6525 Electronic Control Software Technical Guide

February 2001 (Release 3.3.7)

Prepared

by
Tom Kobelt

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General Introduction

The purpose of this guide is to assist Kobelt Dealers and field personnel to understand the basic internals of the 6525 Advanced software functions. With a full understanding of the software features and their benefits the 6525 can be configured and adjusted to meet most system needs. Any functions required that are not described by this manual should be sent in writing to Kobelt Manufacturing.

It is understood that the person using this manual and configuring the control system is already familiar with the basic setup and installation of the control system as outlined in the 6525 installation instructions. This manual is intended to complement the installation manual and not replace it.

Equipment required to program the 6525 include a 6525 CPU with the advanced software function. An RS232 cable is required to be attached to the 6525 CPU and the 9 pin or 25 pin connector should be attached to a PC or ASCII terminal. To gain access to the 6525 you need to set the communications on your PC as follows: Speed: 9600 baud

        Parity: None
        Data bits: 8
        Stop bits: 1

There are a number of terminal emulation functions available that would be suitable for your PC. It is expected that the technician is familiar enough with their PC and software that no further mention of RS232 communications will be covered in this manual.

Changes in this Manual

Additional functions included since the 3.3.0 release include the wire break tests on the actuator, the control head and the tachometer. Head Boards have been employed to indicate station in command, alarm conditions as well as pitch, trolling and throttle positioning. Additional calibration options has also been added to the steering function. The matching handles will now test up to four handles.

Calibration Values

The 6525 and 6535 are digital control systems. All analogue values are converted to a digital value between 0 and 1023 (10 bits). Neutral = 511.

Calibration Constants

Calibration Constants Menu

To get to the calibration constants menu key 'CC' followed by <u>Enter</u>.

```
 Kobelt Control Version 3.3.7   6525 CPU
 Copyright 1993, 2001
The following system settings may be changed:
 1) System Configuration
 2) Actuator Position
 3) 0-20 ma output
 4) Control Heads
 5) Timing
 6) Synchronizer
 7) Engine
 8) CPP Options
 9) Alarm Panel
10) Head Boards
11) Other ...
12) Steering
```

The Main Calibration Constants Menu

Major System Configuration Values

The first menu option covers the major system options. These options define the major scope and activity of the control system. To change a major system value take option 1.

```
This routine allows the following system variables to be changed:
 1. Maximum Stations        4
 2. Number of Engines       3
 3. Relay Logic              1
 4. Trolling Logic           1
 5. Trolling Idle          100
 6. Engine Braking(0=off)    0
 7. Alarm Monitor (0=off)    0
 8. Membrane Switch(1=On)  1
 9. Station Display 0=off     0
10. Max Cpu Temp - Counts  120
11. Alarm Location 0-8       0
12. Fail in Mode (1=YES      1.
```

1. Maximum Stations
This value determines the number of control stations within the system. Currently a maximum of 8 stations are permitted. A minimum of one station is required. Other head board functions such as an electric clutch board is not included in the total number of control stations. The control stations should be numbered from 1 to N. Where N is the maximum number of stations.

This value is used by the main CPU to poll the control stations.

2. Number of Engines
This value is used to determine the logical number of engines to be controlled by the 6525 CPU. Typically the 6525 is used for a twin engine system. There are cases where the number of engines is set greater than the actual number of engines to be controlled. This is done to support other functions such as a bow thruster, stern thruster or other auxiliary function.

The maximum number of engines to be controlled by one CPU is 6.

3. Relay Logic
This value determines how the two neutral safety/brake relays are to be used. The values are used as follows:
0 - Brake/safety switch logic is OFF
1 - Neutral Safety Switch Logic is ON
    When the handles of the main station are in Neutral /Idle or the CPU powers
     up in station acknowledgement mode the relay contacts will close.

2 - Brake Logic is ON
  When the gear demand is in Neutral Position the relay will close activating
  an air applied shaft brake.
3 - Not used on the 6525
4 - CPP gear - engage / dis engage logic.
  When this function is on the relays are used in conjunction with the engine
  warmup (gear engage) switch on the control head panel to activate or
  de activate the gear.
5 - Engine Shutdown
  This function is not currently implemented on the 6525.
6 - Autotroll
  Close Safety Switch when in trolling mode.

