Step Number	Task Description	Results	Notes	Unexpected Result Comments; or Changes made to equipment during inspection
			Test the multimter for proper function before beginning. Also, after finishing.	
			Conduct "6-point test" before beginning work.	Machine performs the same as previous inspections?
		Switch Position: Pedal Pushed - Alarm Sound Forward: Forward - _____ Forward: Reverse - _____ Center: Forward - _____ Center: Reverse - _____ Reverse: Forward - _____		
Phase 1 - Determine if wires are mislabled, or if wires are in the wrong place.				
1	Open Master Control Cabinet (MCC)			
2	Locate Travel light directional Switch labeled RKS 1002 inside the panel		NS Contractor On-site to record video of process.	
3	Verify RKS 1002 has the following wires in the corresponding spots on the back of the switch			
3.1	a. Wire #1002 (red) Spot 2b	Verified; or Not Verified		
3.2	b. Wire #1726 (red) spot 5b	Verified; or Not Verified		
3.3	c. Wire #1002A (black) spot 3	Verified; or Not Verified		
3.4	d. Wire #1013 (black) spot 1	Verified; or Not Verified		
3.5	e. Wire #2422 (black) spot 6	Verified; or Not Verified		
3.6	f. Wire #2425 (black) spot 4	Verified; or Not Verified		
4	Locate Terminal block #12 spot 2422 verify wire #2422 (Black) is in this spot	Verified; or Not Verified		
4.1	a. Remove wire #2422 form terminal block #12 spot 2422.			
4.2	b. Using a multimeter set to make a tone when probes are touched together. Place one probe on wire #2422 that was removed from terminal block, and the other probe on wire #2422 at rocker switch (RKS1002) spot 6 listen for tone on Multimeter.	Tone; or No Tone		
4.3	c. If tone is heard wire are labeled correctly. If no tone is heard move to next step.	Expected; or Unexpected	What do we do if the tone is heard? Move to step 7	
5	Move probe from Wire #2422 spot 6 to wire #2425 at spot 4 of rocker switch (RKS1002).	Tone; or No Tone	This step is only done if no tone is heard in step 4.3 If tone is heard, wires are mislabelbed	
6	Reinstall Wire #2422 in Terminal block #12 spot 2422			
7	Locate terminal block #12 spot 2425			
7.1	a. Verify wire #2425 (black) is in this spot and remove from terminal block.	Verified; or Not Verified		
7.2	b. Using multimeter set to make a tone when probes are touched together place one probe on wire #2425 that was just removed, and one probe on wire #2425 at rocker switch (RKS1002) spot 4.	Tone; or No Tone		
7.3	c. If tone is heard from the Multimeter wires are labeled correctly. If no tone is heard move on to the next step.	Expected; or Unexpected	What do we do if the tone is heard? Move to step 9	
8	Move probe from wire #2425 spot 4 to Wire #2422 spot 6	Tone; or No Tone	This step is only done if no tone is heard in step 7.3	
8.1	If tone is heard, wires are mislabled	Expected; or Unexpected		
8.2	Reinstall wire #2425 in Terminal Block #12 spot 2425			
9	Locate the plug at the computer and unplug the computer			
9.1	a. Locate Wire #2422 (yellow) at terminal block 12 spot 2422.			
9.2	b. Remove wire #2422 (yellow) from the terminal block.			
9.3	c. With the multimeter set to tone place one probe on pin #74 of the computer plug.			
9.4	d. Place the other probe on wire #2422 (yellow) that was removed from terminal block #12 spot 2422.	Tone; or No Tone		
9.5	e. If you hear a tone from the multimeter wire is label correctly. If no tone is heard move to next step.	Expected; or Unexpected	What do we do if the tone is heard? Move to step 10.1 a	
10	Move probe from wire #2422 at terminal block to wire #2425, if tone is heard, wire is mislabeled	Tone; or No Tone	This step is onlyl done if no tone is heard in step 9.5	
10.1	a. Reinstall wire 2422 in terminal block #12 spot 2422.			
10.2	b. Locate wire #2425 at terminal block #12 spot 2425, and remove.			
10.3	c. Place one probe on wire #2425 that was just removed from terminal block, and place the other probe on pin #16 of the computer plug. If tone is heard wires are labeled correctly. If no tone is heard move to next step.	Tone; or No Tone	What do we do if the tone is heard? Move to step 11.2.b	
11	Move probe from wire #2425 (yellow) at terminal block #12 to wire #2422 at terminal block #12	Tone; or No Tone	This step is only done if not tone is heard in step 10.3	
11.1	a. If tone is heard wires are mislabeled.	Expected; or Unexpected		
11.2	b. Reinstall wire #2425 in the terminal block #12 spot 2425.			

