USER GUIDE

MPC100 / MPC300

CAT® MARINE PROPULSION CONTROL SYSTEM

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1. Introduction

Purpose

This document is a reference for the Cat Marine Propulsion Control system also known as MPC system.

Caterpillar® control systems are designed and built to provide superior value, however, achieving the end user's value expectations depends greatly on the performance of the complete installation to assure proper function and design life.

Caterpillar® does not guarantee or approve the validity or correctness of any installation. Caterpillar's obligation with respect to any product is as set forth in the applicable Cat warranty statement.

It is the installer's responsibility to consider and avoid possible hazardous conditions, which could develop from the systems involved in the installation. The suggestions provided in this guide will be considered general examples only and are in no way intended to cover every possible hazard in every installation.

Contact the appropriate application support group for the latest information on CAT Marine Propulsion guidelines.

Scope

The scope of this document covers the user controls for the Marine Propulsion Control system or "MPC" system. This includes the MCP100/300, MCL100, MCD100, MPL100 and all lever head designs that uses MPC Marine control systems.

2. CONTROL STATIONS

MCL100

The integrated lever head has five physical buttons and two lever heads for port and starboard movement. These five buttons can change button functions with the selection of different configurations made on the lever head display. Below are some *typical* lever head button operations at an active station.

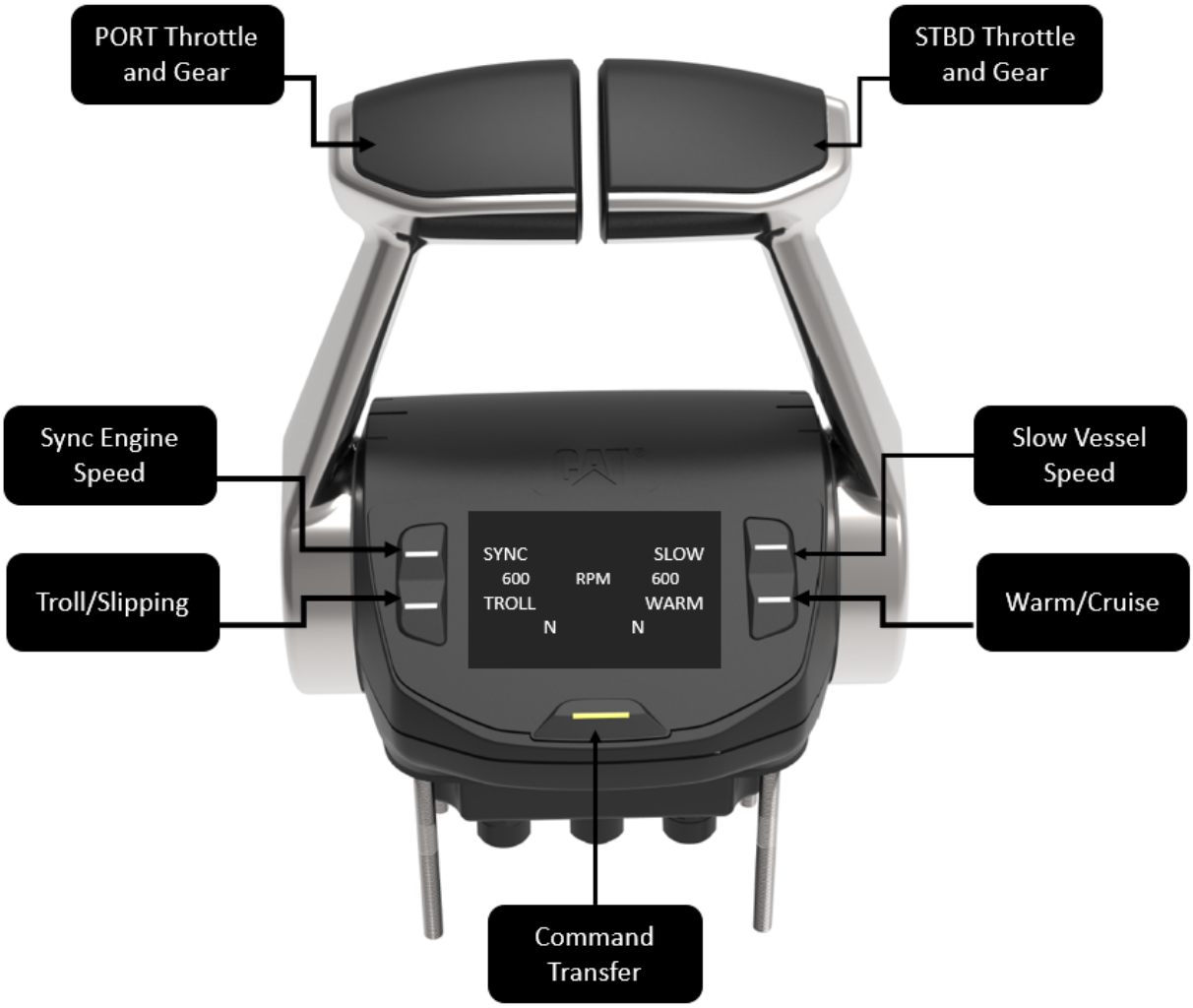

Figure 1: MCL100

MCD100

The MCD100 button panel (shown below) will have the same type of operations but without lever handles attached. This can be used as a standalone station (backup panel), part of the MPL100 offering (palm beach lever setup), or part of the MML package (Advanced leverhead setup).
The buttons on the button panel follow the same orientation as the MCL100 above with similar function. The backup panel does offer a few additional functions as a backup panel. Those functions will be outlined below in the operations section.

Figure 2: MCD100

Control Station Button/LED Definitions Button specifics

Buttons press definitions

The below figure outlines the actions a button press will elicit.

Single button press – Any press of a button that is more than 0.05 seconds but less than 2 seconds. Less than 2 seconds is not considered a “hold”.

Double button press – 2 subsequent button presses within 0.6 seconds.

Press and hold of a button – When a single button is depressed for more than 2 seconds, E.g. press and hold of button 5 for 2 seconds is the all stop command and press and hold of button 5 for 5 seconds deactivates the station.

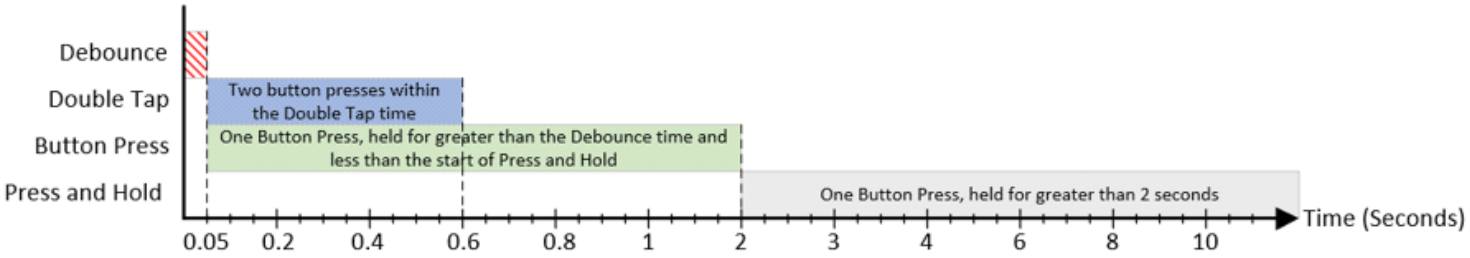

Figure 3 Button press visual description

LED specifics

The LEDs can be adjusted for brightness, as well as color adjusted for day (white backlit) or night (amber backlit) mode. The LEDs also serve as indicators via flash patterns during station transfer. The flash rate is applicable to the target station’s button 5 flash rate. The below table is a guide for the flash patterns.

Table 1 – Button LEDs, flash status table

Active Station LED Flash Rate	Active Control Station Gear	Target Control Station Gear	Throttle mismatch %
Active Control Station			
Steady On	Active Gear	Same Gear	Throttle Mismatch < 5%
Fast Flash	Active Gear	Same Gear	5% < Throttle Mismatch < 15%
Slow Flash	Active Gear	Same Gear	15% < Throttle Mismatch < Any
Slow Flash	Active Gear	Neutral	Any
Slow Flash	Active Gear	Opposite Gear	Any
Active Control Station in Neutral			
Steady On	N	N	N/A – Immediate transfer
Fast Flash	N	F	Throttle Mismatch < 5%
Slow Flash	N	F	Throttle Mismatch > 5%
Fast Flash	N	R	Throttle Mismatch < 5%
Slow Flash	N	R	Throttle Mismatch > 5%

3. Display Operator Settings

"Operator Settings" refers to MPC System settings that the operator may change from a Control Station HMI's "Settings" menu. The "Settings" menu is accessed from any Control Station HMI's Configuration screen. All operator settings are retained during a power cycle.

The below operator settings apply to both the **MCL100 Leverhead** and the **MCD100 button panel**.

Initial Start Up

Upon initial startup of either an MCL100 or MCD100 the first thing an operator will notice is the HMI boot up screen with the CAT emblem.

Figure 4: Boot Screen

When you first power up the Lever Head / Display it will give you the option to setup the display and configure as needed. Each time you boot the system up it will show you the screen below in Figure 5.

Note: Each non-active station will show the screen below. The active station is listed in the center banner.

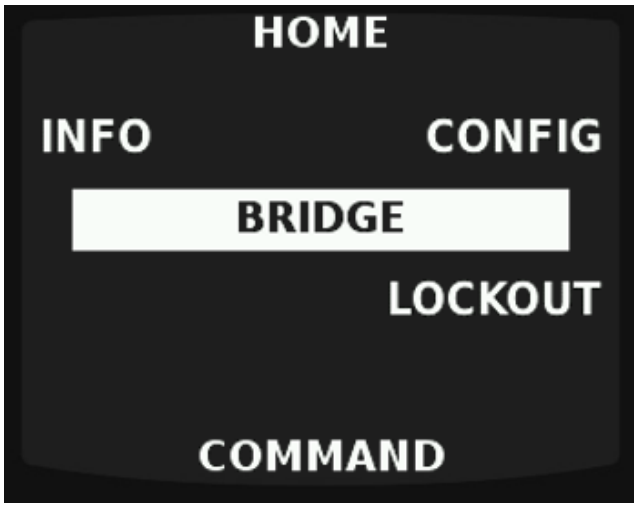

Figure 5: Home screen (Inactive Station)

When the user selects the “INFO” selection, the following screen below shows the software part number. If the user then selects the upper left button, the screen will show the boot loader screen with part numbers.

Figure 6: Software screen

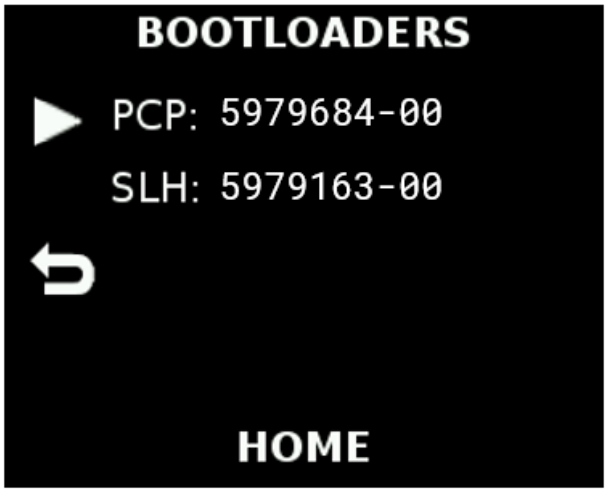

Figure 7: Bootloader screen (numbers may not be the most updated versions)

If the user selects the CONFIG option, it will show the screen below.

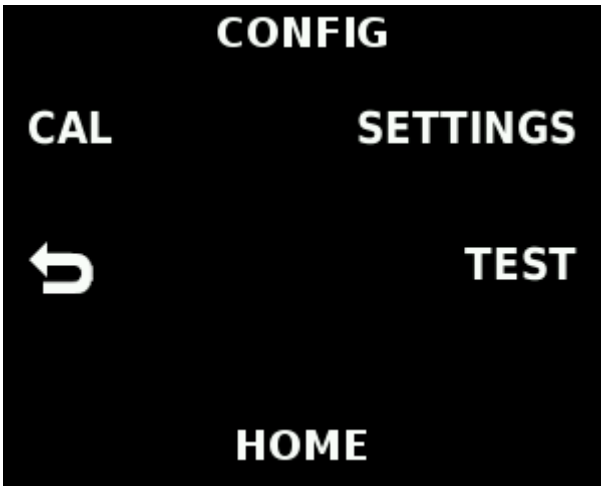

Figure 8: Config screen

Note: It is recommended for the user to calibrate the Lever Heads during commissioning. Each time the system is powered up it will give you this option, *but the user only needs to do it on the initial startup.*

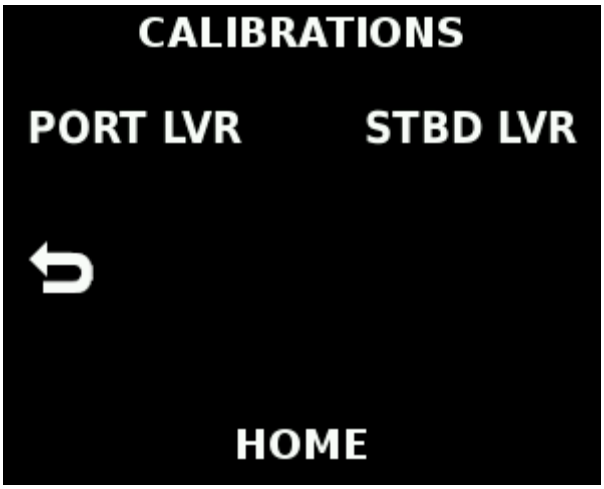

Figure 9: Calibration Screen

If calibrating the lever heads on initial start up the display will ask you to calibrate both Port and Starboard sides.

