

# *The* BRAKESMART®

BrakeSmooth, BrakeSafe, BrakeSmart™



- Any Tow Vehicle / Trailer
- Electric / Electric Hydraulic Brakes
- Unique Gain Adjustment
- Loaded or Unloaded
- Smooth, Proportional Braking

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**OVERVIEW**

The **BrakeSmart** Electric Brake Control allows full system power (amps times volts) to operate standard electric brakes. The **BrakeSmart** also contains features that allow it to work with electric/hydraulic brake actuators. After the **BrakeSmart** has been connected to an electric braked trailer, it will briefly display this information on the vacuum fluorescent display. For electric braked trailers, the **BrakeSmart** rechecks this information every two minutes to verify that it is still connected to the same trailer or if a new one has been connected. The **BrakeSmart** is also checking for problems which will be displayed if encountered. See the section on Error Messages. It is important to understand that the **BrakeSmart** gain setting allows the maximum amount of brake power (voltage) to be generated based on your tow vehicle brake application. With the **BrakeSmart** gain adjustment, you are not setting power limits but spreading available power over a brake pressure spectrum. This is accomplished by utilizing the pressure transducer mounted at the master cylinder of your tow vehicle. The BrakeSmart takes that data and translates it into a smooth, proportionate, trailer brake signal.

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**APPLICATION GUIDE**

The **BrakeSmart** Electric Brake Control is for anyone who wants a trailer brake control that is superior to any other unit on the market. Because the **BrakeSmart** monitors the brake pressure in the tow vehicles brakes, the **BrakeSmart** can be adjusted to provide the desired amount of brakes to the trailer actuator in proportion to the tow vehicle brakes. This is superior to either a pendulum, accelerometer, timer, or cable position based control. As soon as the brake pedal is depressed, some braking is applied to the trailer actuator. Since it is monitoring tow vehicle brake pressure, you have trailer braking that is smooth and proportional to the tow vehicle braking.

**MINIMUM ELECTRICAL REQUIREMENTS**

For the **BrakeSmart** Electric Brake Control to work properly, the electrical system to the controller must provide the following:

- 1. A **battery ground**, not a frame ground.  
**NOTE: Failure to provide proper grounding can result in dangerous intermittent brake operation.**
- 2. A 30 ampere (minimum if you have four axles with electric brakes) source of **12 Volts DC.**
- 3. A 12 volt signal input when the vehicle brakes are applied.

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**INSTALLATION**

Using only standard (SAE) tools, installation is pretty straight forward. Find a space big enough for the **BrakeSmart** that is close to the operator so it can be seen and the buttons can be used. The **BrakeSmart** can be mounted at an angle because it does not use a level sensitive pendulum or accelerometer inside to determine the amount of brakes needed.

**OPERATIONAL TESTING**

Mechanically and electrically connect the tow vehicle to your trailer. Press the "Thumb Brake" on your **BrakeSmart** trailer brake controller and try to pull away. You should feel the trailer brakes trying to hold you back. Release the "Thumb Brake" and you should almost immediately feel the trailer brakes release. If this is not the case, you will need to do some trouble shooting. See the section on **Trouble Shooting Guide** beginning on the next page.

**RESETTING THE CONTROLLER**

Pressing the "M" and "E" keys together at once for a brief moment will reset the controller much like resetting your home computer. All of the settings will be retained. Unplugging the controller from the power harness for 1 to 2 minutes is another reset procedure or a "hard reboot."

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**TROUBLE SHOOTING GUIDE**

<b><u>SYMPTOM</u></b>	<b><u>POSSIBLE CAUSE</u></b>	<b><u>CORRECTIVE ACTION</u></b>
No display No normal trailer brakes No "Thumb Brake"	12 VDC from battery to <b>BrakeSmart</b> missing	Unplug the connector with the Black, Blue, White and Red wires from the back of the <b>BrakeSmart</b> . Use a volt meter or test light to check for 12 VDC between the Black wire on the connector and ground. If no voltage, check for blown "trailer brake control" fuse.
	Improper grounding of <b>BrakeSmart</b> .	Unplug connector with the Black, White, Red and Blue wires from back of <b>BrakeSmart</b> . Use a volt meter to check for continuity between the White wire on the connector and ground. Be sure the electric brake control is grounded to the <u>battery</u> , <b>not the dash or frame</b> .

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**Set Pump Mode:** This is to be set to "ON" if your trailer is equipped with an electric/hydraulic brake actuator. If your trailer is equipped with electric brakes, then the Pump Mode should be set to "OFF." Every 2 minutes the BrakeSmart sends an extremely brief pulse along the trailer brake signal. This voltage pulse is checking for wiring integrity and only lasts milliseconds. Setting the Pump Mode to OFF will not allow any voltage to be sent to the electric motor that runs some of these Electric/Hydraulic pumps.

**Set Power Factor:** Think of this as a very fine tuned gain adjustment, a voltage tuning mechanism. The unit is programmed from the factory at 1.0. This scale can be adjusted in increments from .5 to 1.5. Most users will never need to adjust this setting. Always adjust the Brake Controller Gain first. What this function does is limit or increase the amount of maximum brake you can achieve. Roll it down past 1.0 and essentially maximum brake availability will not be achieved. Raise this up past 1.0 and you will achieve maximum brake at a lower brake pressure, essentially achieving maximum brake faster.

