General Operating Information

GETTING STARTED

This section will help the first time user become familiar with the operation of the DA1855A and how it interfaces with an oscilloscope.

To carry out the following exercises, the operator will need an oscilloscope and a general purpose function generator.

POWER CONNECTION

Check to make sure the power switch located on the rear panel is in the **0** (OFF) position. Connect the power cable to an appropriate power source. The DA1855A will operate on a 50 or 60 Hz AC power source with a nominal voltage range from 100 V to 250 V.

COMPARATOR MODE

The DA1855 becomes a differential comparator when the internal Precision Voltage generator (PVG) output is selected as the amplifier's inverting (–) input. The – Input is disconnected form the amplifier and does not serve any purpose in the V_{COMP} mode. In this mode the DA1855A can be used to very accurately measure relatively small signals riding on large DC components.

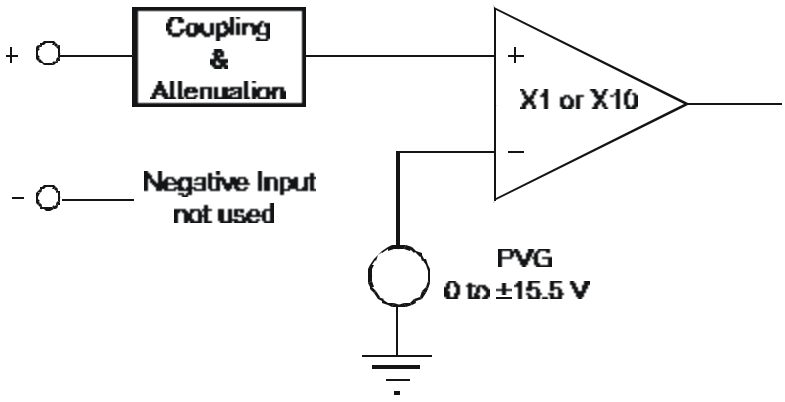

Figure 3-1. Block Diagram V_{Comp} Mode

DIFFERENTIAL MODE

The DA1855A built-in Precision Voltage Generator can be used to generate a true differential offset while still allowing both inputs to be used as differential inputs. This mode facilitates making measurements such as changes to a transistor's base to emitter voltage caused by variations in temperature. Used in this mode, the voltage generator can be set to a value that will zero out the static value of the junction's ON voltage. the DA1855A's differential measurement capability will reject any dynamic signal common to both sides of the junction and the oscilloscope is left to measure only the changes in the junction voltage.

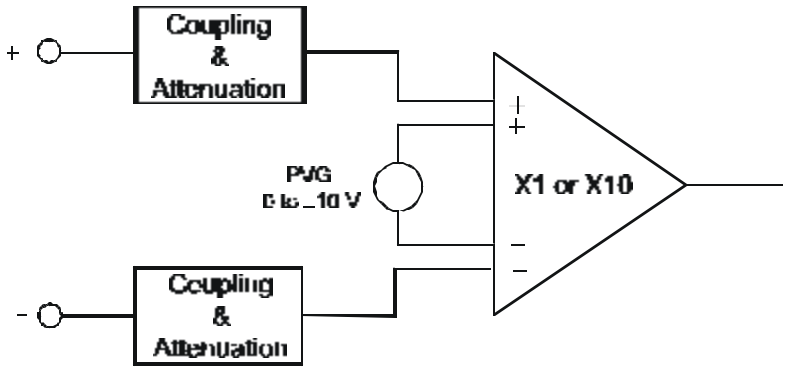

Figure 4-2. Block Diagram V_{Diff} Mode.

The following part is divided in 2 sections: One pertaining to oscilloscopes with ProBus interface and one pertaining to instruments without ProBus interface.