Figure 10: Calibration screen on port side example

When calibrating the lever heads, follow the instructions shown on the display. It will be the same for both port and starboard sides.

Figure 11: Port lever test screen max fwd

Figure 12: Port lever test screen min fwd

Figure 13: Port lever test screen max rev

Figure 14: Port lever test screen min rev

When the user selects the TEST option from the CONFIG display screen, the display will show a few options the user can select to test out certain functions on the Display / Lever Head or the MCP processer.

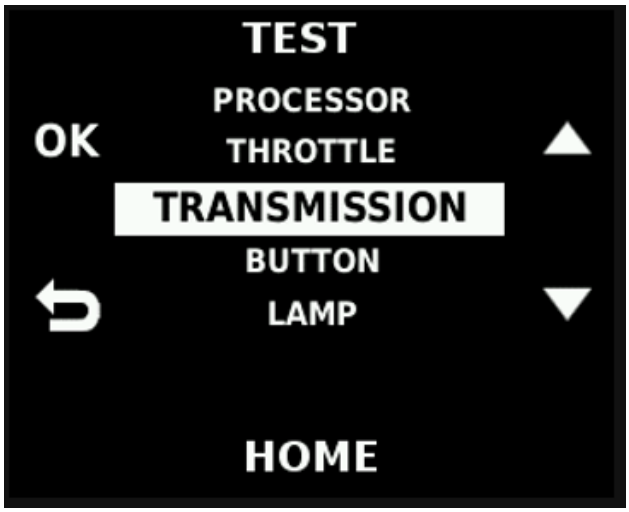

Figure 15: Test Screen

The LAMP TEST simply tests all the lights on the buttons. This test will be performed by cycling the LEDs from the lowest dimming level to the highest dimming level in a cycling fashion. It will start slowly with the lowest white light available to the brightest white light and then transition through the amber brightness spectrum.

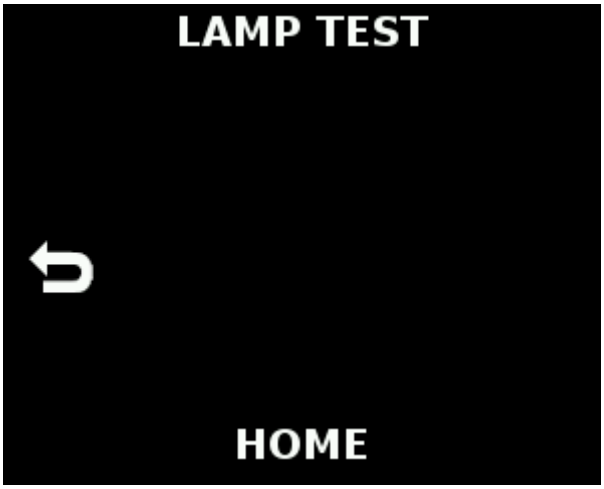

Figure 16: Lamp test screen

The BUTTON TEST simply gives the user a feedback check on whether the buttons are working or not.

Figure 17: Button Test Screen

Here, the top left button has been pressed, indicated by PRESSED showing next to that button.

Figure 18: Button Test Screen showing “acknowledgement of button press”

The PROCESSOR screen shown below gives the user the ability to change to the backup processor in the MCP. If the user believes there is an error with the MCP, this option gives the user the option to move to the backup processor manually. Note: If the user makes another Lever Head /Display active it will revert the processor back to the primary processor.

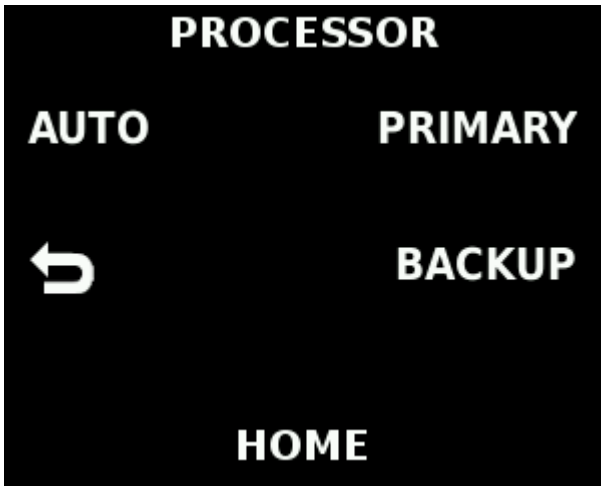

Figure 19: Processor selection screen

Backup Processor

Backup processor engaged is considered a nonstandard operation, this will cause the diagnostic symbols to populate on the operation screen first, then in the banner, as well as the B between the gear position indicators. If the backup processor is engaged via the Test screen, the below image will populate first, mute this and proceed forward. The diagnostic symbols will always be present in the banner while in backup mode.

Figure 20: When Backup Processor is enabled, this will be the first screen shown.

When using the Backup Processor is in use, then a small Red “B” will appear on the screen as shown in figure 21.

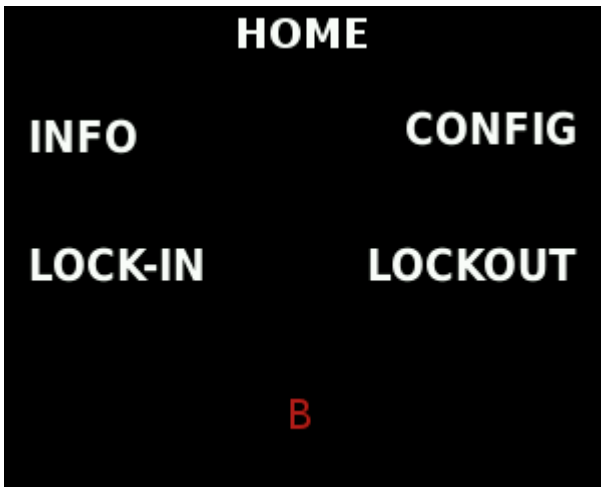

Figure 21: Backup Processor selected example

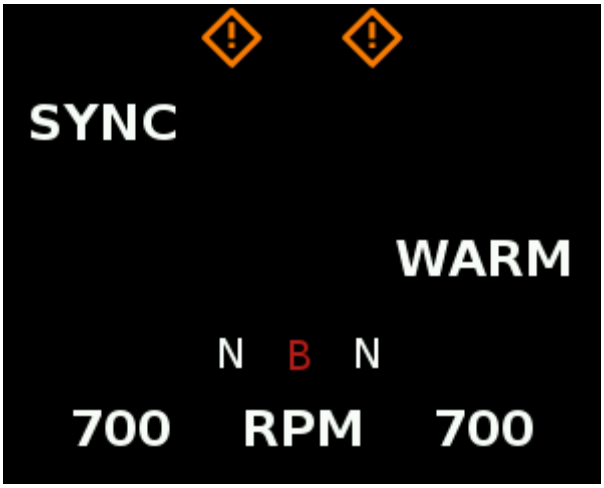

Figure 22: Backup Processor engaged with diagnostic indicators

Station Type

The Station Type Operator Setting refers to the Control Station function that is selected for an MCD100 Button Panel. The Station Type operator setting is only accessible from MCD100 Button Panels (not from MCL100).

The MCD100 Button Panel serves as the Control Head for all Palm Beach Control Stations, Advanced Lever Heads, and Backup Panels. Palm Beach Lever Assemblies and Advanced Lever Heads shall be connected to the MPC system via their Button Panel's PORT PBH and STBD PBH connections.

All Button Panels will have their Station Function set to one of the following types:

Station Type = "Palm Beach" or MPL100
Button Panel is for a Palm Beach Control Station
Station Type = "Advanced" or MML100
Button Panel is for an Advanced Lever Head Control Station
Station Type = "Backup" (**Default**) MCD100
Button Panel is a for Backup Panel Control Station

The Station Type setting will only be applied to the Control Station where the selection was made by the operator and will be retained through a power cycle.

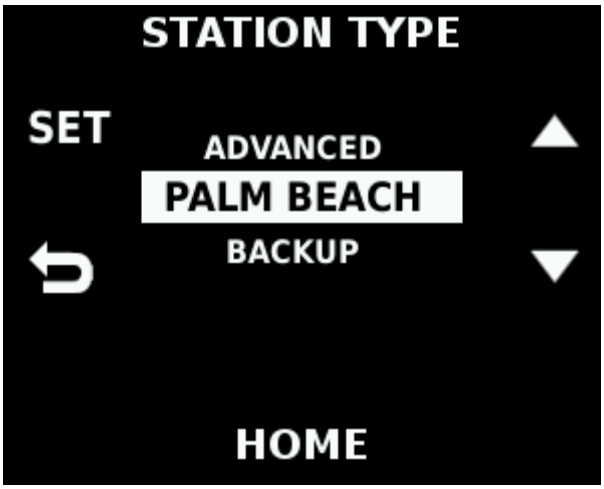

Figure 23: Station Settings

The MCD100 Button Panel will automatically detect which kind of hardware is connected to its PORT PBH and STBD PBH connections (such as Palm Beach, Advanced Lever Head, or none), but it will not automatically change the Station Type setting. If the Station Type setting **is changed to** “Advanced” or “Palm Beach” and the Button Panel does not detect the appropriate hardware, the Button Panel HMI will show the “Hardware Not Detected” Popup.

Note: A diagnostic will appear if a station is set to active and the hardware is not detected once the operator tries to “take the station”. Image below will appear in the event this occurs.

Figure 24: Diagnostic in the event of no hardware detected.

Figure 25: Station type settings screen

If at Keyswitch-ON a Button Panel detects Palm Beach or Advanced Lever Head and its Station Type is set to “Backup”, the Button Panel HMI will show the “New Station Hardware” Popup. Once the “New Station Hardware” Popup is acknowledged, the HMI will navigate to the Station Type screen. The operator may elect to leave the Station Type set to “Backup” if they suspect their MAL or MAA is non-functional and want to control via Backup Controls.

Figure 26: Station type screen

SVM (SLOW) Set Speed

At Keyswitch-ON the SVM (SLOW) Set Speed shall be set to the engine's *Slow Vessel Mode Set Speed*. The SVM (SLOW) Set Speed Operator Setting may be used to increase the SVM (SLOW) Set Speed. The SVM (SLOW) Set Speed may not be set any higher than *Slow Vessel Mode (SVM) Maximum Idle Engine Speed*, which is defined during initial commissioning. Please refer to LEGM20971 for guidance.

The SVM (SLOW) Set Speed setting will be applied to all Control Stations and will be retained through a power cycle. This setting will not be available any time any control station is active. The default range for SVM (SLOW) speed is 550-750 rpms, but this can be increased if the *Slow Vessel Mode (SVM) Maximum Idle Engine Speed is increased by a CAT Technician with the service tool.*

Note: Slow vessel mode cannot be set below 550 rpms.

Figure 27: SVM set speed

SYNC Master

The SYNC Master Operator Setting will be used to choose the master lever for SYNC Mode operations. The operator may select PORT, STBD, or AUTO as the SYNC Master lever, shown in the figures below. If AUTO is selected, then the Master lever will be the first lever that is moved after entering SYNC Mode. The current master lever will be shown in the Active Control Station's HMI in the top banner.

The SYNC Master setting will be applied to all Control Stations and is retained through a power cycle. This setting will not be available any time any control station is active.

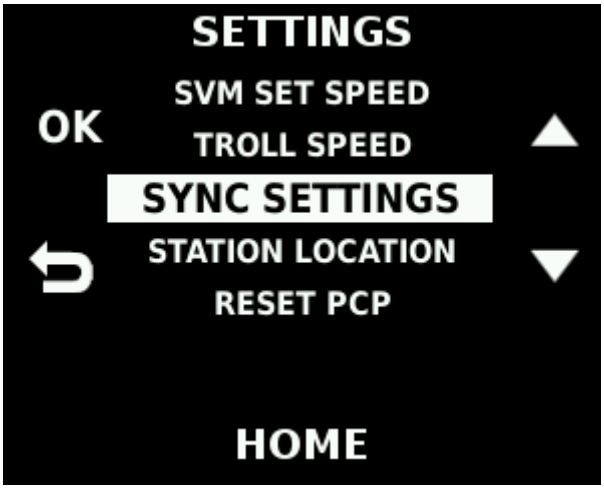

Figure 28: SYNC setting selection screen

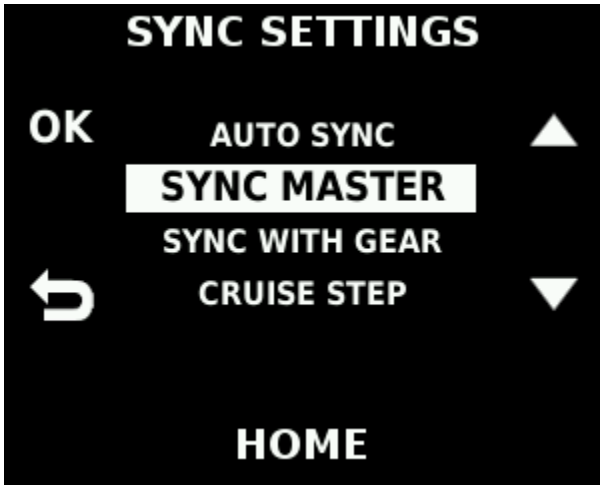

Figure 29: SYNC master selection

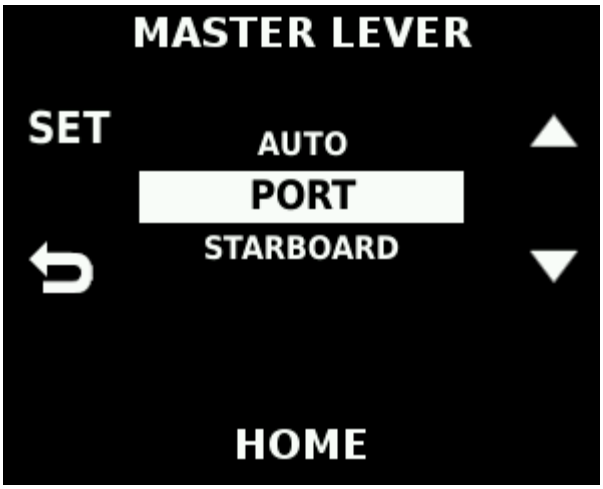

Figure 30: SYNC master lever head selection

SYNC With Gear

The SYNC With Gear operator setting will be used to choose whether or not the SYNC Master Lever will control engine speed **and** gear or just engine speed. The SYNC With Gear setting will have the following options:

With Gear: When SYNC Mode is active, the SYNC Master Lever will control the Port and Starboard throttle positions and gear for both powertrains.

