Probit Manual Version 1.3

NAVITAS

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The contents of this manual outline and define all of the features available in the Navitas Controllers model
TSE550/1000, PSE550/1000 and **PSE550P/1000P**

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ACCELERATION, ADJUSTING

Path : O.K. <> Customize <> Driving <> Speed & Steer <> Speed/Accel <> Accel

Range: 0.2 to 9.9 seconds Default: 2.0 seconds

When the accelerator sends an input to the controller, this parameter sets the response time. At the default setting, the controller will ramp up to full power over two seconds.

ACCELERATION LIFTING, ADJUSTING

Path : O.K. <> Customize <> Lifting <> Acceleration

Range: 0.2 to 32.0 seconds Default: 0.5 second

When a lift switch or the lift accelerator sends an input to the controller, this parameter sets the response time. At the default setting, the controller will ramp up to full power over half a second.

ACCELERATOR TYPE, SETTING

Path: O.K. <> Customize <> Setup <> Accelerator <> Drive Accel <> Type

Options: 5-0 Volts, 0-5 Volts Default: 5-0 Volts or bi-
        directional ~ 2.5V center

This parameter allows the controller to support a wide variety of accelerators. The most common setup is 5-0 Volts, as this configuration will not cause a runaway in the event of a broken or disconnected wire. The Navitas will also support the reverse accelerators (0-5) such as the ones used by Sevcon or Curtis.

ACCELERATOR, ADJUSTING

Path : O.K. <> Customize <> Setup <> Accelerator <> Drive Accel

This area lets you adjust the accelerator sweep as well as the polarity of the throttle. Under Auto Setup, the accelerator is automatically installed with proper margins at both ends of the sweep for smooth operations, but these margins can be increased or decreased if the need arises.

ACCELERATOR, INSTALLING

Path : O.K. <> Install <> Set Throttle

This area lets you install a new accelerator or automatically adjust the existing throttle. The ProBit will ask you if the accelerator has Forward, Reverse, and Speed on the same handle (reach, walkies and pallet trucks) or not (sit-drives) to determine what type of accelerator you are installing.

It will then automatically set the maximum, minimum and polarity of the throttle with reasonable operating margins. These margins can be viewed and/or adjusted. See Accelerator, adjusting. Also, this setup procedure is done automatically as part of the Auto Setup installation procedure when you install a new Controller.

BATTERY DISCHARGE INTERLOCK, SETTING

Path : O.K. <> Customize <> Protection <> Low Battery

Range: 1.65 to 2.1 VPC   Defaults: 1.85 VPC
        0 to 100% Cutback   50%

        ON or OFF   ON

This area lets you turn the B.D.I. on or off, as well as adjust the level of battery charge at which the B.D.I. will start "lift interrupt" and the amount of speed cutback that it will apply.
The Interrupt level, or Cutout Voltage is based on the Voltage per Cell (VPC) with the default of
1.85 VPC equivalent to approximately 1.180 specific gravity of the electrolyte. The ideal range of operation for a lead/acid battery is between 1.300 (full charge) and 1.160 (maximum allowable discharge).

BATTERY VOLTAGE, SETTING

Path : O.K. <> Customize <> Setup <> Battery <> Voltage

Range: 0 to 48 Volts Default: Battery Volts

By default the Battery Voltage is set automatically during the installation process to the closest standard (24, 36 or 48 volts) based on the voltage read by the ProBit.
This setting allows for a change in battery voltage (i.e. from 48 to 36 volts) or to compensate for a battery with bad cells. A 36-volt battery with 2 bad cells would be detrimental to the system, as well as throw off the B.D.I. settings.

Resetting the voltage to 32 Volts will recalibrate the B.D.I. and avoid problems until the battery can be replaced or repaired.

BATTERY, VIEWING CHARGE CONDITION

Path : O.K. <> Maintenance <> System Info

BELLY SWITCH, SETTING

Path : O.K. <> Install <> Auto Setup

The Belly Switch is a safety device used on pallet trucks and walkies to force the truck to travel in the Forward direction at full speed for 2 seconds if the switch mounted on the end of the Operator control arm is depressed. This

would happen if the Operator drove the unit against his body, or was pinned between the truck and an object or a wall.

This feature can only be setup during the Auto Setup procedure by answering "YES" to the question: "Do you want to use a Belly Switch".

The Belly Switch must be wired to the #1 Cutback input on the Controller Harness (white/brown wire).

EXTREME CARE MUST BE TAKEN NOT TO INVERT THE FORWARD AND REVERSE CONTACTOR OUTPUTS, OR THE FORWARD AND REVERSE DIRECTIONAL SWITCH INPUTS, AS THE TRUCK WILL TRAVEL IN THE WRONG DIRECTION WHEN THE BELLY SWITCH IS PRESSED !!!

BYPASS, SETTING

This function has been disabled in all current Navitas products.

Path :   O.K. <> Customize <> Driving <> FW, Bypass & D Ctr.

Range: ON or OFF Default: OFF 0 to 10 seconds 3 seconds

The use of a Bypass contactor is not recommended with the Navitas Controller.

Please see Bypass, use of. If you choose to use one, these parameters let you turn the Bypass on or off for either or both Forward and Reverse.

The time adjustment refers to the delay after the controller reads full speed before the Bypass contactor is pulled in.