SETTING UP THE OSCILLOSCOPE WITH PROBUS INTERFACE

Connect the RJ-45 type connector of the ProBus interface cable to the **REMOTE** connector and one end of the BNC cable to the **AMPLIFIER OUTPUT** on the rear panel of the DA1855A and the other end of the BNC cable to the ProBus connector. Connect the

ProBus connector to any vertical channel. Select the channel to which the DA1855A is connected and, if necessary, press the button next the **Trace** menu, located on the right side of the screen, to turn the channel ON. Figure 4-1

Switch the power switch located on the DA1855A's rear panel to **1** (ON) and observe the front panel indicators. Initially, each indicator light will be ON and the red **OVERLOAD** indicator will be ON as well. All segments in the Precision Voltage Generator display will be ON. The **+INPUT** and **–INPUT** Coupling Indicators will switch to OFF while the amplifier performs the Auto Zero function and back to the original setting. After approximately 3 seconds from turn on, the DA1855A will return to the settings in effect when the power was last turned off. The oscilloscope's input impedance has been set to 50 Ω automatically through the ProBus interface, the trace has been centered and all DA1855A front panel controls are locked out.

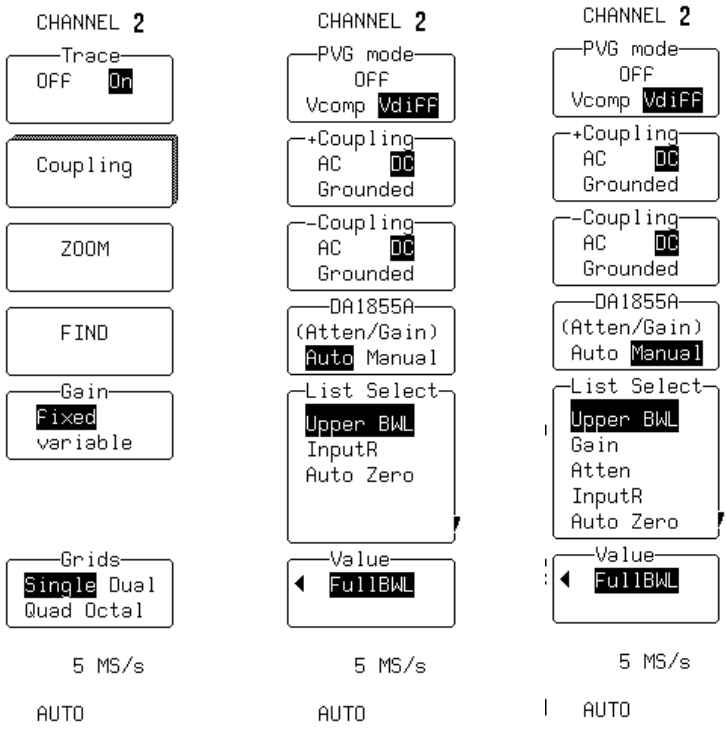

Figure 4-1. Oscilloscope set up

Pressing the button next to the **Coupling** menu will activate the DA1855A menus. Pressing the button next to the **DA1855A** menu to switch from **Auto** to **Manual** causes a new menu to appear to allow access to the Gain and Attenuator functions of the DA1855A. Figure 4-1.

Set the DA1855A as follows by selecting and pressing the appropriate menu buttons:

PVG Mode	OFF
+Coupling	DC
–Coupling	Grounded (OFF)
DA1855A (Atten/Gain)	Auto
List Select: Upper BWL	Full BWL
List Select: Gain	X1
List Select: Atten	¸10
List Select: Input R	1 MW

ATTENUATOR AND GAIN OPERATION

Connect the function generator output to the **+INPUT** BNC connector and apply a sine wave of 50 kHz and 1.0 Vp-p amplitude. If necessary, set the oscilloscope scale factor to 0.50 V/div. The signal on the oscilloscope should be 2 divisions peak to peak. Adjust the oscilloscope's time per division and trigger to display at least two complete cycles of the waveform. Set the DA1855A **Atten/Gain** in the menu to **Manual**. In the List Select menu, select **Atten** and in the Value menu select **/1**. The waveform's magnitude on the oscilloscope's display will increase by a factor of 10, to 50 mV/div, the waveform will extend and extend off the top and bottom of the screen. The **X1** light will be lighted in the **EFFECTIVE GAIN** front panel display. Reduce the function generator's output until the oscilloscope's display is again 2 divisions peak to peak.