Without Gear: When SYNC Mode is active, the SYNC Master Lever will only control the Port and Starboard throttle position. The non-Master lever will retain control of the requested gear for the non-Master transmission.

The SYNC With Gear setting will be applied to all Control Stations and will be retained through a power cycle. This setting will not be available any time any control station is active.

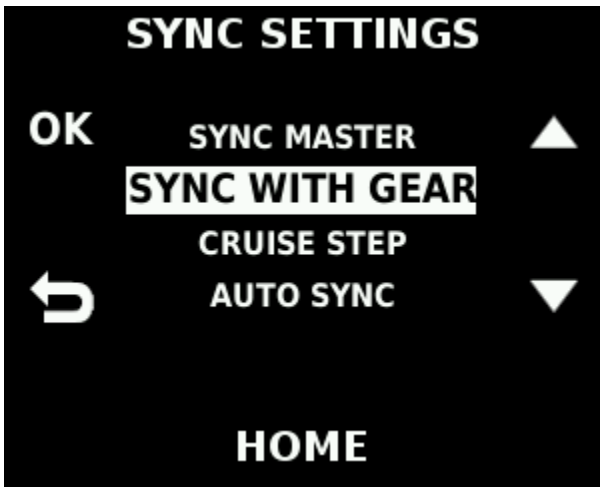

Figure 31: SYNC with gear selection

Figure 32: SYNC gear selection scree

Cruise Step

The Cruise Step Operator Setting will be used to define the size of Engine Speed Increments and Decrements that are made using the “+” and “–” buttons on the Cruise screen. The Cruise Step setting will have a minimum of 5 RPM and a maximum of 200 RPM. The cruise step can change by increments of 5 RPMs, this is applicable for single and dual engine configurations. The default for cruise step is 50 RPMs.

The Cruise Step setting will be applied to all Control Stations and will be retained through a power cycle. This setting will not be available any time any control station is active.

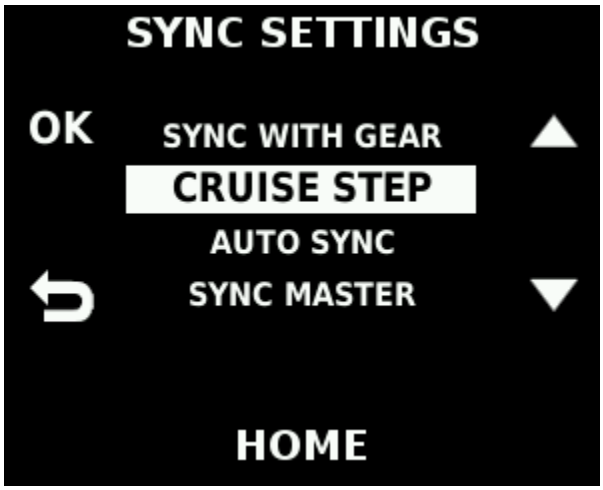

Figure 33: Cruise step selection screen

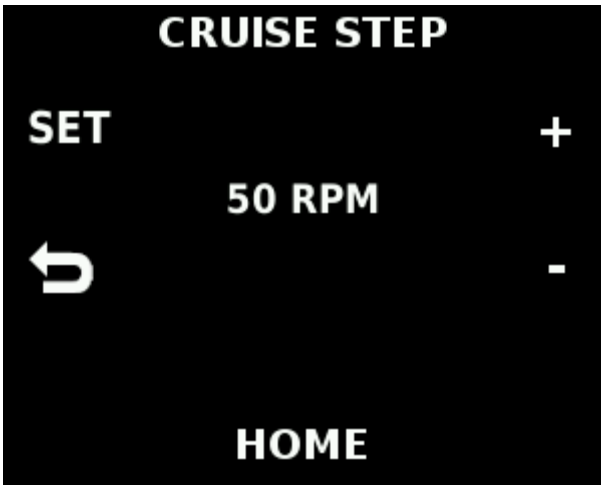

Figure 34: Cruise step RPM selection default of 50RPMs

Auto SYNC Enable

The Auto-SYNC Enable Operator Setting will be used to Enable or Disable the Auto-SYNC feature. The Auto-SYNC feature allows the Port and Starboard commanded engine speed values to synchronize automatically when the difference between the Port and Starboard throttle positions is less than the *Automatic Engine Synchronize Enable Speed Difference Percentage* for longer than *Automatic Engine Synchronize Activation Delay Time*. At Keyswitch-ON, the Auto-SYNC feature will be enabled or disabled based on the setting for the *Automatic Engine Synchronize Enable Status* configuration.

The Auto-SYNC setting will be applied to all Control Stations and will not be retained through a power cycle. When the MCP is powered down, Auto-SYNC will revert to enabled or disabled based on the ET setting for the *Automatic Engine Synchronize Enable Status* configuration setup *by a CAT Technician with the service tool.* This setting will not be available any time any control station is active.

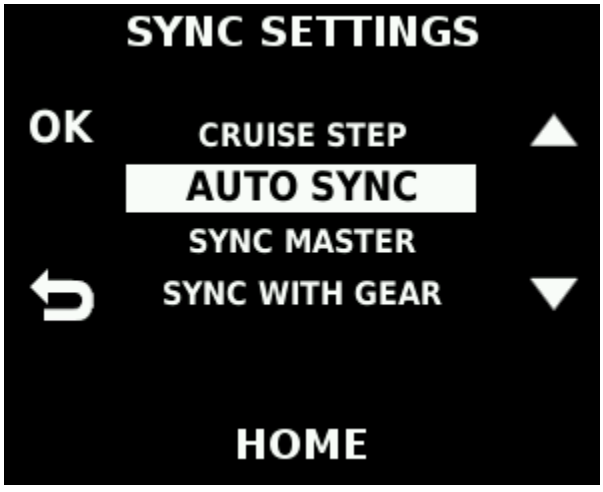

Figure 35: AUTO SYNC selection screen

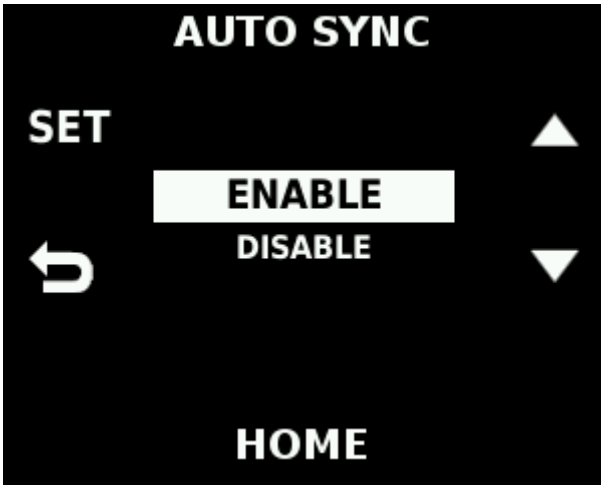

Figure 36: Enabling AUTO SYNC

Troll Set Speed

At Power up the Traditional Troll Set Speed shall be set with the service tool by a CAT Technician to *Traditional Troll Activation Maximum Engine Speed*. However, this can be adjusted based on *Traditional Troll Activation Maximum Engine Speed* in the ET settings. The Troll Set Speed Operator Setting may be used to increase the Traditional Troll Set Speed, default range of 700-1000 rpms. The Traditional Troll Set Speed may not be set any higher than *Traditional Troll Maximum Engine Speed*.

The Troll Set Speed setting will be applied to all Control Stations and will not be retained through a power cycle. When the MCP is powered down the Traditional Troll Set Speed will revert to *Traditional Troll Activation Maximum Engine Speed*. This setting will not be available any time any control station is active.

Note: An operator can also change the Traditional Troll Set Speed from an Active Control Station by pressing and holding the Troll Button for 2 seconds.

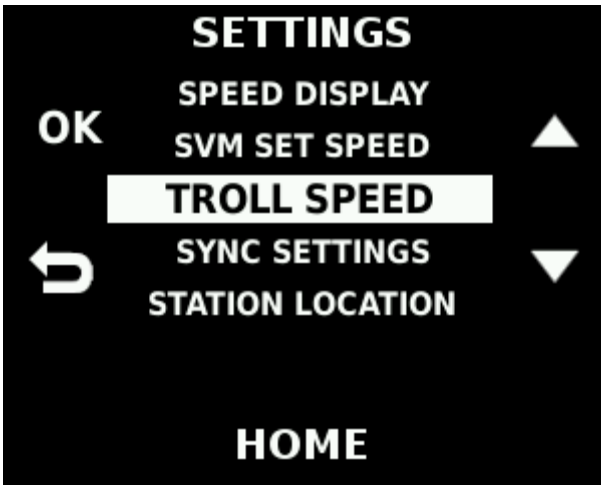

Figure 37: Troll speed selection screen

Troll set speed can be changed by pressing the buttons next to the plus/minus.

Figure 38: Selecting troll RPM screen

Speed Display

The Speed Display Operator Setting is used to determine whether Engine Speed or Shaft speed will be displayed in the Control Station's Active Station and Cruise screens. The operator will be able to select "OFF", which will remove all text from the bottom banner on the HMI.

The Speed Display setting will only be applied to the Control Station where the selection was made by the operator and will be retained through a power cycle.

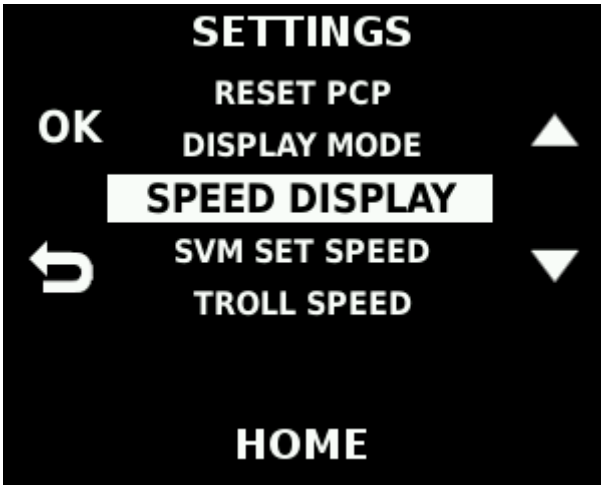

Figure 39: Speed display selection

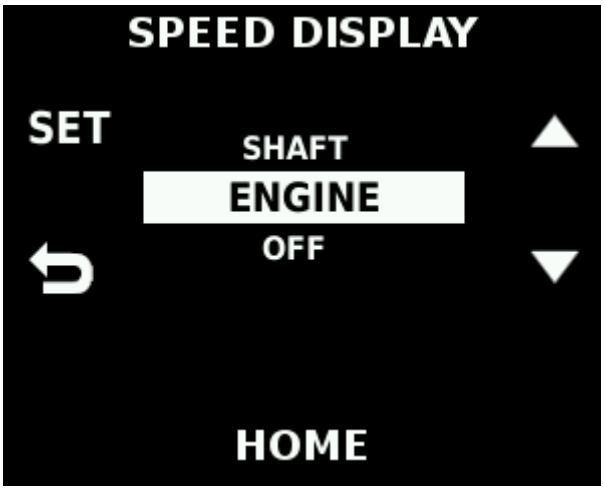

Figure 40: Speed selection for screen

Display Options

Each Display Panel and Lever Head has a “Night Mode”(amber text) and a “Day Mode” (white text) and the ability to change the display brightness.