4. Trolling Logic
  This value is used to activate trolling valve logic for fixed pitch propellor
systems.
0 - trolling valve logic is off
1 - trolling valve logic is on
2 - trolling valve logic is on with a selectable trolling idle.
  This function enables the trolling idle (high idle) switch on the control head

5. Trolling Idle
If the trolling idle function or CPP harbour mode is used then this value
represents the number of throttle actuator counts over throttle minimum that the
throttle should be preset to. If the value is 100 then when the trolling idle button is
activated the engine throttle will be set to 100 counts over minimum for each
throttle.

6. Engine Braking
  0=OFF
Engine braking is used where there are no shaft brakes and you want to keep the
engine engaged to the gear to slow the propellor before shifting from forward to
reverse. If the value is greater than 0 then the number represents the number of
logic CPU cycles that the gear will be left engaged in its previous position before
shifting into neutral. A CPU cycle is equal to approximately 1/10 of a second.

7. Alarm Monitor
This value is used to activate the CPU switched input alarm monitor. If this value
is 0=off it will not perform any alarm functions regardless of whether they have
been calibrated in the alarm functions.
0 - Alarm monitoring is off
1 - Alarm Monitor is on and takes pre programmed actions
2 - Alarm monitor is on, takes actions and updates alarm display.

8. Membrane Switch
0-Not a membrane switch - using a custom or 6511 panel.
1- We are using a membrane switch on a 6505, 6509 ... control.
This function is used to determine switch characteristics. In particular for engine warmup or trolling. The membrane (default) puts the entire system in warmup or trolling mode. If the membrane switch is off and the system has been configured correctly then the warmup or trolling could be split between port and starboard engines.

9. Station Display
0=OFF
1=ON
The station display functions uses headboards with address 8 to indicate which station is in command. So lamp one of the headboard is lit when station one is in command. Lamp two would be turned on if station two was in command. If the system has station acknowledgement then lamp one would flash until station one takes command.

10. CPU Temperature Threshold
This value is used to set the point when the CPU is near the overheating point. The CPU will send a warble signal to all control stations as it is getting hot. This allows the operator to do some corrective action before the CPU has a thermal check. Should the CPU actually overheat, turn off the power, cool the CPU (DO NOT IMMERSE THE CPU IN WATER) and restart the CPU. This value is used to activate the warble and to log any heat problems in the system failure log. The values are 'counts' and can should be set by factory personnel. To turn off the heat test set the threshold to 1000.

11. Alarm Location
This function uses a headboard (electric clutch unit) to indicate to an external alarm system the nature of a possible system failure. The value to be entered is a the head board address of the unit. Each relay on the unit indicates a particular alarm condition:
Relay   1 - Head Pot failure
          2 - Actuator Jam
          3 - Active Head Failure
          4 - CPU Heat Warning

12. Fail in Mode
0=OFF
1=ON
The default action of the system when there is a permanent communications failure is to remove the station lock and bring the system to neutral / idle. The fail in Mode option satisfies the requirements of some classification agencies that when there is a permanent communications failure that the system will continue to use the last command. If the last command was for full forward the system will continue to full forward until another command station can be used or the system is bypassed.

Actuator Position Calibration

Select (0=exit CC)? 2

Dead Band, Minimum, Maximum, Fail, Neutral, speed, Engine, Action

	Dead Band	Minimum	Maximum	Fail	Neutral	speed	Engine	Action
1 :	12	250	750	600	511	511	0	0
2 :	12	250	750	600	511	511	0	0
3 :	12	250	750	600	511	511	0	0
4 :	12	250	750	600	511	511	0	0
5 :	12	250	750	600	511	511	0	0
6 :	12	250	750	600	511	511	0	0

Select actuator or eXit (1-6,X)?

By taking option 2 from the main calibration menu you will get the above display. We show an array of actuator values. The left hand side of the display is the actuator number. To change the default values for any actuator enter the actuator number and then answer the prompts for each actuator value. Use **X** to exit this menu.

Dead Band
This setting is measured in counts and relates to the positioning accuracy of the actuators. 10 to 30 counts will give an accuracy of between 1 to 6 percent. The percent of accuracy is determined by the dead band / overall actuator travel.