Step Number	Task Description	Results	Notes	Unexpected Result Comments; or Changes made to equipment during inspection
12	Find control Relay 2826 and verify the wire are as follows			
12.1	a. Wire #2826 is on spot A1.	Verified; or Not Verified		
12.2	b. Wire #2 is on spot A2.	Verified; or Not Verified		
12.3	c. Wire #944a is on spot 14	Verified; or Not Verified		
12.4	d. Wire #944 is on spot 11	Verified; or Not Verified		
13	Find control relay #2829 and verify the wire are as follows.			
13.1	a. Wire #2829 on spot A1.	Verified; or Not Verified		
13.2	b. Wire #2 on spot A2.	Verified; or Not Verified		
13.3	c. Wire #947 on spot 14.	Verified; or Not Verified		
13.4	d. Wire #944 on spot 11	Verified; or Not Verified		
14	With Multimeter set to tone, place one probe on pin #13 of the computer plug, and the other probe on wire 2826 spot A1. Listen for tone on multimeter. If no tone, move to next step	Tone; or No Tone	What do we do if there is a tone? Move to step 16	
15	Move probe from wire #2826 of the control relay 2826 to wire #2829 on control relay 2829. If there is a tone, wires are mislabled	Tone; or No Tone	This step is only done if there is no tone on step 14.	
16	Move probe to pin #14 on the computer plug and place the other probe on wire #2829 of the control relay. Listen for tone. If no tone is heard, move to the next step	Tone; or No Tone	What do we do if there is a tone? Move to step 18.	
17	Move probe from wire #2829 of the control relay to wire #2826. If tone is heard, wires are mislabled.	Tone; or No Tone	This step is only done if there is no tone on step 16	
18	locate Plug 904 on the side of the MCC and unplug			
18.1	a. Place one probe on wire #944a At control relay 2826 pin 14 and the other probe on on pin H of plug 904 on side of MCC. Listen for tone if no tone is heard move to step	Tone; or No Tone	if tone is heard move to step 20	
19	move probe from plug 904 pin H to pin J. if tone is heard wires are in wrong location in plug	Tone; or No Tone	This step is only done if there is no tone on step 18	
20	Place probe on wire #947 spot 14 of control relay 2829 and the other probe on pin J of plug 904 on the Side of the MCC. If no tone move to the next step.	Tone; or No Tone	if tone is heard move to step 22	
21	move probe from pin J of plug 904 on the side of MCC to pin H if tone is heard wire are in the wrong spot of pug 904.	Tone; or No Tone		
22	locate Plug for the front change of direction alarm on the front roof			
22.1	a locate pin 1 of the front change of diretion alarm and place probe on pin. Place the other probe on pin H of plug 904 inside the cab. If no tone is heard move on to the next step	Tone; or No Tone	if tone is heard move on to step 23	
22	move probe from pin H on plug 904 inside the cab to pin J. if tone is heard the wire is in the wrong location in plug 904	Tone; or No Tone		
23	locate plug for rear change of direcion alarm on the rear roof and unplug			
23.1	a place one probe on pin 1 of the rear change of direction alarm and the other probe on pin J of plug 904 inside the cab. If no tone is heard move to the next step.	Tone; or No Tone		
24	move prove from pin J of plug 904 inside the cab to pin H if tone is heard wire is in the wrong location in plug 904.	Tone; or No Tone		
	steps to test the roof mounted horns			
1	verify the following wire are on control relay 923			
1.1	a. Wire #951 Spot 11	Verified; or Not Verified		
1.2	b. Wire #951 Spot 41	Verified; or Not Verified		
1.3	c. Wire #951a spot 14	Verified; or Not Verified		
1.4	d. Wire #951a spot 44	Verified; or Not Verified		
2	with multimeter set to read DC Volts place black probe on Ground stud in side the MCC and the red probe on #951 spot 11 of control relay 923. push horn button meter should read 24V			
3	move red probe to wire #951 spot 41 on control relay 923. push horn button should read 24V.			