CLOCKS, RESETTING

Path :   O.K. <> Maintenance <> Clocks

This area of the ProBit allows you to reset any or all of the four maintenance clocks. Pressing the letter in front of the clock will bring you to the reset screen.

COASTING TIME PUMP, SETTING

Path: O.K. <> Customize <> Setup <> Other <> Advanced <> Pump Coasting

Range: 1 to 32 seconds Default: 1.0 second

Coasting Time is a parameter that compensates for the normal deceleration of a motor with regards to the ramped acceleration. As an explanation, let's look at this example:

Your acceleration "time to full" is set to 2 seconds. It then takes the Controller 2 seconds to ramp up to full after the signal has been received. Assuming that no coasting time had been set, if the signal is removed and immediately re-applied, it would take the Controller, starting from zero, another 2 seconds to get back to full output. That would give the truck, or the pump a sluggish feel.

As an example, with the coasting time set at 4 seconds, the Controller assumes that it will take the motor 4 seconds to slow down to zero. Therefore, if a signal is applied before these 4 seconds are over, the Controller will start

applying power from a level proportional to the time elapsed. For instance:

- After 1 second:Ramp up from 75%
- After 2 seconds:Ramp up from 50%
- After 3 seconds:Ramp up from 25%
- After 4 seconds:Ramp up from 0%

The setting of the coasting time is greatly a matter of feel that will vary from one application to the next, and that will change from truck to truck.
As a rule, if the coasting time is too short, the truck will feel sluggish when power is removed and re-applied quickly.
If the coasting time is too long, the truck will jerk when power is re-applied under the same conditions. The defaults usually work well in most application, but a good understanding of this parameter will allow you to fine tune the truck, especially in tight quarters where smoothness is critical.

COASTING TIME, SETTING

Path: O.K. <> Customize <> Setup <> Other <> Advanced <> PC Parameters <> Coasting Time

Range: 1 to 10 seconds Default: 4.0 second

Coasting Time is a parameter that compensates for the normal deceleration of a motor with regards to the ramped acceleration. As an explanation, let's look at this example:
Your acceleration "time to full" is set to 2 seconds. It then takes the Controller 2 seconds to ramp up to full after the signal has been received. Assuming that no coasting time had been set, if the signal is removed and immediately re-applied, it would take the Controller, starting from zero, another 2 seconds to get back to full output. That would give the truck, or the pump a sluggish feel.

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COILS (CONTACTOR) VOLTAGE, SETTING

Path : O.K. <> Customize <> Setup <> Contactors

Range: 0 to Batt. Volts Default: 36 Volts

During installation with the Auto Setup feature the ProBit will read the battery voltage and ask you if

the contactor coils are of the same voltage. In this area you can change that setting for pull-in voltage, as well as adjust an optional hold voltage.

The pull-in voltage should match the coil rating, but this can be different from the battery voltage. For instance you could use 24-Volt contactors on a 48-Volt truck. The Controller will send a 24-Volt pull-in voltage to the contactors.

The hold voltage option is based on the fact that it requires more voltage to pull-in the contactor, than it does to hold it in. Using a lower hold voltage will reduce the heat generated by the coil, thus extending its life. A setting of 25% below rated voltage is usually adequate (i.e. 18 Volts for your 24-volt coils).
Reducing the voltage to the coils by 25% will cut the heat in half!

CONTACTORS, TEST

Path : O.K. <> Troubleshoot <> Test Truck <> Contactors

This diagnostics function will allow you to check the contactors for proper operation. It will pull the contactors in, one by one, and hold them in for 5 seconds to make sure that they are not drawing excessive current, as would happen if the coils were shorted, installed with the wrong polarity, or if the suppressors were installed backwards.
This procedure is run automatically during the "Auto Setup" sequence.

CURRENT LIMIT, SETTING

Path : O.K. <> Customize <> Protection <> Current Limit

1000 models Range: 0 to 1,000 amps Default: 600 amps
550 models Range: 0 to 550 amps Default: 350 amps

Current limits on the Navitas system are set in a way that is very different than the conventional SCR type system. The "fixed" current limit of the Navitas is a poor compromise between providing enough power to get the job done and protecting the motors and the system.
The current limiting on the Navitas, or "Smart Current Management" is based on three separate levels. The hardware current limit, and two adjustable levels, the "peak limit" and the "average limit".

The peak limit is the maximum amount of current that the motor will receive for a short period of time. This limit will be set much higher than the old SCR current limit. It is designed to protect the motor(s) in the Short term.
The average limit will be set about 20% lower than the OEM recommended limit for an SCR system.
It is designed to protect the motor(s) in the Long term.

CUSTOMIZING

Path : O.K. <> Customize

This is the menu where most of the adjustable parameters are accessed. The available options will change based on the products installed. For example, you will see different options if you have a pump controller installed as well as the traction, and the options will also change based on the vintage of the controller(s) that you are working on.

D CONTACTOR, SETTING

Path : O.K. <> Customize <> Driving <> FW, Bypass & D Ctr

Options: ON or OFF Default: OFF

      The "D" Contactor is a device installed between the two fields of a dual motor parallel installation. When "plugging" with a dual motor truck there is a strong possibility that if the fields are not perfectly matched, the stronger field will "push" into the weaker field and lock up that motor.

      The purpose of the "D" Contactor is to, during plugging, connect the two fields together so that the voltage will be equal between them, thus preventing a lockup. The "D" Contactor is wired instead of the Field Weakening contactor (yellow output on the Navitas harness) and turning it ON redirects that output. To our best knowledge, there are no trucks that require both Field Weakening and a "D" Contactor.

