

Positive Train Control Quick Reference Guide



What is PTC?




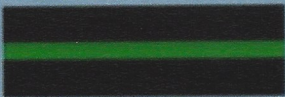
- “PTC is a safety overlay system designed to prevent train-to-train collisions, overspeed derailments, incursions into established work zone limits and the movement of a train through a switch left in the wrong position.”
- PTC is a system that adheres to maximum speeds per timetable, signal indications, equipment speed restrictions and dispatcher bulletins.
- The PTC system does not conform to railroad specific operating rules. Ex. Heat Orders, Rule 308.1, Flagging rules (OR115, 310, and 700) for example.

Operational PTC Locomotive

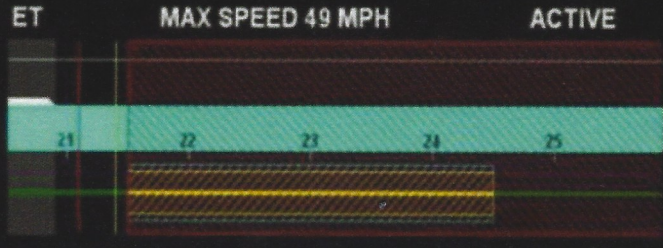
Only locomotives with the PTC cut out switches {Emergency Brake, Penalty Brake, and Horn} that are sealed and cut in should be used as a PTC locomotive.






Track Lines

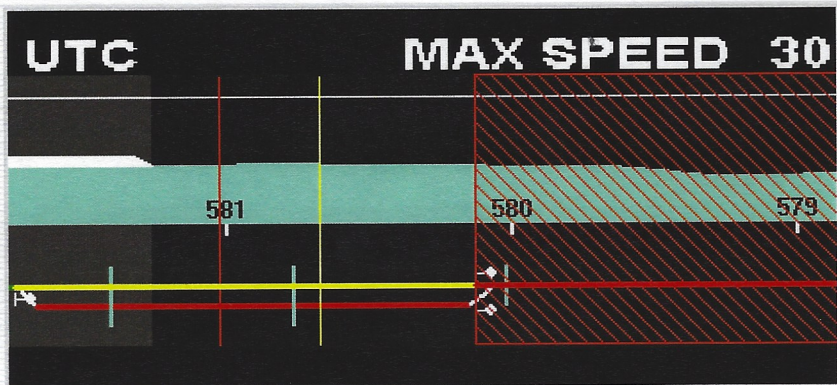
RED		PTC TRACK NOT ON TRAIN'S CALCULATED ROUTE AND PTC TRACK COVERED BY A ZERO MPH TARGET.
YELLOW		PTC TRACK COVERED BY A NON-ZERO SPEED TARGET DUE TO A MANDATORY DIRECTIVE OR A SIGNAL INDICATION OTHER THAN A PASSENGER TARGET SPEED. PTC TRACK COVERED BY A RESTRICTED SPEED TARGET OTHER THAN A HEAD-END ONLY RESTRICTED SPEED TARGET.
GREY		NON-PTC TRACK OR PTC ENTRY TRACK. TRACK ON THE TRAIN'S CALCULATED ROUTE THAT IS GOVERNED BY A SIGNAL IN ADVANCE OF THE TRAIN WHERE THE INDICATION TO THAT SIGNAL HAS NOT BEEN DETERMINED. TRACK IN A NON-SYNCHRONIZED SUBDIVISION FOR WHICH THE ONBOARD SEGMENT HAS VALID DATA.
GREEN		AUTHORIZED PTC TRACK ON TRAIN'S ROUTE NOT COVERED BY A NON-ZERO SPEED TARGET DUE TO MANDATORY DIRECTIVE, SIGNAL INDICATION OR ZERO MPH TARGET.

Track Line Overlay (Fences)



COLOR	SYMBOL	SIGNIFIES	PRIORITY	HEIGHT
RED		STOP	1	TALL
YELLOW		RESTRICTED SPEED	2	SHORT
BLUE		WORK ZONE	3	MEDIUM

Track Line Overlay (Fences)

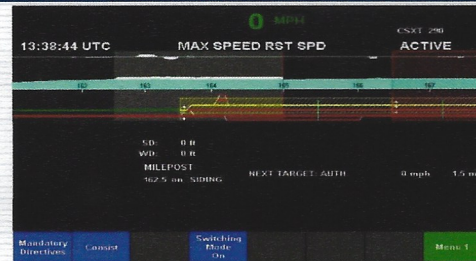
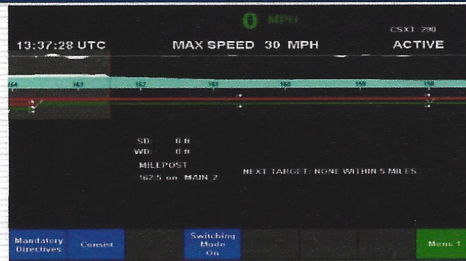


- Approaching a Stop signal
 - Red track – Not Authorized on Track
 - Yellow track - Approach

Self-Dispatching

- Self-dispatching while operating PTC is prohibited!
 - Example: A train passes an Approach signal and the PTC map then shows the next signal has become more favorable;
 - The train must approach next signal prepared to stop until the signal can be plainly seen and in accordance with OPR 504.4.