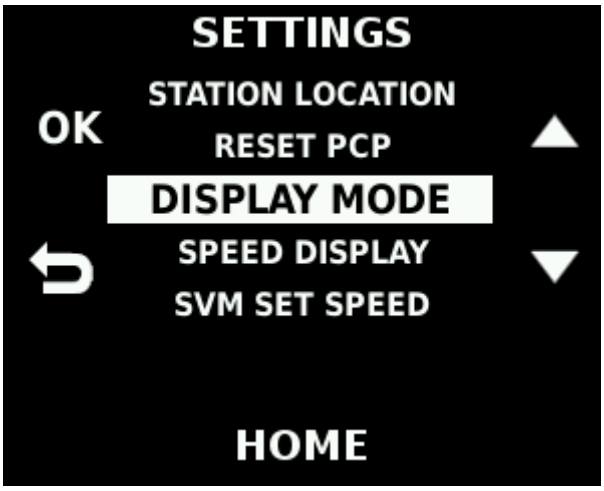

Figure 41: Display settings

Day/Night mode is selected by pressing the “moon” and “Sun” icons which will be in the upper left button. This page also allows for manually dimming of the station brightness (LCD backlight and LED brightness)

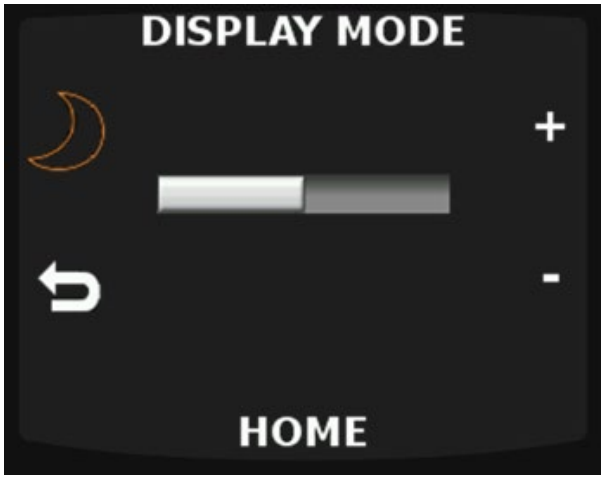

Figure 42: Display mode (day)

Figure 43: Display mode (night)

4. Using the Control stations

Once the Display is setup, it can be used to control the vessel. Below are some instructions on how to use the control system once configured. The display will show the screen below when Active, this is considered the home screen. There are four options that can be used here, as long as those pieces of hardware are connected and setup with the service tool by a CAT Technician. SYNC, SLOW, TROLL, AND WARM.

The MPC system has integrated shift protection and crash reversal. There may be a delay in shifting to the opposite gear based on the shift protection configuration.

Note the screen is also displaying the gear state (N in the figure below)
Note Engine Speed (RPM) readout can be set to shaft speed (If shaft speed sensors are installed or this can be estimated by the MPC system) in the Speed Display setting above.

The gear state will be shown as.

F = Forward

N = Neutral

R = Reverse

Figure 44: Gear indicator

1. In dual engine mode, this will be SYNC. In single engine mode, this will become CRUISE as sync is not needed. SYNC allows 2 engines' speeds to be matched.
2. SLOW vessel mode
3. TROLL mode
4. WARM mode – this mode locks gear in Neutral and allows the operator to ramp engines for engine warm up.
    a. When in SYNC mode, WARM becomes CRUISE.

*Note – Modes will only appear if they are supported.

When the Lever heads are in the forward position the screen will show a scaled graph that raises or lowers depending on the throttle percent requested.

F = Forward

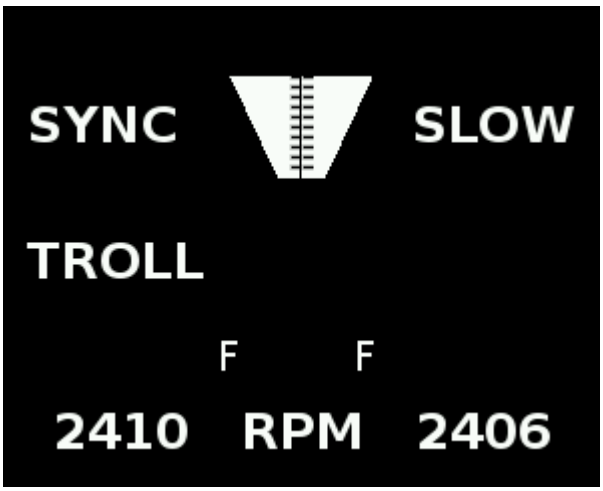

Figure 45: Forward position indicator

When the Lever heads are in the reverse position the screen will show a scaled graph that raises or lowers depending on the throttle percent requested.

R = Reverse

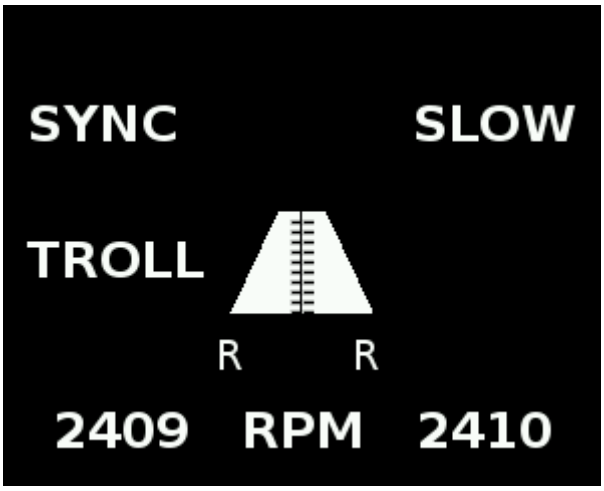

Figure 46: Reverse position indicator

Active diagnostics

Active diagnostics will be indicated by a popup on the control station. This can be muted to maintain operations, which will move the diagnostic symbol to the banner for the home screen.

Level 1 and 2 diagnostics use Amber coloring.

Level 3 diagnostics use Red coloring.

This screen identifies a new (unmuted) diagnostics is present in the system.

Note: Once an active diagnostic pops up, the operator can press the button next to mute on the control station. This will move the diagnostic symbol to the top banner, until addressed.

Figure 47: Active station screen: New (unmuted) diagnostic(s) present

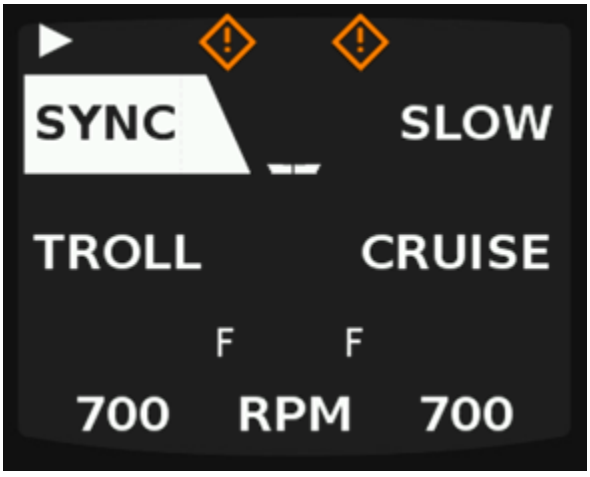

Figure 48: Active station screen: muted diagnostic(s) present

Backup Processor active

When the backup processor is active, only the options shown below will be functional *as the back processor does not support Troll and Slow mode*. Note the red **B** indicator between the gear indicators.

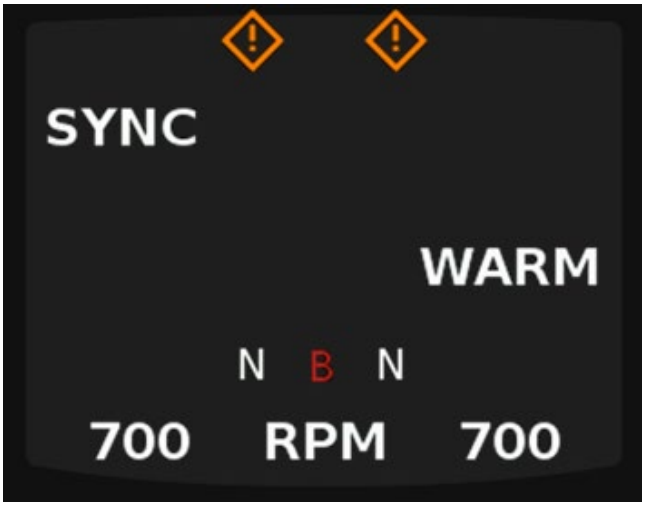

Figure 49: Backup processor indicator while secondary processor is active

Warm Mode

Warm mode locks the transmissions in Neutral and allows the operator to ramp up engine speed without gear. When engaged, gear will remain in Neutral.

Note: When using “WARM” mode, “TROLL” will not be available.

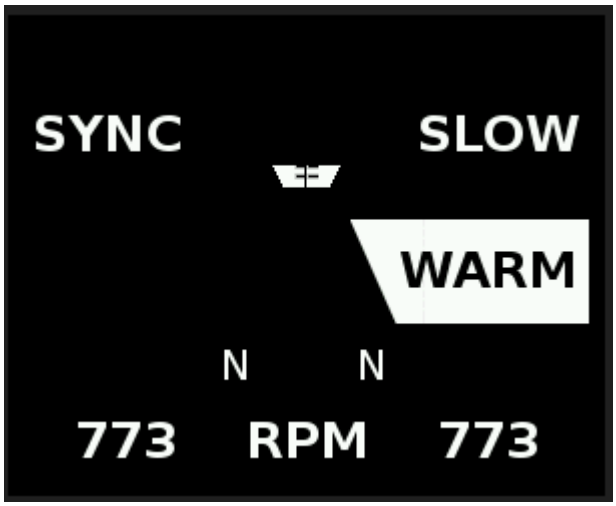

Figure 50: WARM mode indicator

Slow Vessel Mode

Slow Vessel Mode reduces the minimum engine speed to below Low Idle for operations in no-wake zones and/or harbors. Depending on MPC system settings, SVM may also be used as an alternative idle speed. Slow vessel mode set speed is set by a CAT Technician with the service tool under Vessel Engine set speed. Once this speed is set in ET, it will be the same on all control stations.

When “SLOW” mode is activated, the engine will be idling below the standard engine idle speed. Note the RPMs in the bottom of the screen. There will be a small **S** as the top of the screen to note the engine is in slow mode. This **S** will stay on the top screen banner when looking at other display screens until Slow mode is turned off.

Figure 51: Slow mode indicator

If SLOW vessel mode isn’t engaged by the engines within 10 seconds, the operator will see this popup and the system will deactivate SLOW.

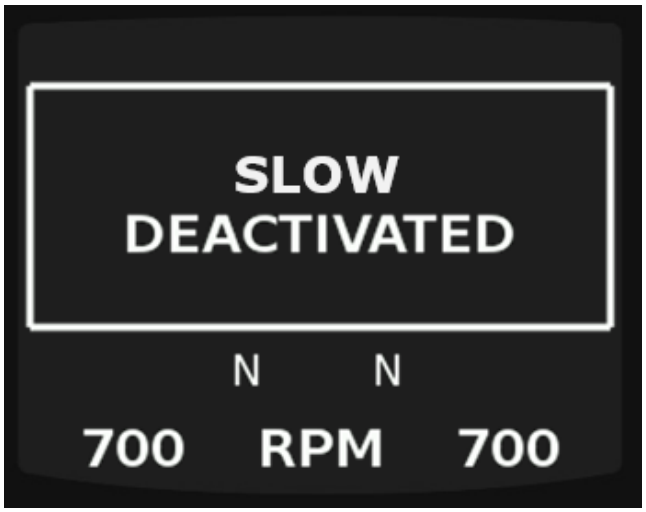

Figure 52: SLOW deactivated

Troll Mode

If equipped with appropriate troll hardware, Troll mode allows the transmission/clutch to be slipped to reduce propeller speeds. The MPC system allows for two troll modes, providing the transmissions can do so, and hardware is in place. Whether that is supported via trolling valves or built-in transmission modes. Traditional and Advanced are the 2 types of modes available.

TRAD or T = Traditional Mode – This mode slips the clutch from full slip to full lock up across the entire lever throw.

ADV or A = Advanced Troll Mode – This mode slips the clutch from full slip to full lock up across 40% of lever throw. 40-100% lever throw is throttle increase.

When pressing the TROLL button, subsequent presses toggle through the modes, the operator will first see TRAD or ADV (to help understand which mode). When the selection is made (by not pressing the button again), either a T or A will be the character present below TROLL.

The first press of TROLL will highlight TROLL and show either TRAD or ADV select whichever TROLL mode is set by a CAT Technician with the service tool. For example, if Advanced Troll is set upon initial installation then Advanced will populate first, second press will be traditional mode, then the third press would be OFF. Once the desired mode is reach simple do not press the button again to enter that mode.

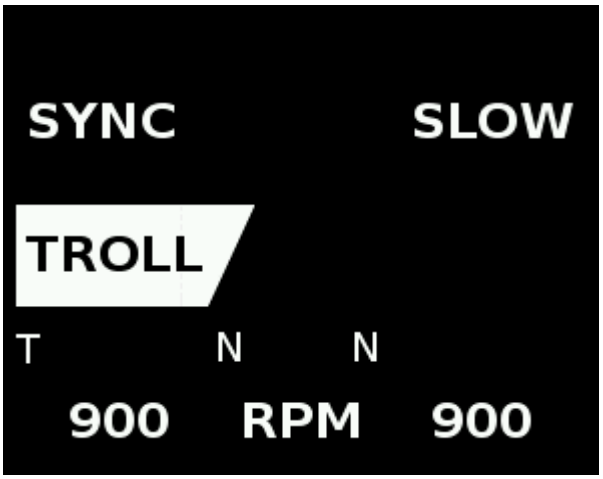

Figure 53:Traditional Troll Mode

Once in Trad TROLL, the desired speed can be adjusted by using the plus and minus arrows. The speed is then confirmed by pressing the button next to SET on the upper left.