      The "D" Contactor is normally turned on originally during the Auto Install procedure as you answer "yes" to the dual motor questions.

DIRECTION FORGIVE TIME, SETTING

Path: O.K. <> Customize <> Setup <> Other <> Misc. Timing <> Dir. Forgive

Range: 0 to 2.0 seconds Default: 0.5 second

      The Direction Forgive Time is the amount of time that the truck can spend in neutral, with the accelerator depressed, before the Controller sees it as an "out of sequence" situation and causes an RTN (return to neutral).

      Normally, if the accelerator is depressed before a direction is selected, the system is out of sequence and will not operate. When an operator moves the directional lever from one direction to the other with the accelerator still depressed, he is technically "out of sequence" from the neutral part to the direction selected because of his accelerator position.

To prevent a RTN reset, the Controller allows a Direction Forgive Time. As long as the "stay" in neutral does not exceed the Forgive Time, the Controller will not see a fault.

DRIVE LOCK, SETTING

Path: O.K. <> Customize <> Setup <> Other <> Advanced <> Elec. Lock <> Drive Lock

This parameter is used to set PASSWORDS that must be entered by the operator to be able to drive the truck. As, at the present time, the ProBit is the only device available for the operator to enter the Password, the system is not very practical to use.

      Improper setting of the passwords can cause a permanent lockout of the Controller!!

END OF PLUG POINT, SETTING

Path : O.K. <> Customize <> Setup <> Other <> Advanced <> End Plug Pt.

Range: 0 to 100% Default: 25%

      The "End of Plug Point" is the short transition period when the Controller comes out of "plugging" and goes into normal acceleration. The initial PWM (power level) applied at the beginning of this acceleration is

normally the same as it was at the end of the "plugging" phase.

On some trucks, this amount of PWM on startup can be sufficient to cause the Controller to hit a Hardware Current Limit, cause an RTO (return to off) reset.

The "End of Plug Point" parameter sets the maximum percentage of PWM that can be applied at the beginning of acceleration. Therefore upon entering acceleration, the Controller will apply either the preset level, or the level at the end of "plugging", depending which is lower.

If a truck "resets" coming out of "plugging", it is likely hitting a Hardware Current Limit, and lowering the "End of Plug Point" may solve this problem.

EXTERNAL PLUG DETECT, SETTING

Path: O.K. <> Customize <> Driving <> Plugging <> Ext. Plug Dt.

Options: ON or OFF Default: OFF

This parameter is only used in conjunction with the Optional Navitas TTR-50 Tight Turn Reverser. The TTR-50 allows reversal of the inboard wheel on a dual motor truck, as well as the standard simple dropout.

The TTR-50 detects "plugging" on one of the motors and relays that signal to the Controller. This parameter redirects Cutback #3 (white/purple on Navitas harness) to receive this input.

This parameter is normally set during the Auto Setup procedure by answering the questions relating to Dual Motors/TTR-50.

FAULTS, READING

Path: O.K. <> Maintenance <> Faults or O.K. <> Troubleshoot <> List Faults

Options: VIEW or CLEAR

In this area the Faults recorded by the Controller during Startup Diagnostics or by the Run-time Diagnostics can be viewed and/or cleared. Faults cannot disappear on their own, even if power to the Controller is lost. Faults must be cleared using the "Clear" function of the ProBit.

Faults are also listed in order of occurrence, with the last fault showing up first on the ProBit. For a more in depth troubleshooting session, see the Find Problems section of the Troubleshooting menu.

When viewing Faults, the first menu will indicate that fault(s) is/are present, and hitting "A: Explain" will describe the fault. Some faults may span more than one menu. Hit "O.K. to Continue" to view the whole fault explanation.

Simply correcting the fault will not clear it from memory. Be sure to use the "Clear Faults" function on the ProBit before exiting.

FIELD WEAKENING, SETTING

Path: O.K. <> Customize <> Driving <> FW, Bypass & D Ctr <> Field Weakening

Range: 0 to 999 amps Default: Pull-in 215 amps
Drop-out 435 amps

This area allows for the setting of the Pull-in and Dropout Field Weakening parameters. For F/W to work, the truck has to be equipped with either split fields set up for F/W and a contactor, or an external F/W resistor and a contactor.

Then the parameters have to be set properly. Two parameters come into play: pull-in and dropout. Field Weakening should happen when the motor has reached its maximum normal velocity, and the current draw has dropped to a reasonably low level. The field is then weakened by either shortening it (split field) or connecting a

resistor of proper value across it.

This allows the motor to run faster, but with lesser torque. Therefore, the motor will be more vulnerable to heat and damage, and the F/W will have to be dropped out if the current draw exceeds a preset level.

The proper way to set these values is to determine the normal running current for the particular truck. Set the ProBit to monitor Motor Current and run the truck at full speed, with full rated load on a flat and even floor. Notice the amps level after it has stabilized, and set your Pick-up level to 10% above that level.

Then set the Dropout level to the recommended OEM current limit for that model. If that information is not available, the rule-of-thumb is 85-90 amps per 1,000 lbs. of truck capacity. Then test-drive the truck.

The F/W should come in when the accelerator is at full and the truck reaches close to full speed with a rated load, and drop out when the accelerator is released or an extra load such as a ramp is applied.