PTC's "Virtual Train"



- Many enforcements are caused from an improper consist or a lack of understanding of the "Virtual Train" consist.
 - Example: Train released EC-1 authority when head end was clear but entire train was not, resulting in track authority violation.
 - Example: Train attempting to work an industry forgetting to CUT OUT PTC causing an enforcement.
 - Example: Conductor attempting to handle switch once train clears switch yet the virtual train has not cleared said switch causing enforcement.
- Trains pulling 150-250 feet past their virtual length, could help eliminate these types of enforcements.

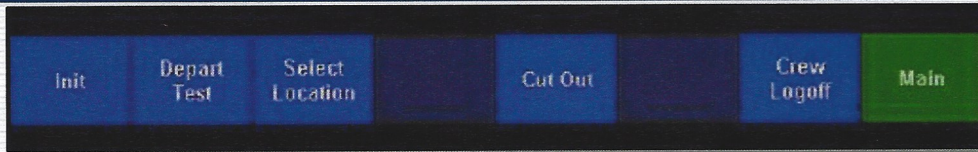
Changing Direction of Travel (Train Orientation)

When a locomotive operator has changed the train's direction of travel by moving the reverser handle from forward to reverse, reverse to forward, center to forward or center to reverse:

- The locomotive operator must ensure sufficient time (3-5 seconds) is provided for the PTC system to determine if there are targets at or near the intended direction prior to moving.
- Providing this brief time for the system to recalculate, will allow PTC to update the OBU screen with any targets or prompts that need to be protected.
- This will also prevent unintended braking enforcements (Reactive) from occurring without warning.
- The PTC map is displayed by the last direction of the reverser and will not default to forward position if centered.

****Note**** Changing the locomotives direction of travel will also cause a change in the direction of mileposts displayed on board the PTC display.

Picking Up/Setting Off (Line of Road Switching)

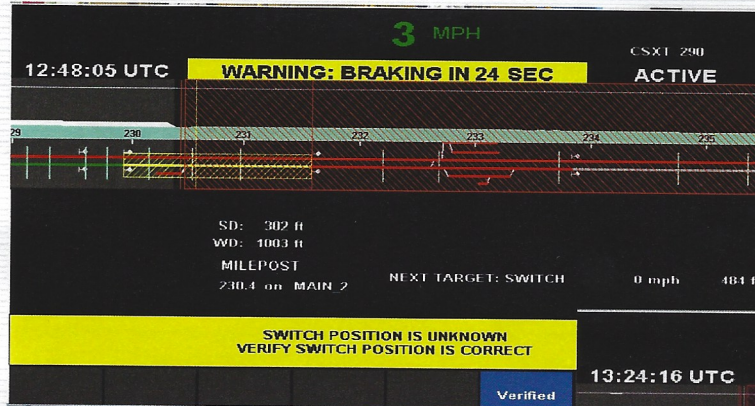


Trains setting off or picking up cars or locomotives on the line of road must:

1. Use the soft keys on the PTC display to cut out PTC. (Do not use the physical cut out switches in the nose of the locomotive unless instructed by dispatcher)
2. Once switching is complete and train is ready to depart, use soft keys on PTC display to cut in PTC system.
3. After cutting PTC back in, train will be held to restricted speed to next signal.

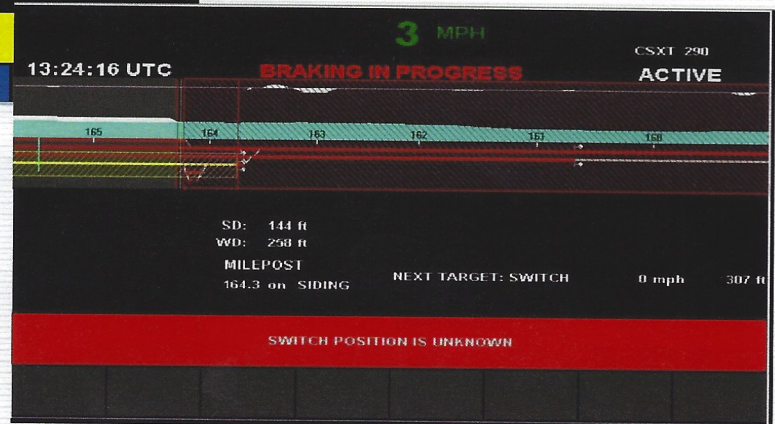
****Note**** System should be cut out anytime locomotives need to cut away from train on the line of road.

Predictive Enforcement

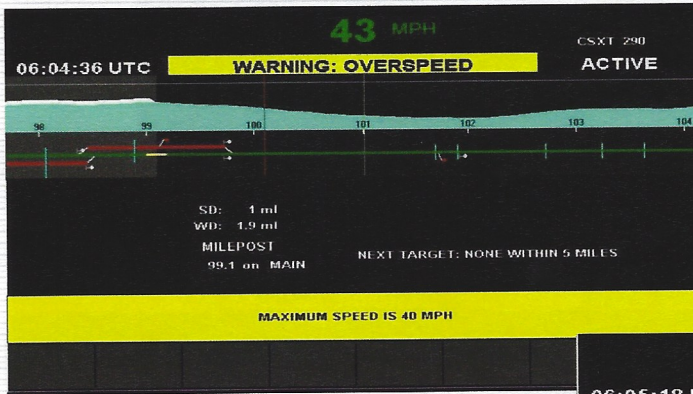


Up to 75 seconds to Stopping Distance...time can vary up or down depending on changes in the train speed.

