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Model: AG6
"Aircraft Annunciator, Volt/Amp/Temp Meter, Oil Gauge & Fuel Gauge in one Push Button Display"

INSTALLATION MANUAL

Rev. E 6/18/2014

THANK YOU! . . . for purchasing our Model AG6 from Aircraft Extras, Inc. Please review **ALL** instructions thoroughly before you install and program the AG6. This manual is for Program Version 3.2 and higher and EEPROM Rev.-V and higher.

SUMMARY DESCRIPTION

The AG6 is a full service Aircraft Annunciator, Fuel Gauge, Oil Level Gauge, Volt Meter, Temp. Meter, Current Meter, & more. All devices have programmable alarms. The AG6 utilizes a three color LED back light, push-button, LCD display to minimize panel space. All functions are programmable. The push-button display can be used for programming, acknowledging the alarms, and paging thru up to 16 different screens or "annunciator points". The user can command the AG6 to automatically scan thru each point, or scan manually by utilizing push-button. The system can accept up to 6 input signals. The AG6 was designed for optimization of panel space and the ease of getting to and wiring all inputs. Input power is 12V only.

In order to wire and program the AG6 for your application, a full understanding is needed as to how it functions. Please read all details.

DETAILED OVERVIEW

ANNUCIATOR POINTS

The AG6 can scan thru or display from 1 to 16 different screens or "points". These points are separate entities and can be individually programmed. The user can designate any one of the six input signals for each of these 16 points.

16 Screens or Points vs 6 Inputs

Why is the AG6 capable of displaying 16 screens or points when there are only 6 inputs? The answer is simple. To allow the user to program several different alarms or gauges for the same input signal. For instance, the user might want to display a fuel gauge with no alarms and also have other alarm screens set up to display alarms such as (<30min. fuel remaining), (<45min. fuel remaining), or (Low Fuel).

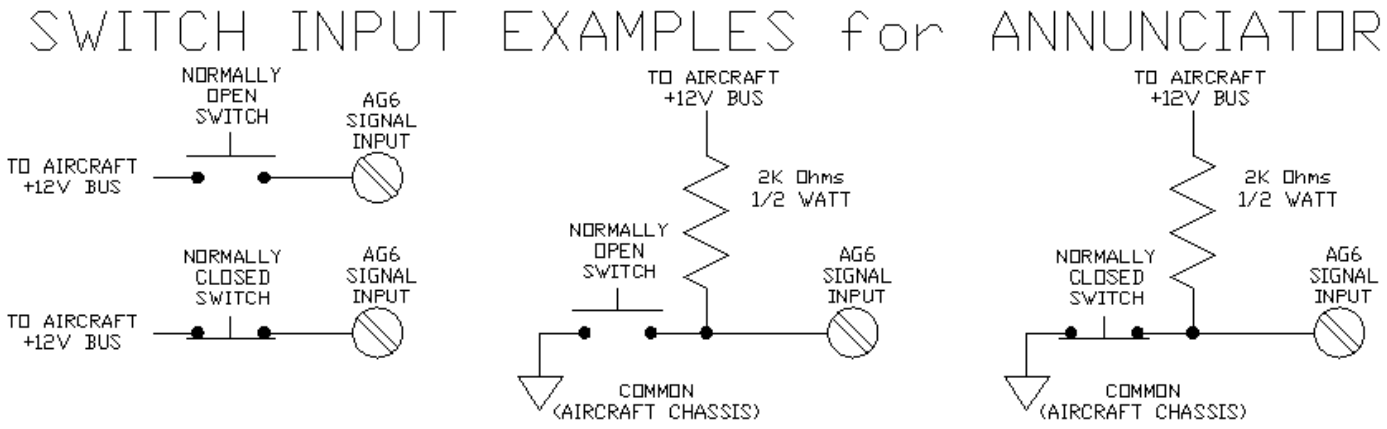
Another example would be that the user might want to monitor the aircraft's bus voltage. He may want to know instantly when there is a high voltage but only want a delayed alarm associated with the low voltage measurement. The user can accomplish this by programming two different annunciator points or screens for the same input.

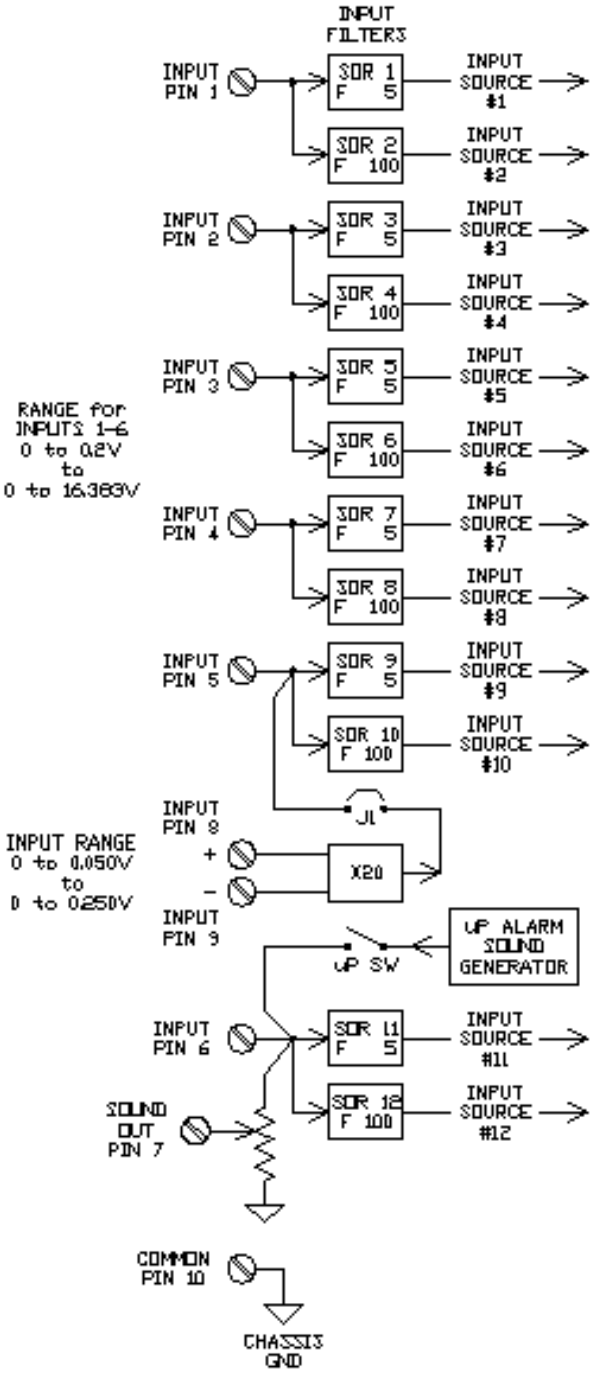
INPUT SIGNALS (Terminals 1, 2, 3, 4, 5, 6 and also 8 & 9)
Refer to Fig. 1. The AG6 can accept up to six input signals. Each input signal must be in the range of (0 to 0.200 volts) minimum, to a maximum of (0 to 16.383 volts) to work properly. (Lower voltage inputs may be used, but are not recommended due to the lower resolution of the input signal.) All inputs are referenced to common or chassis ground with the exception of pins 8 & 9 (see notes below). Negative voltage inputs are **NOT** allowed and will damage the AG6. Pins 1 thru 6 are used for inputs. Common is pin 10 and must be connected to the aircraft negative or chassis ground.

NOTE: If the sound output feature for the alarms is utilized, input #6 (Pin6) cannot be used for an input. The sound feature is configured by the user in the programming set-up. By default, the AG6 is supplied with the sound output off, and input #6 (Pin6) enabled. See detailed description of this feature.

NOTE: If the user decides to use a shunt input or a low voltage input to monitor a current signal, input #5 cannot be used (Pin5). This low voltage input feature is selected by installing the jumper (J1). If J1 is installed, the input source for Input #5 will be terminals 8 & 9. Route your low voltage signal input to these terminals. Be sure that the polarity is correct. The highest voltage accepted by terminals 8 & 9 is 0.25V. By default, the AG6 is supplied with the Low Voltage Input disabled (J1 removed), and the 5th input (Pin5) enabled. See detailed description of this feature.

SIGNAL INPUT for the ANNUNCIATOR
Up to now, we were talking about analog signal inputs for things like fuel gauges, meters, low oil level gauges, etc. The AG6 can also accept switch inputs as well. Examples of these annunciator points are door open, canopy open, fuel pump on, gear down, etc. These types of inputs are referred to as logic inputs. They are either on or off. Below are four examples of how to connect switches to the AG6 inputs. The resistors can be purchased thru Digikey, Mouser, or a local electronic distributor.





←Fig. 1

Current Measurement / Shunt Input / Low Input Voltage Input Terminal 5 vs Terminals 8 & 9

There is one special case where the AG6 can read a low voltage input signal or a signal from a Shunt in order to monitor current. Pins 8 and 9 have been dedicated to this purpose. These two pins can be used for an input signal as low as 0 to 0.050V and as high as 0 to 0.250V. You can even attach these two terminals to the aircraft shunt even if the shunt is in the positive leg of the electrical system. The only stipulation is that the shunt voltage on either terminal is positive with respect to the aircraft common or chassis ground. Please note the proper polarity of this input. If you intend to use these two terminals, you need to install jumper J1 on the board. When you do this, it redirects your signal to the 5th input, pin5. If J1 is installed, DO NOT use pin5 for any other purpose. Leave it disconnected and Pins 8 & 9 will then be your input.