**Manual Button Gain Percentage:** You can actually adjust the gain setting for the manual thumb control from 30% to 90% in increments of 5. Remember that the manual control is separate from the pressure sensor at the master cylinder. The brake achieved by the manual control is only proportionate to how far you depress the manual control.

**Set EGT Cutoff Temperature:** An EGT and Turbo boost module is in the works and will be available soon. This function will allow the user to set the maximum temperature at which the exhaust gas will reach before an alarm is set off.

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**Press Enter for Power Save Mode:** You may instantly turn off the display with this feature. **Note: This does not disable the controller. Your trailer brakes will continue to function if applied.** This function is most commonly utilized during long stretches of night driving. After adjusting the intensity level you may still find the display too bright. The display will come back on as soon as there is any activity such as a brake application.

**Communication Mode:** This function is present to allow for future features and products. Currently, keep this function turned to OFF.

**Daily Devotions Mode:** Turning this ON allows a random Bible verse to be shown in one of the 5 default displays.

**Set Pressure Sensor:** The BrakeSmart can be used with both hydraulic and air brake tow vehicles. There are two types of pressure transducers, hydraulic & air, each of which are included in the appropriate wire harness kit. The controller is factory set for the 2000 psi transducer. For air brake tow vehicles choose 150. There was an earlier version of the pressure sensor that was scaled to 1500 psi. All current kits are using the 2000 psi sensor. The BrakeSmart controller will now recognize the appropriate sensor.

**Fuse Test Mode:** This design feature will alert you if the 15A fuse in the back of the BrakeSmart has blown. This fuse protects the **Manual Brake Light Circuit** only. The BrakeSmart energizes your brake lights when the manual override is used. Your BrakeSmart controller will continue to work if this fuse is blown. This is to alert you that the circuit is being overloaded possibly by other lights. **Note:** If you have LED lights on the Brake Light Circuit, turn this function to Off. LED lights may flash as the BrakeSmart checks this circuit.

**Set Beeper Mode:** Allows you to turn on or off the audible alarm.

**Press Enter for Power Save Mode:** You may instantly turn off the display with this feature. **Note: This does not disable the controller. Your trailer brakes will continue to function if applied.** This function is most commonly utilized during long stretches of night driving. After adjusting the intensity level you may still find the display too bright. The display will come back on as soon as there is any activity such as a brake application.

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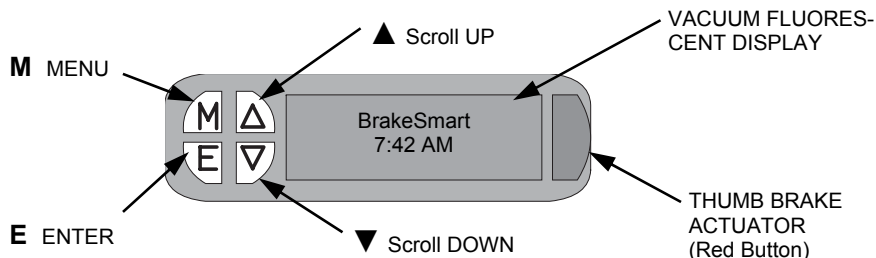
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<u>SYMPTOM</u>	<u>POSSIBLE CAUSE</u>	<u>CORRECTIVE ACTION</u>
No Display & No normal trailer brakes or "Thumb Brake" actuation	Defective electric brake control	If you have both 12 VDC and a good ground, but no display, your control is bad and will have to be replaced.
Has normal display & "Thumb Brake" works but normal tow vehicle activated brakes do not work	Missing tow vehicle brake signal.  Normally operated trailer brakes will not occur without this signal voltage.	Unplug connector with the Black, White, Red and Blue wires from back of <b>BrakeSmart</b> . Use a volt meter to check for 12 VDC between the Red wire and the White wire when the tow vehicle brakes are applied. If not there, check connection of Red wire and brake light switch and vehicle brake light fuse.
Above	Pressure Transducer Signal Missing	Check proper connection at pressure transducer and rear of controller on the transducer harness.
Thumb Brake doesn't turn on stop lights	Fuse in BrakeSmart is blown	Replace 15A fuse located in back panel of BrakeSmart.

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Thumb Brake doesn't turn on stop lights	Fuse in BrakeSmart is blown	Replace 15A fuse located in back panel of BrakeSmart.

**USING THE MENU**

The *BrakeSmart* has a display that normally shows the trademark name "*BrakeSmart*" and the date and/or time, as shown in the picture below.

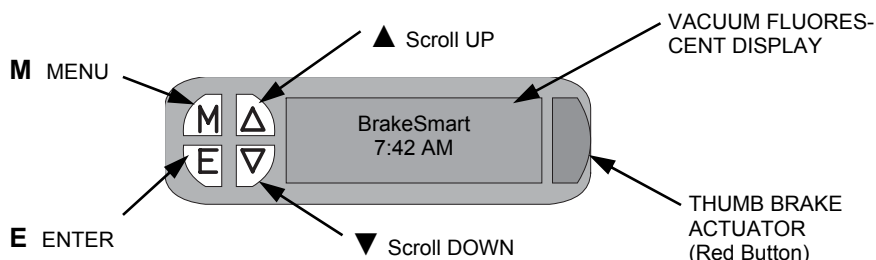


Front view of the *BrakeSmart*

The four buttons on the left provide the operator with access to all adjustments and system information on the *BrakeSmart* controller and brake actuator. The "M" MENU and the "▼" DOWN buttons are the buttons to get into four general categories. There is also a manual "thumb brake" on the right side that can be used anytime to apply trailer brakes.