Actuator Minimum
This is the position for clutch reverse or minimum throttle. This would also represent full lock up on a trolling actuator. It is the low end of the actuator movement. To find the actual minimum count move the actuator to the minimum position and then use the "TA" command (test Analogue) to determine the actuator minimum setting.

Actuator Maximum
This is the position for clutch forward or maximum throttle. It is the high end of the actuator movement. To find the actual maximum count move the actuator to the maximum position and use the "TA" command to determine the actuator maximum.

Maximum Tries until Fail
This setting determines the maximum time allowed for the actuator to reach the requested destination. It is the number of cycles allowed to reach the destination. If the cycle time is approximately 50 milliseconds then a value of 300 would be up to 15 seconds before the system would send an actuator fail alarm to the control station.

Neutral
This setting allows you to calibrate the actuator neutral position. The default is 511 counts. To adjust the Neutral pitch position adjust this value.

Actuator Increment
This function can be used to slow down the actuator movement. In effect it limits the maximum travel per CPU logic cycle to the specified counts.

Engine
The value indicates which engine will affected by the actuator failure.

Action
This value is used to determine what action should occur for the specified engine if this actuator fails. This is a sub set of the alarm actions. If the alarm monitor is not turned on then the action will occur; however, the system will not reset if the actuator failure has been corrected. If the alarm monitor is turned on then once the actuator failure has been corrected the failure action will be removed.
0 - no action taken
1 - move throttle to idle (minimum)
2 - moves to gear to Neutral
3 - moves throttle to idle and gear to Neutral

An example: The gear actuator can be programmed to set the engine to idle on failure. This would mean when shifting gears the throttle will stay in idle if the actuator does not get to the intended position. The operator can press the station select to retry the actuator. If it completes moving to the position the throttle will stay in idle unless the alarm monitor function has been turned on. If the monitor is off then the system will have to be reset (power OFF and power ON) before the throttle will respond.

0-20 ma Calibration

```
Select (0=exit CC)? 3
Minimum, Maximum, Neutral, Speed 4-20ma values:
        1 :        200       800    511    511
        2 :        200       800    511    511
        3 :        200       800    511    511
        4 :        200       800    511    511
 Select 4-20 ma, eXit (1-4,X)? x
```

Minimum
This is the position for minimum throttle or minimum 4-20ma output.   It is the
low end of the current signal. To find the actual minimum count you would need
a multi meter set to read the signal.

Maximum
The is the position for the maximum throttle. It is the high end of the current
signal. To find the actual maximum count you will need a meter set to read the
signal.

Neutral
This setting allows you to calibrate the neutral position. The default is 511 counts.
To adjust the Neutral pitch position adjust this value.

Speed
This function can be used to slow down the 4-20 output. In effect it limits the
maximum output per CPU logic cycle to the specified counts.

Control Heads

```
Select (0=exit CC)? 4
This routine allows the following system variables to be changed:
 1. Safety Switch Range          35
 2. Gear Engage Range            75
 3. Throttle Engage Range       165
 4. Station Acknowledgement       1
 5. Retries to polling fail      20
 6. Station Transfer Logic        1
 7. Matching Handle deadband    100
 8. Station Request Logic         0
 9. Station Lock                  1
10. Dual Pot Deadband             0
11. Polling Delay (msec)         16
12. Pitch Engage Range            0
13. Take Command (1=ON)           1
```

Safety Switch Range
This setting determines the size of the safety switch window. It is the number of counts (plus or minus) from the control head Neutral / Idle position. When the control handles are within this range and the Neutral / Safety switch logic is on then the safety relay contacts will close allowing for engine start. The Safety Switch range should be set lower than the Gear Engage Range.

Gear Engage Range
This setting determines at what point in the handle travel that the gear is engaged in either the forward or reverse position. The factory setting is in the mid position between the Neutral and gear engage detents. This should be set lower than the Throttle Engage Range.

Throttle Engage Range
This setting determines at what point from Neutral / Idle the engine RPM's will begin to increase above idle. It is generally set past the gear detents.

Station Acknowledgement
Station Acknowledgement is the default mode of the system. When the system
is powered on it moves the actuators into Neutral Idle. With Station
Acknowledgement the main station is set as active and the sonalert will beep
until someone presses the Station Select switch. Until the station is selected the
system will treat the handles as being in Neutral / Idle position.