Sound Output & Input Terminal #6

The user may configure the AG6 to generate a sound output on terminal #7 when a valid alarm is present. The sound is only present when the alarm has not been acknowledged by the user. The sound consists of a 1/2 second beeping tone of approximately 668Hz. The sound output is enabled or disabled in one of the initialization variables when programming the input filters. See the programming section for more detail. The output volume can be adjusted by the user by adjusting the "1 turn" VOL potentiometer on the main board. NOTE: When the sound output is enabled, pin #6 cannot be used for an input signal.

INPUT FILTERS

Input filters are used to filter all input signals. One of the reasons for doing this is to eliminate unwanted noise or voltage spikes contained in these signals which interfere with the true input signal. For example, we know that temperature changes rather slowly. To eliminate noise on a temperature input signal, we would set the filter for that input to a "two second time constant". This way, the AG6 will not receive any false readings from the temperature transducer. Another example would be an aircraft battery current signal from a shunt. This current may vary quite dramatically due to the load of the aircraft electrical system. The strobe lights can make the current signal bounce around quite a bit. When you look at this aircraft's current reading on the AG6 display with no filter delay, it is not very stable or readable. If you program the input filter associated with this signal, for a delay of a few seconds, suddenly you obtain a stable reading. You may need to experiment with these filter delays a bit to achieve stable readings. Note that programming too long of a delay may inhibit the ability AG6 from sensing alarms quickly for a given input.

Input Sources – (An important concept to understand before programming)
The AG6 is capable of reading and digitally filtering all 6 input signals every 0.1 Seconds. Each input terminal is routed into 2 separate filters. Each filter is fully programmable by the user from no delay, to a time constant of about 25.5 seconds. The AG6 considers the output of these filters, as "Input Sources". This is an important concept to grasp when configuring the inputs to your AG6. There are 12 "Input Sources" in total, two for each input signal (Input source 1 thru 12). Refer to Fig. 1. When the user chooses an input source for each screen, please refer to this diagram to understand which input source is associated with which input pins. You do not need to utilize both "Input Sources" for an input, unless you desire to use two filter constants and also utilize two programmed points for one signal input.

Input Filter Delay
The AG6 provides two input sources for each signal to give the user the ability to send the same input signal to two different screens and have different response times if desired. (In most cases, only one input source is needed for each signal.) One example of using two input sources may be a fuel gauge and a low fuel alarm. If you want to utilize both screens, for the fuel gauge, you might want the response fast. For the low fuel warning, you might want to slow down the input a bit for better averaging of the fuel quantity due to turbulence and aircraft leveling, etc. In any case, you have the ability to use the same signal input with different output response times.

FILTER VALUE	% of Full Scale 50%	75%	95%	DELAY IN SECONDS
1	0.1	0.1	0.1	
2	0.2	0.3	0.5	
5	0.4	0.75	1.45	
10	0.75	1.45	3.0	
50	3.5	7.0	14.9	
100	7.0	13.9	30.0	
255	17.5	35.4	76.0	

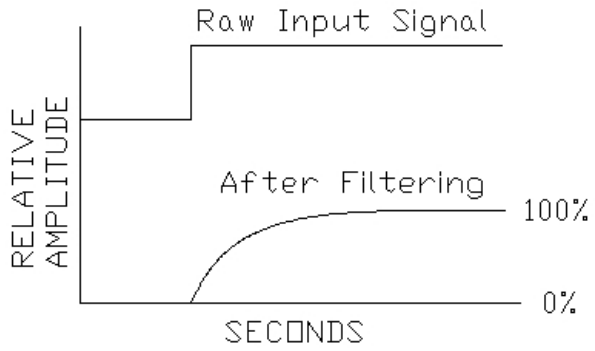
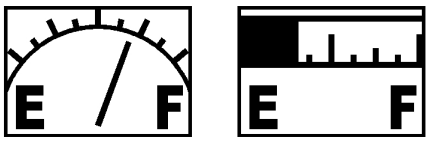


Fig. 2

Fig. 2 details the user programmable filter numbers vs delay in seconds for your reference. For example, if you program a number of 50 for a given input source, the true input signal responds thusly. For a step input, it takes 3.5 seconds to get to 50% of the step value. It takes 7.0 seconds to get to 75% of the step value and so on. ***NOTE:*** It is important to note that *ONLY* the first filter (the ODD numbered Input Sources) can be used as a source for the digital meters.

SCREEN TYPES
There are three basic types of screens that the AG6 is capable of displaying. The first is an "Analog Gauge". The fuel gauge is an example. The second type is a "Digital Meter". An example of this is the Volt Meter or Current Meter. The third type is not a gauge or digital meter. It is a "2 to 5 Zone Alarm" with a screen associated with each zone. See details below.

Screen Type - Analog Gauge
The **Analog Gauge** is simply a digital representation of an analog gauge with alarms. These gauges might look similar to a gauge with a needle or bar meter. You can calibrate the gauge for variations of the input signal like offset and full-scale input. Note: The AG6 does not have the capability of programming the gauge for a non-linear input signal. It assumes a linear signal is coming from your fuel transducer.



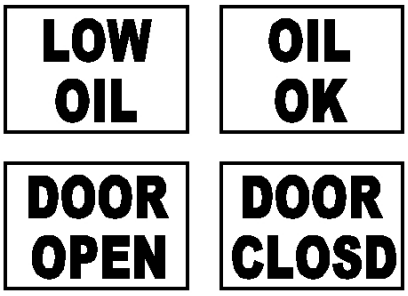
You can also specify 2 to 5 alarm zones for this type of gauge. The alarm zones are fully programmable. You can select attributes such as; number of zones, zone upper and lower limits for each zone, alarm dwell time, alarm self-reset, color, & etc. You can also select the zero and full scale calibration points for a given input signal.

Screen Type - Digital Meter

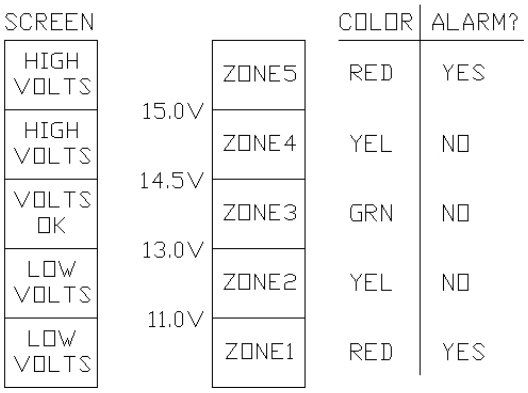
The **Digital Meter** displays a digital number proportional to the input signal. There are several Digital Meter displays available such as Volts, Amps, Temperature, Pressure, and etc. The display numbers are up-dated every second. You can calibrate the number displayed by changing the "Scan Display Offset", the "Scan Display Gain", and the full-scale constants during programming. You can also specify 2 to 5 alarm zones for the digital meter. The alarm zones are fully programmable. You can select attributes such as; number of zones, zone upper and lower limits for each zone, alarm dwell time, alarm self-reset, color, & etc. The AG6 cannot be scalled to display negative numbers. ***It is important to note that ONLY the "ODD numbered input sources" can be used as a source for digital meters.***

Screen Type – Multi-Zone Alarm (2 to 5 Screens/Zones)

The **Multi-Zone Alarm** screen compromises of several screens for a given input. There is an alarm zone specified for each screen. Examples of these displays are below.



For this type of alarm, the user may also specify 2 to 5 screen/alarm zones for each display. Again, these alarm zones are fully programmable. You can select attributes such as; number of zones, zone upper and lower limits for each zone, alarm dwell time, alarm self-reset, color, & etc.



ALARMS

In order to program an alarm for any of the AG6 points or screens, the user needs an understanding of the alarm zone concept. Each annunciator point (whether it is designated a digital meter, analog meter, or multi-state alarm) can be programmed for 2, 3, 4, or 5 alarm zones.

Alarm Zones

Take for instance, one example of a voltage alarm we pre-designated for the user. We know the input signal could go from 0 volts to 16.383V. We would like to designate several alarm zones for this voltage signal. See the diagram. We only want this digital meter to alarm on zone 1 & 5, above 15V and below 11V. We also want the screen to be yellow and not alarm when the voltage is 11V to 13V and 14.5V to 15V. We also want the screen to be green when the input signal is 13V to 14.5V. Using the information in the diagram, the user can easily program all parameters associated with this annunciator point. Note that when programming limits for each zone, you only program the upper limit of each zone. The last zone will not get programmed.

It is assumed that zone1's lower limit is zero, and the upper limit for the last zone is the max input signal voltage.

Alarm Dwell Time (alarm delay)

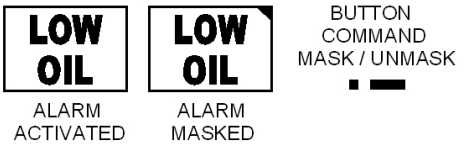
Refer to the diagram in the example above. In order for the AG6 to recognize and display an alarm event, the input "signal source" has to remain within a given alarm zone for a designated period of time. This period of time is called the "Alarm Dwell Time". The user can program this delay time from 0 to 409 Seconds. This alarm delay time will be programmed per a given point. If there are multiple alarm zones designated for a point or screen, and you have two or more zones designated as alarms, all of these alarm zones will use the same delay factor. It is important to note that the "input signal" alone is not used for the alarm zone input. It is the output of the input signal filter (Input Source) as described above. This is why it is important to select the proper filtering delay.