Step Number	Task Description	Results	Notes	Unexpected Result Comments; or Changes made to equipment during inspection
4	move red probe to Wire #951a spot 14 of control relay 923. push the horn button on the MCC. Should read 24V if not relay is bad			
5	Move red probe to Wire #951a spot 41 of control realy 923. push the horn button on MCC. Should read 24V. If not the relay is bad.			
6	locate the plug for the front and rear facing horns on the roof and unplug both.			
6.1	a set multi meter to read DC volts			
6.2	b. Place red probe on pin 1 and the black probe on pin 2 of front facing horn plug. and push the horn button located on the MCC in the cab should read 24V or higher.		If the meter reads 24V move to step 7 if no reading move to step 8	
6.3	c. place red probe on pin 1 and the black probe on pin 2 of the rear facing horn plug. Should read 24V or higher.		If the meter reads 24V move to step 7 if no reading move to step 9	
7	plug in new horn and test funtion.			
8	with meter set to make a tone when probes are touched togther place one probe on pin1 of the front facing horn and the other probe on pin L of plug 904 inside to cab. If no tone wire is boke between the horn plug and plug 904 inside the cab.	Tone; or No Tone	if tone is heard move to step 10	
9	with meter set to make a tone when probes are touched togther place on probe on pin1 of the rear facing horn plug and the other probe on pin L of plug 904 inside to cab. If no tone wire is boke between the horn plug and plug 904 inside the cab.	Tone; or No Tone	if tone is heard move to step 10	
10	Place one probe on pin L on plug 904 on the side of the MCC and the other probe on wire #951a on pin 14 of control relay 923 if no tone is heard there is a break in the wire from plug 904 pin L to control relay 923			
Phase 2: Move Wires to "Correct" Location				
18	Based on Phase 1 results, document any changes made to the equipment to put it in "proper" or "correct" working condition		(photograph and video)	
19	Conduct "6-point test"			
19.1	**Switch Position: Pedal Pushed - Alarm Sound** Forward: Forward - No Alarm Forward: Reverse - Rear Speaker Center: Forward - Both Speakers Center: Reverse - Both Speakers Reverse: Forward - Front Speaker Reverse: Reverse - No Alarm	**Switch Position: Pedal Pushed - Alarm Sound** Forward: Forward - _____ Forward: Reverse - _____ Center: Forward - _____ Center: Reverse - _____ Reverse: Forward - _____ Reverse: Reverse - _____		
19.2	Once the machine is set up for "correct" operation. Conduct a final inspection for signs of failure or maintenance that may have led to the improper functions.			
Phase 3: How to leave the machine?				
20	1. Do we reinstall all wiring back to the way it was found until the machine is released back to Norfolk Southern? 2. Do we leave it in the way that makes the alarms work properly, and re-label any wires that are mislabeled?			
20.1	NTSB Legal Advice . My main concern is that if we try to “fix” it, then we could arguably assume responsibility for making sure it is correct. At the same time, if we fix it, I don t want to break it again. I am going to assume the company has maintenance people on staff. I suggest involving them in the testing process, or at least give them a very thorough, and documented, briefing when we are done outlining exactly what you changed. Make sure to stress to them that they should follow their own procedures to verify the work and ensure the system is configured according to their own standards and procedures. Be sure to document all of that in writing to them, with a copy in the OUO docket.			