Retries to Polling Fail
This value is the number of consecutive polls that fail at the active station needed
to bring the system to Neutral / Idle, Station Lock off, and in a station
acknowledgement mode.

There are communications failures that do occur due to radio emissions, cable or
connections problems or power problems. When there is a failure the system
continues with the last set of values and continues to repoll the control heads.
This value adjusts the sensitivity of the system to a total or partial
communications failure.

Station Transfer Logic
If this option is turned on then station transfer can only occur if all of the handles
in the requesting control station are within the specified dead band of the active
station. With this logic on, station lock off, and all handles within the dead band
then the station select light will flash indicating that a station transfer is allowed.

Matching Handle Dead Band
This value indicates how close the handles must match in order to allow a station
transfer between stations. The value is the maximum number of counts
difference between a handle position.

Station Request Logic
The default value of 0 is off. The value of 1 turns on station request logic. For
stations other than the main station (station 1) a request can be made by pressing
the Station Request Switch (Switch 8). The station request light will flash until
the station lock light has been taken off at the main station. When the control is
available for transfer then the station request light will go on solid. When the
requesting station takes control the station request light will be turned off.

Station Lock
The factory default is station lock is on (value is 1). When the system starts up
on the main station it defaults to station lock on. To turn off the station lock at
start up turn off the function by changing the value to 0 (Off).

Dual Pot Deadband

If the hardware is configured for dual pots at each control station then the dead band must be set. With the dual pot feature both pots are read and compared before executing a station command. If the difference between both pots is greater than the deadband then an audible alarm is sent to the control head with the deadband problem. The system will use the value of the primary potentiometer.

Polling Delay (msec)

This value approximate milli second delay on a head board polling to indiacte a single communications failure. The shorter the Polling the quicker the total cycle; however, the greater the chance for a communication failure.

Pitch Engage Range

This setting determines at what point in the handle travel that the pitch will start to move in either the forward or reverse position. The factory setting is 0. The pitch will move immediately.

Take Command (1=on)

The factory default is for take command to be off. The function may be required by some class societies for a particular class of vessels. It allows station one to take command from another station even if the station lock is on. If matching handles is on it still requires that you match the handles and then take command.

Timing

```
Select (0=exit CC)? 5

This routine allows the following system variables to be changed:
 1. Throttle Delay (Seconds)        2
 2. Neutral Delay   (Counts)    1,500
 3. Bleed rate      (Counts)       500
 4. Engine Braking  (Counts)        0
 5. Throttle Boost  (Counts)        0
 6. Throttle Boost Time(Sec)        0
 7. Throttle Boost Always 1=ON      0
 Select (0=exit)?
```

Throttle Delay
This value determines the approximate delay in seconds between engaging the
gear and increasing the engine RPM's. Typically 2 seconds are allowed for the
gear box to full engage before raising engine RPM's. This value allows you to
adjust the delay as required.

Neutral Delay
The Neutral Delay value is the total throttle actuator counts that can be
accumulated. This value divided by the bleed rate will give the maximum gear
delay. When the gear is engaged the throttle actuator value is added to the
accumulator. This value is added every second. If the vessel has been running
full ahead for 10 seconds and the Neutral delay is set at 1500 with a bleed rate
of 300 counts, then the maximum neutral delay will be five seconds when
switching from full ahead to astern. If the vessel is at idle and the bleed rate is
set above the throttle idle value then the control will shift from ahead to astern
with minimal delay.

Bleed Rate
This is the constant bleed rate that is used with the Neutral Delay value.

Engine Braking (0=Off, Positive Number=On)
Engine braking is used where there is no shaft brake and you want to use the engine in idle to slow the vessel before shifting from forward to reverse. To turn on engine braking use a positive number which represents the number of logic cycles to keep the gear engaged before shifting to Neutral. It is highly recommended to keep this value low. A high value results in poor manoeuvring when docking as the gear is engaged too long.

Another alternative would be to use the engine braking with the alarm logic and an RPM sensor to determine when the shaft rpm is below a specified level before engaging the gear.

Throttle Boost
This is the number of counts over throttle idle when the system is in throttle boost mode.