If the contactor "chatters" in and out when trying to pull in, the dropout level is set too close to the pull-in. As the F/W pulls in, the current rises above the dropout level causing the chatter. Gradually increase the window until the chatter disappears.

F/W levels are not set automatically during Auto Setup and must be set after the installation is completed.

Field Weakening will not pull in if the accelerator is improperly adjusted and does not go to full. See "Accelerator, adjusting"

FIND PROBLEMS

Path : O.K. <> Troubleshoot <> Find Problems

This is an in-depth diagnostics procedure that will find operational problems that would not normally show up under List Faults. For instance, an out of sequence problem, the effects of a faulty seat switch, or a illogical parameter such as top speed set to 2% would not show up under Faults, but will be detected by "Find Problems".

To use, simply follow the online instructions.

HI BATTERY RESPONSE, SETTING

Path: O.K. <> Customize <> Protection <> Battery <> Hi Bat Response
Option: ON or OFF Default: OFF

This parameter determines the response of the Controller to a High Battery Condition. The default setting of OFF will cause the Controller to wait for the battery voltage to be below 55 volts.

By setting the response to ON, the power steering pump will be turned on until the voltage drops.

INPUTS, TEST

Path : O.K. <> Troubleshoot <> Test Truck <> Drive <> Inputs

This section of Troubleshooting allows the technician to interactively test the input switches/wires for proper functioning. The inputs available are forward & reverse switches, SRO switch, brake switch, belly button switch, all of the limit switches and the accelerator.

This routine is run automatically during the "Auto Setup" sequence.

INSTALL INTERLOCK, RESETTING

Path : O.K. <> Troubleshoot <> Find Problems <> Won't Drive
If the Controller is disabled by an Install Interlock, the Find Problems routine will detect and reset it. Also, on ProBits with software version 1.31 or newer, the Install Interlock will be reset automatically by running the Faults routine in Maintenance.

INSTALLATION

Path : O.K. <> Install

This menu gives access to the installation routines. When installing a new Controller for the first time, only two items are available:

> A: Auto Setup
> D: Manual Setup

It is strongly recommended that you use the Auto Setup the first time around. After the initial installation, two more items will be added:

> A: Auto Setup
> B: Check Wires
> C: Set Throttle
> D: Manual Setup

LIFTING SPEED LEVELS, ADJUSTING

Path : O.K. <> Customize <> Lifting <> Level Switch

Range: 0 to 100% Defaults: Level 1: 100%

> Level 2: 80%
> Level 3: 60%
> Level 4: 40%

This area allows the setting of the speeds of the various hydraulic level switches. The switches are prioritized from 1 to 4, with 1 having priority over 2, 2 over 3, and 3 over 4.

This system lets you select a different speed for each of your hydraulic functions such as Lift = 100%, Tilt = 75%, Side Shift = 50%, etc..

In most applications, the Lift switch would be connected to Level switch #1 to give the Lift priority over all others, but in some circumstances you may need to set this up differently.

For instance, you may have a Slip-Sheet Push-Pull Attachment that needs to run at 40% power. But with the attachment switch wired to Level 4 the operators have discovered that, while they use the attachment, if they pull in the lift lever just far enough to activate the switch the power goes up to 100%. This lets them work faster, regardless of the damage done to the Push-Pull.

In a case like this, the following configuration would be ideal:

> Push-Pull Attachment Level 1 40% Lift Level 2 100% Tilt Level 3
> 75% Side-Shifter Attachment Level 4 60%

This setup would give the same performance without letting the operator override the Push-Pull speed.

LIFTING SPEED, ADJUSTING

Path: O.K. <> Customize <> Lifting <> Throttle Max.

Range: 0 to 100% Default: 100%

This adjustment allows you to set the top speed of the lift pump if an accelerator (pot) is installed on the lift lever. If the Lift is controlled by a switch, please see Lifting Speed Levels, adjusting.

If a lift accelerator is used in conjunction with level switches, the greater of the accelerator position or the level switch will take priority. In other words, if the accelerator in held at 75% of full speed and a 50% level switch is pulled in, the 75% remains. But, if a 90% switch is activated, the motor will go to 90%.

LIMIT SWITCHES (CUTBACKS), ADJUSTING

Path : O.K. <> Customize <> Protection <> Limit Switches

Range: 0 to 200%   Defaults: Cutback 1:   75%
                                              Cutback 2:   50%

                                              Cutback 3:   25%

Cutbacks are set to a percentage of the throttle and are prioritized from 3 to 1. In other words, 1 overrides the throttle, 2 overrides 1, 3 overrides 2. They can also be set up to 200%, of course to a maximum output of full battery voltage. For instance, a 200% cutback if the throttle is at 30% speed will result in 60% speed. But if the throttle is at 75%, the 200% cutback will only achieve 100% speed.

Cutbacks can be used for various reasons. The most common are slowing down the truck based on different mast heights, and speed control on walkies and pallet trucks.

The 200% adjustability is particularly useful on pallet trucks with high-speed (rabbit) switches. The accelerator maximum can be set to 50%, and the rabbit switch connected to the cutback input and set to 200%. (200% of 50% = 100%)

On a walkie with a Belly Switch, cutback #1 must be used for the Belly Switch and is not available as a standard cutback.

On a dual motor truck using a TTR-50, cutback #3 is used for external plug detect and is not available as a standard cutback.