Now select **Gain** in the List Select menu and set the gain to **X10** in the Value menu. Observe the following changes: The **+INPUT**'s **DC** light will momentarily go out and its **OFF** light will be lighted before returning to their previous states. This momentary change

is the result of the DA1855A automatically adjusting its DC Balance. The **X10** light will be lighted in the **EFFECTIVE GAIN** display and the display on the oscilloscope will again extend off screen. The overall sensitivity of the DA1855A and the oscilloscope is now 5mV/div.

COMPARISON VOLTAGE OPERATION (V_{COMP})

In the COUPLING menu, set the DA1855A as follows through the oscilloscope user interface:

PVG Mode	**OFF**
+Coupling	**DC**
–Coupling	**Grounded (OFF)**
DA1855A (Atten/Gain)	**Manual**
List Select: Upper BWL	**FULL BWL**
List Select: Gain	**X10**
List Select: Atten	**¸1**
List Select: Inpur R	**1 MW**

Set the Function generator's output to 50 kHz and 100 mVp-p sine wave and the output connected to the DA1855's **+INPUT**.

Set the oscilloscope to 5 mV/div. Under these conditions, the display on the oscilloscope will extend off the top and bottom of the screen.

In the **PVG Mode** menu switch to **V_{COMP}**. This internally applies the Precision Voltage Generator's output to the –**INPUT**. The **OFF** light on the DA1855A's front panel goes out and the –**Coupling** menu on the user interface disappears (the **–INPUT** connector is disabled).

The positive and negative peaks of the waveform displayed on the oscilloscope are (respectively) 10 divisions above and below the display center line. Rotate the **OFFSET** knob on the oscilloscope until the positive peak of the waveform appears in the oscilloscope's display. Continue adjusting the **OFFSET** knob until the peak of the waveform is at the centerline of the

oscilloscope's display. The number in the Precision Voltage Generator display is the waveform's positive peak voltage.

Rotate the **OFFSET** knob clockwise until the negative peak of the signal is now at or near the oscilloscope's display centerline. By adjusting the **OFFSET** knob, the negative peak can be positioned to the oscilloscope's display centerline. Now the number in the Precision Voltage Generator's display is the waveform's negative peak voltage.

Change the oscilloscope's sensitivity from 5 mV/div to 1 mV/div. Select **Auto Zero** in the List Select menu and push the button next to Auto Zero window to cause the DA1855A to adjust its DC balance.

Change the **OFFSET** control to again place the negative peak of the waveform at the oscilloscope's center screen. Note that the Precision Voltage Generator's display represents the negative peak voltage of the waveform with greater resolution.

Return the oscilloscope's sensitivity to 50 mV/div and select **OFF** or in the PVG Menu. The Precision Voltage Generator will retain its setting and the display on the oscilloscope will be centered about the centerline. Following are a few observations on using the DA1855A comparison voltage mode (**V_{COMP}**):

- The negative input and its **AC**, **OFF** and **DC** coupling are disabled. Instead of being a differential amplifier, the DA1855A becomes a differential comparator. It compares the voltage present at the **+INPUT** with the output of the Precision Voltage Generator and when they are equal, the output of the DA1855A is zero volts.
- The value displayed by the Precision Voltage Generator indicates a waveform's voltage, with respect to ground, as it passes through the oscilloscope display's centerline. By using the DA1855A in the comparison voltage mode and the oscilloscope in a high sensitivity setting, highly accurate voltage measurements can be made.

DIFFERENTIAL OFFSET OPERATION (V_{DIFF})

In the Coupling menu, set the DA1855A up as follows through the oscilloscope user interface:

PVG Mode	**V_{COMP}**
+Coupling	**DC**
DA1855A (Atten/Gain)	**Manual**
List Select: Upper BWL	**FULL BWL**
List Select: Gain	**X10**
List Select: Atten	**¸1**
List Select Input R	**1 MW**

Leaving the OFFSET control set as in the previous example, the DA1855A front panel indicators should be lit as follows:

+INPUT	**DC**
–INPUT	**V_{COMP}**
BW LIMIT	**FULL**
GAIN	**X10**
ATTENUATOR	**¸1**
INPUT RESISTANCE	**1 MW**
PVG	**+0.0500**
COMPARISON or DIFFERENTIAL	**COMPARISON**
EFFECTIVE GAIN	**X10**

Set the Function generator's output to 50 kHz and 100 mVp-p sine wave and the output connected to the DA1855's **+INPUT**.