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**FUNCTION OVERVIEW:**

**Adjust the Brake Controllers Gain:** There are 8 gain settings from minimum to the 50% level and 8 gain settings from 50% to the maximum gain setting. Each adjustment is equal to 62.5 psi in brake pressure. The BrakeSmart allows all available brake power (voltage) to be generated based on your brake application. The scale is from 500 psi to 1500 psi. The BrakeSmart is programmed with a gain setting of 50% at the factory. At 50% gain, all of the available brake voltage will be generated at 1000 psi. Adjusting for **More** gain slides the scale closer to 500 psi. Adjusting for **Less** gain spreads the scale out towards 1500 psi.

**Set Initial Brake Constant:** This feature allows you to adjust the initial voltage that is sent back to your brakes as soon as you have a brake action. You can increase or decrease the "IBC" with the result being a harder or lighter initial brake action as soon as your stop light circuit is activated, **your initial brake action**. This feature is helpful in "balancing" the truck and trailer brake action.

**Set Time of Day:** This feature allows you to set the time of day.

**Set Today's Date:** This feature allows you to set the Month, Day, and Year.

**Enter You Own Custom Message:** You can enter a personal message of up to 16 characters.

**Set Power Off Delay:** You may adjust the time allowed before the display screen goes blank when there has been no activity such as a brake application. The BrakeSmart is programmed with a power management system that automatically shuts down power to the display after a period of time. The power off delay time is adjustable through the menu from 30 minutes to 5 hours in thirty minute increments. This reduces the battery drain from less than one ampere to a few thousands of an ampere. Any activity will bring the display back on.

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**ERROR MESSAGES**

The **BrakeSmart** will display the following error messages with standard electric brakes.

<b><u>MESSAGE DISPLAYED</u></b>	<b><u>POSSIBLE CAUSE</u></b>	<b><u>CORRECTIVE ACTION</u></b>
<b>SHORT DETECTED</b> Note: This message will not clear until problem is corrected. Also, a beeper will come on briefly every three minutes as a reminder that this is a serious problem not to be ignored.	Short anywhere along "Blue" electric brake wire, from the controller to the brake actuator, or one or more of the electric brake magnets.	Repair or replace "Blue" wire. Replace electric brake magnet. Replace brake actuator. Note: If <i>BrakeSmart</i> detected short in brake signal circuit and electrically disconnecting trailer clears message, the problem is on the trailer. Conversely, if electrically disconnecting the trailer does not clear the problem, the problem is on the tow vehicle. The "E" button must be pressed to clear this error code.
<b>TRAILER UNIT NOT DETECTED</b> Note: This message will be briefly displayed.	Not pulling trailer at this time or loose connection.	Check trailer to truck plug connection first, then the electrical connections in the junction box, etc.

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Using the buttons may seem a little intimidating at first, but it is really a fast, powerful capability that can provide the operator with better brake control and more information than any other Trailer Brake control. All of the data and operating parameters that the operator can change are in the **first** general category called **Controller Unit (brake control) COMMANDS**. There are 16 options under the **COMMANDS** (Controller Unit) category. Press the "E" button then the "▼" DOWN button to scroll to the other options.

1. **ADJUST THE BRAKE CONTROLLERS GAIN**
2. **SET INITIAL BRAKE CONSTANT**
3. **SET TIME OF DAY**
4. **SET TODAYS DATE**
5. **Enter your own Custom Message** (Set Your Own Message)
6. **SET POWER OFF DELAY** (Set time allowed before display goes blank.)
7. **Press ENTER for POWER SAVE mode!**
8. **COMMUNICATION MODE**
9. **DAILY DEVOTIONS MODE** (Shows one for each day of the year if turned "ON")
10. **SET PRESSURE SENSOR** (2000 for truck w/ hydraulic brakes/150 for air brakes)
11. **FUSE TEST MODE**
12. **SET BEEPER MODE**
13. **SET PUMP MODE**
14. **SET POWER FACTOR**
15. **MANUAL BUTTON GAIN PERCENTAGE**
16. **SET EGT CUTOFF TEMPERATURE**



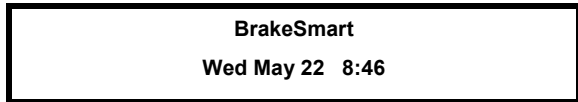
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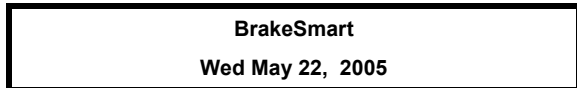
The **second** general category is called **Controller Unit INFORMATION** which cannot be changed. Under this category are:

1. **SERIAL NUMBER** (Serial number of the BrakeSmart brake control)
2. **DISPLAY MFG DATE** (Date BrakeSmart was made)
3. **DISPLAY BIRTHDAY** (Date set after controller was operated 100 times)
4. **VERSION** (Software Version)



Let's ease into how the buttons work by making a few changes.

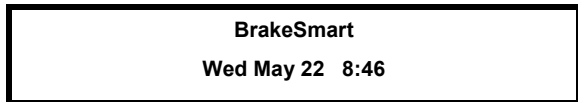
When the BrakeSmart is powered up, it will normally show the trademark name **BrakeSmart** and the time or the date and time. Suppose the unit came up as shown below:



Touch "**E**" ENTER button again and it will toggle to another of the three date/time formats (one with the Daily Devotions) plus a fourth that shows amps on the "blue wire" and the truck battery voltage and one that will show forthcoming EGT and Turbo Boost Information.