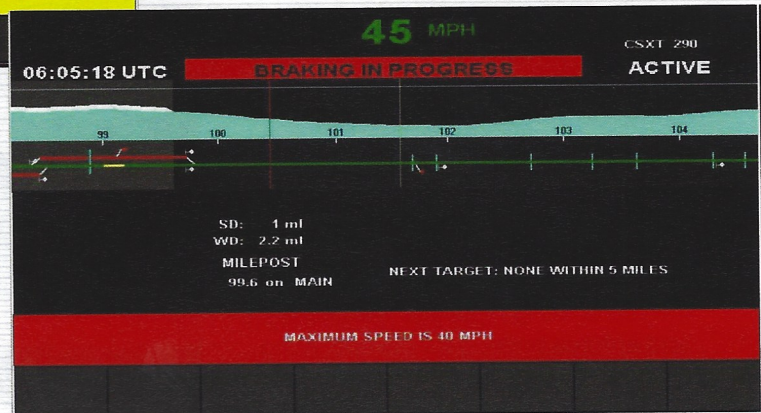
If the train does not brake, the red braking message will display and enforce braking for the upcoming target.



Reactive Enforcement



There is no countdown for reactive enforcement. If enforced to a stop you must contact the train dispatcher and be governed by their instructions!



Reactive Speed Warnings & Enforcements

Restricted Speed

- 19 mph – Warning



- 21 mph – Enforcement



All other Speeds

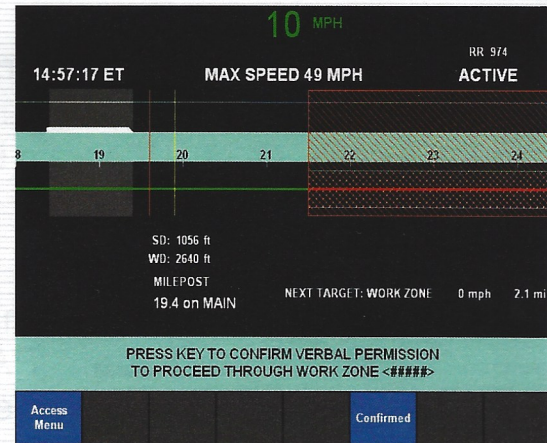
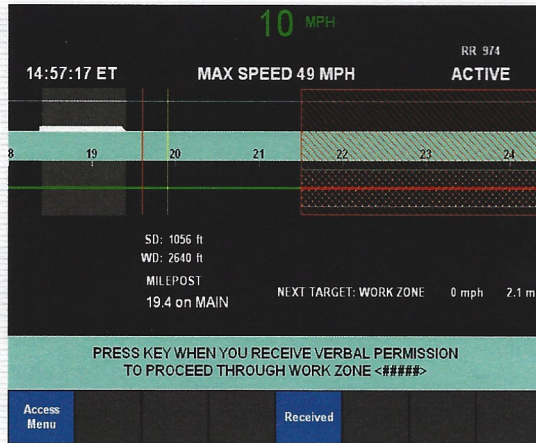
- Warning at 3 mph over maximum authorized speed
- Enforcement at 5 mph over maximum authorized speed

PTC Enforcements

- Dispatcher **MUST** be contacted when a PTC enforcement occurs and be governed by the dispatcher's instructions before moving.
- PTC enforcements resulting in an emergency application of the train brakes;
 - The locomotive operator must reset the emergency penalty **BEFORE** resetting a PTC enforcement.

*** Rule 308.1: When permitted to proceed, operate at a train speed not to exceed 10 MPH for one train length.

Work Zone Prompts and Responses



The PTC system will alert the crew within 3 miles of an active Work Zone. The blue banner will remind the crew that verbal permission from the Employee in Charge needs to be obtained prior to entry into the work zone. A red hash box provides protection at the beginning of the workzone.

After permission has been received from the Employee in Charge, the locomotive operator will press the “Received” soft key. The “Received” soft key is not to be pressed until permission from the Employee in Charge is received.