MANUAL SETUP

Path : O.K. <> Install <> Manual Setup

This level lets you setup one by one most of the parameters that are setup automatically by the "Auto Setup" routine.

MOTOR CURRENT, VIEWING

Path: O.K. <> Troubleshoot <> Monitor Truck <> Drive <> Current

This feature can be used while driving the truck and is especially useful when setting up the pull-in and dropout levels for Field Weakening.

MOTOR VOLTS, VIEWING

Path: O.K. <> Troubleshoot <> Monitor Truck <> Drive <> Voltage

NO DRIVE POWER, TROUBLESHOOTING

Path : O.K. <> Troubleshoot <> Find Problems <> No Drive Pwr

This area lets you check the settings and parameters that may affect the power performance of the truck: Motor Current Motor Voltage Accelerator Output Limit Switches Current or Thermal limits

NO LIFT POWER, TROUBLESHOOTING

Path : O.K. <> Troubleshoot <> Find Problems <> No Lift Pwr

This area lets you check the settings and parameters that may affect the power performance of the truck: Motor Current Motor Voltage Accelerator Output Limit Switches Current or Thermal limits

PASSWORD FOR PROBIT, SETTING

Path: O.K. <> Customize <> Setup <> Other <> Security <> Probit Password

Options: ON or OFF Default: OFF

This feature allows you to set a Password to the ProBit. The Password protection, once turned on will prevent unauthorized people (people without the code) from using the Customize and Install menus, while still having access to Maintenance and Troubleshoot.

THEY CAN LOOK, BUT THEY CAN'T CHANGE ANYTHING!

Entering a 4-digit code sets the password. This code gives access to all of the ProBit features, and can be changed at any time by entering a new code, as long as you still have the old code. DO NOT FORGET YOUR CODE! ONLY A FULL REPROGRAMMING OF THE PROBIT BY NAVITAS CONTROLS WILL TURN OFF THE PASSWORD PROTECTION!

The password protection CAN NOT be turned off once enabled. When the password has been enabled, the default setting on the password input screen is ‑0ø Setting the password to ‑0ø will let you pass the screen by just pressing ‑OKø

PLUGGING, ADJUSTING

Path : O.K. <> Customize <> Driving <> Plugging <> Plugging Parameters

Range: 0 to 999 amps Default: 599 amps
        0.25 to 5.0 seconds 0.4 second

There are two main parameters to consider when adjusting plugging. They are "Strength" and "Decel". If the truck's reaction time to the plugging signal is too fast or too slow, the "Decel" or "time to full" needs to be changed.
        If, on the other hand, the response time is good, but the strength needs adjusting, the "Strength" setting must be modified. These adjustments can be made separately for forward and reverse, as well as under cutback conditions. See Limit Switches, adjusting.

The default-plugging mode of the Navitas Controller is "Proportional Plugging". The plugging strength is directly proportional to the position of the accelerator. This system gives the operator the best control over his machine, but since this is different than the "fixed" plugging used by several OEMs some operators object to proportional plugging. The ProBit allows changing from proportional plugging to fixed plugging to satisfy those operators. See Plugging, fixed.

Also, by default, the Navitas system runs several diagnostic routines during plugging, and this causes a very short delay when changing directions. While this delay is virtually not noticeable on a sit-drive forklift truck, some stand-up operators have complained about it.
        This delay can be eliminated in most machines by turning on the "OEM Plugging" parameter available through the PB-200.

PLUGGING, OEM

Path : Setup <>Other <> Advanced <> SE Parameters <> Advanced Plug <> Plug Type

Options: Navitas or OEM Default: Navitas

By default, the Navitas system runs several diagnostic routines during plugging, and this causes a very short delay when changing directions. While this delay is virtually not noticeable on a sit-drive forklift truck, some stand-up operators have complained about it.
        This delay can be eliminated in most machines by turning on the "OEM Plugging" parameter available through the PB-200.

PLUGGING, FIXED

Path : Setup <> Other <> Advanced <> SE Parameters <> Advanced Plug <> Fix plug

Options: ON or OFF Default: OFF

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        The ProBit allows changing from proportional plugging to fixed plugging to satisfy those operators.

POWER CIRCUIT, TEST

Path : O.K. <> Troubleshoot <> Test Truck <> Power Circuit

This routine will check the motor field, armature, cables and directional contactors for proper connections and continuity. It is very useful to detect motor damage, or sticky contactors.
This routine is run automatically during the "Auto Setup" sequence.

SPEED, ADJUSTING

Path: O.K. <> Customize <> Driving <> Speed & Steer <> Speed/Accel <> Speed

Range: 0 to 100% Default: 100%

This parameter can be adjusted separately for Forward or Reverse and controls the top speed of the truck when the accelerator is at full.
This setting can be overridden, up or down, by the limit (cutback) switches. See Limit Switches, adjusting.

SRO LIFTLOCK, SETTING

Path: O.K. <> Customize <> Lifting <> SRO Lift Lock

Options: ON or OFF Default: OFF

With the SRO Liftlock turned ON, the use of the hydraulic functions is only available if there is an operator in the driving position (standing on the Dead Man pedal, or sitting on the seat).
With the SRO Liftlock OFF, hydraulics can be used at anytime that the key is ON, and the Controller has passed start-up diagnostics.