Set the oscilloscope to 5 mV/div and time/div adjusted to display 2 to 3 cycles.

Externally trigger the oscilloscope by connecting a cable from the function generator's output (same signal as is applied to the DA1855A's **+INPUT**) or from the Trigger Signal out on the

Function generator to the External trigger input of the oscilloscope.

Under these conditions, the negative peak of the display on the oscilloscope should be very near center screen. Adjust the **OFFSET** knob on the oscilloscope until the negative peak is at center screen.

Select **V_{DIFF}** in the PVG Mode window. This internally applies the output of the Precision Voltage Generator to a point within the DA1855A's amplifier that facilitates a true differential offset. The **V_{COMP}** light went out and the **OFF** light was lighted. In the line under the Precision Voltage Generator display (**COMPARISON** or **DIFFERENTIAL OFFSET**), the **COMPARISON** light went out and the **DIFFERENTIAL** light was lighted. This indicates that the Precision Voltage Generator will now be applied as a differential offset rather than as a comparison voltage as in the previous exercise. Both the **+INPUT** and the **–INPUT** inputs are now enabled, even though the **–INPUT OFF** light is still ON**.**

The positive and negative peaks of the waveform displayed on the oscilloscope are (respectively) 10 divisions above and below the display center line. Rotate the **OFFSET** knob above the **VOLTS/DIV** knob on the oscilloscope until the positive peak of the waveform appears in the oscilloscope's display. Continue adjusting the oscilloscope's **OFFSET** knob until the peak of the waveform is at the centerline of the oscilloscope's display. The number in the Precision Voltage Generator display is the waveform's positive peak voltage.

Rotate the **OFFSET** knob clockwise until the negative peak of the signal is now at or near the oscilloscope's display centerline. By adjusting the **OFFSET** knob, the negative peak can be positioned to the oscilloscope's display centerline. Now the number in the Precision Voltage Generator's display is the waveform's negative peak voltage.

Change the oscilloscope's sensitivity from 5 mV/div to 1 mV/div. Select **Auto Zero** in the List Select menu and push the button next to **Auto Zero** window to cause the DA1855A to adjust its DC balance.

Change the **OFFSET** control to again place the negative peak of the waveform at the oscilloscope's center screen. Note that the Precision Voltage Generator's display represents the negative peak voltage of the waveform with greater resolution.

Return the oscilloscope's sensitivity to 50mV/div and select **OFF** in the PVG Menu. The Precision Voltage Generator will retain its setting and the display on the oscilloscope will be centered about the centerline. Following are a few observations on using the differential offset mode (V_{DIFF}) of the DA1855A:

- Both the positive and negative inputs (**AC**, **OFF** and **DC**) are enabled and the DA1855A remains a true differential amplifier.
- The value displayed by the Precision Voltage Generator indicates a waveform's differential voltage, with respect to the –**INPUT**, as it passes through the oscilloscope display's center line.
- By using the DA1855A in the differential offset mode and the oscilloscope in a high sensitivity setting, high resolution voltage measurements can be made.
- The Precision Voltage Generator can be used as a position control which allows the DA1855A to operate in its most linear region.

SETTING UP THE OSCILLOSCOPE WITHOUT PROBUS INTERFACE

Connect a 50 Ω coaxial cable between the **AMPLIFIER OUTPUT** BNC on the DA1855A rear panel and the oscilloscope's input connector. If the oscilloscope has 1 MΩ and 50 Ω input capability, select 50 Ω. If the oscilloscope has only a 1 MΩ input, terminate the coaxial cable at the oscilloscope's input with a 50 Ω feed-through terminator. It is important that the DA1855A be terminated by 50 Ω.

Set the oscilloscope vertical scale factor to 50mV/div. Set the oscilloscope's input coupling to **GND** or **OFF** and position the trace to center screen. **Do not move the oscilloscope position setting after this initial set-up**. Change the oscilloscope input coupling to **DC**.

Change the power switch located on the DA1855A's rear panel to **1** (ON) and observe the DA1855A's front panel indicators. Initially, each indicator light will be ON and the red **OVERLOAD** indicator will be ON as well. All segments in the Precision Voltage Generator display will be ON. After approximately 3 seconds, the DA1855A will return to the settings in effect when the power was last turned off.