218 N. Ervay Road

Page ____ of ____

Meeting_____

Date:_____ Start:_____ End: _____

Attendance Record

NTSB | National Transportation Safety Board

Full Name	Organization	Title	Phone	e-mail	Group/Role
John Manutes	NTSB		[redacted]		Mech WG Chair
Dave Graubard	FRA				MPE Inspector
Kenneth Pugh	FRA				
Todd Kraholik	FRA				Track inspector
Jason Gurzynski	FRA				MPE Inspector
Roy Morrison	BMWED				
Joe Young	NS				NS
Dwayne Gibson	NS				
Jon Mick	Nat. Salvage				National
Ian Barlick	Nat Salvage				
John Gobert	Nordco				
	Nordco				

Page ____ of ____

Meeting_____

Date:_____ Start:_____ End: _____

Attendance Record

NTSB | National Transportation Safety Board

Full Name	Organization	Title	Phone	e-mail	Group/Role
Forrest Koerner -Fcp	National salvage	Project Manager	[redacted]		
Todd Yates	NS	Representative			
Danny Thomas	Nordco	General Manager			
Michael Polite	NS	Manager work Eq			

Step Number	Task Description	Results	Notes	Unexpected Result Comments; or Changes made to equipment during inspection
			Test the multimter for proper function before beginning. Also, after finishing. Conduct "6-point test" before beginning work.	Machine performs the same as previous inspections?
		Switch Position: Pedal Pushed - Alarm Sound Forward: Forward - rear Forward: Reverse - no Center: Forward - 2 Center: Reverse - 2 Reverse: Forward - no FR : R - front		
Phase 1 - Determine if wires are mislabled, or if wires are in the wrong place.				
1	Open Master Control Cabinet (MCC)			
2	Locate Travel light directional Switch labeled RKS 1002 inside the panel		NS Contractor On-site to record video of process.	
3	Verify RKS 1002 has the following wires in the corresponding spots on the back of the switch			
3.1 a.	Wire #1002 (red) Spot 2b	✓ Verified; or Not Verified		
3.2 b.	Wire #1726 (red) spot 5b	✓ Verified; or Not Verified		
3.3 c.	Wire #1002A (black) spot 3	✓ Verified; or Not Verified		
3.4 d.	Wire #1013 (black) spot 1	✓ Verified; or Not Verified		
3.5 e.	Wire #2422 (black) spot 6	✓ Verified; or Not Verified		
3.6 f.	Wire #2425 (black) spot 4	✓ Verified; or Not Verified		
4	Locate Terminal block #12 spot 2422 verify wire #2422 (Black) is in this spot	✓ Verified; or Not Verified		
4.1 a.	Remove wire #2422 form terminal block #12 spot 2422.	✓		
4.2 b.	Using a multimeter set to make a tone when probes are touched together. Place one probe on wire #2422 that was removed from terminal block, and the other probe on wire #2422 at rocker switch (RKS1002) spot 6 listen for tone on Multimeter.	Tone; or No Tone		
4.3 c.	If tone is heard wire are labeled correctly. If no tone is heard move to next step.	Expected; or Unexpected	What do we do if the tone is heard? Move to step 4.6	
5	Move probe from Wire #2422 spot 6 to wire #2425 at spot 4 of rocker switch (RKS1002).	Tone; or No Tone	This step is only done if no tone is heard in step 4.3	
6	Reinstall Wire #2422 in Terminal block #12 spot 2422		If tone is heard, wires are mislabelbed	
7	Locate terminal block #12 spot 2425			
7.1 a.	Verify wire #2425 (black) is in this spot and remove from terminal block.	Verified; or Not Verified		
7.2 b.	Using multimeter set to make a tone when probes are touched together place one probe on wire #2425 that was just removed, and one probe on wire #2425 at rocker switch (RKS1002) spot 4.	Tone; or No Tone		
7.3 c.	If tone is heard from the Multimeter wires are labeled correctly. If no tone is heard move on to the next step.	Expected; or Unexpected	What do we do if the tone is heard? Move to step 8.2	
8	Move probe from wire #2425 spot 4 to Wire #2422 spot 6	Tone; or No Tone	This step is only done if no tone is heard in step 7.3	
8.1	If tone is heard, wires are mislabled	Expected; or Unexpected		
8.2	Reinstall wire #2425 in Terminal Block #12 spot 2425			
9	Locate the plug at the computer and unplug the computer			
9.1 a.	Locate Wire #2422 (yellow) at terminal block 12 spot 2422.			
9.2 b.	Remove wire #2422 (yellow) from the terminal block.			
9.3 c.	With the multimeter set to tone place one probe on pin #74 of the computer plug.			
9.4 d.	Place the other probe on wire #2422 (yellow) that was removed from terminal block #12 spot 2422.	Tone; or No Tone		
9.5 e.	If you hear a tone from the multimeter wire is label correctly. If no tone is heard move to next step.	Expected; or Unexpected	What do we do if the tone is heard? Move to step 10.1 a	
10	Move probe from wire #2422 at terminal block to wire #2425, if tone is heard, wire is mislabeled	Tone; or No Tone	This step is onlyl done if no tone is heard in step 9.5	
10.1 a.	Reinstall wire 2422 in terminal block #12 spot 2422.			
10.2 b.	Locate wire #2425 at terminal block #12 spot 2425, and remove.			
10.3 c.	Place one probe on wire #2425 that was just removed from terminal block, and place the other probe on pin #16 of the computer plug. If tone is heard wires are labeled correctly. If no tone is heard move to next step.	Tone; or No Tone	What do we do if the tone is heard? Move to step 11.2.b	
11	Move probe from wire #2425 (yellow) at terminal block #12 to wire #2422 at terminal block #12	Tone; or No Tone	This step is only done if not tone is heard in step 10.3	
11.1 a.	If tone is heard wires are mislabeled.	Expected; or Unexpected		
11.2 b.	Reinstall wire #2425 in the terminal block #12 spot 2425.			