STEERING RUN-ON TIME, SETTING

Path: O.K. <> Customize <> Setup <> Other <> Misc. Timing <> Steer Run-on

Range: 0 to 32 seconds Default: 5 seconds

This parameter sets the amount of time that the Power Steering pump will keep running after the directional selector is returned to neutral.
On certain trucks, such as stand-ups with "Pistol Grip" accelerators, and counterbalanced trucks equipped with "Monotrol" pedals,

IT IS VERY IMPORTANT TO EXTEND THE DELAY as these trucks are capable of coasting in neutral for a longer period of time, and could loose steering if the delay was not changed.

SYSTEM INFORMATION

Path: O.K. <> Maintenance <> System Info

This handy menu gives the technician quick information on Battery Condition, Controller Temperature, Limit Switches and Current Limits.

TEMPERATURE, VIEWING

Path: O.K. <> Maintenance <> System Info <> Drive Ctrlr
O.K. <> Maintenance <> System Info <> Lift Ctrlr

This area shows the internal temperature of the Controller.

VOLTAGE COMPENSATION, SETTING

Path: O.K. <> Customize <> Setup <> Battery <> Voltage Comp.

Options: ON or OFF Default: OFF

Voltage Compensation works a little like a cruise control system on a car. It tries to maintain a constant voltage to the drive motor based on the accelerator position. As an example, let's assume a 36-volt truck being driven at approximately half speed. The accelerator is at half way, and the Controller is sending approximately 18 volts to the motor.
Now, without changing the accelerator position, the truck starts up a ramp. Under normal conditions, the truck would slow down as the voltage to the motor drops due to the extra load.

With Voltage Compensation turned ON, the Controller feels the drop in voltage and compensates to try to maintain the voltage constant.

BI-DIRECTIONAL ACCELERATOR

Path: OK <> Customize <> Setup <> Accel. <> Drive or Lift Accel.

This feature allows the use of a single 5K to 0, or 0 to 5K pot to control the forward and reverse output to the directional contactors as well as the sweep for acceleration without the use of forward and reverse switches.
In the case of the SE175/325 the forward and reverse inputs (white/yellow and white/gray) must be tied together to B+ for this feature to work.

Four menu items are available:

A: MIN
B: MAX
C: TYPE
D: CENTRE

Use TYPE first to determine the style of accelerator that you wish to use. Then set the CENTRE . With the throttle in the neutral position, the ProBit will show on top of the screen the current voltage. Use that level as your center.
The MIN adjusts the dead zone before the controller responds to the throttle, and the MAX set the point where the controller will be at full.

For example, if your ProBit read 2.0 Volts at rest and goes to 0.2 Volts when the joystick is moved in one direction and 3.8 Volts in the other, the available sweep in either direction is 1.8 Volts.

Part of that sweep will be used as a dead band, and the rest for acceleration. Adjustments are always measured from the CENTRE. One quarter of the sweep is usually a good value for the dead band. You settings in this instance would then be:

CENTRE: MIN:
MAX: 2.0 Volts0.4
Volts 1.7 Volts

PC+ Advanced Settings*

PC+ SWITCHES FUNCTIONS, SETTING*

Path: OK <> Customize <> Lifting <> Switches <> Switch Function

The four available input switches can be configured to different responses based on your requirements. The available choices are:

LIFT	(input 1-4)
ACCESS	(input 1-4)
FUNCTION	(input 1-4)
STEER	(4 only)

The LIFT setup assumes that the lift function is not controlled by a pot, and activating this switch turns on the pump motor the preset motor output. In the case of an installation using switches for lift, tilt and auxiliaries, all of the functions will be set to LIFT. No external drivers are activated.

The ACCESS setup works exactly like the LIFT with the addition of turning on an external, voltage programmable output for each switch used. This output can be mapped to any of the five wires on the output harness. See PC+ Mapping.

When a switch is energized under the FUNCTION setup, the joystick will control two separate coils and proportional motor output based on the direction of joystick travel. These outputs are also mapped to any of the five wires on the output harness. See PC+ Mapping.

For example, if switch #2 is used for side-shifting, moving the joystick in one direction while holding switch #2 will energize the left side-shift coil and control the motor speed proportionally to the joystick position. Moving the stick in the other position will energize the right side-shift coil.

Function #4 only can be set to STEER when it is used to control On-Demand Power Steering. Contact Navitas Controls for further information on the necessary hydraulic setup. The two menu items available are MIN STEER which set the "idle" speed of the motor when the steering in not "in demand" and MAX STEER which is the motor speed used under steering conditions.

PC+ SWITCHES OUTPUT, SETTING*

Path: OK <> Customize <> Lifting <> Switches <> Switch Output

This area allows you to set the motor speed that will result from the switches 1 to 4 being energized. If level switch #4 is used for "On Demand" power steering, the fourth line on the menu will show STEER. Contact

Navitas Controls for further information on the necessary hydraulic setup. The two menu items available are MIN STEER which set the "idle" speed of the motor when the steering in not "in demand" and MAX STEER which is the motor speed used under steering conditions.

PC+ COILS OUTPUT, SETTING*

Path: OK <> Customize <> Setup <> Contactors <> PC+ Coils <> Set Out Volt

This area allows you to set the output voltage to the various coils that will be driven by the PC+. Unlike the contactor coils on the TSE550/1000 series that must all be set to one voltage, the coils on the PC+ can all be set to different voltages.