Note: Adv TROLL does not support the incremental speed adjustments.

Figure 54: Setting Traditional Troll speed

If traditional TROLL mode is active, the operator exits the TROLL mode by pressing the button next to TROLL. TROLL mode will exit immediately. If the levers are not at first detent position, an operator aid will popup indicating the levers need to be moved to first detent either forward or reverse, pending whichever gear the vessel was in at the time of TROLL exit.

If a system error forces TROLL mode exit, the operator will see the below popup. A system error diagnostic or loss of datalink are potential failures to cause this popup.

Figure 55: Trad TROLL deactivated

If Advanced TROLL mode is active and the operator wants to exit, press the TROLL button and then the levers have to be positioned within 10% from the detent in whichever gear the powertrains are in. If the levers are not within 10% from the first detent, then an operator aid will popup indicating the levers should be moved.

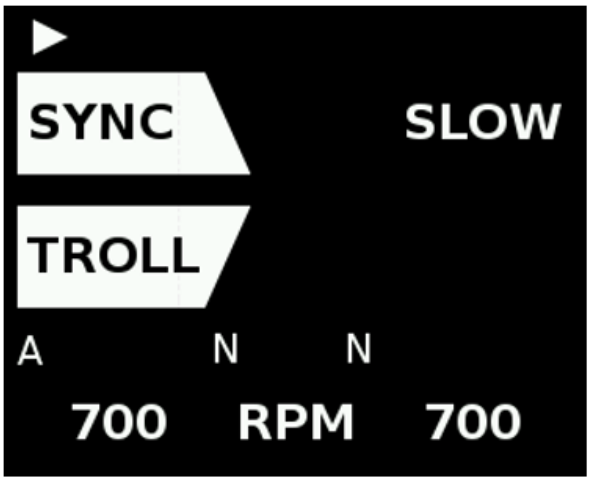

Figure 56: Advanced Troll mode indicator

If a system error forces TROLL mode exit, the operator will see the below popup. A system error diagnostic or loss of datalink are potential failures to cause this popup

Figure 57:Advanced TROLL Deactivated

If Troll is not available, it won't be populated on the screen. Below is an example of Troll not available or a fault with respect to Troll mode.

Figure 58: Troll mode unavailable

Sync Modes

Sync modes include Sync (Sync with Gear, Sync without gear, Sync Master, AutoSync) and Cruise step. The modes are described as follows.

- SYNC synchronizes the PORT and STBD engine speeds to allow throttle control of both engines with a single control station lever. When in Neutral, Standard sync is accessed by pressing the upper left button-SYNC. When in gear, the operator will have to match the levers to within 50 rpms before sync will take effect. Once the levers have been matched and sync is engaged, operations can proceed with a single lever.
- Sync Master lever can be set in the settings menu as PORT, STBD or Auto. If Auto is selected the first lever to be moved will be become the master lever.
- Auto Sync – Automatically synchronizes PORT and STBD Engine Speeds when the difference between the PORT and STBD engines are withing a certain range, as configured by a CAT Technician with the service tool.

Note: When in SYNC mode, the Arrow indication on the top banner will indicate which Lever (port or starboard) is the SYNC master lever. In standard SYNC modes, this is selected in the settings menu. The first Lever moved after using the Auto SYNC feature will make it the "Master" Lever.

- SYNC-Cruise – Cruise control mode with allows the operator to increase or decrease the speed of the engines, in predefined increments, using a button press.

SYNC

Sync without gear, synchronizes the PORT and STBD engine speeds to allow throttle control of both engines with a single control station lever and the gear of the other powertrain is controlled with the non-master lever.

Sync with gear synchronizes the PORT and STBD engine speeds to allow throttle control and gear of both engines with a single control station lever.

When in Neutral, Standard sync is accessed by pressing the upper left button-SYNC. If a Master lever has been chosen in the settings menu, then this lever will become the Master lever which the other engine will sync to. I,e. if the Port lever is chosen as the master lever, then the STBD engine will always sync to the port engine speed when SYNC is engaged and the control for both engines will reside with the Port lever.

Figure 59:SYNC mode Active

If Master Lever is set to Auto in the settings menu, once SYNC is pressed, the highlighted box around SYNC will blink until the operator moves one of the levers. This lever will become the Master Lever until SYNC is exited. The next time the operator enters SYNC, either lever can be chosen by moving that one first.

If entering SYNC when already under way, the levers will have to be matched within the 50 RPMs. Once the levers are within that percentage, the higher engine speed will sync to the lower engine speed.

To exit SYNC mode the operator can do so by pressing the SYNC button one time. If the levers are not matched, a popup will arise indicating the levers need to be moved to within the defined lever position percentage configured by a CAT technician with the service tool. Once the levers are within 50 RPMs, the control station will exit SYNC mode.

Auto SYNC

If Auto SYNC is selected in the settings menu, AUTO will appear in the banner of the active control station once the system has synced the engines. When the levers are not matched but set within the defined lever position range (percentage configured by a CAT technician with the service tool) and left for the defined time frame (also configured with the service

tool) Auto SYNC will sync the engines to the lowest engines RPMs. If one or both levers are moved, it will exit AUTO sync. Once the levers are moved within the defined position percentage for the defined time frame again, the engines will sync.

EXAMPLE if the set position percentage is 5% and the defined time is 5 seconds. Any time the two levers are moved to positions within 5% of each other and left for 5 seconds in those positions, the engine with the higher RPMs will sync to the engine with the lowest RPMs. In this case, the PORT side is at 1388 rpms and STBD side is left at 1352 rpms the levers are left for the defined time. After that defined 5 seconds, PORT will reduce rpms to 1352 rpms.

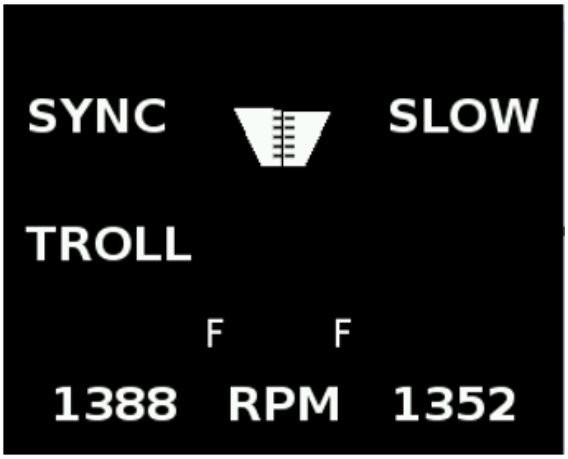

Figure 60: AUTO SYNC has synced the RPMs

Once the levers are left within the defined range for the defined time, AUTO will appear in the banner and the higher rpms will reduce to match the lower rpms as seen below.

Figure 61: AUTO SYNC before Auto syncs rpms

SYNC – CRUISE

CRUISE can be set after the engine or shaft speeds have been synced. CRUISE control mode allows the operator to increase or decrease the speed of the engines from the control station, in predefined increments, using button presses. CRUISE set speed will be shown as engine speed, however, the current speed displayed will still be shaft speed if this is what is set. CRUIScan be used in both single and dual engine configurations.

When SYNC is active, CRUISE will replace WARM as the bottom right button location. The cruise step (predefined increments) is set in the settings menu. Enter CRUISE by pressing the bottom right button. CRUISE cannot be set to a speed lower than the current lever position.

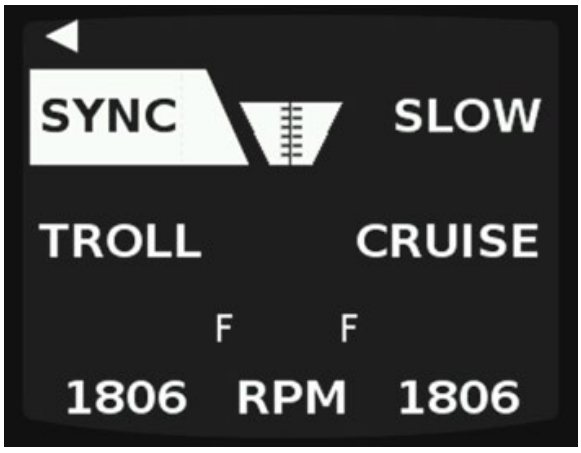

Figure 62: Cruise location

Once an operator has pressed the button to enter CRUISE, the operator will then use the buttons next to the plus/minus to toggle to the desired cruise speed. SET will appear to identify the desired speed. One press will be the increment set (5-200 rpms), press and hold will increase by 200 rpms per second.

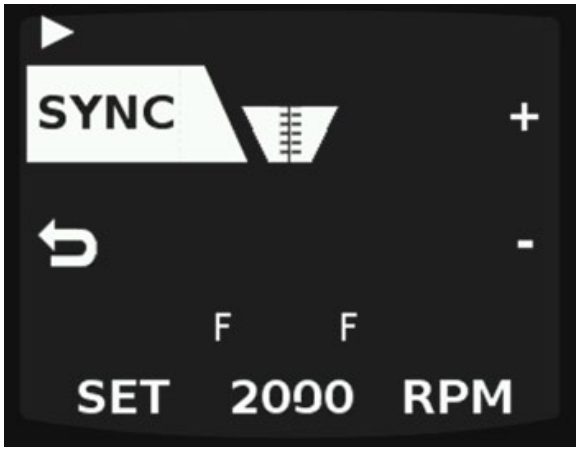

Figure 63:SYNC-Cruise Incrementing via plus/minus buttons

Once the operator stops pressing the plus/minus buttons, the current speed will be shown for both engines. This does not require any movement of the levers. If the operator choses to move the levers to match position, they may do so but is not required.

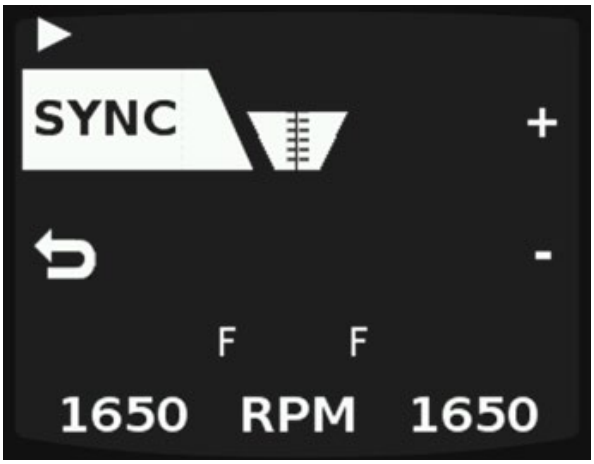

Figure 64:SYNC- Cruise speed set

CRUISE can be exit by pressing the back arrow. Once CRUISE exit has taken effect, the engine speed will return back to the master lever SYNC speed. To prevent a drastic reduction in speed, the levers can be moved closer to the current speed. However, if the levers are moved to a speed beyond the cruise speed, this will exit the control station from CRUISE mode.

Single engine CRUISE

Cruise is available for single engine use and will be present in the upper left side of the screen (dual engine cruise is in the bottom right), replacing SYNC on dual engine installs. Cruise step will be a default of 50 rpms per button press when changing cruise speed.

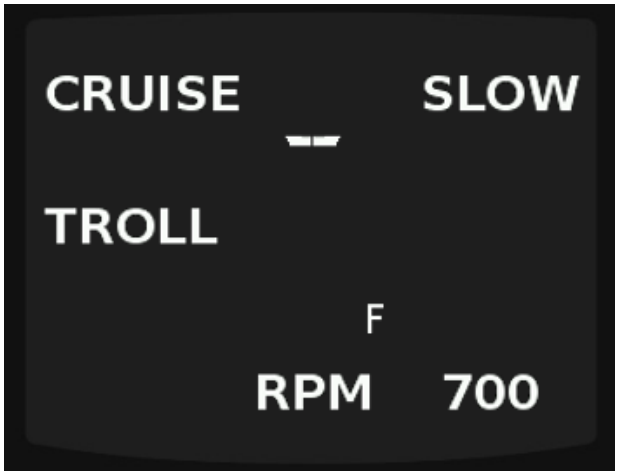

Figure 65: Single Engine Home screen

To enter single engine CRUISE mode, press the top left button, then selected desired speed using the plus/minus arrows.

Figure 66: Single engine cruise mode activated

Once desired engine speed is chosen, engine speed will be displayed as shown below.

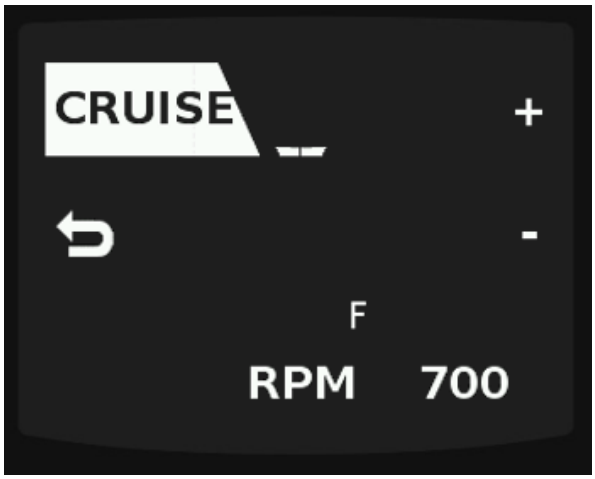

Figure 67: Single Engine Cruise Activated

To Exit CRUISE mode, press the button next to the “return” arrow.

Combinational Modes

The lever heads and displays have the ability to run a combination of modes simultaneously.