Δ of plan:
① 2422 w/ 2425
② 6pt chk

f:f	no
f:r	front
c:f	2
c:r	2
r:f	Rear
r:r	no

Step Number	Task Description	Results	Notes	Unexpected Result Comments; or Changes made to equipment during inspection
12	Find control Relay 2826 and verify the wire are as follows			
12.1 a.	Wire #2826 is on spot A1.	Verified; or Not Verified		
12.2 b.	Wire #2 is on spot A2.	Verified; or Not Verified		
12.3 c.	Wire #944a is on spot 14	Verified; or Not Verified		
12.4 d.	Wire #944 is on spot 11	Verified; or Not Verified		
13	Find control relay #2829 and verify the wire are as follows.			
13.1 a.	Wire #2829 on spot A1.	Verified; or Not Verified		
13.2 b.	Wire #2 on spot A2.	Verified; or Not Verified		
13.3 c.	Wire #947 on spot 14.	Verified; or Not Verified		
13.4 d.	Wire #944 on spot 11	Verified; or Not Verified		
14	With Multimeter set to tone, place one probe on pin #13 of the computer plug, and the other probe on wire 2826 spot A1. Listen for tone on multimeter. If no tone, move to next step	Tone; or No Tone	What do we do if there is a tone? Move to step 16	
15	Move probe from wire #2826 of the control relay 2826 to wire #2829 on control relay 2829. If there is a tone, wires are mislabled	Tone; or No Tone	This step is only done if there is no tone on step 14.	
16	Move probe to pin #14 on the computer plug and place the other probe on wire #2829 of the control relay. Listen for tone. If no tone is heard, move to the next step	Tone; or No Tone	What do we do if there is a tone? Move to step 18.	
17	Move probe from wire #2829 of the control relay to wire #2826. If tone is heard, wires are mislabled.	Tone; or No Tone	This step is only done if there is no tone on step 16	
18	locate Plug 904 on the side of the MCC and unplug			
18.1 a.	Place one probe on wire #944a At control relay 2826 pin 14 and the other probe on on pin H of plug 904 on side of MCC. Listen for tone if no tone is heard move to step	Tone; or No Tone	if tone is heard move to step 20	
19	move probe from plug 904 pin H to pin J. if tone is heard wires are in wrong location in plug	Tone; or No Tone	This step is only done if there is no tone on step 18	
20	Place probe on wire #947 spot 14 of control relay 2829 and the other probe on pin J of plug 904 on the Side of the MCC. If no tone move to the next step.	Tone; or No Tone	if tone is heard move to step 22	
21	move probe from pin J of plug 904 on the side of MCC to pin H if tone is heard wire are in the wrong spot of pug 904.	Tone; or No Tone		
22	locate Plug for the front change of direction alarm on the front roof			
22.1 a	locate pin 1 of the front change of diretion alarm and place probe on pin. Place the other probe on pin H of plug 904 inside the cab. If no tone is heard move on to the next step	Tone; or No Tone	if tone is heard move on to step 23	
22	move probe from pin H on plug 904 inside the cab to pin J. if tone is heard the wire is in the wrong location in plug 904	Tone; or No Tone		
23	locate plug for rear change of direcion alarm on the rear roof and unplug			
23.1 a	place one probe on pin 1 of the rear change of direction alarm and the other probe on pin J of plug 904 inside the cab. If no tone is heard move to the next step.	Tone; or No Tone		
24	move prove from pin J of plug 904 inside the cab to pin H if tone is heard wire is in the wrong location in plug 904.	Tone; or No Tone		