Alarm Self Reset

The user has the ability to have the AG6 automatically acknowledge the alarm of any point. This is designated in the programming for each point. If the Alarm Self Reset is enabled, the alarm will sound and flash for a second or two, then go silent and stop flashing. The screen will still remain red if the input signal source is remains within the alarm zone. Enabling this feature allows the pilot to see and hear these alarms, but relieves him of the task of acknowledging the alarm. This feature could be used for frequent or annoying alarms.

Alarms – Masked

Upon occasion, there may be an alarm that pops up quite frequently. If this alarm is annoying or distracting to the pilot, the pilot may want to get rid of the alarm. The AG6 was designed so that any alarm can be masked or turned off during normal operation. To accomplish this, when the annoyance alarm is visible on the screen, the pilot should enter the mask/unmask command. If the alarm is deactivated, a small triangle will blink in the upper right hand corner of that screen. From this point forward, no alarm condition will activate the alarm for that particular point. Other points are not affected unless they are also masked. The pilot may unmask the alarm with the same command. The blinking triangle will disappear. If the AG6 is turned off and then back on, it will remember that the alarm has been masked. The pilot should scan thru all screens or points to be sure that all alarms are unmasked if he is relying on them to display an alarm. If all alarms are enabled, no blinking triangles will appear on any screen.



Alarms immediately at Start-Up

Upon start-up, there may be alarms present. In other words, the input signals may be within the zones designated as alarms. By default, the AG6 is configured to recognize these alarms and flash an alarm appropriately. If this happens, the pilot must acknowledge the alarms or they will continue to flash and output a sound. All points or screens MAY have to be acknowledged if they are within the alarm zones. If this becomes annoying on start-up, the user may program the AG6 to ignore this condition at start-up only. This feature can be enabled or disabled in one of the initialization variables when programming. It is found at the end of the input filters programming section.

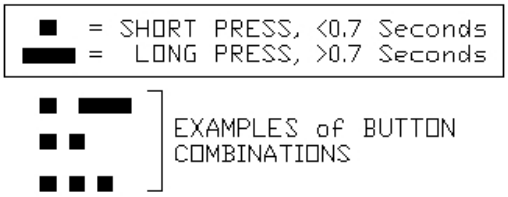
> ***NOTE:*** *If the alarms at start-up are disabled, the input signals have to exit their designated alarm zones and then re-enter for the AG6 to recognize a valid alarm again for that input. If the alarms at start-up are disabled, if they remain within their alarm zones, they will remain red designating an alarm. A danger of disabling this feature is that the pilot may not see all of the alarms unless he scans thru all points or screens after AG6 is powered on.*

Screen – Visible during Scan

There may be some instances where the user only wants to display a screen or point when it has an alarm.

Normally, the example "Cabin Fire" will display "Cabin OK" if there is no fire. This point may be one of 16 screens the user has programmed. It is not necessary in most cases to look at this point when scanning or looking thru all points. In order to minimize the number of points scanned or that the user has to page thru, you can choose the option to only display the screen if there is a valid alarm. The user has this option when programming each point.

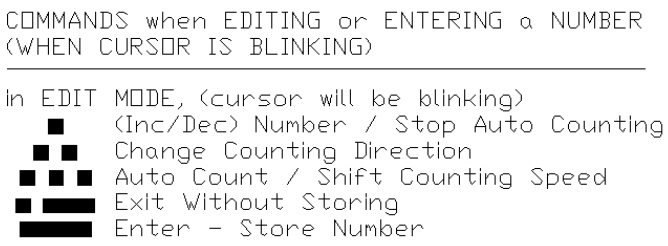
BUTTON PRESSING METHODOLOGY



In order for the user to operate or program any information into the AG6, a good understanding how to use the single button input is necessary. The first two commands you need to know is the short button press, and the long button press. Both are diagramed here. Press the button and hold it down for less than 0.7 seconds, and you have accomplished the short button press. Try this again for greater than 0.7 seconds, and you have accomplished a long press. A given command may be one press (long or short) or a combination of these two presses. You may have to practice this a couple of times to get it right.

BUTTON PRESSING in PROGRAM MODE when EDITING A NUMBER

Some numbers that need to be entered during programming may be quite large, 65535 for example. Entering this number can be difficult if you increment the number by one at a time. The AG6 one button editing method makes this a bit easier if you understand how to use it. Please refer to the diagram. Initially, you will enter the editing mode to edit the programming numbers by initiating a long press. You will know when you are in the edit mode by the appearance of a blinking cursor. From that point on, the commands in the diagram to the left will be active. You can increment or decrement a number one by one using a short press. Doing two short presses will change the counting direction. You will see nothing change after you do this, but the next time you do a short press, it will count in the opposite direction. Doing three short presses will make the number automatically count. Doing three short presses again will make it count even faster. Stop the counting by doing a short press. Doing two short presses can also change counting direction during fast counting. When you are satisfied with the number, do a long press. This will enter in. The blinking cursor will disappear. This also exits out of the editing mode.



LIGHT DIMMING

Pin 12 is connected to the positive end LEDs in the AG6. If no display dimming is desired, connect pin 12 directly to the +12V bus. If you desire to dim the AG6 screen, connect pin 12 to the aircraft light dimmer. The dimmer should output 0V to +12V to fully control the light from no light, to the highest intensity.

SET-UP & PROGRAMMING STEPS MADE EASIER

The AG6 is simple to set-up if you follow these steps.

1.) First, decide how many screens you want to program and what they will be. Review the AG6 screen definitions to select the proper ones for your application. Write these down for a reference. Determine how many inputs you will need and what the signals are. Write those down for each input, (1 thru 6) and (8 & 9).

(for 5 or less inputs or screens)

If you want to use 5 points or less, you can also choose to activate the sound output option. The sound output will be pin 7. (If activated, you cannot use Pin 6.)
If you utilize the lower voltage input pins 8 & 9, you cannot use input pin 5.

(for 6 points or screens)

If you want to use 6 points, you cannot use the sound output option. Deactivate it.
If you utilize the lower voltage input pins 8 & 9, you cannot use input pin 5.

Refer to the programming section how to activate and deactivate the sound output. You will program it accordingly later.

2.) Decide what input pins will be used for your input signals and write these down for your reference. Your input signals must be in the range of (0-0.2V) at the low end, and (0-16.383V) on the high end. There is one exception. If you want to use a shunt input to measure current, or you have a voltage input that is lower than 0 to 0.2V, you can use pins 8 & 9. The input range of these pins is (0-0.05V) to (0-0.25V). If you utilize these pins, do not use pin 5. If you are using pins 8 & 9, install J1.

3.) Install the display in the control panel. For best viewing by the pilot, it should be installed in the panel directly in front of the pilot. A few degrees off from a forward view (30°) may be OK too. Install the motherboard somewhere you can have easy access to the wiring. Wire the unit to the aircraft. Connect the ribbon cable between the display and the motherboard. ***CAUTION - Make sure the banded side of the ribbon cable is on the same side as pin 1 designated on both boards near this connector. See interconnecting cable picture. NO WARRANTY repair if you mistakenly connect the display backward!***

4.) Before you begin programming the AG6, review your list of screen definitions you decided upon for your application. Decide in what order you want your screens to display. Write down the screen definition numbers for the screens you select. Make a note what input signals correspond to these screens.

5.) Turn the AG6 on. Adjust the contrast potentiometer on the driver board for best display viewing.

6.) Programming is next. Review how to enter commands with the push button. Follow the directions for "Enter Programming Mode". Enter the "Prog Screen" Menu. Follow the directions under "Programming the Screen Scan Order". Start with screen #1. Enter your the screens you have selected in the order you desire. Be sure that all other screens have been programmed with a "zero". Exit the "Prog Screen" mode.

7.) Now that you have programmed the AG6 to display your screens in the proper order, you need to select an input filter constant to be associated with all of your screens. Please review the information under "Input Signals", "Input Sources" and "Input Filters" to determine what numbers are right for your application. Enter "Prog Filter" programming area. Here you will enter numbers for the filters for all

input sources. If you do not use both input filters for a given input, enter a "0" in the unused filter. This will program it for no delay. You can change it later if you decide to use it for an additional screen.

8.) You must now alter the programming of the "Screen Definitions" for the points or screens you have selected. This has to be done to customize them for your application. Enter the "Screen Definition" area of the programming menu. IMPORTANT: Follow the instructions under "Screen Definitions" for entering or changing all 32 fields for your application. All 32 fields will need to be changed.

9.) Exit the programming mode. Turn Power off to the AG6 and then power it up. Test the unit for the correct functionality. Review the "System Operation Overview" section. Test the AG6 and yourself to see if you have programmed it correctly and you can operate the AG6 successfully.