Throttle Boost Time
The number of seconds the throttle boost should take effect. Throttle boost takes effect over throttle delay. With rel 3.2.5 the throttle boost will only take effect when there has been a gear delay. This was done to improve the manoeuverability of vessels. The throttle boost on most vessels was needed only to prevent the engine stalling when shifting gears. The logic has been changed to work only when a gear delay is needed. When starting out from the dock no throttle boost will occur.

Throttle Boost Always On
With release 3.2.5 the throttle boost will only take effect when there has been a gear delay. The throttle boost on most vessels was needed only to prevent the engine stalling when shifting gears. On some larger vessels they always need the throttle boost to be turned on. **"1"** Ensures that the throttle boost is always on regardless of the throttle delay.

Synchronizer

This routine allows the following system variables to be changed:
1. Synchronizer Logic (0=Off,1=On)   1
2. Synchronizer Dead Band (pulses)   2
3. Fast Synchronizer Dead Band   20
4. Fast Synchronizer Adjust (counts)   20
Select (0=exit)?

Synchronizer Logic
Engine Synchronizer is meant to synchronize the speed of the shafts. It uses the
tach sensor input as feedback and adjusts the engine throttle. On some
electronic engines the ECM is so accurate that no feedback is required and the
synchronizer is used to send identical signals to all engines.

0= OFF
1= Turns on synchronizer logic.

Synchronizer Dead Band
This value is the number of shaft pulses within a sample that indicates that the
engines are synchronized.

Fast Synchronizer Dead Band
If the difference in shaft pulses is greater than this dead band then adjust the
throttles by the Fast Synchronizer adjustment.

Fast Synchronizer Adjust
The number of counts to adjust the throttle of the following engine when in fast
synchronizer mode.

Engine Calibration

```
 Select (0=exit CC)? 7
Engine: Pot1, Pot2,Throt, Gear,Troll,Pitch,Relay,Logic,Master,Tach#, Rack
      1:     1    3     1     0     0     3     1    11     0     0     1
      2:     0    0     0     0     0     0     0     0     0     0     0
      3:     0    0     0     0     0     0     0     0     0     0     0
      4:     0    0     0     0     0     0     0     0     0     0     0
      5:     0    0     0     0     0     0     0     0     0     0     0
      6:     0    0     0     0     0     0     0     0     0     0     0
Enter Engine Number (eXit, (1-6,X):1
```

This function shows the engine calibration array. The main engines as well as thrusters or steering are treated as engines. To make changes or add a new function select an engine number and then adjust. For each engine you will be guided through each parameter.

Please note: The array changes do not take effect until the CPU has been reset! Power down and power up for changes to take effect.

Head Pot Location#1
This value must be completed with a value from 1 to 11. This is the pot location expected on each head board. Typically Pot location 1 is used for engine one.

Head Pot Location #2
This value is used for a secondary function for the engine logic. It may be the pitch lever on a two lever throttle & pitch control or it could be the redundant pot for dual pot control.

Throttle Output (0-10)?
This is the actuator number (1-6) or 4-20 ma output(7-10) that will control the throttle output for this engine.

Gear Output (0-10)?
This is the gear output. 0 indicates there is no gear output. A value of 1 to 6 indicates an actuator output. A value of 7 to 10 indicates a 4-20 ma output. An electric clutch unit can also be specified. A value of 21 to 84 can be specified where XY represents the following:
X - the electric clutch unit address (2 to 8)
Y - the relay pair controlled by the clutch board.(1 to 2).

Trolling Output (0 - 10)
This is the trolling valve output. 0 indicates there is no trolling output. A value of 1 to 6 indicates an actuator output. A value of 7 to 10 indicates a 4-20 ma output.

Pitch Output (0 - 10)
This indicates the pitch output. 0 indicates that there is no pitch control. A value of 1 to 6 indicates an actuator output. A vaule of 7 to 10 indicates a 4-20 ma output.

Brake Relay (0 - 2)
Indicates the brake relay to be used in conjunction with the brake relay logic. If two engines share a relay for the Neutral safety switch then both engine handles must be in Neutral idle for the relay to close.

Engine Logic
This value determines the logic to be used for a particular engine. The flexibility allows three engines to be controlled with fixed propellor logic and two thrusters to be controlled with CPP logic.