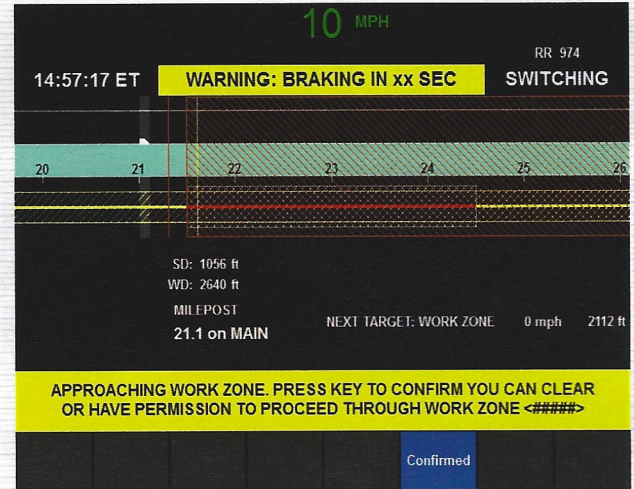
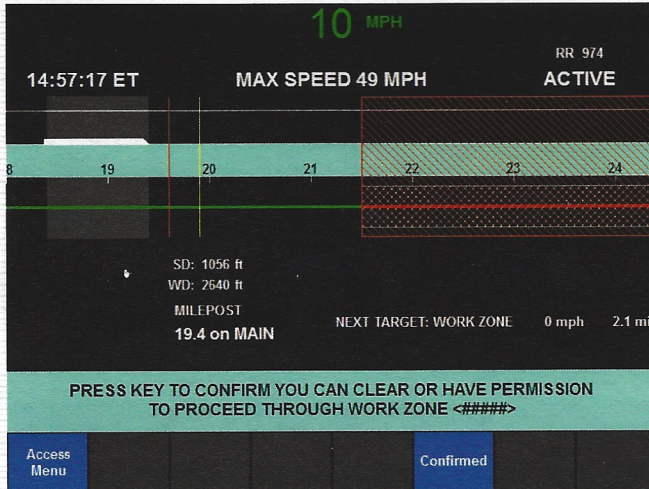
After permission has been received and the locomotive operator has pressed the “Received” soft key, the locomotive operator will then press the “Confirmed” soft key to complete the process. The red hash box is then removed. If movement is stopped prior to clearing the work zone limits, the same protection described above is given again.

Back-to-Back Work Zones

In cases where a train encounters back-to-back zones, locomotive operators will not receive an acknowledgment prompt for the second work zone until the train is within the warning distance for that work zone.

Example: A train has a work zone from MPA 100.1 to A 101.1. A second work zone begins at MPA 101.1. The locomotive operator will not receive the prompt for the MP A 101.1 until the train is within the warning distance of that zone.

Working Limits Not Yet In Effect



An additional confirmation has been added to the PTC work zone prompts. Should a train be required to enter or move inside working limits within 30 minutes prior to the effective time, the locomotive operator will receive the following prompt. "Press key to confirm you can clear or have permission to proceed through work zone."

The locomotive operator must be able to have the head end of the train clear of the limits prior to the effective time or receive permission from the employee-in-charge to enter the limits.

Permission Through Work Zone Prior to Moving

0 MPH
14:57:17 ET MAX SPEED 0 MPH RR 974 ACTIVE

21 22 23 24 25 26

SD: 0 ft
WD: 0 ft
MILEPOST
21.9 on MAIN NEXT TARGET: NONE WITHIN 5 MILES

PRESS KEY WHEN YOU RECEIVE VERBAL PERMISSION TO PROCEED THROUGH WORK ZONE <####>

Access Menu Received

Detailed description: This screenshot shows a PTC interface for a train at 0 MPH. The top status bar displays '0 MPH', '14:57:17 ET', 'MAX SPEED 0 MPH', and 'RR 974 ACTIVE'. Below this is a track diagram with mileposts 21 through 26. A red hatched area indicates an active work zone between mileposts 21 and 24. A green hatched area indicates a work zone between mileposts 22 and 25. The interface prompts the user to press a key when they receive verbal permission to proceed through the work zone. The 'Received' button is highlighted in blue.

0 MPH
14:57:17 ET MAX SPEED 0 MPH RR 974 ACTIVE

21 22 23 24 25 26

SD: 0 ft
WD: 0 ft
MILEPOST
21.9 on MAIN NEXT TARGET: NONE WITHIN 5 MILES

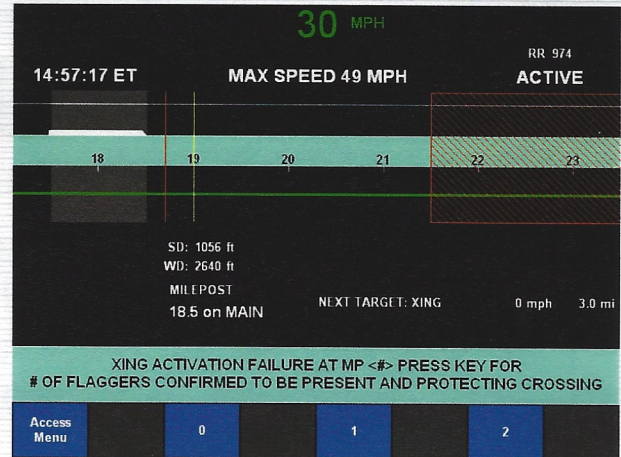
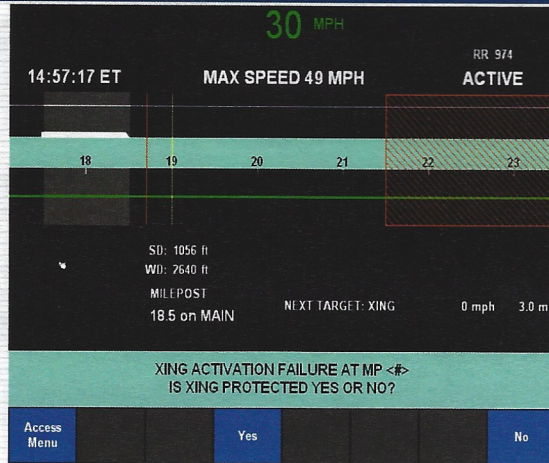
PRESS KEY TO CONFIRM VERBAL PERMISSION TO PROCEED THROUGH WORK ZONE <####>

Access Menu Confirmed

Detailed description: This screenshot shows the same PTC interface as the previous one, but with the 'Confirmed' button highlighted in blue. The status bar and track diagram are identical, showing the train at 0 MPH and the active work zone between mileposts 21 and 24.