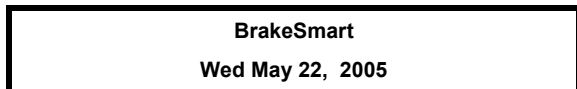
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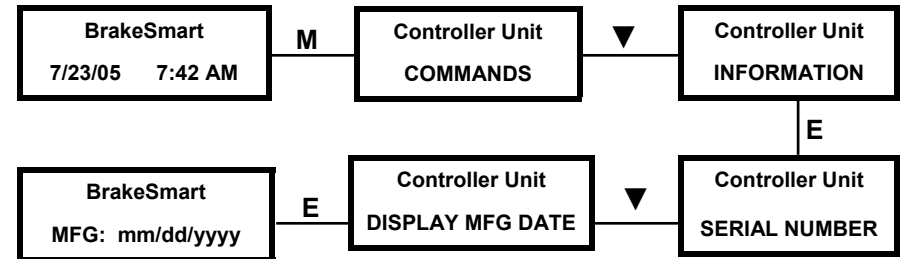
Let's ease into how the buttons work by making a few changes.

When the BrakeSmart is powered up, it will normally show the trademark name **BrakeSmart** and the time or the date and time. Suppose the unit came up as shown below:



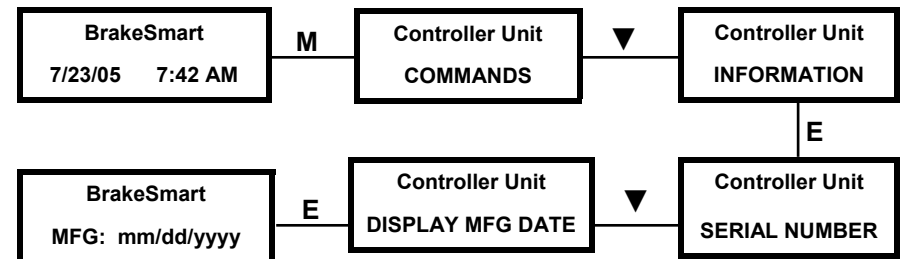
Touch "**E**" ENTER button again and it will toggle to another of the three date/time formats (one with the Daily Devotions) plus a fourth that shows amps on the "blue wire" and the truck battery voltage and one that will show forthcoming EGT and Turbo Boost Information.

MANUFACTURE DATE of Controller Unit Block Diagram



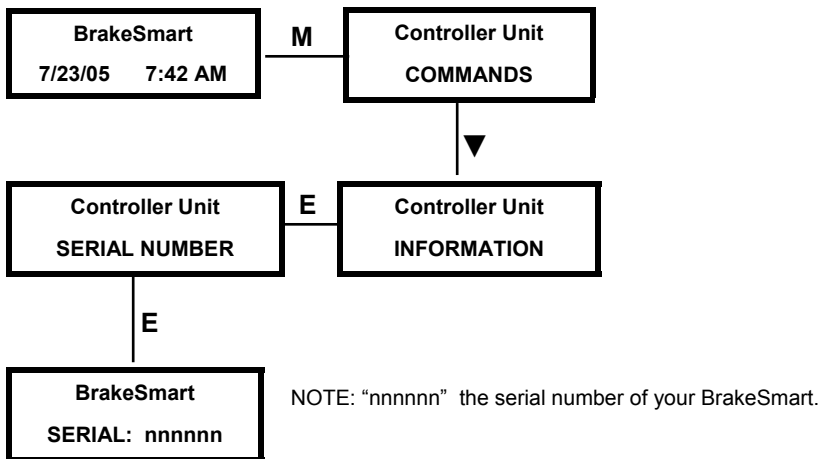
NOTE: "mm/dd/yyyy" is the month, day and year your **BrakeSmart** was manufactured. Record this information on Page 23 for future reference.

MANUFACTURE DATE of Controller Unit Block Diagram



NOTE: "mm/dd/yyyy" is the month, day and year your **BrakeSmart** was manufactured. Record this information on Page 23 for future reference.

SERIAL NUMBER of Controller Unit Block Diagram



Pressing the “**M**” MENU button takes the operator to COMMANDS and using the “**▼**” DOWN button will reveal INFORMATION.

1. **COMMANDS** (Controller Unit)
2. **INFORMATION** (Controller Unit)

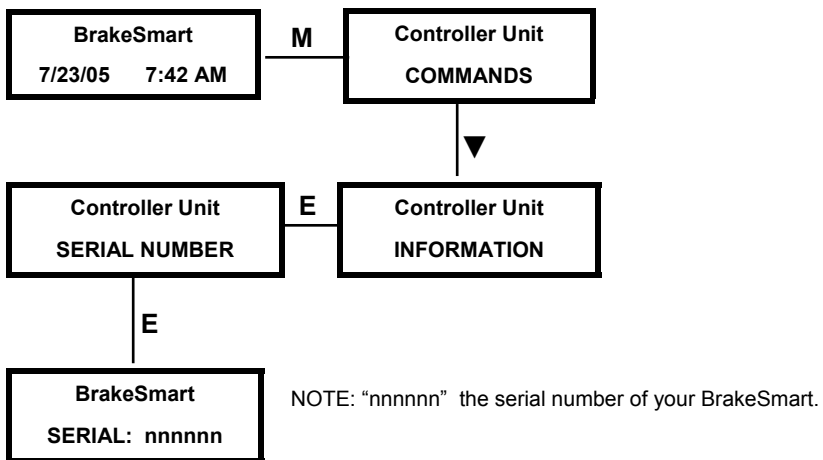
The **second** general category is called **Controller Unit INFORMATION** which cannot be changed. Under this category are:

1. **SERIAL NUMBER** (Serial number of the BrakeSmart brake control)
2. **DISPLAY MFG DATE** (Date BrakeSmart was made)
3. **DISPLAY BIRTHDAY** (Date set after controller was operated 100 times)

**ADJUSTING THE GAIN:**

Let’s say the operator would like to **ADJUST THE BRAKE CONTROLLERS GAIN**. The display will look like the box at the top of the next page before any button is pressed. Remember, the gain adjustment spreads available power over a brake pressure spectrum. It does not set a limit on power output. The BrakeSmart outputs power based on an output brake pressure scale. The scale is from 500 psi to 1500 psi. The controller is factory set at a 50% which is 1000 psi. At 1000 psi output brake pressure, all available brake power (voltage) will be generated. Adjusting the gain for “**More**” will pull the spectrum closer to 500 psi. Adjusting for “**Less**” gain spreads the spectrum out towards 1500 psi. There are 8 settings between 500 and 1000 psi and 8 settings between 1000 and 1500 psi. Each setting is equal to 62.5 psi.

SERIAL NUMBER of Controller Unit Block Diagram



Pressing the “**M**” MENU button takes the operator to COMMANDS and using the “**▼**” DOWN button will reveal INFORMATION.

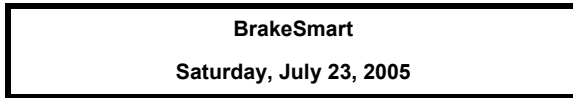
1. **COMMANDS** (Controller Unit)
2. **INFORMATION** (Controller Unit)

The **second** general category is called **Controller Unit INFORMATION** which cannot be changed. Under this category are:

1. **SERIAL NUMBER** (Serial number of the BrakeSmart brake control)
2. **DISPLAY MFG DATE** (Date BrakeSmart was made)
3. **DISPLAY BIRTHDAY** (Date set after controller was operated 100 times)

**ADJUSTING THE GAIN:**

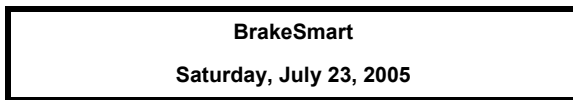
Let’s say the operator would like to **ADJUST THE BRAKE CONTROLLERS GAIN**. The display will look like the box at the top of the next page before any button is pressed. Remember, the gain adjustment spreads available power over a brake pressure spectrum. It does not set a limit on power output. The BrakeSmart outputs power based on an output brake pressure scale. The scale is from 500 psi to 1500 psi. The controller is factory set at a 50% which is 1000 psi. At 1000 psi output brake pressure, all available brake power (voltage) will be generated. Adjusting the gain for “**More**” will pull the spectrum closer to 500 psi. Adjusting for “**Less**” gain spreads the spectrum out towards 1500 psi. There are 8 settings between 500 and 1000 psi and 8 settings between 1000 and 1500 psi. Each setting is equal to 62.5 psi.



Pressing the "M" MENU button and the display will change to:



Pressing the "E" ENTER button to go into the first option under the COMMANDS (Controller Unit) category ADJUST THE BRAKE CONTROLLERS GAIN.



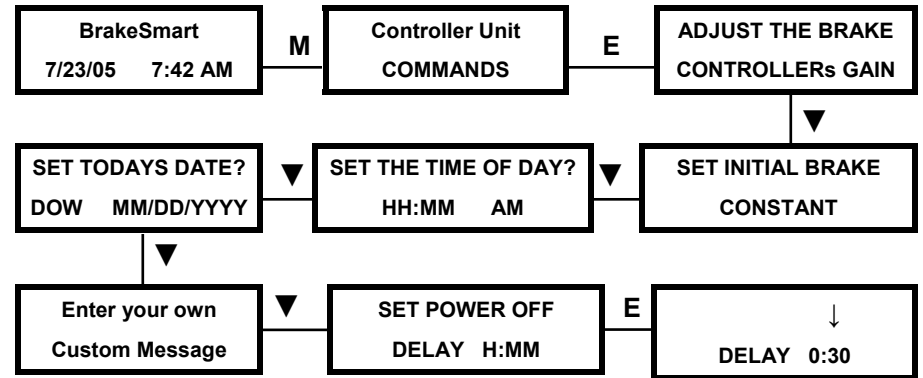
Pressing the "M" MENU button and the display will change to:



Pressing the "E" ENTER button to go into the first option under the COMMANDS (Controller Unit) category ADJUST THE BRAKE CONTROLLERS GAIN.