Sync/Troll –
When SYNC and Traditional Troll are both active, and Shaft Speed Sensors are installed, the PORT and STBD Troll Valves will be controlled such that the PORT and STBD shaft speeds are synchronized to the Master Lever position. If Shaft Speed Sensors are not installed, then the PORT and STBD clutch slipping percentages will be synchronized to the Master Lever position.

Sync/Slow –

When SYNC and SVM are both active, the PORT and STBD engine speeds shall be synchronized to the speed indicated by the Master Lever position for Slow Vessel Mode.

Troll/Slow –

When Traditional Troll and SVM are both active, the *Vessel Engine Set Speed* will be set to the SVM Set Speed, and lever movements will control clutch slipping as defined in [Traditional Troll Mode]. If Traditional Troll was activated first, then the PORT and STBD engine speeds will be ramped down to the SVM Set Speed.

When Advanced Troll and SVM are both active, the 0-40% range of the levers will be rescaled such that it linearly increases from the SVM Set Speed to the *Advanced Troll Maximum Engine Speed @ Full Engage*.

Sync/Troll/Slow-

When SYNC, Traditional or Advanced Troll, and SVM are all active, shaft speed or clutch slipping will be synchronized as described in [SYNC and Troll] and the PORT and STBD Engine Speeds will be set as described in [Troll and SVM].

Sync/Warm-

When SYNC and Warm are both active, the PORT and STBD engines speed shall be synchronized to the speed indicated by the Master lever position.
NOTE: The warm mode (gear lockout) should be activated before activating the SYNC.

Slow/Warm-

When SLOW and Warm are both active, the engine(s) speed shall follow as described in Slow Vessel Mode (SLOW) by locking out the gear.
NOTE: The warm mode (gear lockout) should be activated before activating the SYNC.

Sync/Slow/Warm

When SYNC, SLOW and Warm are all active, the engines speed will be synchronized as described in SYNC and SLOW by locking out the gear.
NOTE: The warm mode (gear lockout) should be activated before activating SYNC or SLOW

For an example, in the figure shown below, the engine is in SYNC and TROLL mode. SYNC mode has “synced” PORT to STBD lever and the drive train is in TROLL mode.

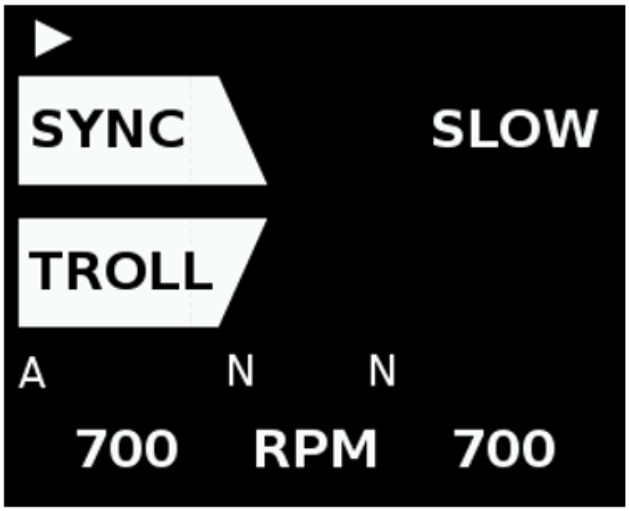

Figure 68: SYNC/TROLL engaged with stbd lever in control

Another combination of modes shown below. The Lever Heads are “synced” while the engines are being used in SLOW mode.

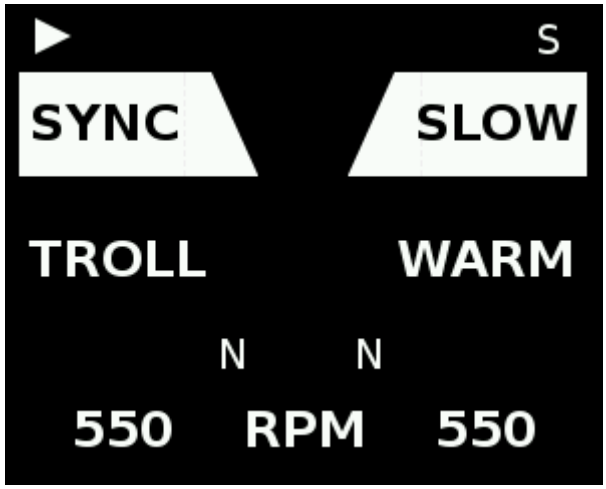

Figure 69: Combination of modes

In this figure, the same combination as mentioned above now also has troll mode activated. *Note that both traditional and advanced troll mode can be used in this combination.*

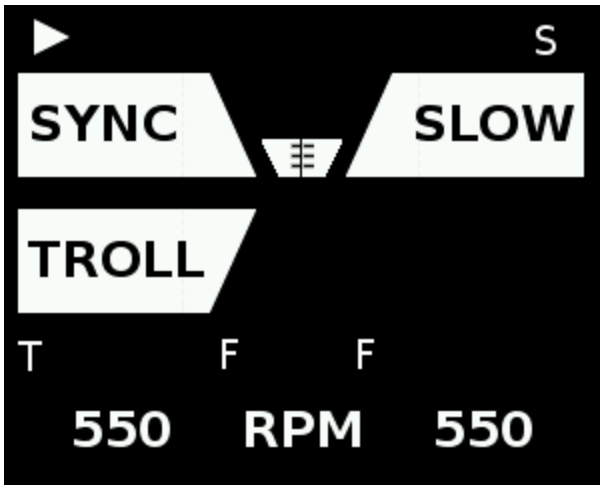

Figure 70: Combination of modes

Station transfer

Station transfer is classified in a few ways, standard transfer, transfer to a backup panel, and transfer with acknowledge(which is configured by a CAT technician with the service tool).

Standard Command Transfer

To initiate a standard transfer, the operator will press and hold the command button for up to 2 seconds(see figure below for view of screen).

Figure 71: Initiate standard transfer with command button

Standard Transfer can only occur when the levers at the target station are within 5% of the current engine speed at the current station and the same gear direction. If the levers are not in the appropriate position, this will be indicated by an operator aide/ as well as the flash rates of the LEDs. The levers at the target station will need to be moved to the appropriate position before the transfer can occur. The LED flash rate table can be seen in section 2.

Transfer with Acknowledge

Station transfer with acknowledge can be processed in a few ways. Initiation from an inactive station or an active station. If starting from an active station, pre-acknowledge/accept at the current active station is an option, this will help to prevent the need to travel from the target station back to the previously active station to accept the transfer.

Figure 72: Initiate transfer with command button

Request **from Target Station**, view from **Active station**

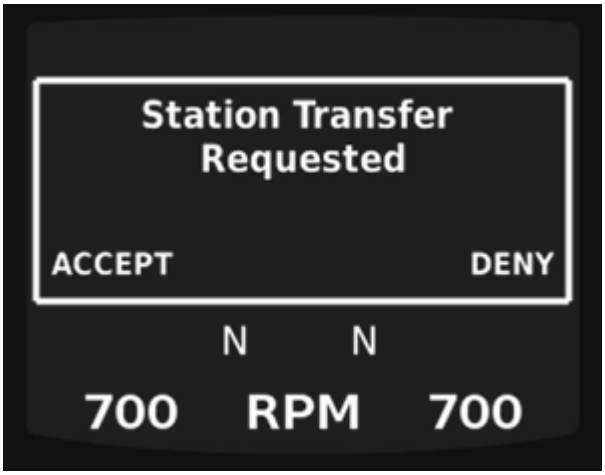

Figure 73: Station Transfer requested view from Active Station.

The operator can accept, deny or allow the transfer to timeout from the active station. If the transfer is denied or not accepted after XX seconds (configured by a CAT technician with the service tool), the transfer will cancel.

Once an operator accepts or denies the transfer request from an active station, the screen will either revert to the home screen or inactive station screen.

Note: If the levers are not matched at the target station to the Active stations current speed within the timeout period, this will cancel the transfer and control will return to the Active station.

Request from **Target station**, view from **Target station**.

During the transfer process, the target station will see the screen below when transfer with acknowledge is made. The station transfer can be cancelled by pressing the command button at the target station.

Figure 75:Home screen – Requesting the transfer to the target station

Figure 74: Station Transfer denied

The request must be accepted at the active station as shown in figure 74 for the target station to complete the transfer. The home screen will populate on the target station.

Figure 76: Home screen at target station

If during the transfer process, the Active station has denied the request for transfer from the Target station, the target station will see.

If the transfer is cancelled at target station, an acknowledge is required.

Figure 77: Target Station transfer cancelled

Transfer to a Button Panel

Transfers to a button panel configured as an Advanced leverhead or Palm beach must continue to match levers at the target station to complete the transfer just like a standard leverhead.

Station transfer to a button panel that is configured as a backup panel does not require lever qualification, however the levers at the previous station will need be moved to the Neutral position after the transfer is complete. When transferring to a button panel configured as a backup panel, it will auto command the engines to low idle and transmission to Neutral.

Figure 78: Transfer to backup panel, low idle and neutral gear

Master Station Transfer

A master station can be configured by a CAT technician with the service tool. If a master station is set, a double button press at whichever station is chosen, will allow for transfer to that station regardless of the condition of any of the other stations. The levers at the master station **will** need to be qualified before the transfer will complete. Additionally, the transfer does not require acknowledgement. Only one station can be set as the master station.

Figure 79: Active station – Master Station Transfer

Sleep Mode

The screen below shows Sleep mode at an inactive station. In sleep mode, the only thing that will be displayed, is the location of the current active station. All button leds will be turned off except the command button, it will dim to approximately 20%.

Figure 80: Sleep Mode

Engine Remote Start/Stop

Remote start/stop can be wired through the Aux I/O harness on either an MCL100 or MCD100. Starting/Stopping will be performed via one momentary switch per engine. This section will provide detail for the screens associated with the conditions of start/stop operations. This will include engines not ready for start or stopping operations, prestart, not in neutral, as well as start/stop ready conditions.

Start/stop operations can only occur at an/the active control station. Push to start will require 2 button presses, a single press of the button, followed by another press. These presses will be followed/indicated by aides on the control station. If the second press is not completed in 30 seconds, the control station will automatically exit the start/stop operation.

When engines are in any condition that is not suitable for starting or stopping, such as not in neutral, rpms too high to start, and one of the start or stop buttons is depressed, the screen will display Not Ready for the engine's start/stop button that was pressed. From here, the operator can press the buttons next to Cancel for each engine.

Figure 81: Remote Start/Stop Engines Not Ready

IF the operator presses the start button again, a popup will indicate that the engines are not ready to start and require a button press to acknowledge.

Figure 82: Second press of the start button when the engines are not ready

Upon first press of the start/stop button, the system confirms, the screen will display ready to start, indicating the system is ready for the second press which will initiate engine start. If the operator choses to cancel the start, they can press the button next to cancel for each engine.

Figure 83: Remote Start/Stop Ready to Start

Pre-start follows the above screen indicating that an engine's start button has been depressed once, and the system is verifying its operating state such that starting the engines is possible. If the operator chooses to, Cancel can be pressed for each engine which will stop the starting process.

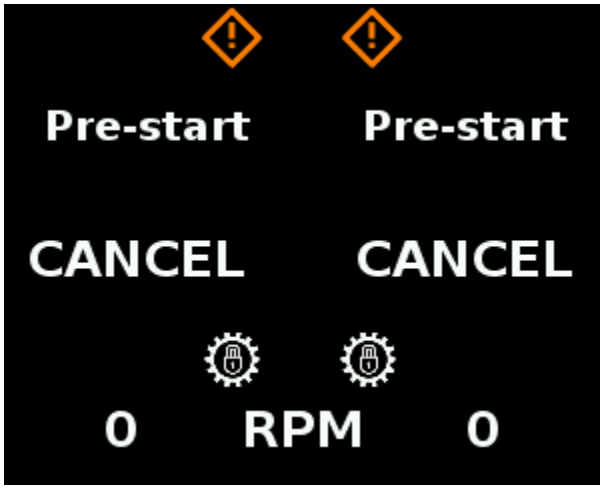

Figure 84: Remote Start/Stop Prestart

This will be followed by Starting to appear on the HMI and the rpms will begin to populate as the engine ramps up to idle speed.

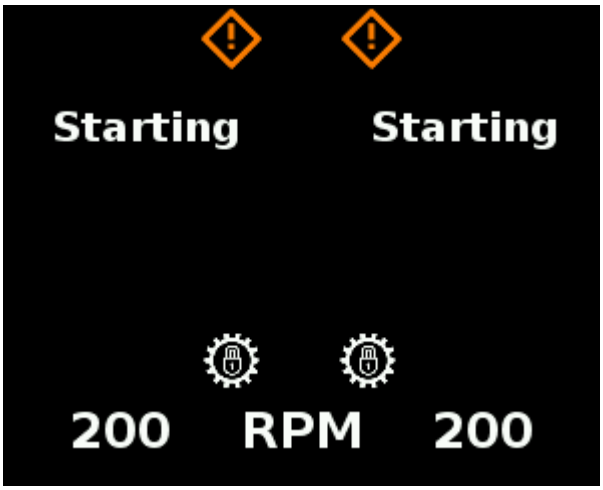

Figure 85:Remote Start/Stop Starting

Once both engines have started, the home screen will populate on the active station.

When using the start/stop function to stop the engines, if, conditions are met, the first press gives the ready to stop message.