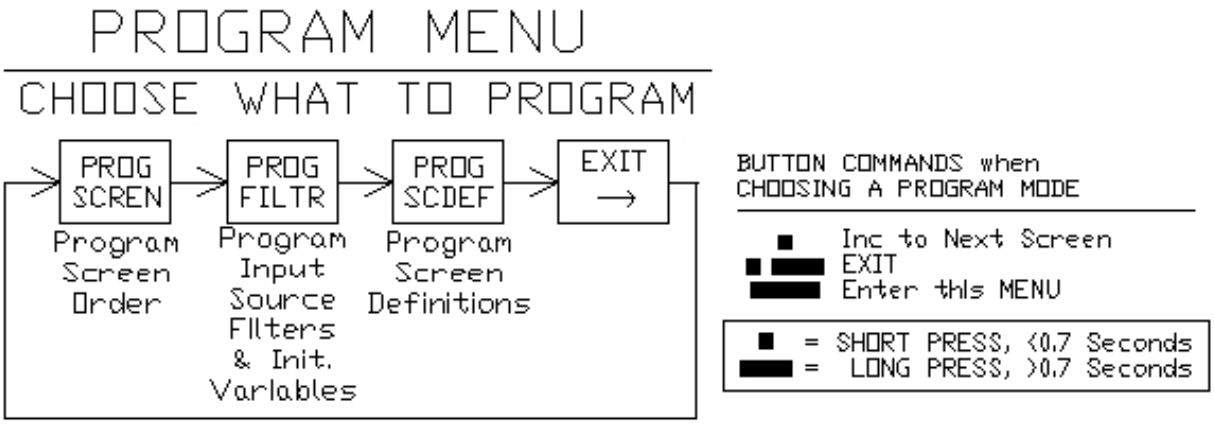
10.) Make a copy of the button operation diagram under "Button Commands During Normal Operation". Put this diagram in the pilot manual. If desired, you can make it a cheat sheet for operation of the AG6.

PROGRAMMING DETAILS

ENTERING PROGRAM MODE

To enter the programming mode, make sure the AG6 is off. While holding the button in, turn on the AG6. Release the button. You are now in the programming mode. You should see the first screen in the Program Menu "Prog Screen". See Fig. 3 for the program mode summary.

Fig 3



Now, by pressing the button with a short press, you can toggle thru the screens as depicted in Fig 3. There are 4 screens to choose from. When you come to a screen that you want to enter, use the button to enter a long press.

PROGRAMMING the SCREEN SCAN ORDER

Enter the "Screen Scan Order" programming section by following the directions under "Entering Program Mode". This is where the user chooses how many screens or points to use and in what order they will be displayed. Toggle thru all screens (1 thru 16) and enter your "Screen Definition Numbers" using the button commands in Fig. 4. Note: to enter data, you have to do a long press. At that point, the cursor under the

number will be blinking. NOTE: Entering a number can be tricky the first time. Please review the number editing commands in figure 4 listed under "when cursor is blinking".

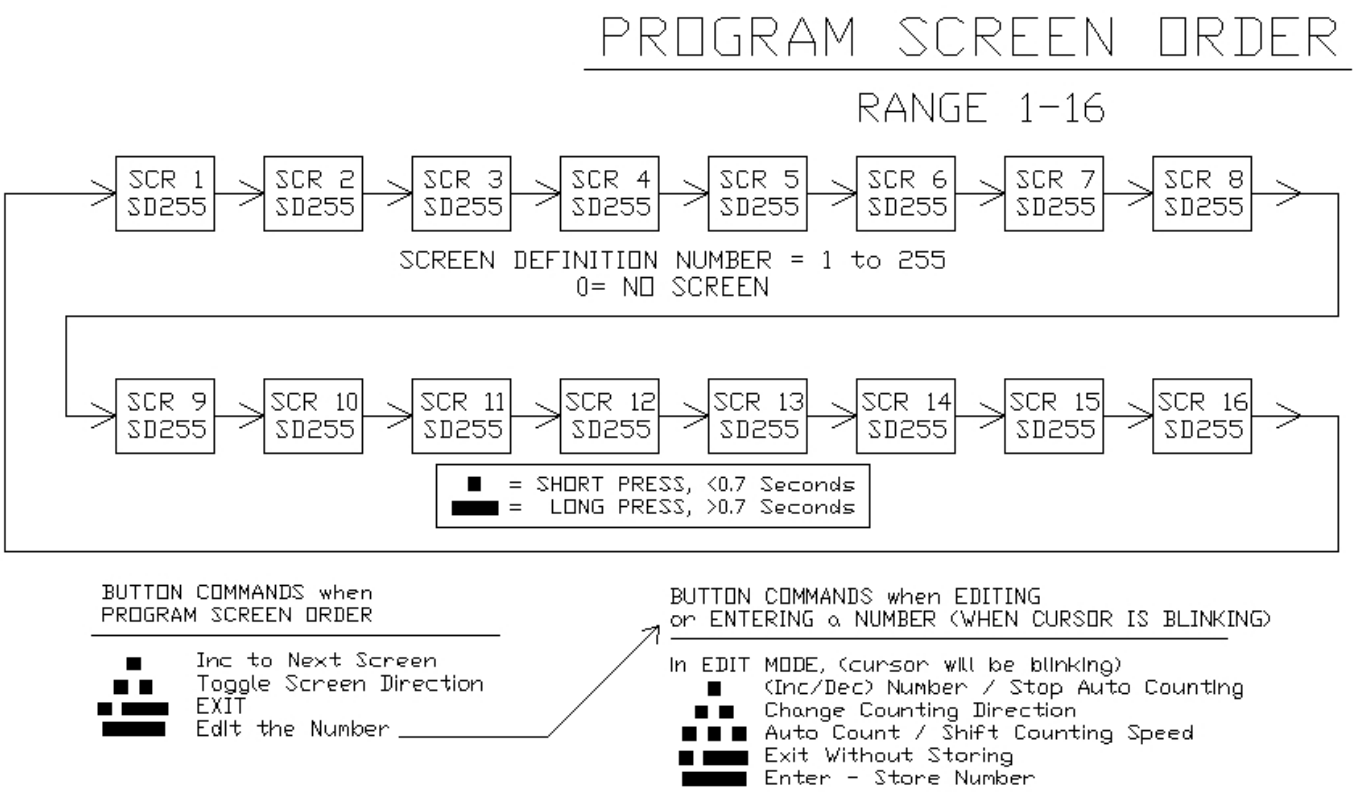


Fig. 4

SCREEN DEFINITION NUMBERS

"Screen Definition Numbers" designate many pre-defined screens. There are 255 possible screen definitions. There are 32 parameters for each screen definition. Please refer to Fig. 5. These screen definitions define what and how the AG6 displays information for each screen. It also tells the AG6 how to operate the alarms and delays. See the Screen Definition Parameter List for an explanation of all 32 screen definitions parameters.

Aircraft Extras, Inc. has created many of these Screen Definitions for the ease of the user. Other Screen Definition Numbers have been left blank so the user can enter their own parameters to create new screens.

NOTE: There can only be one unique Screen Definition Number for each screen in Fig. 4. They should all be different.

Screen Definition Parameter List

(also see Fig. 5)

Screen Number (range 0 - 255)

NOTE: Do NOT program screen 0. It is not used.
Only 1-255 should be a user programmable screen.

IMPORTANT: Entering a number here defines the screen definition number that will be edited when the user views all other remaining parameters. The list is below. Upon entering the "Screen Definition" programming area, this screen will appear asking the user for the Screen Definition Number that is to be programmed. The user **MUST** first enter the screen definition number here, before any other parameters get programmed or changed. Be sure that this number is correct before changing any other parameter! To program another "Screen Definition", go back to this parameter and enter another screen number. From that moment on, all other parameters that will be viewed will be for that screen definition. ***ALWAYS check this number first to see what screen is being programmed!***

Screen Type (64 = Analog Gauge, 128 to 186 = Digital Meter, 32 = 2to5 Zone Alarm)

The Screen Type tells the AG6 what type of screen it should display.
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Digital Meter Screen Types

Screen Type	Description
129	1 Digit, with 0 leading digits blanked
137	1 Digit, with 1 leading digits blanked
130	2 Digit, with 0 leading digits blanked
138	2 Digit, with 1 leading digits blanked
146	2 Digit, with 2 leading digits blanked
131	3 Digit, with 0 leading digits blanked
139	3 Digit, with 1 leading digits blanked
147	3 Digit, with 2 leading digits blanked
155	3 Digit, with 3 leading digits blanked
132	4 Digit, with 0 leading digits blanked
140	4 Digit, with 1 leading digits blanked
148	4 Digit, with 2 leading digits blanked
156	4 Digit, with 3 leading digits blanked
164	4 Digit, with 4 leading digits blanked

Screen Type	Description
133	5 Digit, with 0 leading digits blanked
141	5 Digit, with 1 leading digits blanked
149	5 Digit, with 2 leading digits blanked
157	5 Digit, with 3 leading digits blanked
165	5 Digit, with 4 leading digits blanked
173	5 Digit, with 5 leading digits blanked
134	6 Digit, with 0 leading digits blanked
142	6 Digit, with 1 leading digits blanked
150	6 Digit, with 2 leading digits blanked
158	6 Digit, with 3 leading digits blanked
166	6 Digit, with 4 leading digits blanked
174	6 Digit, with 5 leading digits blanked
182	6 Digit, with 6 leading digits blanked

Screen Base Address (range 0 - 65535)

This is the base address in the AG6 memory for the graphic data for this screen. It points only to the first screen. There may be more data that follows for subsequent screens.
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Number of Frames (range 1 - 32)

This number tells the AG6 how many graphic screens of data are used to define this point or screen. For most points, there will be one set of screen data for every alarm zone.
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Overlay Base Address (range 0 - 65535)

This is the base address in AG6 memory, of the overlay screen graphic data. An overlay is a one

screen picture that is displayed on top of the main screen picture data. Most screens do not use this. *(If you are modifying a predetermined screen, you shouldn't have to change this parameter)*

Screen Dwell Time (range 0 – 25.5)
This is the time that the screen will be visible during an automatic scan.