PC+ COILS MAPPING*

Path: OK <> Customize <> Setup <> Contactors <> PC+ Coils <> Map Output

This function allows you to "map" any of your switch inputs or functions to the required coil output wire.

The available menu items are:

> A: RAISE/LOWER
> B: ACCESS
> C: FUNCTION
> D: ON

The first three lines refer to the function that has been set for the input switches. See PC+ Switches Functions, setting. The fourth line allows the setting of a fixed output. This output will be turned on at a preset voltage, see PC+ Switches Output, setting, whenever the controller is running.

When you select a function that you need to map, the ProBit displays the following menu:

> A: ORG D: YEL
> B: BRN 1: GRN
> C: BLU 2: OFF

The colors refer to the five wires on the output harness of the controller. Simply select the color of the wire that you wish that function mapped to or the "OFF" function. For example, if you are setting your lift and lower functions and your lift solenoid is connected to the orange wire on the harness, you would choose: A: RAISE/LOWER, then LIFT ON and map this function to A: ORG.

The ProBit will show parentheses (.) around the output selected.

PSE550P/1000P INSTALLATION SEQUENCE (Not a Probit Function)

The installation of the TSE550/1000 and PSE550P/1000P+ combination cannot be done using the Auto Install feature of the ProBit. Therefore the following sequence should be adhered to in order not to miss any of the important adjustments: 1-Set the contactor coils voltage. See Contactor Coils, setting

2-Set PC+ coils voltages. See PC+ Coils Output, setting 3-Calibrate drive accelerator. See Accelerator bi-

directional, setting 4-Calibrate lift accelerator. See Accelerator bi-directional, setting 5-Set PC+ Switches Functions.

See PC+ Switches Functions, setting 6-Set PC+ Switches Output. See PC+ Switches Output, setting 7-Map PC+

Outputs. See PC+ Coils Mapping 8-Adjust current limits. See Current Limits, setting 9-Set acceleration and

plugging for drive. See Plugging, adjusting 10-Set acceleration for lift motor. See Acceleration, Lift Motor 11-

Adjust all relief valves on hydraulic manifolds 12-Adjust relief valve on steering priority valve (if used) 13-Adjust

On-Demand Steering levels (if used). See PC+ Switches Output, setting

Navitas ProBit PB-200

Faults & Settings Explained

A contactor uses more than 2 amps (13) (14)

The 2 Amp maximum contactor output current has been exceeded.

a) Check the polarity of the contactor coil and/or suppressor.
b) Measure contactor coil resistances using an ohmmeter. The voltage divided by the resistance will determine the amp draw. For example, a 36-Volt coil should have a resistance of 18 Ohms or more to ensure less than 2 Amps.
c) Using the ProBit adjust the contactor output voltage. Older contactors may draw more current. Multiplying the coil resistance by 2 will give the maximum allowable voltage. For example, a coil resistance of 15.5 Ohms will result in a maximum voltage of 31 Volts to stay under 2 Amps.

Accel must be mechanically adjusted, or replaced before use.

The ProBit is reading no voltage sweep, or an insufficient sweep of the throttle.

a) Physically adjust throttle mechanical linkage. b) Check the
sweep with the ProBit or a multimeter. c) Re-calibrate throttle
with the ProBit.

Bad Accel Diff. from stop to full is to small

The ProBit is reading an insufficient sweep of the throttle.

a) Replace throttle for one with adequate travel.
b) Physically adjust throttle mechanical linkage.

c) Replace potentiometer with 5K single direction (20K double direction pot).
d) Re-calibrate throttle.

Bad Accel. Inconsistent polarity.

The polarity of the accelerator is not consistent throughout the sweep.

a) Adjust the pot mechanically so that the sweep is constant, up or down. b) Re-calibrate throttle with the ProBit.

Battery current limit for drive/lift exceeded (05/85)

The controller's hardware current limit has been exceeded.

a)   There may be a short circuit in the main motor cables. Repair.
b)   The motor(s) may be drawing too much current from a shorted field or armature. Check the motor(s) and repair as necessary.

Battery voltage too high for drive/lift.(over 55V) (27/77)

48-Volt battery recently charged. Surface charge has not dissipated.

a)   This fault can be self-correcting. On a truck with power steering, the controller, if set to do so, will pull in the steering pump briefly to dissipate the surface charge. If the truck does not have a power steering, the surface charge will dissipate over a few minutes.
b)   Ensure that the high voltage response is properly set with the ProBit based on whether the truck has a power steering or not.
c)   Clear the fault(s) with the ProBit.

Both direction switches on at same time (10)

The Controller has seen both direction switches on at the same time.

a) One or both switches are sticking. Replace b)
Switches are miswired. Correct

Check for a sticky forward/reverse contactor. (30/31)

The controller has determined that the forward/reverse contactor has not dropped out properly or has not pulled in fast enough.

a) If this message appears on a truck that has the ability to coast in neutral, i.e. stand-up reach trucks and power pallet trucks, it is likely due to a problem called residual magnetism. This issue has been fixed on the later SE175/325. On older units, please contact FSIP for further information.
b) On all trucks not included above, the switching time of the contactor exceeds the maximum allowable value. Check the plungers for free movement, the coils for shorts and anything that could physically restrict the speed of the contactor.

Check for welded direction contactor (20)

The directional contactor has failed to open, or is shorted.

a) Tips may be welded. Replace.
b) Something is shorting the contactor posts or tips.