Video narration starting here

Computer Swap

RR	Rear
FL	no
CR	2.
CL	2
RF	no
FF	Front

Steps to test the roof mounted horns

1	verify the following wire are on control relay 923			
1.1 a.	Wire #951 Spot 11	Verified; or Not Verified		
1.2 b.	Wire #951 Spot 41	Verified; or Not Verified		
1.3 c.	Wire #951a spot 14	Verified; or Not Verified		
1.4 d.	Wire #951a spot 44	Verified; or Not Verified		
2	with multimeter set to read DC Volts place black probe on Ground stud in side the MCC and the red probe on #951 spot 11 of control relay 923. push horn button meter should read 24V			
3	move red probe to wire #951 spot 41 on control relay 923. push horn button should read 24V.			

Step Number	Task Description	Results	Notes	Unexpected Result Comments; or Changes made to equipment during inspection
4	move red probe to Wire #951a spot 14 of control relay 923. push the horn button on the MCC. Should read 24V if not relay is bad			
5	Move red probe to Wire #951a spot 41 of control realy 923. push the horn button on MCC. Should read 24V. If not the relay is bad.			
6	locate the plug for the front and rear facing horns on the roof and unplug both.			
6.1	a set multi meter to read DC volts			
6.2	b. Place red probe on pin 1 and the black probe on pin 2 of front facing horn plug. and push the horn button located on the MCC in the cab should read 24V or higher.		If the meter reads 24V move to step 7 if no reading move to step 8	
6.3	c. place red probe on pin 1 and the black probe on pin 2 of the rear facing horn plug. Should read 24V or higher.		If the meter reads 24V move to step 7 if no reading move to step 9	
7	plug in new horn and test funtion.			
8	with meter set to make a tone when probes are touched togther place one probe on pin1 of the front facing horn and the other probe on pin L of plug 904 inside to cab. If no tone wire is boke between the horn plug and plug 904 inside the cab.	Tone; or No Tone	if tone is heard move to step 10	
9	with meter set to make a tone when probes are touched togther place on probe on pin1 of the rear facing horn plug and the other probe on pin L of plug 904 inside to cab. If no tone wire is boke between the horn plug and plug 904 inside the cab.	Tone; or No Tone	if tone is heard move to step 10	
10	Place one probe on pin L on plug 904 on the side of the MCC and the other probe on wire #951a on pin 14 of control relay 923 if no tone is heard there is a break in the wire from plug 904 pin L to control relay 923			
Phase 2: Move Wires to "Correct" Location				
18	Based on Phase 1 results, document any changes made to the equipment to put it in "proper" or "correct" working condition		(photograph and video)	
19	Conduct "6-point test"			
19.1	**Switch Position: Pedal Pushed - Alarm Sound** Forward: Forward - No Alarm Forward: Reverse - Rear Speaker Center: Forward - Both Speakers Center: Reverse - Both Speakers Reverse: Forward - Front Speaker Reverse: Reverse - No Alarm	**Switch Position: Pedal Pushed - Alarm Sound** Forward: Forward - _____ Forward: Reverse - _____ Center: Forward - _____ Center: Reverse - _____ Reverse: Forward - _____ Reverse: Reverse - _____		
19.2	Once the machine is set up for "correct" operation. Conduct a final inspection for signs of failure or maintenance that may have led to the improper functions.			
Phase 3: How to leave the machine?				
20	1. Do we reinstall all wiring back to the way it was found until the machine is released back to Norfolk Southern? 2. Do we leave it in the way that makes the alarms work properly, and re-label any wires that are mislabeled?			
20.1	NTSB Legal Advice . My main concern is that if we try to "fix" it, then we could arguably assume responsibility for making sure it is correct. At the same time, if we fix it, I don't want to break it again. I am going to assume the company has maintenance people on staff. I suggest involving them in the testing process, or at least give them a very thorough, and documented, briefing when we are done outlining exactly what you changed. Make sure to stress to them that they should follow their own procedures to verify the work and ensure the system is configured according to their own standards and procedures. Be sure to document all of that in writing to them, with a copy in the OUO docket.			