Screen Visible in Auto Scan and Manual Mode (0 = not visible, 1 = visible)
This tells the AG6 whether to display a screen or not. For example, if it is set to visible, the screen will display as normal. If it is set to not visible, it will only display this screen when there is a valid alarm.

Input Source (range 1-12)
This number designated the input source that is used for this screen. Refer to Fig. 1 for more details.

Input Inverted (0 = input not inverted, 1 = input inverted)
This parameter applies to an "Analog Gauge" or "Multi-Zone Alarm" Screen Type only. It simply reverses the direction of the gauge or display order of the frames for the "Multi-Zone Alarm" Screen Types. Example for Analog Gauge; Normally, an input signal for a fuel gauge will go from 0.0 volts at no fuel, to some higher voltage, say 2.0 volts for a full tank. If this is the case, set the value here to "0".

If the AG6 input signal for this fuel gauge is reversed from this polarity, set this parameter to "1". This will reverse the gauge direction. The voltage span will still be 0 V to 2V, but the zero volt reading display a full tank and the 2V reading will display an empty tank.

Calibration Min. (range 0 – 16.383) the reading is in volts
This number is used for the Analog Gauge type screens only. It defines the minimum voltage input that corresponds with the lowest analog reading. An example of this is a low fuel gauge. If the input voltage goes from 0.1V (min) to 5.1V (max.) this number should be set at 0.100.

Calibration Max. (range 0 – 16.383) the reading is in volts
(This number is used for the Analog Gauge type screens only.) It defines the maximum voltage input that corresponds with the highest analog reading. An example of this is a low fuel gauge. If the input voltage goes from 0.1V (min) to 5.1V (max.) this number should be set at 5.100.

Scan Display Offset (range 0-65535)
This offset parameter is used for the "Digital Meter" Screen Type only. This number will be interpreted by the AG6 as a number from –32767 to +32767. To calculate the correct number for the Scan Display Offset, use this formula. For offsets between 0 and 32767, simply enter the number. For an offset number from –1 to –32767, convert the negative number to a positive value and add it to 32768. Enter this number. Example: If your offset equals "10", enter 10 in **Scan Display Offset** field. For a **Scan Display Offset** of –5, enter 32773. See Scan Display Gain for more explanation.

Scan Display Gain (range 0-65535)
This parameter is only used for the "Digital Meter" Screen Type only. It is used to properly scale the output number on the screen for a given input signal. The following formula is used for normal AG6 inputs.

Number Displayed = [(Input Voltage) x 4000 / (Scan Display Gain)] + Scan Display Offset

(If you are modifying a predetermined screen, you shouldn't have to change this parameter; however, it may need changed if your input signal is different from what we have specified.)

Data Table Address (range 0-65535)

The AG6 does not use the Data Table Address.

(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Alarm Delay (0- 409.0) reading is in seconds

This number corresponds to the number of seconds that the input signal source has to remain in a predefined alarm zone before the AG6 detects an alarm.

Alarm Mask Flag (0 = alarms enabled) (1 = alarms disabled)

If the Alarm Mask Flag = 1, no alarms will be detected for this screen or point. This number can also be set or cleared during normal operation of the AG6 by pressing the button. See the AG6 operating command list to review how to mask an alarm during scan..

Alarm Self Reset (or Alarm Self Acknowledge) Flag (0 = alarm normal, 1 = self reset)

This setting allows the AG6 to automatically acknowledge an alarm after a 5 second interval. Otherwise, the pilot must acknowledge a flashing alarm by pressing the button.

Overlay Present During Alarm Flag (0 = no overlay present, 1 = overlay present during alarm)

This number selects whether the graphic overlay screen is displayed over top of the normal screen during an alarm, or always when the screen is displayed.

(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone1 Boundary (range 0-16.383) the reading is in volts

This number defines the upper boundary of alarm zone1. (volts related to the input signal)
The lower boundary for zone1 is 0.000 volts.

Zone2 Boundary (range 0-16.383) the reading is in volts

This number defines the upper boundary of alarm zone2. (volts related to the input signal)
The lower boundary for zone2 is the upper boundary number for zone1.

Zone3 Boundary (range 0-16.383) the reading is in volts

This number defines the upper boundary of alarm zone3. (volts related to the input signal)
The lower boundary for zone3 is the upper boundary number for zone2.

Zone4 Boundary (range 0-16.383) the reading is in volts

This number defines the upper boundary of alarm zone4. (volts related to the input signal)
The lower boundary for zone4 is the upper boundary number for zone3.

Zone5 Color (0 = LEDs off, 1 = Green, 2=Red, 3= Yellow)

This number defines the upper boundary of alarm zone5. (volts related to the input signal)
The lower limit for boundary is the upper boundary number for zone4.

Zone1 Color (0 = LEDs off, 1 = Green, 2=Red, 3= Yellow)

This number defines what color will be displayed when the input signal is within zone1

(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone2 Color (0 = LEDs off, 1 = Green, 2=Red, 3= Yellow)

This number defines what color will be displayed when the input signal is within zone2

(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone3 Color (0 = LEDs off, 1 = Green, 2=Red, 3= Yellow)
This number defines what color will be displayed when the input signal is within zone3
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone4 Color (0 = LEDs off, 1 = Green, 2=Red, 3= Yellow)
This number defines what color will be displayed when the input signal is within zone4
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone5 Color (0 = LEDs off, 1 = Green, 2=Red, 3= Yellow)
This number defines what color will be displayed when the input signal is within zone5
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone1 Enable Flag (0 = zone1 is not an alarm zone, 1 = zone1 is an alarm zone)
This number defines if zone1 is an active alarm zone.
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone2 Enable Flag (0 = zone2 is not an alarm zone, 1 = zone2 is an alarm zone)
This number defines if zone2 is an active alarm zone.
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone3 Enable Flag (0 = zone3 is not an alarm zone, 1 = zone3 is an alarm zone)
This number defines if zone3 is an active alarm zone.
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone4 Enable Flag (0 = zone4 is not an alarm zone, 1 = zone4 is an alarm zone)
This number defines if zone4 is an active alarm zone.
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

Zone5 Enable Flag (0 = zone5 is not an alarm zone, 1 = zone5 is an alarm zone)
This number defines if zone5 is an active alarm zone.
(If you are modifying a predetermined screen, you shouldn't have to change this parameter)

EXIT

CREATING NEW SCREEN DEFINITIONS

If you discover that we did not preprogram more than one screen that you need to utilize for another point, you can simply create your own Screen Definition and use it. First, you must find a Screen Definition that was not preprogrammed. Look thru the list of Screen Definitions that were not preprogrammed. Another way to fine one that hasn't been pre-programmed, is to find a Screen Definition that has all zeros programmed in all of its variables. If this is the case, it has not been preprogrammed. Programming these will not erase any of the preprogrammed screen definitions.