Set the DA1855A as follows:

+INPUT	**DC**
–INPUT	**OFF**
BW LIMIT	**FULL**
GAIN	**X1**
ATTENUATOR	**¸10**
INPUT RESISTANCE	**1 MW**
PVG	**+00.000**
COMPARISON or DIFFERENTIAL	**COMPARISON**
EFFECTIVE GAIN	**¸10**

ATTENUATOR AND GAIN OPERATION

Connect the function generator output to the **+INPUT** BNC connector and apply a sine wave of 50 kHz and 1.0 Vp-p amplitude. The signal on the oscilloscope should be 2 divisions peak to peak amplitude. Adjust the oscilloscope's time per division and trigger to display at least two complete cycles of the waveform.

Press the **¸1 ATTENUATOR** button on non-ProBus operated systems or selecting **Atten** in the List Select menu and setting the attenuation to **/1** in systems with ProBus interface. The waveform's magnitude on the oscilloscope's display will increase by a factor of 10 and extend off the top and bottom of the screen. The **X1** light will be lighted in the **EFFECTIVE GAIN** display. Reduce the function generator's output until the oscilloscope's display is again 2 divisions peak to peak. The overall sensitivity of the DA1855A and the oscilloscope is now 50 mV/div.

Now press the **X10 GAIN** button. Observe the following changes: The **+INPUT**'s **DC** light will momentarily go out and its **OFF** light will be lighted before returning to their previous states. This momentary change is the result of the DA1855A automatically adjusting its DC Balance. The **X10** light will be lighted in the **EFFECTIVE GAIN** display and the display on the oscilloscope will again extend off screen. The overall sensitivity of the DA1855A and the oscilloscope is now 5 mV/div.

COMPARISON VOLTAGE OPERATION (V_{COMP})

Leave the DA1855A set up as in the previous exercise or set as follows:

+INPUT	**DC**
–INPUT	**OFF**
BW LIMIT	**FULL**
GAIN	**X10**
ATTENUATOR	**¸1**
INPUT RESISTANCE	**1MW**
PVG	**+00.00**
COMPARISON or DIFFERENTIAL	**COMPARISON**
EFFECTIVE GAIN	**X10**

Set the Function generator's output to 50 kHz and 100 mVp-p sine wave and the output connected to the DA1855's **+INPUT**.

Set the oscilloscope to 50 mV/div (equivalent to 5 mV/div with DA1855A set at X10 GAIN) and time/div adjusted for 2 to 3 cycles.

Under these conditions, the display on the oscilloscope will extend off the top and bottom of the screen.

Press the –**INPUT**'s **V_{COMP}** button. This internally applies the Precision Voltage Generator's output to the DA1855A's –**INPUT** and the **OFF** light goes out (the –**INPUT** connector is disabled).

The positive and negative peaks of the waveform displayed on the oscilloscope are (respectively) 10 divisions above and below the display center line. Push the button above the digit that is two places right of the decimal (10 mV) in the Precision Voltage Generator (PVG) until the positive peak of the waveform appears in the oscilloscope's display. Continue incrementing and decrementing Precision Voltage Generator's digits until the peak of the waveform is at the centerline of the oscilloscope's display. The number in the Precision Voltage Generator display is the waveform's positive peak voltage.

Press the ± button in the Precision Voltage Generator. Observe that the negative peak of the signal is now at or near the oscilloscope's display centerline. By incrementing and decrementing the digits, the negative peak can be positioned to the oscilloscope's display centerline. At this point the number in the Precision Voltage Generator's display is the waveform's negative peak voltage.

Change the oscilloscope's sensitivity from 50mV/div to 10mV/div. Overall sensitivity, including the DA1855A, is now 1mV/div. Temporarily change the oscilloscope's input coupling from **DC** to **GND** (or **OFF**) and re-center the trace to center screen using the oscilloscope's position control. Return its input coupling to **DC**. Now press the **X10** button on the DA1855A to invoke its autozero function. (Note that pressing the gain button that is already selected causes the DA1855A to adjust its DC balance, but does not change its gain.)