Swaped wire test

	Exp	Act
f:f	no	no
f:r	R	R
c:f	2	2
c:r	2	2
r:f	F	F
R:R	NO	no

Travel ok

Manutes John

From: Manutes John
Sent: Tuesday, January 25, 2022 9:06 PM
To: Young, Joseph; Gobert, John; Jon Mick; [redacted] Roy Morrison; Graubard, David (FRA); Pugh, Kenneth (FRA)
Cc: Gurzynski, Jason (FRA); j[redacted]; Harley Sheryl; Lloyd Troy; Hoepf Michael
Subject: Request: NTSB Investigative Hold Release
Attachments: Attendance.pdf

(Please note: I buried a request for a reply below. Please read the whole message, distribute in your organizations as necessary, and have a representative reply before Jan 31.)

Mechanical Working Group,

Thank you for the great work today. I will compose a set of supplement field notes and distribute them for your approval/review in the next week.

In the meantime, we need to formalize the condition we left the Spiker and discuss the release of the investigative hold on the Spiker.

Condition of the Spiker

Prior to the end of the day the Mechanical Working Group agreed to make every attempt to leave the Spiker in the condition we found it at the beginning of the day. We believe we met that goal. NS had a videographer on site to record every change we made to the machine, and every time we changed something back. Highlights and key components include:

- The rear speaker is plugged in. It was found on-site unplugged, however during the course of the initial on scene inspection it was plugged back in and was that way when we got there this morning. The team did unplug it to check continuity of the wires, but plugged it back in immediatley following the test.
- All six pedals (three positions, Forward and reverse at each) were found to be miss-wired as compared to the Spiker's design. The left side forward and reverse plugs were swapped for testing and returned to the position where they were found (miss-wired) A yellow label was very nearly falling off the left side wiring bundle. The team zip-tied that wire in place where it was found.
- The plugs connected to the hydrostatic pump were found to be miss-wired at locations C1 and C2. These were swapped for testing. They were returned after testing.
- Wires in the MCC were removed for continuity testing and replaced to their original locations.
- The computer in the MCC was unplugged.
    - A new computer was plugged in, without actually removing the old computer physically from it's brackets.
    - The original computer was plugged back in. The old computer was removed and returned to Nordco.
- A horn trumpet (No. 1 in our notes) was disassembled. It was reassembled.
- Both horn assemblies were unplugged to allow for a new horn to be tested on the existing wiring. The horn assemblies were plugged back in.

The mechanical working group, including Nordco and Norfolk Southern, understand that the machine is *not* in mechanically sound condition for operation. Prior to any return to service; testing, inspection, and repairs for compliance and safety would need to be addressed.

Investigative Hold

The mechancial working group has released the NS Spiker GS 15022 to the Norfolk Southern for the purposes of additional inspection by claims agents and attorneys for the railroad and/or the family of the deceased. The mechanical working group has asked that any parts removed from the machine be held for NTSB inspection prior to any additional testing (on or off-site) or disposal. If any party member, including the NS, wishes to seek additional testing or inspection, the NTSB must be notified in advance.