Engine Logic 1
Standard fixed propellor logic. Also allows for trolling valve if the trolling valve logic is turned on.

Engine Logic 2
Same as engine logic 1 except it allows the use of switch 8 - the high idle for a fixed propellor without the use of trolling valve logic.

Engine Logic 3
Dual propulsion logic. This function allows for a fixed propellor logic without trolling valve. The trolling valve switch is used to switch between a primary and secondary propulsion. The trolling valve output is used for the secondary throttle output and the pitch output value is used to control the gear. For more information on the suitability of this logic contact the factory.

Engine Logic 4
PTO logic.

Engine Logic 5
Steering Logic.
The primary pot (pot1) is read and translated directly to a headboard, 4-20 ma or
an actuator port. There is no timing or other logic. This logic could also be used
to control a bow thruster etc. If a feedback is specified and the output is on the
4-20 ma circuit the system can then control a proportional valve. It will ramp
down the signal as the feedback approaches the demand position. If the output is
sent to a head board then the feedback is wired directly to the headboard. With
release 3.3.7 and a special release of the headboard software a two speed
steering can be specified.

Engine Logic 11
Twin Lever CPP control. The first pot input is used for throttle and the second
pot input is used for the pitch control.

Engine Logic 12.
Combined Lever CPP control. The pitch and throttle are combined in one
handle. A clutch Engage/Disengage gear is handled through the relay logic.

Engine Logic 13.
Combined Lever CPP Control. This works the same as engine logic 12 except it
was modified for a Twin Disc Omega Drive application. The gear box is
controlled as a pitch actuator. The Engine warmup button is used to keep the
pitch actuator in mid position (neutral) the same as a gear box.

Engine Logic 14.
Combined Lever CPP control. The pitch and throttle are combined in one
handle. A clutch Engage/Disengage gear is handled through the relay logic.
Pitch trim is available using the second pot specified in the engine array. The
pitch will be the specified pitch less the pitch trim pot reading divided by eight

Engine Logic 15.
Combined Lever CPP control. The pitch and throttle are combined in one
handle. A clutch Engage/Disengage gear is handled through the relay logic. In
Harbour mode the second pot specified in the engine array is used as an
independent throttle when the high idle switch is active.

Engine Logic 16.
Combined Lever CPP control with Feather mode. The pitch and throttle are combined in one handle. A clutch Engage/Disengage gear is handled through the relay logic. The Synchronizer switch is interlocked to Neutral / Idle and, when active, indicates that the pitch is in feather mode.

Master Engine for Synchronizer (0-6)
This parameter is used to determine which engine number should be used as the master engine when the control is in synchronizer mode. If the current engine is not to be synchronized or is the master engine then the value is 0. If the engine should follow another engine then this value specifies the engine number to be followed.

Engine Tach Number(0-4)
This parameter determines which tachometer input should be used to compare the pulses between engines when in synchronizer mode. If there is no tachometer leave the value as 0. There are a total of four tachometer inputs available to the CPU.

Fuel Rack (Feedback) Location (0-2)
This parameter determines which fuel rack input to use when using the load control feature on the CPP logic or the feedback for proportional steering control.
0=No feedback input
1=Port Feedback (Analogue 7)
2=Starboard Feedback (Analogue 8)

CPP Options

This routine allows the following system variables to be changed:
```
 1. Max Pitch Head Offset        440
 2. Pitch Adjustment               2
 3. Maximum # of Adjustments      64
 4. Near Fuel Rack               10
 5. Fuel Rack Dead Band           9
 6. Feedback 1 @ idle (Port)     300
 7. Feedback 1 @ Max (Strbd)     750
 8. Feedback 2 @ idle (Port)     300
 9. Feedback 2 @ Max (Strbd)     750
10. Pitch Ramping Offset         256
11. Pitch Ramping (Counts)         2
12. Feather Position(Counts)     800
```

The following values relate only to the CPP functions. The system will only use these values if the engine logic value is ten or greater.

Maximum Pitch Head Offset
This value is the number of counts from the head neutral/ Idle to maximum pitch. It defaults to 512 and is adjusted primarily for the combined handle pitch logic.