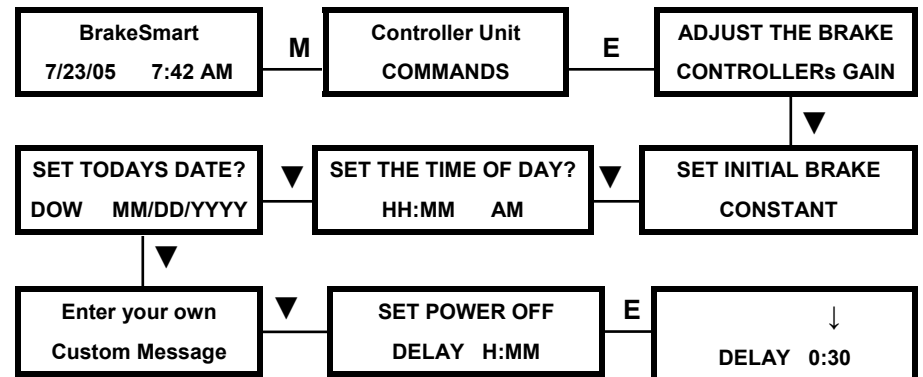


SET POWER OFF DELAY of Controller Unit Block Diagram



NOTE: Use "▲" and "▼" to adjust the time allowed before the display screen goes blank when there has been no activity such as a brake application. Press the "E" to lock in the new time and return to the normal display or just wait and it will return automatically.

SET POWER OFF DELAY of Controller Unit Block Diagram



NOTE: Use "▲" and "▼" to adjust the time allowed before the display screen goes blank when there has been no activity such as a brake application. Press the "E" to lock in the new time and return to the normal display or just wait and it will return automatically.

Fill in the table below with the letters, numbers and symbols you want to show up in your Custom Message, including blanks. This will make it easier to do when you begin to enter your Custom Message .

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

For example, if you wanted the message to read "Bubba's Truck", your work table should be filled in as shown below

		B	u	b	b	a	'	s		T	r	u	c	k					
--	--	---	---	---	---	---	---	---	--	---	---	---	---	---	--	--	--	--	--

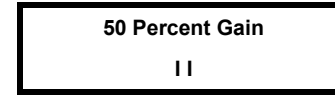
Fill in the table below with the letters, numbers and symbols you want to show up in your Custom Message, including blanks. This will make it easier to do when you begin to enter your Custom Message .

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

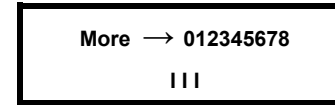
For example, if you wanted the message to read "Bubba's Truck", your work table should be filled in as shown below

		B	u	b	b	a	'	s		T	r	u	c	k					
--	--	---	---	---	---	---	---	---	--	---	---	---	---	---	--	--	--	--	--

Pressing the "E" ENTER button again and the display will show the last setting. The factory setting is for 50% gain as shown below:

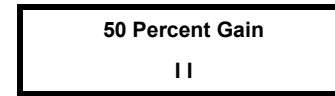


The two vertical bars on the second line indicate that the gain is in the middle. If the operator would like to increase the gain, press "▲" UP button and the display will change to a display as shown below:

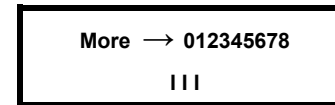


The gain will be increased each time the "▲" UP button is pressed as indicated by the number of bars on the second line as shown on the next page:

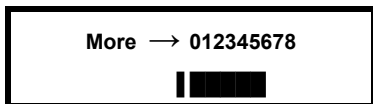
Pressing the "E" ENTER button again and the display will show the last setting. The factory setting is for 50% gain as shown below:



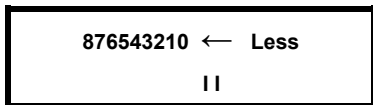
The two vertical bars on the second line indicate that the gain is in the middle. If the operator would like to increase the gain, press "▲" UP button and the display will change to a display as shown below:



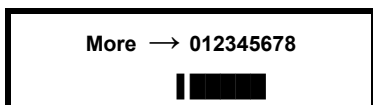
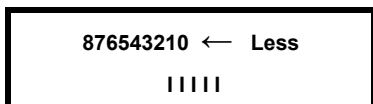
The gain will be increased each time the "▲" UP button is pressed as indicated by the number of bars on the second line as shown on the next page:



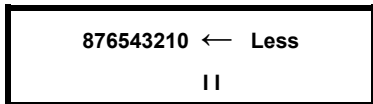
If the operator presses the “▼” DOWN button, the number of bars will decrease until it gets back to the 50% setting. If the operator wants less gain, continue to press the “▼” DOWN button and the display will look like the box below:



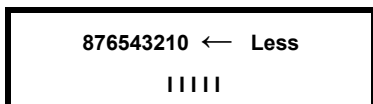
For each touch of the “▼” DOWN button more bars will appear indicating the decrease in gain. Each bar is equal to 62.5 psi.



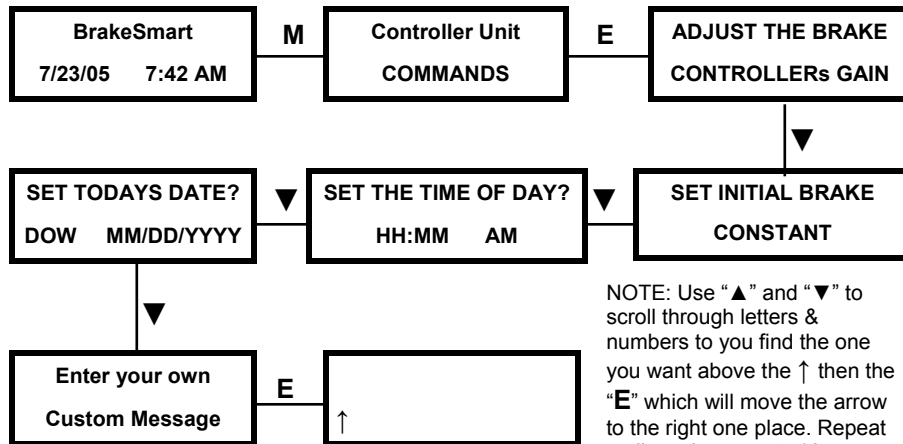
If the operator presses the “▼” DOWN button, the number of bars will decrease until it gets back to the 50% setting. If the operator wants less gain, continue to press the “▼” DOWN button and the display will look like the box below:



For each touch of the “▼” DOWN button more bars will appear indicating the decrease in gain. Each bar is equal to 62.5 psi.