PROGRAM SCREEN DEFINITIONS

0-32 SCREEN DEFINITIONS

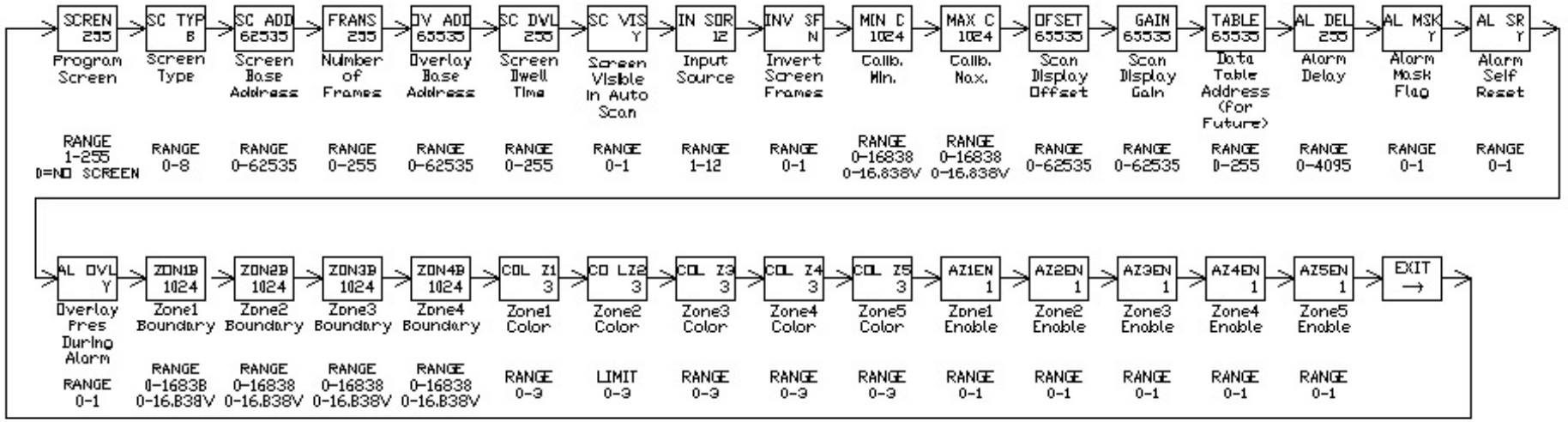
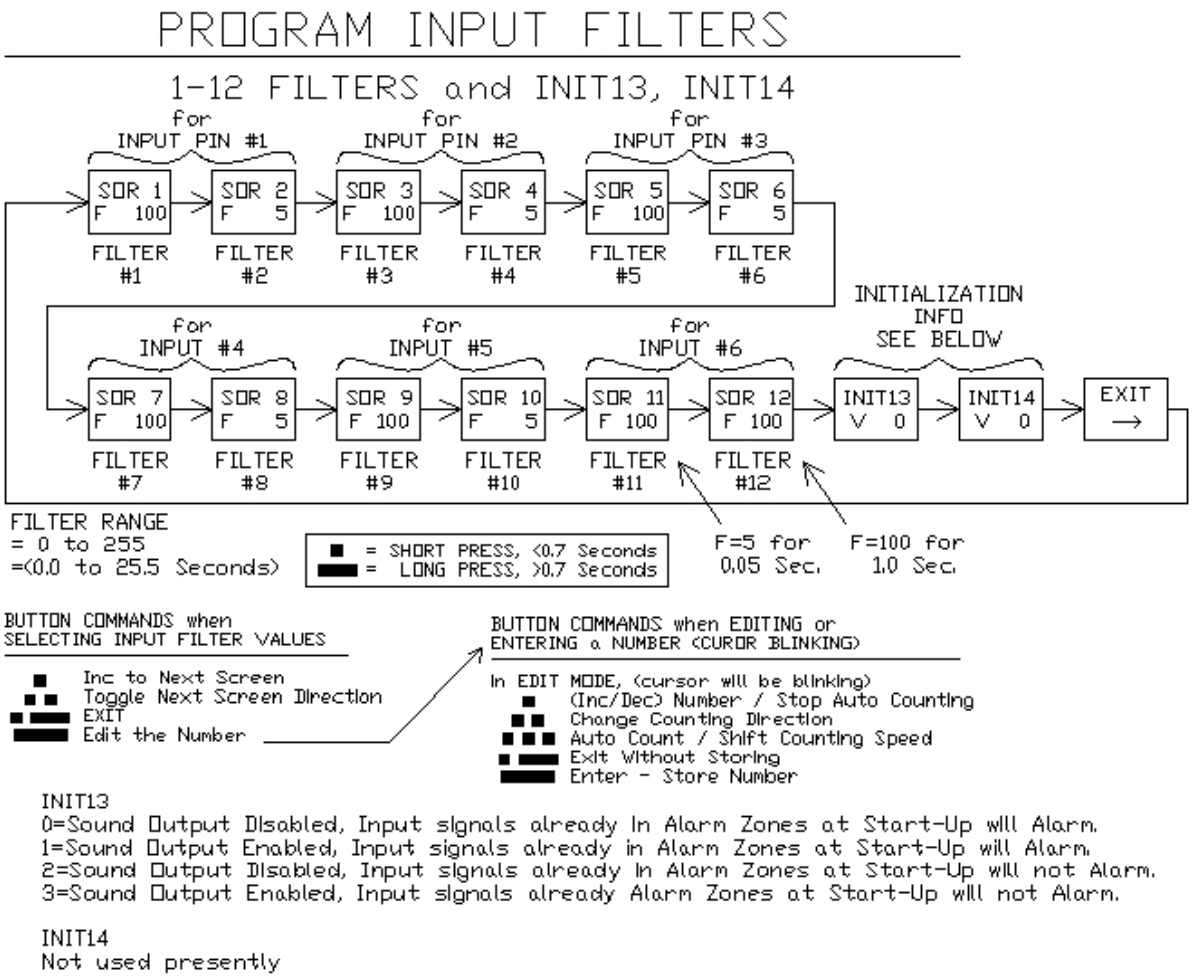


Fig. 5

PROGRAM INPUT FILTERS & INITIALIZATION VARIABLES

Please refer to Fig. 6 and the function of these filters in the detailed overview of this manual. Enter the "Program Input Filters" programming section by following the directions under "Entering Program Mode". This is where the user chooses the input signal filtering and some important initialization variables. Toggle thru all screens and enter your filter numbers and initialization variables. Note: to enter data, you have to do a long press. At that point, the cursor under the number will be blinking. NOTE: Entering a number can be tricky the first time. Please review the number editing commands in figure 4 listed under "when cursor is blinking". Use the information in Fig. 6 to guide you thru the process.

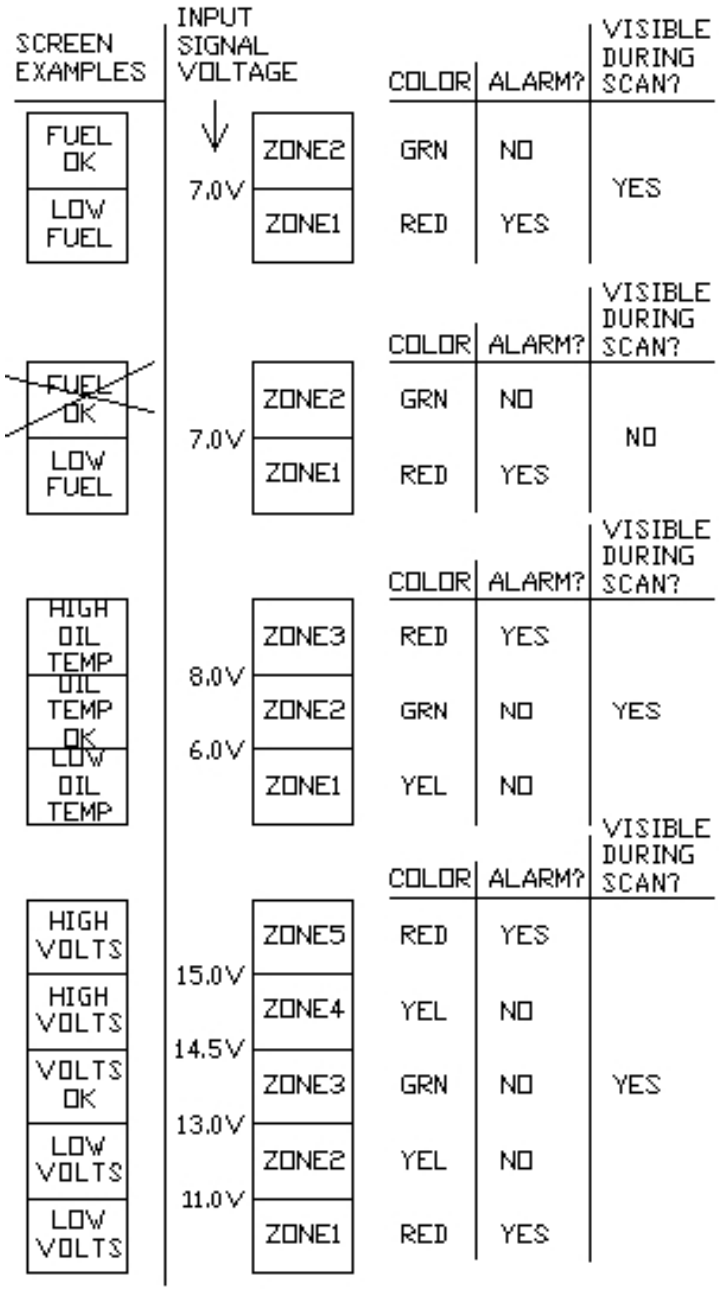


INIT13
0=Sound Output Disabled, Input signals already in Alarm Zones at Start-Up will Alarm.
1=Sound Output Enabled, Input signals already in Alarm Zones at Start-Up will Alarm.
2=Sound Output Disabled, Input signals already in Alarm Zones at Start-Up will not Alarm.
3=Sound Output Enabled, Input signals already Alarm Zones at Start-Up will not Alarm.

INIT14
Not used presently

Fig. 6

SCREEN TYPE
(2 to 5 ZONE ALARMS)



2 ZONE SCREEN with ALARMS
In this example, if the input signal is above 7.0V, the "Fuel OK" will display. If the input signal is below 7.0V, the screen will flash red designating an alarm condition.

2 ZONE SCREEN with ALARMS
This example is the same as the previous example except for one difference. If the input signal is not within the alarm zone (below 7.0V), the screen will now show when you page thru the various screens. It will normally be invisible until it alarms.

3 ZONE SCREEN with ALARMS
In this example, if the input signal is above 8.0V, the "High Oil Temp" will display and the screen will flash red designating an alarm condition. If the input signal is between 6.0V and 8.0V the "Oil Temp OK" screen will display green. If the input signal is below 6.0V, the "Low Oil Temp" will display yellow.

5 ZONE SCREEN with ALARMS
In this example, if the input signal is above 15.0V, the "High Volts" will display and the screen will flash red designating an alarm condition. If the input signal is between 13.0V and 14.5V the "Volts OK" screen will display green. If the input signal is between 14.5 and 15.0V or between 11.0V and 13.0V, the "High Volts" or Low Volts" will display yellow. If the input signal is below 11.0V, the "Low Volts" will display and the screen will flash red designating an alarm condition.