Check if field (F) bar shorting to B- bar. (21B)

The controller is reading a short between the motor field and B-.

a) The most common cause of this fault is a ground fault on the truck. As a rule of thumb, the maximum allowable voltage between the battery and the chassis is 50% of battery voltage. The resistance measured between the chassis and motor terminals or controller bars should be in excess of 30K Ohms. Clean up any existing ground fault and try again.
b) With all cables disconnected and the capacitors fully discharged, read the resistance between the "B-" bar on the controller and the "F" bar. The reading should exceed 10K Ohms. If the resistance is substantially lower (0 to 100 Ohms) the controller will need to be replaced.

Check the forward/reverse contactor. (25/24)

This error occurs during start-up. The controller is reading an open circuit across the motor when the contactor is pulled in.

a) The most likely cause of this fault is a poor contact across the contactor tips, especially on the normally closed side of the directional contactor assembly. Check and correct.
b) Check cable connections to the motor terminals and contactors. There should be continuity between the "A" bar and the "F" bar when either the forward or reverse contactor is pulled in.

Direction contactor failed to drop out. (33)

The controller has the detected that the contactor tips were still closed after the contactor coil was dropped.

a) Most likely the contactor tips are welded, or mechanically held closed. Correct. b) On older controllers, the change time may be set too low. Correct with the ProBit.

Low Battery. Lift locked out.

The BDI (Battery Discharge Interlock) has been activated.

a)   By default the controller is set to lift interrupt when the battery reaches 1.85 Volts per cell.
b)   A bad cell in the battery will reduce total battery voltage and prematurely set off the BDI. Adjusting the battery voltage in õCustomizeö with the ProBit can compensate this for this.
c)   The cut out level can also be changed with the ProBit under "Customize" and "Protection"

No cct path from A thru armature, fld & FWD ctr (23)

This error occurs mostly during start-up. The controller is reading an open circuit across the motor when the contactor is pulled in.

a)   The most likely cause of this fault is a poor contact across the contactor tips, especially on the normally closed side of the directional contactor assembly. Check and correct.
b)   Check cable connections to the motor terminals and contactors. There should be continuity between the "A" bar and the "F" bar when either the forward or reverse contactor is pulled in.

No power circuit through lift motor. Check wiring.

This error occurs mostly during start-up. The controller is reading an open circuit across the motor.

a)   Check for loose or broken motor cables.

There is a path from B+ to the F bar. Pls check wiring.

The controller has seen continuity between the B+ bar and the F bar.

a) If this is the initial installation, check for improper wiring. Correct.
b) Check to see if a directional contactor is stuck on. Correct.
c) If the truck uses a Bypass (1-A) contactor, the tips may be welded. Correct. It is strongly recommended that the Bypass contactor NOT be used, as it is not needed with the Navitas System.
d) With the "A" "AF" and "F" bars disconnected, measuring with a voltmeter, you should get approximately 50% of battery voltage between these two points. If you get full battery voltage, replace the controller.
e) With the "A" "AF" and "F" bars disconnected and the capacitors fully discharged, measuring with the Ohmmeter you should get in excess of 10K Ohms. If the resistance is very low (0 to 100 Ohms) replace the controller.

There is a path from B- to the F bar. Pls check wiring.

The controller is reading a short between the motor field and B-.

a) The most common cause of this fault is a ground fault on the truck. As a rule of thumb, the maximum allowable voltage between the battery and the chassis is 50% of battery voltage. The resistance measured between the chassis and motor terminals or controller bars should be in excess of 30K Ohms. Clean up any existing ground fault and try again.
b) With all cables disconnected and the capacitors fully discharged, read the resistance between the "B-" bar on the controller and the "F" bar. The reading should exceed 10K Ohms. If the resistance is substantially lower (0 to 100 Ohms) the controller will need to be replaced.

Truck not in Neutral. Forward/Reverse switch stuck on.

The controller has determined that the Forward switch is closed.

a) The switch may be stuck. Correct.
b) The switch may be miswired (normally closed used instead of normally open). Correct.
c) The wiring may be faulty. Correct.
d) The controller may be in an "Install Interlock". Run through "Find Problems" in the "Troubleshoot" section of the ProBit to correct the problem.

Truck not in Neutral. SRO Switch open.

The controller has determined that the SRO (seat or dead-man switch) is open.

a) The switch may be stuck. Correct.
b) The switch may be miswired (normally closed used instead of normally open). Correct.
c) The wiring may be faulty. Correct.

Truck not in Neutral. Throttle not at rest.

The controller has determined that the accelerator is not at rest.

a) Check that the accelerator is moving freely.
b) Check to wiring to the accelerator.
c) With the ProBit check that the accelerator is giving a reasonable sweep (2 to 5 volts). Replace if necessary.
d) With the ProBit, check the minimum and maximum settings of the throttle. Reset if necessary.

Stack Overflow/ No Network/ Controller Failure.

The controller has experienced a fatal software or hardware failure.

a) Try to restart the controller by cycling the key switch.
b) Unplug the battery from the forklift and cycle the key switch on for 10 seconds to discharge the capacitors. Plug the battery back into the forklift and try to start it again.
c) If the above suggestions fail to correct the problem, try to use a different Probit to ensure the problem isn't related to the Probit. Otherwise, contact Flight Systems Industrial Products at 1-800-333-9194 for further instructions.