If required to stop either within or approaching an active work zone , PTC will prompt the crew for permission to continue through the work zone prior to the train moving. Previously, trains had to begin moving in order to get prompted for permission to continue through the work zone. If movement is made prior to answering this prompt, train will be enforced.

Crossing Activation Failure Warning Notifications

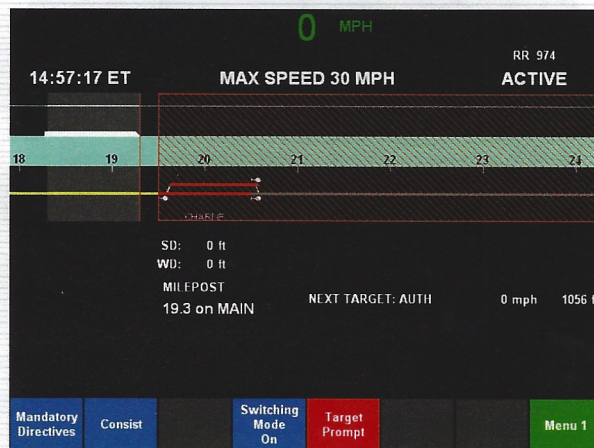
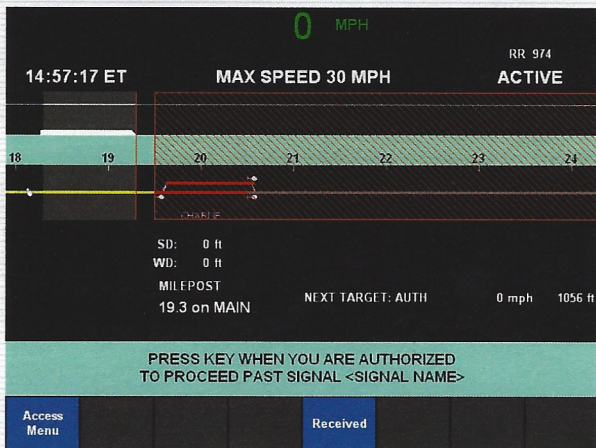


If on train messages or upon receiving EC-1 directive that there is a crossing malfunction, the PTC system will alert the crew prior to arrival at the indicated crossing, by displaying a red hash box, notification banners and “Yes” and “No” soft keys.

If the locomotive operator selects the “Yes” soft key, another prompt will appear asking for number of flaggers present. If the “0” soft key is selected, the train must stop prior to reaching the crossing so that proper protection can be provided. If the “1” soft key is selected, the train may proceed with caution over the crossing at 15 MPH. If the “2” soft key is selected, the train may proceed over the crossing at authorized speed.

If the locomotive operator selects the “No” soft key, the train must stop prior to reaching the crossing so that proper protection can be provided. **Note** : A False/Partial activation failure will have the same prompts, but will display a yellow line on the crossing instead of a red hash box and show next target at 15 MPH.

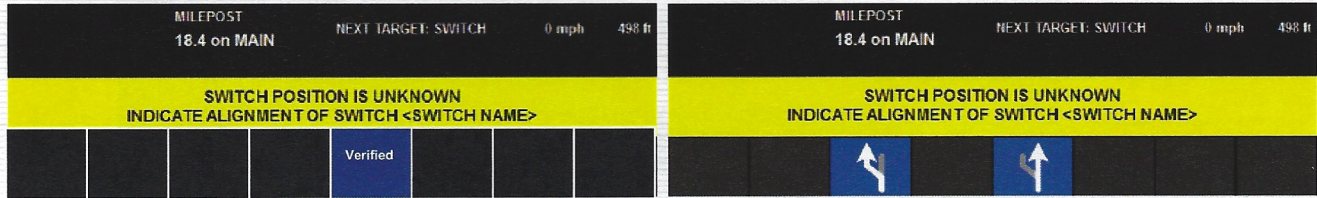
Pass Signal At Stop



After stopping within 1500 feet of the stop target, the permission past the stop signal prompt will not immediately appear on the onboard screen. Once the crew receives verbal permission to pass the stop signal from the train dispatcher, PTC will automatically remove the red fence. If the red fence fails to be removed after receiving permission, the permission past the stop signal prompt will be displayed after 3 minutes. The locomotive operator would then be required to answer the prompt according to procedure.

While stopped, if the crew needs to access the menu, locomotive operator should select "Access Menu" soft key. This will take you back to Main Menu screen. Pressing the red "Target Prompt" soft key takes the locomotive operator back to original signal prompt.

Switches



- PTC will prompt for switch alignment at 500 feet. In TWC territory, PTC switch prompts may occur when there is an issue with the WIU communicating with the system.
 - All switches will need to be either verified for movement or switch alignment.