The above screen examples are just some of the pre-determined screens stored within the AG6. You may start with any of these examples and modify them if necessary for your application. The user has the ability to change many parameters associated with each screen. See the list of parameters for the Screen Definitions for more detail.

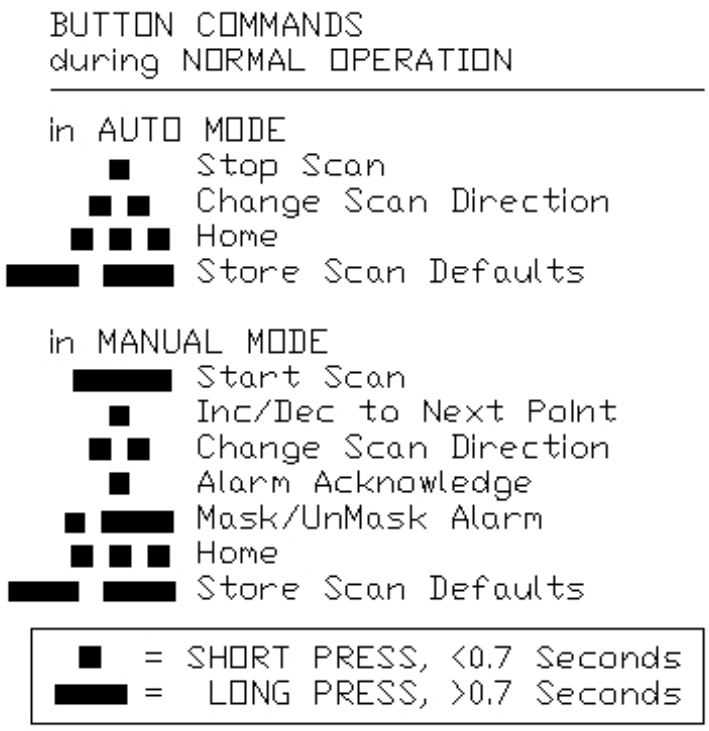
ALARM DWELL TIME
The AG6 utilizes the same dwell time for every zone. It can be set from 0.0 to 409 seconds (6minutes and 49 seconds). This large variable of time lends itself well for a wide variety of applications. One such application is the Fuel Pump On alarm. It gives you the ability to have it on as long as 409 seconds before it alarms.

SYSTEM OPERATION OVERVIEW

COMMANDS
In order to maximize the command capability of a "one button" display, the AG6 adopted a command input similar to the Morse code. A short press is equivalent to a press less than one second. A long press is equivalent a press longer than one second. A combination of these two types of presses will define all commands. Please see the diagram below.

Please notice that there are two different operating modes, manual and automatic. In the automatic mode, the AG6 automatically scans thru each point or screen. (The time delay for each screen is defined in screen definition programming for each screen.) There is a slightly different set of commands for the two different modes. You might cut this diagram out and use it for an operation cheat sheet for the AG6.

BUTTON COMMANDS DURING NORMAL OPERATION



START SCAN / STOP SCAN – This command starts and stops the automatic scanning thru each point or screen.

CHANGE SCAN DIRECTION – This command reverses the present scan direction.

HOME – This command positions the scan to the first point or screen in the scan.

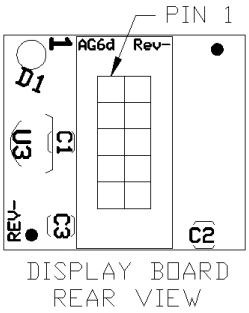
ALARM MASK/UNMASK – This command allows the pilot to mask annoyance alarms so they do not reoccur. Unmasking enables the alarm function for that point again.

ALARM ACKNOWLEDGE – This command acknowledges a blinking alarm. The point or screen will stop blinking and remain red if it is still an alarm zone. The input signal has to exit the alarm zone then re-enter it to trigger another alarm event.

STORE SCAN DEFAULT – This command stores the present scan mode, manual scan or auto scan. Put the AG6 in the mode that you want it to start-up in. Invoke this command. After the scan default is stored, the AG6 will start in that mode when it it powered up.

INSTALLATION

INSTALLING the AG6 DISPLAY/ BUTTON

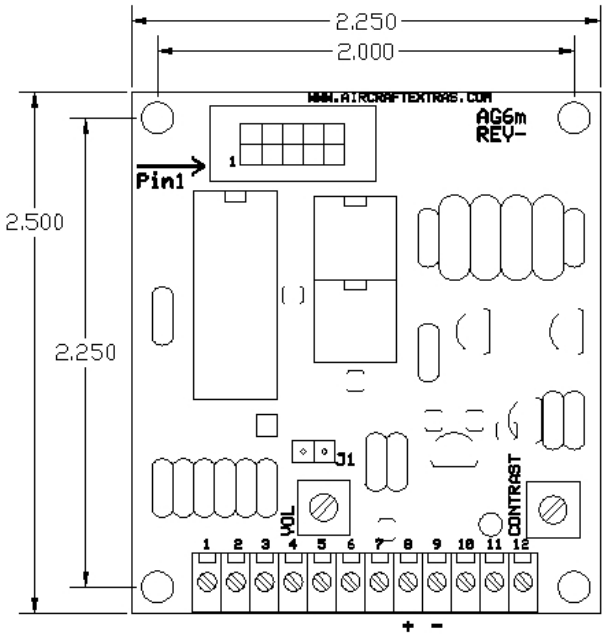


DISPLAY BOARD
REAR VIEW

The AG6 Display/Button should be installed inside the cockpit on the instrument panel. Each button is to be mounted in a rectangular panel cut-out (1.142in. x 0.933in.) [.9mm x 23.7mm] The panel thickness limits are (0.059in. to .157in.) [1.5mm to 4mm]. The maximum width and height of the Display/Button frame is (1.24in. x 1.087in.) [31.5mm x 27.6mm].

INSTALLING the AG6 INPUT/DRIVER BOARD

The associated Input/Driver board should be installed no further from the display/button than 18". This board should be secured to aircraft chassis as shown. The dimensions of the Input Driver board are (2.0in. x 2.5in.) Four mounting holes are used to secure the board to the aircraft chassis using #6-32 mounting hardware. Center to center dimensions are ( )



TERMINAL DESIGNATIONS
1.) INPUT #1
2.) INPUT #2
3.) INPUT #3
4.) INPUT #4
5.) INPUT #5 (See NOTE)
6.) INPUT #6 (See NOTE)
7.) SOUND OUTPUT
8.) SHUNT INPUT +
9.) SHUNT INPUT -
10.) COMMON (AIRCRAFT CHASSIS)
11.) +12V
12.) TO LIGHT DIMMER (0-12Vdc)

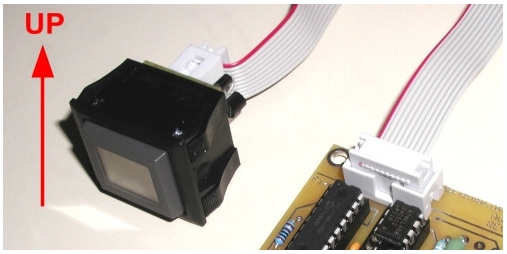
VOL = SOUND VOLUME

CONTRAST = DISPLAY CONTRAST

J1,
INSTALL JUMPER FOR SHUNT INPUT
TERNINALS 8 & 9 TO BE ACTIVE
(NOTE: IF ACTIVE, DO NOT USE INPUT #5)

TERMINAL #6,
(NOTE: DO NOT USE IF SOUND OUTPUT IS
IS ENABLED IN SOFTWARE THE
CONFIGURATION.)