Change the Precision Voltage Generator's reading to again place the negative peak of the waveform at the oscilloscope's center screen. Note that the Precision Voltage Generator's display represents the negative peak voltage of the waveform with greater resolution.

Return the oscilloscope's sensitivity to 50 mV/div and press the DA1855A's **–INPUT OFF** (or **AC** or **DC**) button. The Precision Voltage Generator will retain its setting and the display on the oscilloscope will be centered about the centerline. Press the **V_{COMP}** button on the **–INPUT** again and observe that the Precision Voltage Generator's output is again connected to the **–INPUT** of the DA1855A.

Following are a few observations on using the DA1855A comparison voltage mode (**V_{COMP}**):

- The negative input and its **AC**, **OFF** and **DC** coupling are disabled. Instead of being a differential amplifier, the DA1855A becomes a differential comparator. It compares the voltage present at the **+INPUT** with the output of the Precision Voltage Generator and when they are equal, the output of the DA1855A is zero volts.
- The value displayed by the Precision Voltage Generator indicates a waveform's voltage, with respect to ground, as it passes through the oscilloscope display's centerline. It is very important that the oscilloscope's trace be positioned to center screen if an accurate measurement is to be made using this method.

- By using the DA1855A in the comparison voltage mode and the oscilloscope in a high sensitivity setting, highly accurate voltage measurements can be made.
- The Precision Voltage Generator can be used as a position control which allows the DA1855A to operate in its linear region.

DIFFERENTIAL OFFSET OPERATION (V_{DIFF})

Leave the DA1855A set up as in the previous exercise or set it up as follows:

+INPUT	**DC**
–INPUT	**V_{COMP}**
BW LIMIT	**FULL**
GAIN	**X10**
ATTENUATOR	**¸1**
INPUT RESISTANCE	**1 MW**
PVG	**+0.0500**
COMPARISON or DIFFERENTIAL	**COMPARISON**
EFFECTIVE GAIN	**X10**

Set the Function generator's output to 50 kHz and 100 mVp-p sine wave and the output connected to the DA1855A's **+INPUT**.

Set the oscilloscope to 50 mV/div (equivalent to 5 mV/div with DA1855A set at X10 GAIN) and time/div adjusted for 2 to 3 cycles.

Externally trigger the oscilloscope by connecting a cable from the function generator's output (same signal as is applied to the DA1855A's **+INPUT**) or from the Trigger Signal out on the Function generator to the External trigger input of the oscilloscope.

Under these conditions, the negative peak of the display on the oscilloscope should be very near center screen. Adjust the value in the Precision Voltage Generator until the negative peak is at center screen.

Press the **V_{DIFF}** button. This internally applies the output of the Precision Voltage Generator to a point within the DA1855A's amplifier that facilitates a true differential offset. The **V_{COMP}** light went out and the **OFF** light was lighted. In the line under the Precision Voltage Generator display (**COMPARISON** or **DIFFERENTIAL OFFSET**), the **COMPARISON** light went out and the **DIFFERENTIAL** light was lighted. This indicates that the Precision Voltage Generator will now be applied as a differential offset rather than as a comparison voltage as in the previous exercise. Both the **+INPUT** and the **–INPUT** inputs are now enabled.

The positive and negative peaks of the waveform displayed on the oscilloscope are 10 divisions above and below (respectively) the center line of the display. Push the button above the digit that is two places right of the decimal (10mV) in the Precision Voltage Generator until the positive peak of the waveform appears in the oscilloscope's display. Continue incrementing and decrementing the digits in the Precision Voltage Generator until the peak of the waveform is at the center line of the oscilloscope's display. The number in the Precision Voltage Generator display is the value of the waveform's positive peak voltage.

Press the ± button in the Precision Voltage Generator. Observe that the negative peak of the signal is now at or near the oscilloscope display's center line. By incrementing and decrementing the digits, the negative peak can be positioned to the oscilloscope display's center line. Now the number in the Precision Voltage Generator's display is the value of the waveform's negative peak voltage.

Change the oscilloscope's sensitivity from 50 mV/div to 10 mV/div. Overall sensitivity, including the DA1855A, is now 1 mV/div. Temporarily change the oscilloscope's input coupling from **DC** to **GND** (or **OFF**) and re-center the trace to center screen using the oscilloscope's position control. Return its input coupling to **DC**. Now press the **X10** button on the DA1855A to invoke its autobalance function. (Note that pressing the gain button that is already selected causes the DA1855A to adjust its DC balance, but does not change its gain.)