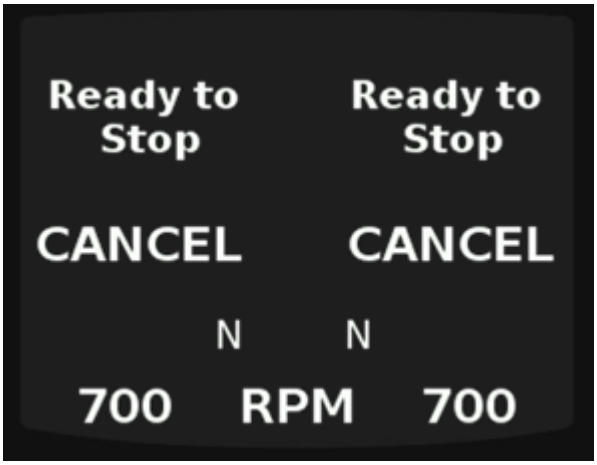

Figure 86:Remote Start/Stop Ready to Stop

The second button press initiates stopping the engines.

Figure 87:Remote Start/Stop Stopping

Both engines do not have to be started or stopped at the same time, the following screens are examples to show conditions such that one of the engines is still running while the other is being commanded to start or stop.

Starboard engine is still running while the operator has initiated the port engine to stop with the first press of the start/stop button.

Figure 88: PORT Engine Remote Start/Stop button Pressed while engines running

Starboard engine is still running while the operator has initiated the port engine to stop by pressing the button a second time.

Figure 89: PORT Remote Start/Stop Button Pressed Again (engines running)

Cooldown time is configured by a CAT technician with the service tool, this time allows the engines to continue running (cooling down) before sending the stop command to the engine.

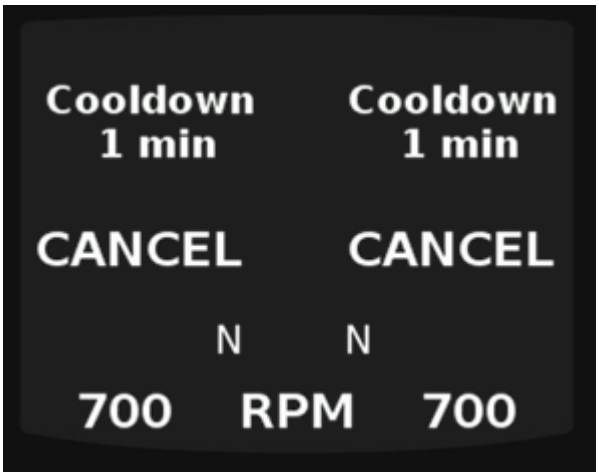

Figure 90: Remote Start/Stop Mode Cooldown

If one of the 2 engines is ready to start but the other is not, the system will allow the one of the engines to start while displaying not ready for the engine that is not ready.

Figure 91:STBD Engine Started, PORT Engine Not Ready

Engine is giving a state such that it is not ready to be started. Engine starter interlock is preventing starting.

Figure 92:Not Ready Start Inhibited

Start/stop can only be initiated from an active control station, if someone tries to initiate start/stop on an engine from an inactive station, it will display this message.

Figure 93: Station Inactive Start Inhibited

Local Operation Mode – Engine operating panel

CAT supplied local operating panel disables the active MPC station when Local/remote switch on the engine panel has been switched to Local mode. This will remove control at any active control station.

A popup, like the one seen below, will indicate which engine panel has been placed in local mode. “STBD panel is local mode, this acknowledge means the station is disabled.

Figure 94: Local Operating Mode

While in local operation mode, at the engine panel, and any button is pressed to acknowledge, the following screen shows that the transmissions are locked.

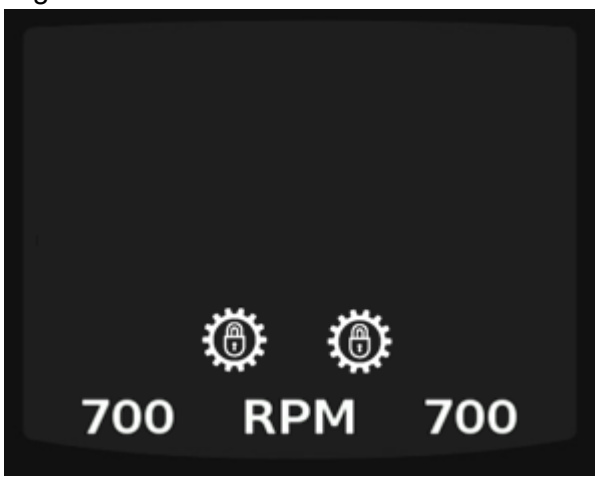

Figure 95: Local Operating Mode Transmission Lock

If a Panel is set to local operating mode, this removes that ability of remote start/stop operations to occur from a control station. If start/stop buttons are pressed at the control station while in local operating mode, the follow indication will be shown at the control station.

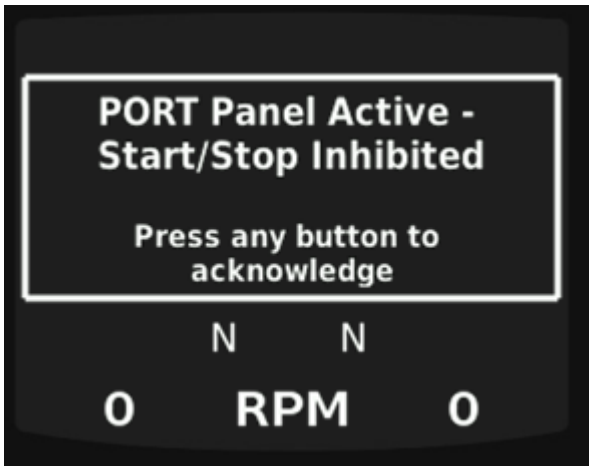

Figure 96:Local Operating Mode – Start/Stop Inhibit Popup

Station Lock In/Out

Station Lock – This is only applicable when standard transfer is configured by a CAT technician with the service tool. When an active station is locked, the lock indicator will be seen in the banner. To unlock the station, an additional button press confirmation is required.

If a station is Locked In, you cannot transfer away from the station.

If a station is Locked Out, you cannot transfer to that station.

Note – If a Master station is set, lock in/lock out do not apply to the master station.

To Lock In an active station when standard transfer is set (not available when transfer with acknowledge is selected). Lock In is unavailable when another station is active.

1. First, deactivate the station by pressing and holding the command button for 5 seconds. Then press the button next to Lock In (lower left). See figure below.

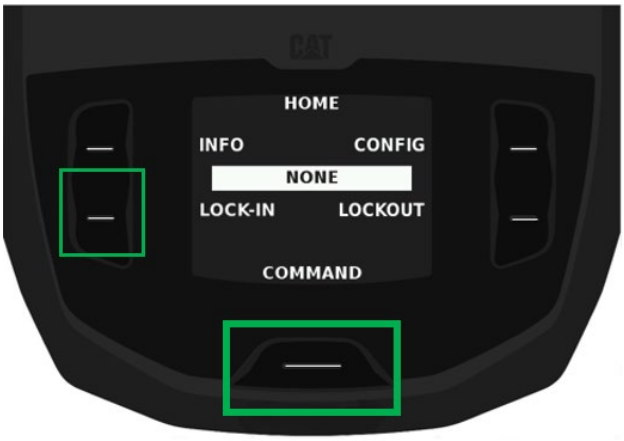

Figure 97: Process to Lock In a station

Below you can see that an active station has been Locked In. This will prevent a transfer from this active station. The rest of the button functions will work for the modes shown.

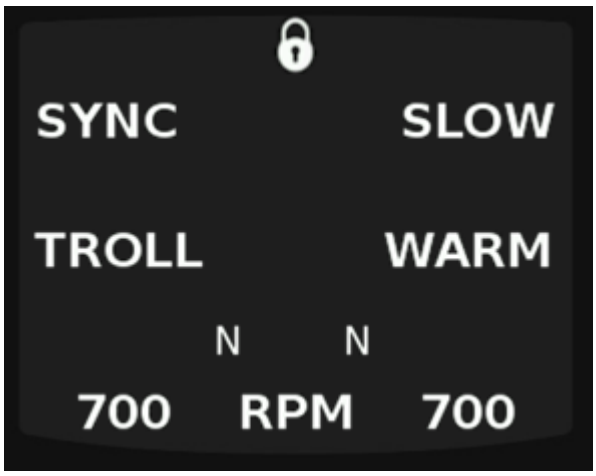

Figure 98:Active Station Screen: Station Lock In activated

Once an operator is ready to unlock a station, press the command button from that active station. This will require a confirmation with the button to the left of Confirm. Or if the operator chooses to cancel the unlock, simple press the button Cancel.

Figure 99: Confirm unlock station

Lockout screen of an inactive station –View of a locked-out, inactive station, meaning it cannot be activated. To activate a Lockout out station the operator can do so by pressing both the buttons next to Unlock simultaneously. Then proceed to transfer from the active station.

Figure 100: Inactive station - Locked Out, press both buttons to unlock

Backup Panel operations

If an operator transfers to a backup Panel, operations are performed differently. Backup throttle operations are controlled with buttons instead of levers on the backup panel. Once a Backup panel takes station, a single button press is a 50 rpm increase/decrease. If a button is pressed and held, the speed will ramp at 250 rpms until released at desired speed.

Figure 101:Single engine operation backup panel view

When transitioning from Forward to Reverse or vice versa, an additional button press will be required once Neutral is reached, to then proceed to “in gear” and continue to ramp up Engine Speed. The system will stop the operator at neutral and require an additional button press to enter either Forward or Reverse.

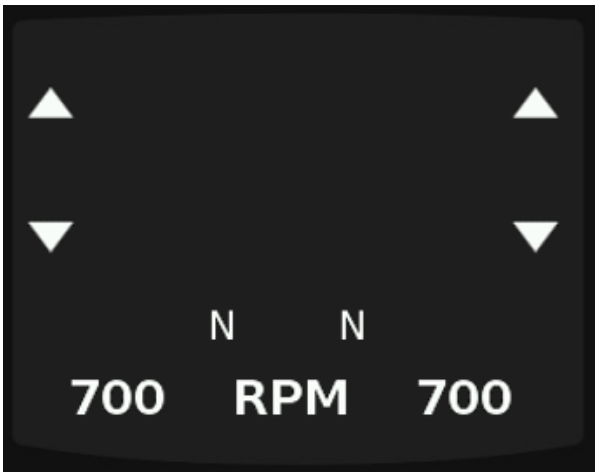

Figure 102: Dual engine operation Backup Panel view

5. Ancillary Control station functions

Audible Alarm driver

If an audible alarm is wired into an aux I/O port on a control station and configured by a CAT technician with the service tool. The control station will produce 1 of 2 audible alarms.

1. Station transfer alarm pattern will sound as such - a long audible (1 second), short pause (.25 second), long audible (1 second), followed by another short pause (.25 second).

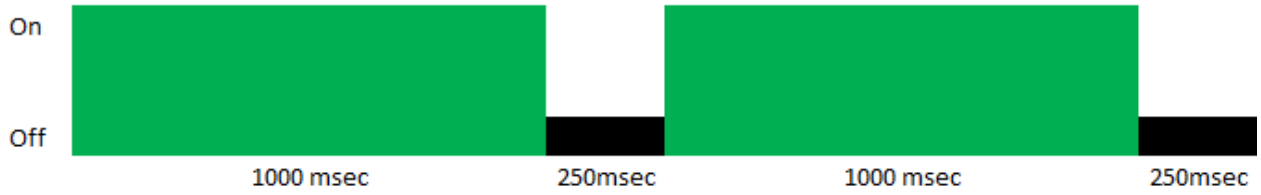

Figure 103: Station Transfer Audible pattern

2. Diagnostic alarm pattern will sound as such – each tone will be the same duration (.5 seconds), audible, pause, audible, pause.

Figure 104:Diagnostic Audible pattern

Syncing Day/Night and Dimming between CMD/Active control station

If equipped, and the CMD and active control station are set as the same station location, dimming and day/night modes can be synced between the two devices. A switch, potentiometer or both need to be installed at the control station to control day/night mode and dimming operations. The switch will control day/night mode and the potentiometer will control dimming. Both I/O will need to be configured by a CAT technician with the service tool, separately. This will allow for adjustments to be made to the CMD from the active control station location.

If a switch or potentiometer are installed and configured as an I/O, this takes higher priority over adjustments made at the CMD. If a switch or potentiometer are not installed, and the CMD sends a sync request, the control station will sync to the CMD settings, and the respective day/night mode and dimming settings will be set at the active control station.

Syncing between the CMD and Active control station is enabled and disabled at the CMD.