Updating Consist (No Accept Key)

ALWAYS SELECT "MODIFY"
TO VERIFY
LOCOMOTIVE CONSIST
AND UPDATE TRAIN DATA

0 MPH

RR 974

INITIALIZING

TRAIN TYPE: FREIGHT
LEAD LOCOMOTIVE ORIENTATION: FRONT
LOCOMOTIVE COUNT: 2 (NO DP)
TRAILING TONNAGE: 12000 TONS (CARS ONLY)
OPERATIVE BRAKE COUNT: *****
AXLE COUNT: ***** (CARS ONLY)
TOTAL LENGTH: 6000 FT
LOADED CAR COUNT: 100 (CARS ONLY)
EMPTY CAR COUNT: 0
EQUIPMENT SPEED RESTRICTION: -- MPH
TOTAL BRAKING FORCE: PROVIDED BY OFFICE

PRESS KEY TO MODIFY CONSIST DATA
OR REQUEST NEW CONSIST DATA

Modify Request
New
Consist

During Initialization, the Onboard will receive and display the summary consist information to the locomotive operator with a prompt "PRESS KEY TO MODIFY CONSIST DATA OR REQUEST NEW CONSIST DATA". This is an indication that there are items that need to be modified. In addition, another indication would be asterisks noted in the body of the Consist Summary. The locomotive operator would need to select the "Modify" key, make changes and then select the "Accept" key if available.

Adding Locomotives

09:58:09 ET 0 MPH RR 974
MAX SPEED 49 MPH ACTIVE

LOCOMOTIVE	POSITION	STATUS	ORIENTATION
RR 974	1	RUN	FRONT
RR 4321	2	ISOLATE	
RR 2143	105	RUN	

ENTER LOCOMOTIVE IDENTIFICATION

RR NULL NULL 4 0 0 0

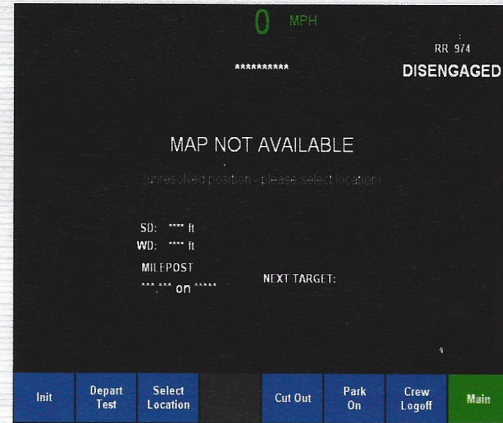
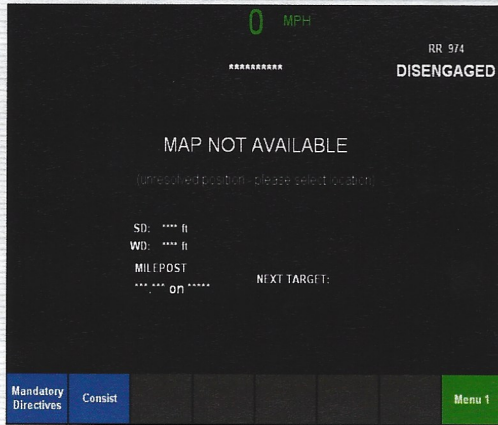
Cancel Enter ▲ ▲ ▼ ◀ ▶

When required to add a locomotive to the consist, locomotive operators must ensure the engine number to be added is preceded by “Null” in the appropriate boxes.

Track Selection

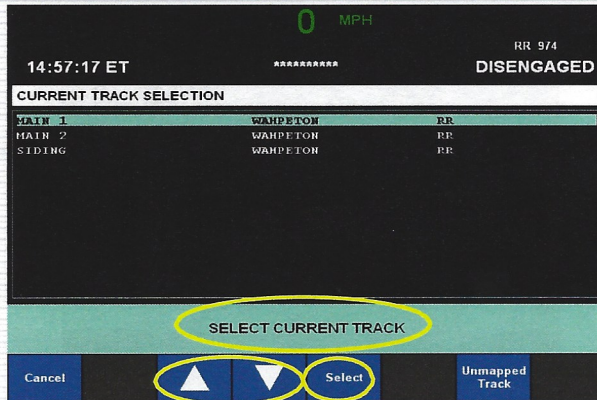
- Many enforcements have been caused due to improper Track Selection. The locomotive operator is to select the track that the head end is occupying and not the intended route. When possible, track selection should be avoided in turnouts, crossovers or near switches and Restricting signals.
- Transitioning to Active State too close to a switch or signal could cause a PTC enforcement. Selecting a track once head end has cleared a switch may eliminate enforcements if conditions permit.

Selecting Track Location



If after completing Initialization, the On-Board Unit cannot determine the train's current location, the OBU will indicate "MAP NOT AVAILABLE". This is an indication that the locomotive operator must manually select the train's location by pressing the "Menu 1" key. The locomotive operator will then select the "Select Location" key.