Change the Precision Voltage Generator's reading to again place the negative peak of the waveform at the oscilloscope's center line. Note that the Precision Voltage Generator's display more accurately represents the negative peak voltage of the waveform.

Return the oscilloscope's sensitivity to 50 mV/div and again press the DA1855A's **V_{DIFF}** button. The **V_{DIFF}** light will go out and the display on the oscilloscope will be centered about the center line. Notice that the PVG retains its setting, but the output of the PVG is not applied to the amplifier. Press the **V_{DIFF}** button again and observe that the Precision Voltage Generator's output is reapplied internally to the DA1855A amplifier.

Following are a few observations on using the differential offset mode (V_{DIFF}) of the DA1855A:

- Both the positive and negative inputs (**AC**, **OFF** and **DC**) are enabled and the DA1855A remains a true differential amplifier.
- The value displayed by the Precision Voltage Generator indicates a waveform's differential voltage, with respect to the –**INPUT**, as it passes through the oscilloscope display's center line. It is very important that the oscilloscope's trace be positioned to center screen if an accurate measurement is to be made using this method.
- By using the DA1855A in the differential offset mode and the oscilloscope in a high sensitivity setting, high resolution voltage measurements can be made. The –**INPUT** is the reference for these measurements.
- The Precision Voltage Generator can be used as a position control which allows the DA1855A to operate in its most linear region.

DETERMINING THE PROPER OFFSET MODE

The operation of the Comparison (**V_{COMP}**) and Differential Offset modes (**V_{DIFF}**) are quite similar. The Comparison mode is easier to understand and has a wider range, 15.5 Volt vs. 10.0 Volt. The Differential Offset mode provides offset operation while allowing the DA1855A to function as a true differential amplifier.

For most applications, the Differential Offset (**V_{DIFF}**) mode has advantages over the Comparison (**V_{COMP}**) mode. When using the Comparison mode, the Precision Voltage Generator's output is subtracted from the **+INPUT**. Except for the PVG's offset, operation is the same as a standard single-ended oscilloscope... only one DA1855A input is available. In the Differential Offset mode, the DA1855A functions as a differential amplifier…both

+INPUT and –**INPUT** function. This allows the operator to choose a measurement reference point other than ground. Even in ground referenced measurements, signal degradation can be reduced by using the –**INPUT** probe to select a ground reference point with the least noise. This method is especially useful in eliminating hum and noise from ground loops.

There is one instance in which the Differential Offset ($\mathbf{V_{DIFF}}$) mode might result in more noise. Magnetic pick-up is proportional to the area between the probes. If twisting the probe leads together is not sufficient to reduce magnetic pick-up, the Comparison Offset ($\mathbf{V_{COMP}}$) mode may be preferable.

The Differential Offset ($\mathbf{V_{DIFF}}$) mode is usually the mode of choice if the wider range or higher accuracy of the Comparison ($\mathbf{V_{COMP}}$) mode is not needed.

AVOIDING COMMON PROBLEMS

There are a few situations the operator of either the DA1855A should be aware of to avoid some potential measurement traps.

Exceeding the Common Mode Range

The DA1855A Differential Amplifiers have the largest common mode range available for this type of amplifier and are very good at measuring small differences between two large signals. However, care still must be taken not to allow a large common mode signal to exceed the available common mode range.

Unlike the differential mode signal, which is viewed on the oscilloscope, the common mode signal is normally rejected. Thus, exceeding the common mode signal range may not be noticed by the user.

The maximum common mode range is ± 15.5 Volt when a signal is applied directly (**÷1 ATTENUATOR** and no probes) to the DA1855A's **+** and –**INPUT**s.

Attenuating the input signal extends the common mode range by the same factor as the attenuation. Pressing the **÷10 ATTENUATOR** button increases the common mode range to ±155 Volt, and using a probe with a ¸**10** attenuation factor will too. The effect of the internal **÷10 ATTENUATOR** and the attenuation factor of probes is multiplied just as the signal is attenuated. As an example, using the amplifier's **÷10 ATTENUATOR** with a probe having a ÷100 attenuation factor (total attenuation of ÷1000) results in a common mode range of

15,500 Volt. In this case, the probe's maximum voltage rating probably limits the maximum common mode input voltage.