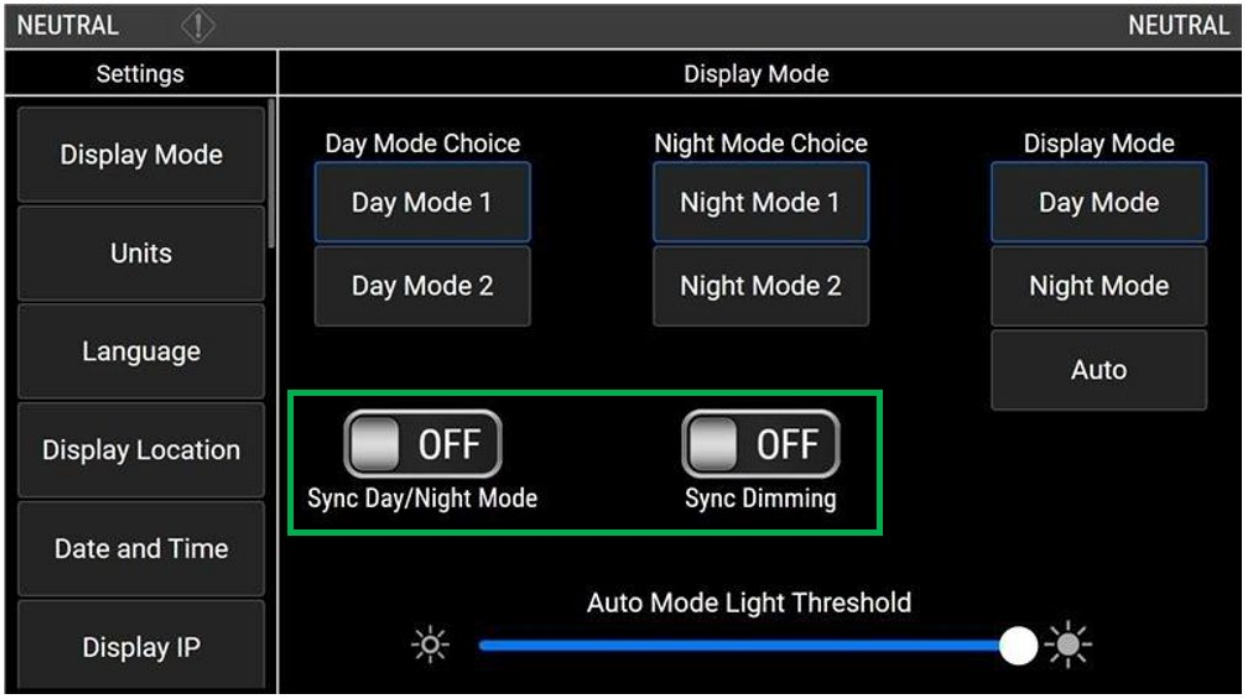

Figure 105: CMD Sync Day/Night and Dimming

Thruster control

If a station is configured with thruster inputs, a warning will populate when transferring to that station.

Figure 106: Warning station configured for Thruster Control

Emergency Stop

If Emergency Stop is equipped.

If Emergency stop is installed as an I/O, on a control station, and pressed, the system will go to Low Idle speed and Neutral gear. Lever qualification (levers back to N) will be required before control will be allowed at the station again.

MCP LED Diagnostic

In the Table below, the operator can understand what the LEDs represent on the MCP.

Table 2: MCP LED illumination explanation

LED	Green	Blinking Green	Yellow	Blinking Yellow	Red	Blinking Red	Off
Power 1	Batt 1 Voltage in valid range	Batt 1 voltage outside valid range	Batt 1 Voltage not present	N/A	N/A	N/A	No power (neither 1 nor 2)
Power 2	Batt 2 Voltage in valid range	Batt 2 voltage outside valid range	Batt 2 Voltage not present	N/A	N/A	N/A	No power (neither 1 nor 2)
Datalink 1	Datalink 1 active	N/A	N/A	N/A	Datalink 1 inactive/not connected	N/A	Not running
Datalink 2	Datalink 2 active	N/A	N/A	N/A	Datalink 2 inactive/not connected	N/A	Not running
Primary CPU	Running and active		Secondary took over from primary being active	Program Not Installed (waiting for CAT® ET) or Download in Progress	Secondary took over and primary had not run	N/A	Not running
Secondary CPU	Running and active	Running and not active (monitoring)	N/A	Program Not Installed or Board to Board Flash On Going	N/A	N/A	Not running
Fault*	No Active DM1 faults from MCP. Change from green if fault from MCP	N/A	Level 1 & 2 MCP Fault	N/A	N/A	Level 3 MCP fault. MCP fault with FMI code 0 or 1	N/A

* MCP will only indicate faults with the LED for MCP initiated diagnostics not for other diagnostics with the Vessel's system; i.e. engine or transmission specific diagnostics.

MPC Diagnostics

The following table outlines a list of diagnostics an operator might encounter from the MPC system specifically. This list does not include diagnostics from other systems on the vessel. The diagnostics (SPNs and FMIs) will also be present on a CMD if installed.

Table 3: MPC Diagnostics

Diagnostic	SPN	FMI	Description
Transmission 1 Control Module	9471	12	The MCP's Primary Processor has failed.
		19	The MCP detected an error in its calibrations and has reset all parameters back to the factory default values.
		31	The MCP detects control station software is updated and MCP software is still outdated
Secondary Control Module	12912	12	The MCP's Secondary Processor has failed.
		31	The operator has placed the MCP in Backup Mode by taking control at Backup Panel or at any other Control Station which is configured to operate on the Secondary Processor.
Proprietary Network 1	625	6	Station Datalink #1 Over-current
		9	Loss of communications on Station Datalink # 1.
		7	Loss of communications with one or more Control Stations on Station Datalink # 1.
		13	The *Datalink #1 Number of Control Stations* configuration is less than the number of actual Control Stations on the Datalink.
		11	At least one Control Station on Datalink #1 has an undefined location
Proprietary Network 2	5588	6	Station Datalink #2 Over-current
		9	Loss of communications on Station Datalink # 2.
		7	Loss of communications with one or more Control Stations on Station Datalink # 2.
		13	The *Datalink #2 Number of Control Stations* configuration is less than the number of actual Control Stations on the Datalink.
		11	At least one Control Station on Datalink #2 has an undefined location
Proprietary Network 3	9506	9	Loss of communications on the STBD PBH serial datalink (to an Advanced Leverhead or Palm Beach Lever Assembly) at the Active Control Station.

Diagnostic	SPN	FMI	Description
Proprietary Network 4	9507	9	Loss of communications on a PORT PBH serial datalink (to an Advanced Leverhead or Palm Beach Lever Assembly) at the Active Control Station.
J1939 Network 1	639	7	PORT and STBD datalinks are cross connected.
		9	Loss of communications on the Primary STBD Engine Datalink.
J1939 Network 2	1231	7	PORT and STBD datalinks are cross connected.
		9	Loss of communications on the Primary PORT Engine Datalink.
J1939 Network 3	1235	7	PORT and STBD datalinks are cross connected.
		9	Loss of communications on the Secondary STBD Engine Datalink.
J1939 Network 4	1668	7	PORT and STBD datalinks are cross connected.
		9	Loss of communications on the Secondary PORT Engine Datalink.
Throttle Lever Module #	9462 – Bridge 9463 – Port Wing 9464 – Starboard wing 13074 – Tower 13075 – Engine room 13076 – Aft 13077 – Fly Bridge 13078 - Bow	3	Control Station Overvoltage fault
		4	Control Station Undervoltage fault
		7	An MPC Button Panel has lost communications with its Advanced Leverhead Hardware.
		9	Loss of communications with a specific Control Station.
		12	Control Station has failed (Stuck Button, Lever Sensor Over-current)
		13	Control Station Calibration Failure (Lever Calibration, Lever Out of Range, Idle Switch)
		14	More than one Control Station has been set to the same location
		19	The Control Station detected an error in its calibrations and has reset all parameters back to the factory default values.
		31	The MCP detects MCP software is updated and control station software is outdated
Port Active Station Throttle	12919	12	the Active Control Station's PORT lever has failed.
Starboard Active Station Throttle	12920	12	the Active Control Station's STBD lever has failed.
Transmission 1 Oil Pressure	127	16	STBD *Commanded Gear* is Neutral and the STBD *Transmission Oil Pressure* has remained above the *Transmission Pressure Neutral Limit* for greater than 2 seconds.
Transmission 2 Oil Pressure	9475	16	PORT *Commanded Gear* is Neutral and the PORT *Transmission Oil Pressure* has remained above the *Transmission Pressure Neutral Limit* for greater than 2 seconds.
Battery Potential / Power Input 1	168	3	The MCP's Primary supply voltage is above the normal range.
		4	The MCP's Primary supply voltage is below the normal range.
Battery Potential / Power Input 2	444	3	The MCP's Secondary supply voltage is above the normal range.

Diagnostic	SPN	FMI	Description
		4	The MCP's Secondary supply voltage is below the normal range.
Port Troll Valve	12915	5	PORT Troll solenoid open load fault. (4-20mA and PWM driver)
		6	PORT Troll solenoid over-current fault. (PWM driver only)
Starboard Troll Valve	12916	5	STBD Troll solenoid open load fault. (4-20mA and PWM driver)
		6	STBD Troll solenoid over-current fault. (PWM driver only)
Port Troll ON valve	5901	5	PORT Troll solenoid open load fault. (Troll On driver)
		6	PORT Troll solenoid over-current fault. (Troll On driver)
Starboard Troll ON Valve	5900	5	PORT Troll solenoid open load fault. (Troll On driver)
		6	PORT Troll solenoid over-current fault. (Troll On driver)
Port Engine Commands	12917	0	The PORT *Desired Engine Speed* has been more than 200 RPM greater than the PORT *Commanded Engine Speed* for more than 2 seconds. This indicates that the Engine ECM is not responding to command.
		7	The MCP is not receiving *Engine Speed* or *Desired Engine Speed* from the PORT engine ECM.
Starboard Engine Commands	12918	0	The STBD *Desired Engine Speed* has been more than 200 RPM greater than the PORT *Commanded Engine Speed* for more than 2 seconds. This indicates that the Engine ECM is not responding to command.
		7	The MCP is not receiving *Engine Speed* or *Desired Engine Speed* from the STBD engine ECM.
Port Transmission Gear Mismatch	12296	12	The PORT Neutral driver and feedback have mismatched for >1 sec
		31	The PORT Transmission is indicating an improper position
Starboard Transmission Gear Mismatch	12297	12	The STBD Neutral driver and feedback have mismatched for >1 sec
		31	The STBD Transmission is indicating an improper position
Key Switch 2	12911	3	The PORT ignition switch voltage is above normal.
Key Switch Battery Potential	158	3	The STBD ignition switch voltage is above normal.
Transmission 2 Forward Solenoid Valve	6722	5	PORT Forward solenoid open load fault.
		6	PORT Forward solenoid over-current fault.
Transmission 1 Forward Solenoid Valve	741	5	STBD Forward solenoid open load fault.
		6	STBD Forward solenoid over-current fault.
Transmission 2 Reverse Solenoid Valve	6723	5	PORT Reverse solenoid open load fault.
		6	PORT Reverse solenoid over-current fault.
Transmission 1 Reverse Solenoid Valve	4216	5	STBD Reverse solenoid open load fault.
		6	STBD Reverse solenoid over-current fault.

Diagnostic	SPN	FMI	Description
Transmission 1 Output Shaft Speed	191	8	The STBD Shaft Speed signal is erratic, intermittent, or incorrect.
Transmission 2 Output Shaft Speed	9481	8	The PORT Shaft Speed signal is erratic, intermittent, or incorrect
Leverhead AUX I/O #	3840 – 3887	6	HSD Outputs – Over-current fault.
MCP Config I/O #	701 – 714	5	HSD Outputs – Open load fault.
		6	HSD Outputs – Over-current fault.
Transmission Output Shaft Brake Request	11752	12	The PORT and/or STBD Shaft Brake has failed to actuate when commanded
Engine Remote Start	4002	2	One of the two Remote Start/Stop contacts failed to change state when a Remote Start was requested.
		7	Invalid Engine Operating State for Remote Start/Stop operations.
Engine Remote Stop	4003	2	One of the two Remote Start/Stop contacts failed to change state when a Remote Stop was requested.
		7	Invalid Engine Operating State for Remote Start/Stop operations.
Engine Remote Start/Stop Enable	4033	13	Only one of the parity contacts for Push to Start is configured. Remote Start/Stop will be disabled until the other contact is configured.
Engine Throttle Synchronization Mode Status	2615	7	The MCP switched throttle control to its primary/secondary PWM throttle output and the state of SPN 2615 (from the engine ECM) did not change to “synchronized stbd” or “synchronized port” (Secondary Throttle)
Engine Alternate Low Idle Switch	2883	7	The MCP attempted to activate/deactivate SVM and the state of SPN 2617 (from the engine ECM) did not change to “SVM is ACTIVE” or “SVM is INACTIVE”.
Station Activation Button Status	9667	12	Station Activation Button is registered as stuck by the MCP due to button being pressed for more than 20 sec at active CS
Troll Mode Button Status	9668	12	Troll Mode Button is registered as stuck by the MCP due to button being pressed for more than 20 sec at active CS
Sync Mode Button Status	9669	12	Sync Mode Button is registered as stuck by the MCP due to button being pressed for more than 20 sec at active CS
Gear Lock-Out Button Status	9670	12	Gear Lock-out Button is registered as stuck by the MCP due to button being pressed for more than 20 sec at active CS
SVM Button Status	9671	12	SVM Button is registered as stuck by the MCP due to button being pressed for more than 20 sec at active CS
Local Mode Status	969	2	Mismatch between STBD *Local Mode Status* and Configurable I/O input for STBD Local/Remote state

Diagnostic	SPN	FMI	Description
		7	Mismatch between PORT *Local Mode Status* and Configurable I/O input for PORT Local/Remote state

Cleaning

All components can be cleaned off with a soft damp cloth. No harsh chemicals are recommended. Please do not pressure wash the MPC components directly.

6. References

CMD display Manual - M0117394

CMD A&I guide – LEBM0077

CAT MPC100/300 A&I Guide – LEGM20971

LEBM20970-00