Pitch Adjustment
When the system goes into overload this is the minimum pitch reduction. If the fuel rack feedback exceeds the maximum by ten counts then the initial pitch reduction would be ten counts multiplied by the pitch adjustment. As long as the system is in overload it will continue to reduce the pitch by this adjustment amount.

Maximum # of Adjustments

This is maximum number of pitch reduction adjustments allowed. This value combined with the prior pitch adjustment gives the maximum counts that the pitch can be reduced. The pitch will not be reduced below neutral.

Near Fuel Rack

This value acts as a deadband within the fuel rack maximum. If the pitch is increased when the feedback is near the fuel rack maximum the system will only increment the pitch actuator by one count per CPU cycle.

Fuel Rack Dead Band

This value is a deadband for the fuel rack feedback unit. Due to the mechanical linkages small variations in the feedback could cause the system to make additional pitch corrections. To avoid unnecessary corrections adjust this value. If the current feedback is within the deadband or the prior value to old value will be used.

Port Over Rack @ idle

The port fuel rack sensor (analogue 7) at idle in counts. This is not used for the load control; however, it is anticipated for load balancing.

Port Over Rack @ Maximum

The port fuel rack sensor value at the overload condition. Any feedback over this value indicates that the engine is overloaded.

Stbd Over Rack @ idle

The starboard fuel rack sensor (analogue 8) at idle in counts. This is not used for the load control; however, it is anticipated to be used for load sharing.

Pitch Ramping Offset

This is used to slow down the pitch actuator as it goes beyond the offset value from neutral. The Actuator would used the Pitch Ramping value every CPU cycle rather than moving to the desired pitch at full speed.

Pitch Ramping (Counts)

The value in counts that the pitch actuator would move for each CPU cycle.

Feather Position

This is used to move the pitch actuator to a pre set location when in Feather position.

Alarm Panel

Switch	Open/Close	delay	Lamp#	Engine	Action
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0

This function shows the Alarm Calibration array. The alarm monitor value, in the system configuration, must be turned on for any of these values to become effective.

The system provides for 8 direct switched inputs. The switches can be assigned to any engine or function.

Alarm Condition
The alarm condition signifies whether the alarm is activated by a switch "on" or switch "off" condition.

Alarm Delay
The alarm delay in seconds determines how long the condition should persist before it becomes an alarm.

Alarm Lamp
The alarm lamp is used in conjunction with the alarm display panel. This value determines which panel lamp turns "on" for this alarm.

Alarm Engine
The value indicates which engine will affected by the alarm action.

Alarm Action
This value is used to determine what action should occur for an alarm condition.
0 - no action taken
1 - move throttle to idle (minimum)
2 - moves to gear to Neutral
3 - moves throttle to idle and gear to Neutral
4 - moves throttle to idle and then activates the engine shutdown relay
   This function is not active with this software release.
   The throttle will move to idle.
5 - Gear Engaged
6 - Move Pitch to Folded position.
   This function is available with custom software.
7 - Move Pitch Actuator to Neutral
8 - Throttle Limit (throttle can only go to a preset maximum)
   This function is available with custom software
9 - Pitch Stays in current position
   - used with oil pressure sensor. Do not try to move if no oil pressure.
   This function is available with custom software

Head Boards

```
Board Monitor Action DeadBand HighSpeed
   1 :     0       0        16    -1
   2 :     0       0        16    -1
   3 :     0       0        16    -1
   4 :     0       0        16    -1
   5 :     0       0        16    -1
   6 :     0       0        16    -1
   7 :     0       1        16    -1
   8 :     0       3        16   120
```

This displays any special programming related to the head boards.
In addition to using the head boards as a station micro processor the head board
can be programmed for alternative functions.

Monitor
To use the headboard to collect and transmit analogue information for the
SmartEngine enter **1**.

Action
If the headboard is to be used for control purposes then set the action to one of
the following values:

1=Electric Clutch Board
2=Remote Steering
3=Dual Speed Remote Steering

Deadband
The number of counts to use as a deadband when using a head board in the
remote steering function. This value is transmitted and set in the steering head
boards on power up.

High Speed Deadband
The number of counts to use for the high speed deadband. When the difference
between the demand and feedback is greater than the high speed deadband then
the second headboard relay is activated. This value is transmitted and set in the
steering head boards only on power up.