Selecting Track Location



0 MPH
RR 9/4
DISENGAGED
14:57:17 ET

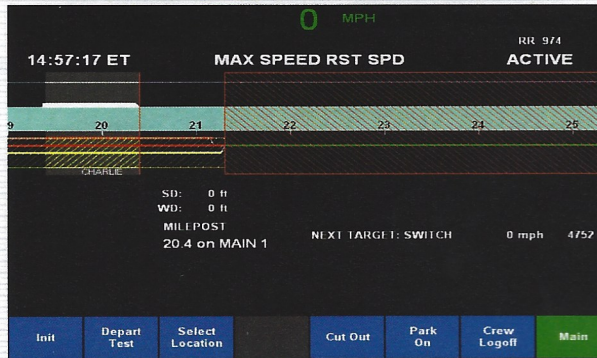
CURRENT TRACK SELECTION

MAIN 1	WAHPETON	RR
MAIN 2	WAHPETON	RR
SIDING	WAHPETON	RR

SELECT CURRENT TRACK

Cancel Unmapped Track

▲ ▼ Select

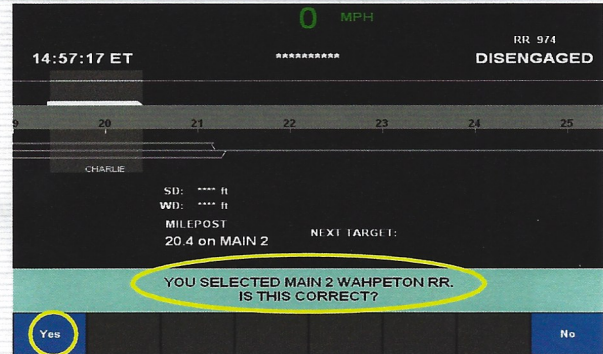


0 MPH
RR 9/4
ACTIVE
14:57:17 ET

MAX SPEED RST SPD

SD: 0 ft
WD: 0 ft
MILEPOST 20.4 on MAIN 1
NEXT TARGET: SWITCH 0 mph 4752 ft

Init Depart Test Select Location Cut Out Park On Crew Logoff Main



0 MPH
RR 9/4
DISENGAGED
14:57:17 ET

SD: **** ft
WD: **** ft
MILEPOST 20.4 on MAIN 2
NEXT TARGET:

YOU SELECTED MAIN 2 WAHPETON RR.
IS THIS CORRECT?

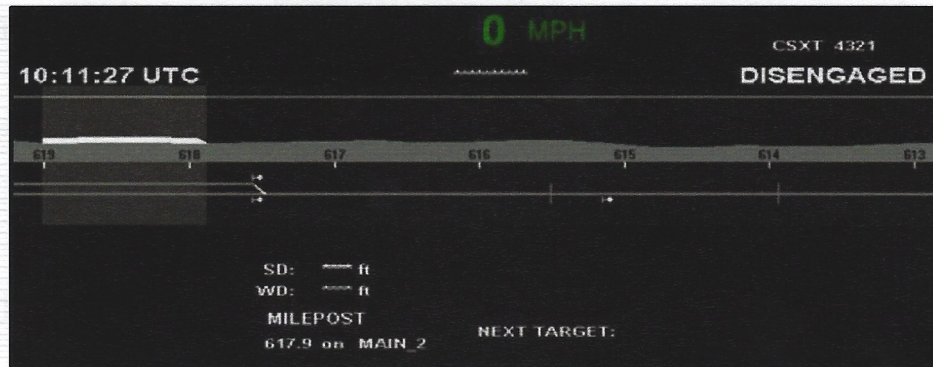
Yes No

The locomotive operator will be prompted to "Select Current Track". The up and down arrow keys should be used to highlight the track the train is currently on. The "Select" key should then be pressed. After pressing the "Select" key, the "You Selected Main 2 Wahpeton RR" Is this Correct?" prompt will appear. If the track the train is currently on is correct, the locomotive operator will select "Yes". Once the "Yes" key is pressed and the train detects its direction of travel, the OBU will go "Active". Train speed must be 19 MPH or below in order for the "Select Location" key to be visible. If stopped, train may have to move approximately 30-80 feet for state to change to "Active".

****NOTE** The "Select Location" process must be completed prior to entering PTC territory. Clarity of track selection must be understood before selecting. Track selection should be determined by head end and not lined route.**

Transitioning to Active State

PTC will not go Active until movement is made

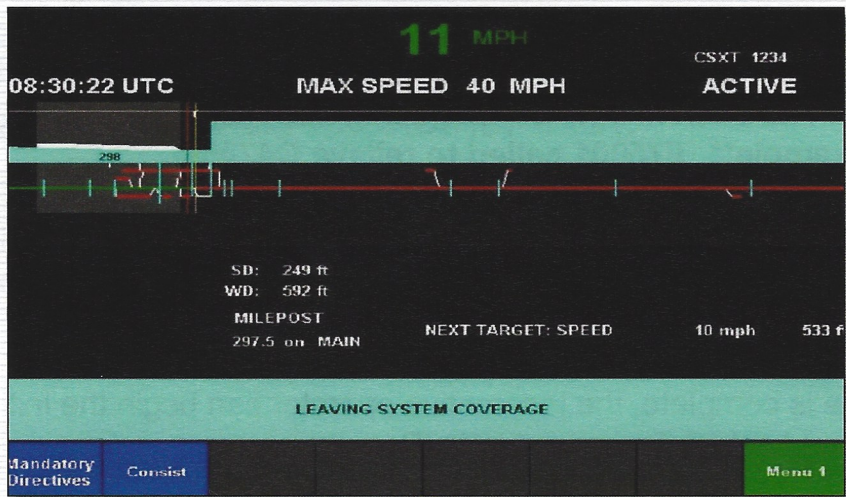


A movement of 30 to 80 feet must be made to transition into Active state.

