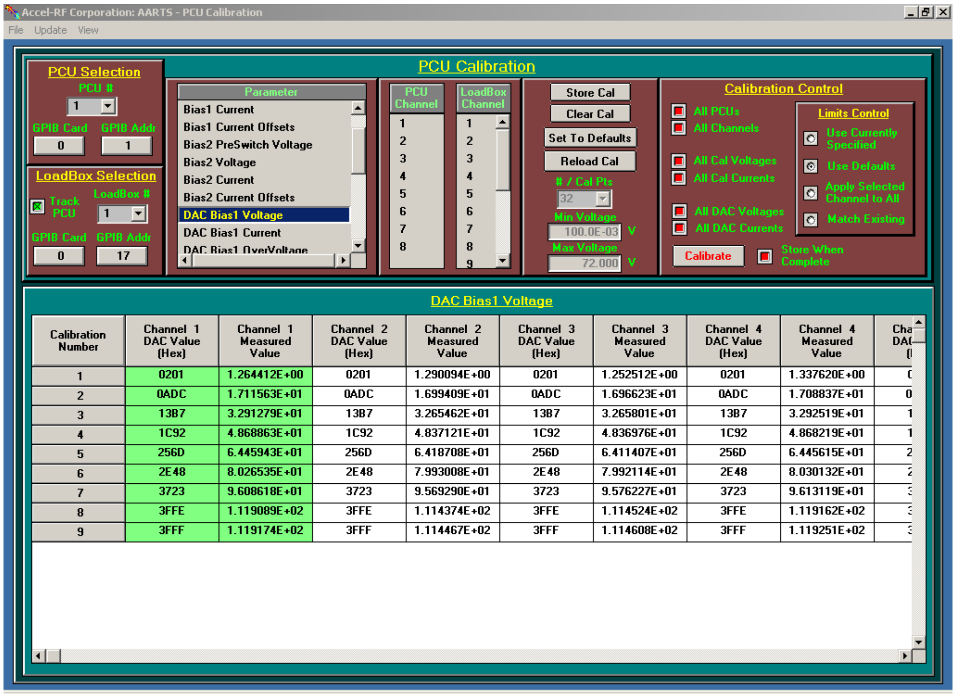
14) DAC Bias2 UnderCurrent – DAC value vs. Bias2 UnderCurrent trip level. This parameter is used to set the low-current fast shutdown trip point.

15) DAC Bias2 OverCurrent – DAC value vs. Bias2 OverVoltage trip level. This parameter is used to set the high-current fast shutdown trip point.

A typical calibration table for the DAC Bias1 Voltage is presented in Figure 3-3. The calibration control values may be used to select multiple channels for calibration, and defining which parameters are to calibrated. Use the multiple selection technique to select which parameters to calibrate, or by selected “All Cal Voltages”, “All Cal Currents”, “All DAC Voltages”, and/or “All DAC Currents” a full calibration may be performed with little user interaction. Note that the DAC calibration values require accurate voltage and current Cal Factors to function properly. Hence, when all parameters are selected for calibration, the “Store When Complete” check box should be checked to cause the cal factors to be incorporated into the system variables right after they are complete.

If the “Track PCU” check box is checked the LoadBox channel number will automatically track the PCU channel number. To match a different LoadBox channel number to the PCU channel number, uncheck the “Track PCU” check box and select the LoadBox channel of interest.

Figure 3-3: PCU DAC Calibration Table



Calibration Number	Channel 1 DAC Value (Hex)	Channel 1 Measured Value	Channel 2 DAC Value (Hex)	Channel 2 Measured Value	Channel 3 DAC Value (Hex)	Channel 3 Measured Value	Channel 4 DAC Value (Hex)	Channel 4 Measured Value
1	0201	1.264412E+00	0201	1.290094E+00	0201	1.252512E+00	0201	1.337620E+00
2	0ADC	1.711563E+01	0ADC	1.699409E+01	0ADC	1.696623E+01	0ADC	1.708837E+01
3	13B7	3.291279E+01	13B7	3.265462E+01	13B7	3.265801E+01	13B7	3.292519E+01
4	1C92	4.868863E+01	1C92	4.837121E+01	1C92	4.836976E+01	1C92	4.868219E+01
5	256D	6.445943E+01	256D	6.418708E+01	256D	6.411407E+01	256D	6.445615E+01
6	2E48	8.026535E+01	2E48	7.993008E+01	2E48	7.992114E+01	2E48	8.030132E+01
7	3723	9.608618E+01	3723	9.569290E+01	3723	9.576227E+01	3723	9.613119E+01
8	3FFE	1.119089E+02	3FFE	1.114374E+02	3FFE	1.114524E+02	3FFE	1.119162E+02
9	3FFF	1.119174E+02	3FFF	1.114467E+02	3FFF	1.114608E+02	3FFF	1.119251E+02

The PCU calibration factors may be permanently stored in the system variables by selecting {File{Save and Exit}}. To discard changes to the system variables, use the {File{Quit}} menu option to close the Form.

4 Contact Information

For additional, please contact Accel-RF at the following number:

Accel-RF
858-332-0708 (8:00AM to 5:00PM Pacific Time Zone)
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