Head Boards

This routine allows the following system variables to be changed:
  1. Head Pot 1 Neutral/Idle   511
  2. Head Pot 2 Neutral/Idle   511
  3. Head Pot 3 Neutral/Idle   511
  4. Head Pot 4 Neutral/Idle   511
  Select (0=exit)?

This function is used to store other software values. Values for custom systems may be stored here as well or placed under a new option (12).

Head Pot #1 Neutral/Idle
This value defaults to 511; however, you may move the Neutral/Idle position by adjusting this value.

Head Pot #2 Neutral/Idle
This value defaults to 511; however, you may move the Neutral/Idle position by adjusting this value.

Head Pot #3 Neutral/Idle
This value defaults to 511; however, you may move the Neutral/Idle position by adjusting this value.

Head Pot #4 Neutral/Idle
This value defaults to 511; however, you may move the Neutral/Idle position by adjusting this value.

System Failure Log

```
CPU Temperature Threshold      120
   Current Trip Number            22
   Current Trip Maximum Heat      49
   Maximum Heat Encountered       52
   Trip of Maximum Heat           10
   Actuator Failures:
   Overheat      -1
   Actuator 1    -1
   Actuator 2    -1
   Actuator 3    -1
   Actuator 4    -1
   Actuator 5    -1
   Actuator 6    -1
```

This function is not available through the CC command. This panel is displayed
at the end of the DC command and is used to assist in problem determination.

CPU Temperature Threshold
This value defaults to 120 counts. This is a setting below 55 degrees Celsius and
is used to warn when the CPU is getting hot.

Current Trip Number
This is the current number assigned to the CPU 'trip'. The trip counter is
incremented every time the CPU is powered on. Resetting the CPU, by
powering it off and then on, increments the current trip number by one.

Current Trip Maximum Heat
This is the maximum heat setting (in counts) for the current trip.

Maximum Heat Encountered
This value is the maximum heat (in counts) read from the internal sensor on the
CPU board. This is the maximum heat ever encountered by the sensor on the
board.

Trip of Maximum Heat
This indicates the trip number the maximum heat had occurred.

Actuator Failure Array:

Overheat
This is the trip number of the last over CPU Temperature Threshold.

Actuator 1 to 6
This is the trip number of the last actuator failure.

Other Commands

Display Calibration Values

When you have completed the system configuration you should record all the changes made. The 'DC' command is used to display the configuration. After any major changes please record the DC command and send it back to Kobelt Manufacturing with the CPU serial number. This information is used for technical support.

Calibrate Head

The potentiometers are a mechanical device and there is some variation in their mounting. Calibrating the head allows for the CPU in the control head to 'normalize' the values sent to the main CPU. The 'CH' command will prompt you for any 360 potentiometers, which can not be calibrated, and the head number.

You will be asked to put the handle to full minimum and full maximum. The system reads the raw values of the potentiometers and sends back to the head board the calibration values. If the readings are incorrect do not accept the values.

Read Head

This command can be used to assist in trouble shooting. It allows you to read a specified control head values. The command is 'RH'.

Read (Test) Analogue Input

The 'TA' command displays a continuous output of the values being read directly by the main CPU. This is useful in trouble shooting as well as calibrating the actuators and the fuel rack.

On & Off

The ON command displays system inputs and demands on the RS232.
The OFF command turns off the RS232 monitor.

Smart Engine Commands

The following commands where written as low level interface to the SmartEngine remote control system.

POT

This allows you to key in the pot values for four POTS. Enter POT followed by Enter. Key in four head pot values with each value followed by Enter.
This function only works when the RS232 is selected as the active station.

SS1

This command is used to select the RS232 channel as the active head. The station lock has to be off on the active station for you to take command. Station lock is not available on the RS232 channel. If the RS232 is active the system will respond with RS232. If the active station has the station lock on then the system will respond with **[LOCK]**.

SS9

This command is your method to turn off, deselect, the RS232 mode. The system will use the last set of POT values entered until someone takes command at a regular control head.

SS0

Turn the system in to a monitor. The same rules apply for SS0 as SS1. The system can no be locked. Effectively this allows you to collect the RS232 data with out communication messages. The system will output the values of the active head, the actuators and any monitor board that are configured.