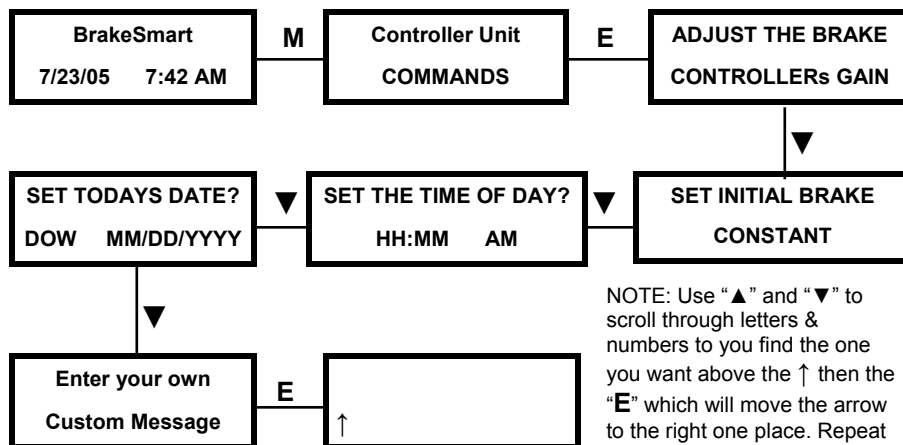


Enter your own Custom Message Block Diagram (see work table on next page)



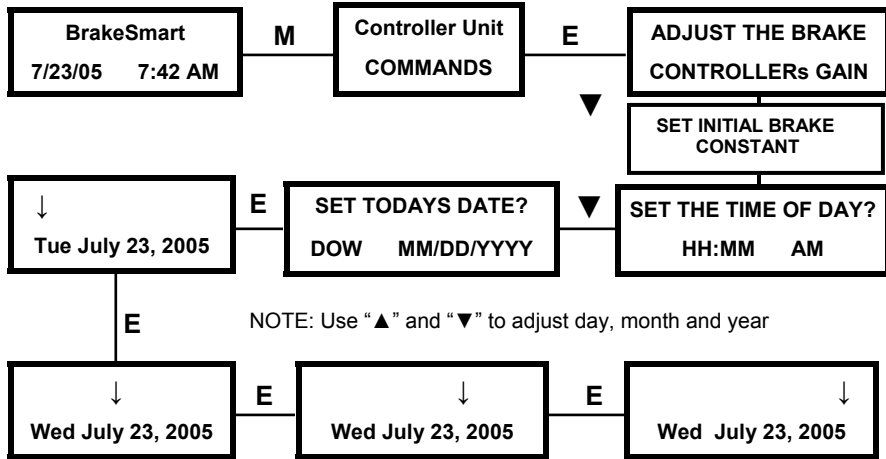
NOTE: Use “▲” and “▼” to scroll through letters & numbers to you find the one you want above the ↑ then the “E” which will move the arrow to the right one place. Repeat until you have up to 16 characters or blank spaces.

Enter your own Custom Message Block Diagram (see work table on next page)

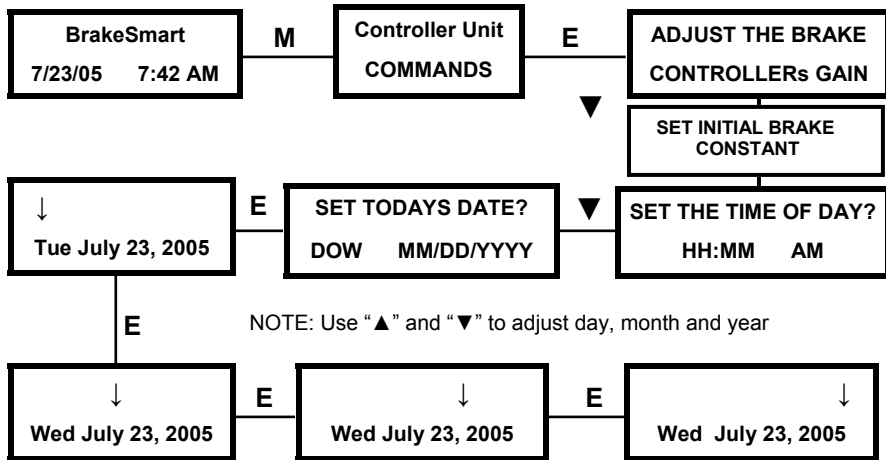


NOTE: Use “▲” and “▼” to scroll through letters & numbers to you find the one you want above the ↑ then the “E” which will move the arrow to the right one place. Repeat until you have up to 16 characters or blank spaces.

SET TODAYs DATE Block Diagram



SET TODAYs DATE Block Diagram



NOTE: The last change shown is what the BRAKE GAIN will be changed to.

Press the "E" ENTER button to return to the normal display or just leave it alone and it will return automatically.

The preceding example should give the operator the concept of how to move around in the various menus and commands. The block diagrams beginning on the next page can be used to aid the operator. By just experimenting, the operator will probably find that it is not too hard to use. Using the following block diagrams, find the Serial Number & Manufacture Date of your BrakeSmart controller unit and record below.