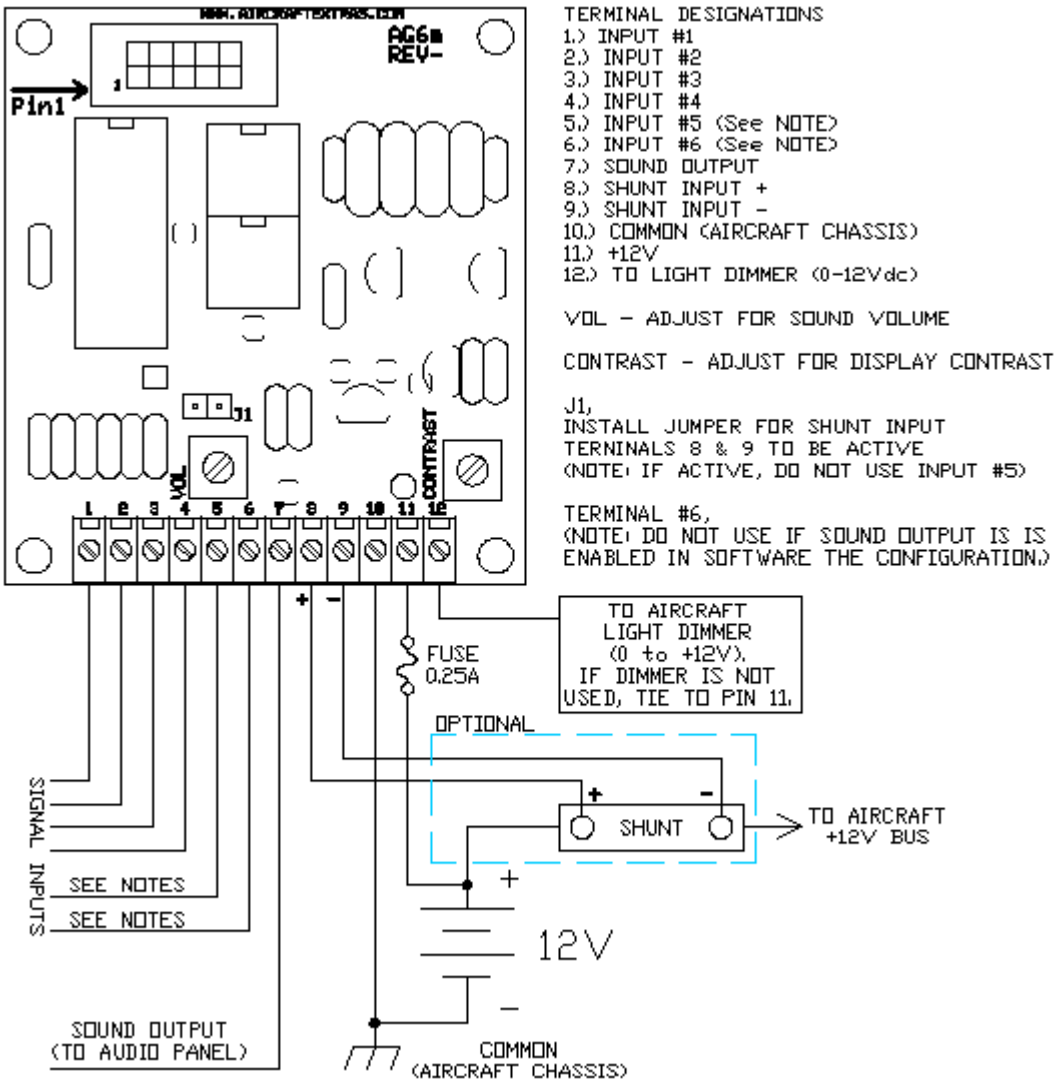
INTERCONNECTING CABLE



We provide an 18 inch long interconnecting ribbon cable to connect the Display/Button to the Input/Driver board. When connecting these two boards together, please pay attention to the location of pin 1. Orient the banded side of the ribbon cable towards pin 1 on both boards. Pin 1 is marked on both boards. If the cable has no banded side, use the pin 1 designation on the connector for this indicator. ***NO WARRANTY repair if you mistakenly connect the display backward, sorry!***

WIRING – INPUTS AND POWER

Review the wiring diagram included, along with the "Standard Aircraft Wiring Practices Guide". All wires are low amperage wires and can be #20AWG to #24AWG. Fusing of the +12V can be done with a 1/4 amp fuse.



CONNECTION DIAGRAM

CAUTION !!

To <u>avoid electrical interference</u>, you should avoid routing all wiring for the AG6, in the same vicinity of your radio transmitter antenna cabling or the strobe light systems. This also includes devices such as the transponder or other types of RF transmitters, or devices that put transients on the +12V power bus.

CURRENT METER CONNECTION

The AG6 was designed to monitor aircraft current by means of an in-line shunt. There are many models and different scalings available of shunts. There is only one input dedicated to this purpose, pins 8 and 9. Please follow the guidelines in the "Shunt Input" section of this manual for programming. Refer to the connection diagram for wiring.

Aircraft Extras, Inc. provided many choices for programming shunts. Review the screen definitions. Choose one of the shunt screen definitions that is closest to your application. If there are no shunts in this list that are exact matches, use the closest one to your shunt scaling. You may alter the gain variable of that screen definition to make the shunt read correctly.

NOTE: A voltage input (referenced to common or aircraft chassis) can also be used as an input for a current meter. This input voltage must be proportional to your current. The signal should be (0 to 0.200 volts) to a maximum of (0 to 16.383 volts). In this case, this voltage can be wired to any input, (terminals 1 thru 6). For programming, select the shunt screen definition that is the closest to your input signal. Choose the proper input source for your signal. Set the gain scaling to calibrate the reading with the actual current.

VOLT METER CONNECTIONS

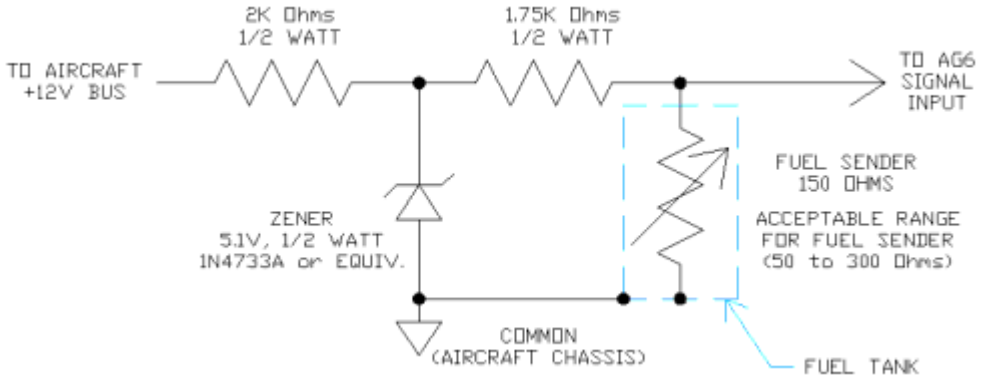
All input terminals (1 thru 6) can be used to measure voltages. The input signal should be (0 to 0.200 volts) to a maximum of (0 to 16.383 volts). Please follow the guidelines in the "Voltage Input" section of this manual for programming. Refer to the connection diagram for wiring.

FUEL GAUGE CONNECTIONS

The AG6 is capable of monitoring a signal from an existing fuel sender that is connected to a fuel gauge, or it can be used with a stand-alone fuel sender. It can be used with a capacitance type fuel sender as long as the sender's output is a current or a voltage proportional to the fuel level. If you want to monitor the voltage signal of an existing fuel sender, simply wire it to any input terminal. This signal should be (0 to 0.200 volts) to a maximum of (0 to 16.383 volts). *NOTE: Monitoring an existing fuel sender (may) not display a linear representation of the fuel. Even though this is the case, this will NOT affect the AG6's ability to detect an alarm at the proper point if the alarm level is programmed properly.*

Fuel Sender New Installation

If you do not presently have a fuel gauge and sender, you will need to design your own system. Follow the example below. Purchase a fuel sender. The maximum fuel sender resistance should be between 50 and 300 Ohms. Most senders fall within this range. Ask your dealer to help you select one. Obtain the rest of the parts below from Digikey, Mouser, etc. Wire per the schematic below. Program the AG6 for a fuel gauge. Set all of the screen definitions for this device; gain, input source, alarms, etc.



OTHER SENSOR INPUTS

There are a variety of sensors for aircraft that the AG6 can utilize as inputs. Sensors that simply have a voltage output can be connected directly to the AG6 inputs. Sensors that change their resistance for a given condition, need to be converted to a voltage first. This can be accomplished using a stable voltage supply and a combination of resistors. Some of these sensors are not very linear. We have designed small resistor networks to linearize them for various customers. The scope and details of this method are too complicated to explain in the AG6 manual. Please e-mail or call us for more details. We can do this for you in most cases. *NOTE: (The AG6 cannot use thermocouple sensors due to their very low voltage output.)*

SOFTWARE UP-DATES

The AG6 is micro-controller based. If there are any safety issues or up-dates, we will attempt to contact you and advise you how to obtain the latest up-dates. Please keep us informed as to your latest address, or please visit our web site regularly to review any up-dates on this product.

DISPLAY CONTRAST ADJUSTMENT

We provide a display contrast adjustment on the mother board. It is possible when the AG6 is turned on, that the display will not be readable at all. This adjustment is provided to optimize the display for your viewing angle. Adjust it on initial power on.

VOLUME ADJUSTMENT

The AG6 will output a tone on pin 7 when there is a valid alarm. The output volume can be adjusted by use of the potentiometer labeled VOL.

SPECIFICATIONS:

Power in:	10 to 15Vdc, (NEGATIVE ground system only)
Current draw:	0.6mA max. (AG6 without LED back light) 65.6mA max. (AG6 with LED back light)
Inputs:	6 inputs (0 to 16.383 volts) (5 inputs available if sound output is utilized)
Input impedance:	36.6K Ohms (terminals 1 to 6)
Input terminals:	accepts 16 to 26AWG
Shunt input:	1 input, 0.05V to 0.25V full scale (If utilized, input #5 cannot be used.)
Display:	LCD with LED back light (Green, Yellow, Red)
Interconnecting cable:	10 conductor ribbon, 18" [457mm] long
Panel cutout for display:	1.142in. x 0.933in. [.9mm x 23.7mm]
Panel thickness for display:	0.059in. to 0.157in. [1.5mm to 3.98mm]
Motherboard:	2.25" x 2.5" [57.2mm x 63.5mm]
Alarms:	All screens are programmable with alarms. Ability for pilot to mask annoyance alarms.
Adjustments:	volume & display contrast
Programmable items:	input source, input filtering, input inverted, auto scan screen dwell times, alarm thresholds, time in alarm zone before alarming (409 seconds max.), alarm self reset, scan or auto scan, number of alarm zones, screen colors, sound output, calibration gain & zero for gauges
Programmable screens:	many - many annunciator type screens, fuel gauges (several types), low oil level gauge, volt meter, current meter

(On the web: www.aircraftextras.com, By e-mail: sales@aircraftextras.com)

GOOD LUCK, have FUN, and please FLY with SAFETY!