The gain setting of the amplifier has no effect on common mode range; it is the same in **X10 GAIN** as it is in **X1**.

When making measurements on circuits that are power line referenced, be sure to use enough total attenuation to keep the peak voltage at the amplifier input below 15.5 Volt. **The power line voltage in North America and Japan can exceed 170 Vp and therefore at least a total attenuation of ÷100 should be used.** Line voltages in some other countries are larger but their peak voltages do not exceed the 1550 Volt common mode range that a ÷100 attenuation factor provides.

Using the Oscilloscope POSITION control
(Does not apply when using a LeCroy oscilloscope with ProBus interface)

When operating the DA1855A with a scope, it is very important to set the oscilloscope's position and/or offset control to center screen. There are a couple of reasons for this.

First, the linear portion of the DA1855A's ± 500 mV output range is centered around zero volts. As the DA1855A begins to exceed its limits, the output signal will be distorted. Moving the oscilloscope's position control way from center screen can allow these distortions to appear on the oscilloscope's screen where they may be mistaken for part of the displayed signal.

Second, proper operation of the DA1855A's Precision Voltage Generator (PVG) depends on the operator knowing the location of zero volts on the display. The readout in the PVG is designed to display the voltage of the signal as it crosses the centerline of the oscilloscope screen. If the oscilloscope's position or offset control has been moved, incorrect readings could result.

Using scale factors greater than 100 mV/Div
(Does not apply when using a LeCroy oscilloscope with ProBus interface)

"I know the input to the DA1855A is a sine wave, but I am seeing a square wave on the oscilloscope." This comment is the result of the user setting the oscilloscope Volt/Div to something greater than 100 mV/div. If the oscilloscope sensitivity is set to 200mV/div, the DA1855A will limit at 2½ divisions above and below center screen (zero volt point if the oscilloscope's position control is properly set). Thus, a sine wave large enough to overdrive the DA1855A will appear as a square wave on the oscilloscope.

The DA1855A is designed to cleanly limit the output signal to ± 500 mV. The DA1855A goes into limit when its output reaches ±

500 mV and is designed to recover very quickly once its input signal level decreases sufficiently to allow the amplifier to return to its linear range. The DA1855A will recover from overdrive to its full accuracy much more quickly than most oscilloscopes. Keeping the oscilloscope's position at center screen and using oscilloscope sensitivities between 100 mV/div and 2 mV/div (or the oscilloscope's most sensitive setting) will insure good signal integrity. When the displayed signal contains mostly low frequency components, the operator can use the oscilloscope's 100 mV/div setting to allow large signals to be completely shown on screen.

Failure to Terminate the Amplifier into 50 Ω

(Does not apply when using a LeCroy oscilloscope with ProBus interface)

"All the signals displayed on my oscilloscope seem to be twice as large as they should be." This comment results from not having the output of the DA1855A properly terminated into 50 Ω. When interfaced using ProBus to a LeCroy oscilloscope, the user does not need to be concerned about the termination resistance, as the oscilloscope sets the termination mode automatically.

The DA1855A output impedance is 50 Ω. The cable connecting the DA1855A to the oscilloscope or spectrum analyzer should be 50 Ω and be terminated with a 50 Ω load. If the termination at the end of the connecting coaxial cable is missing, the amplifier will not be properly terminated.

In addition to the error in scale factor, operating the DA1855A with the output unterminated may result in poor high frequency, linearity and transient response. Proper operation of the 1 MHz and 20 MHz bandwidth limit filters also require 50 Ω termination.

POOR OVERDRIVE RECOVERY

The DA1855A output is limited at ± 500 mVp-p to prevent the amplifier from being overdriven by large inputs. Poor recovery may still occur when the oscilloscope vertical scale is set to too high a sensitivity, causing the oscilloscope to be overdriven rather than the DA1855A amplifier. Care must be taken to set the vertical sensitivity such that the oscilloscope is not being overdriven.

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