BrakeSmart Serial Number \_\_\_\_\_

BrakeSmart Manufacture Date \_\_\_\_\_

Brightness Control for the Display:

The operator can press the "▲" UP button or "▼" DOWN button to increase or decrease the brightness at anytime.

NOTE: The last change shown is what the BRAKE GAIN will be changed to.

Press the "E" ENTER button to return to the normal display or just leave it alone and it will return automatically.

The preceding example should give the operator the concept of how to move around in the various menus and commands. The block diagrams beginning on the next page can be used to aid the operator. By just experimenting, the operator will probably find that it is not too hard to use. Using the following block diagrams, find the Serial Number & Manufacture Date of your BrakeSmart controller unit and record below.

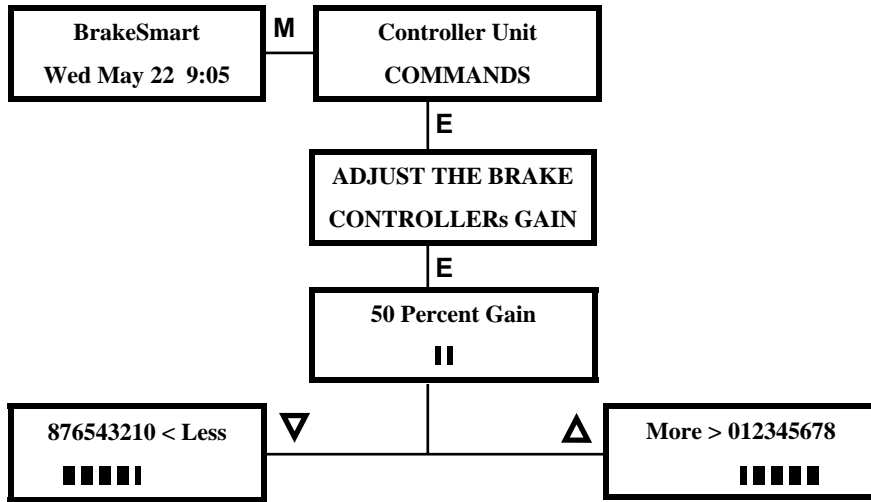
BrakeSmart Serial Number \_\_\_\_\_

BrakeSmart Manufacture Date \_\_\_\_\_

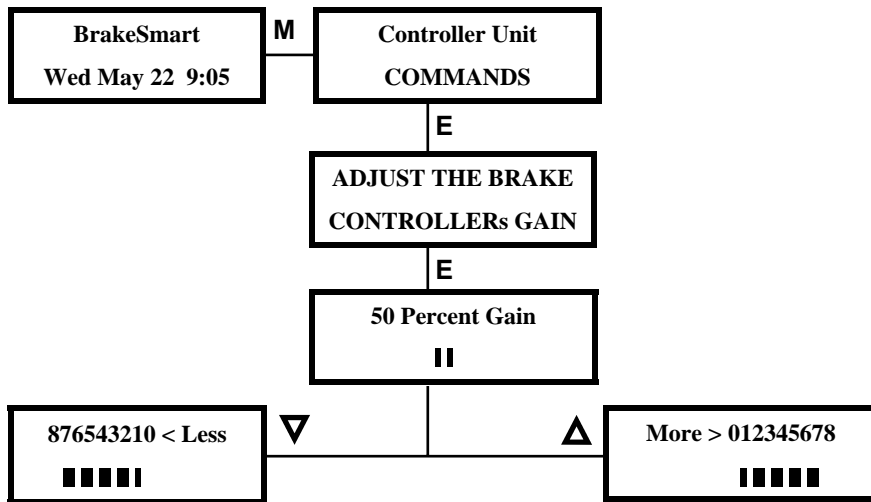
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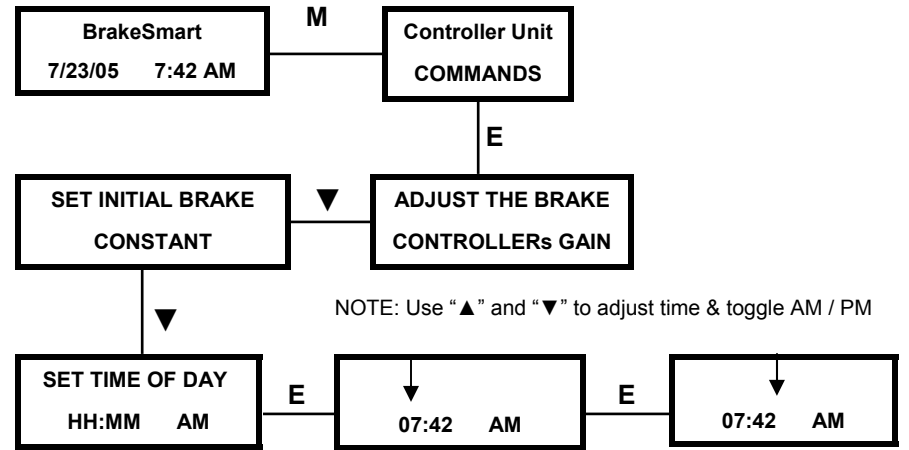
ADJUST THE GAIN Block Diagram



ADJUST THE GAIN Block Diagram



SET THE TIME OF DAY Block Diagram



SET THE TIME OF DAY Block Diagram