Horn Protection Feature

- Should the locomotive operator fail to manually operate the horn, PTC will automatically sound the horn at crossings. This feature will not be active at speeds below 7 MPH.
- This feature does not relieve the locomotive operator from all locomotive horn and bell rules.

Leaving System Coverage



The system will display a “Leaving System Coverage” banner anytime the train moves from PTC track to Non-PTC track. Crew will receive this banner upon exiting PTC track. EXAMPLE: “Leaving System Coverage” may indicate that a hand operated switch is lined for a movement away from the main line.

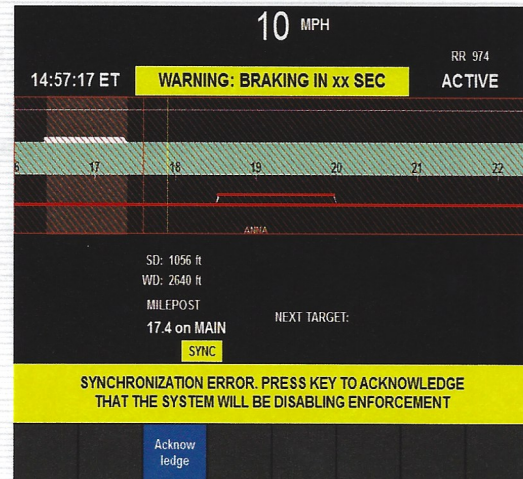
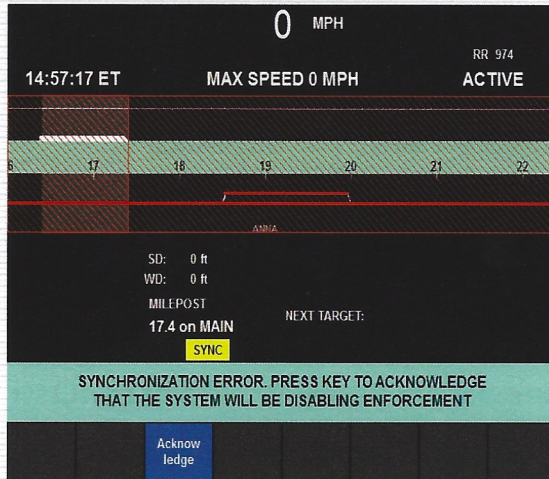
Relief Crew Initialization

- The locomotive operator must contact the train dispatcher prior to the start of initialization and confirm their train ID when called as a relief crew that has a train ID different from the one being relieved.
 - ****Example** F75001 called to relieve Q47801.**
- The train dispatcher must ensure that the locomotive being initialized is on the corresponding train sheet and the locomotive operator's bulletin is activated for the train ID the crew will be operating.
- Once this is complete, the locomotive operator can begin the Initialization process and select the correct train ID.

Pusher / Helper Train Service

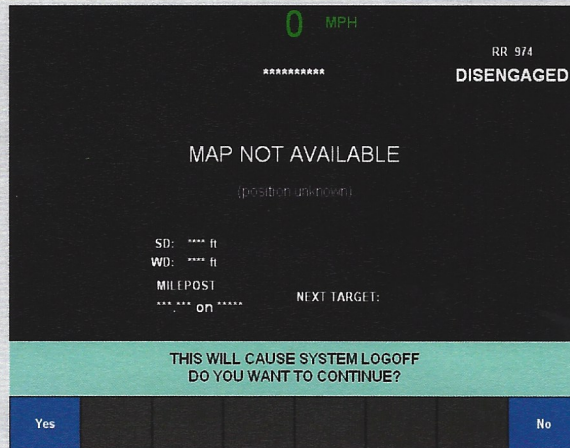
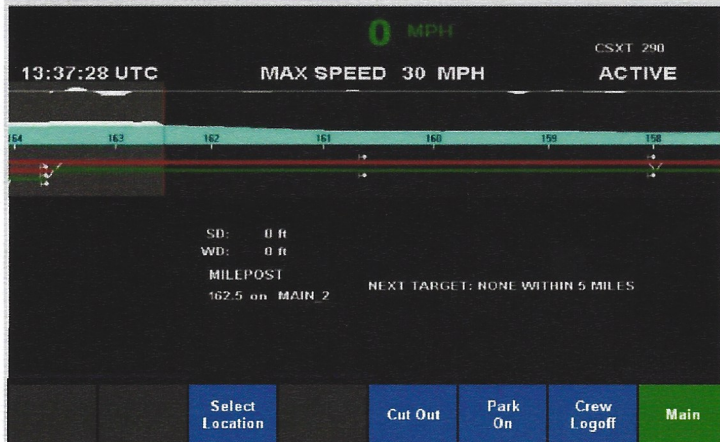
- Pusher/Helper Service crews will NOT INITIALIZE PTC while attached to another train.

Synchronization Error Prompt



Locomotive operators are required to answer Synchronization Error prompt when displayed on the PTC screen. Locomotive operators should press the “Acknowledge” soft key when displayed. If the soft key is not pressed within the warning timeframe, PTC will initiate an enforcement

Crew Logoff



Locomotive operators are required to logoff of the PTC system at the end of their tour of duty. The crew logoff soft key can be accessed by pressing the Menu 1 key.