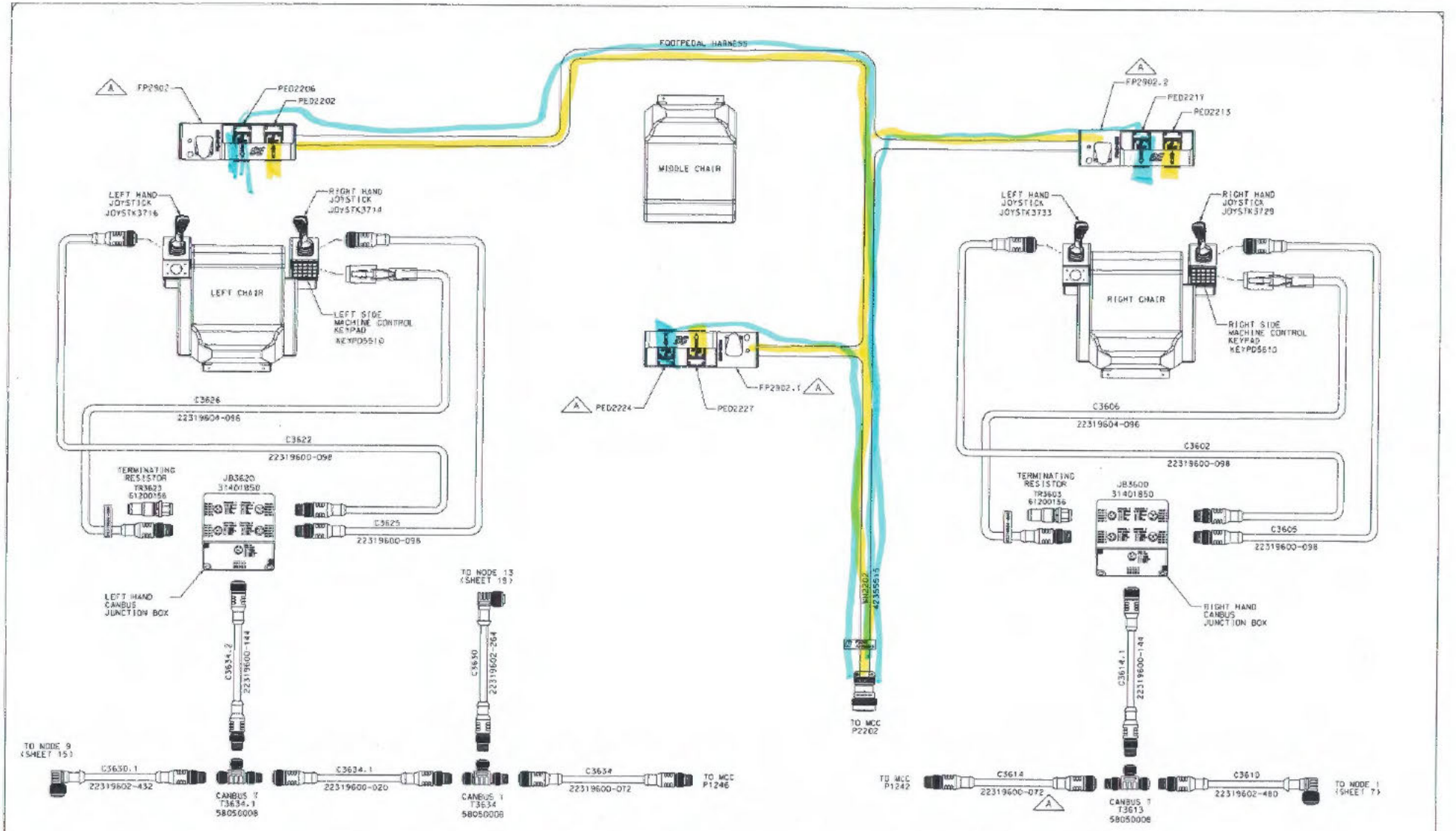
Finally, the NTSB anticipates a full release of the Spiker GS 15022 to the Norfolk Southern by January 31st. This additional time is meant to give parties the oportunity to discuss this full release within their organizations. Please have a representative from your organizations reply to this message confirming your concurrance with the full release, or with any concerns. We can set up a Teams meeting to discuss any concerns.

I am grateful to have had the oportunity to spend the day with this team. Great things were accomplished, in short time, with a lot of creativity and drive. Thank you for your time, efforts, travels, expertice, and hospitlatliy. I will be back in touch early next week.

Thank you,

John

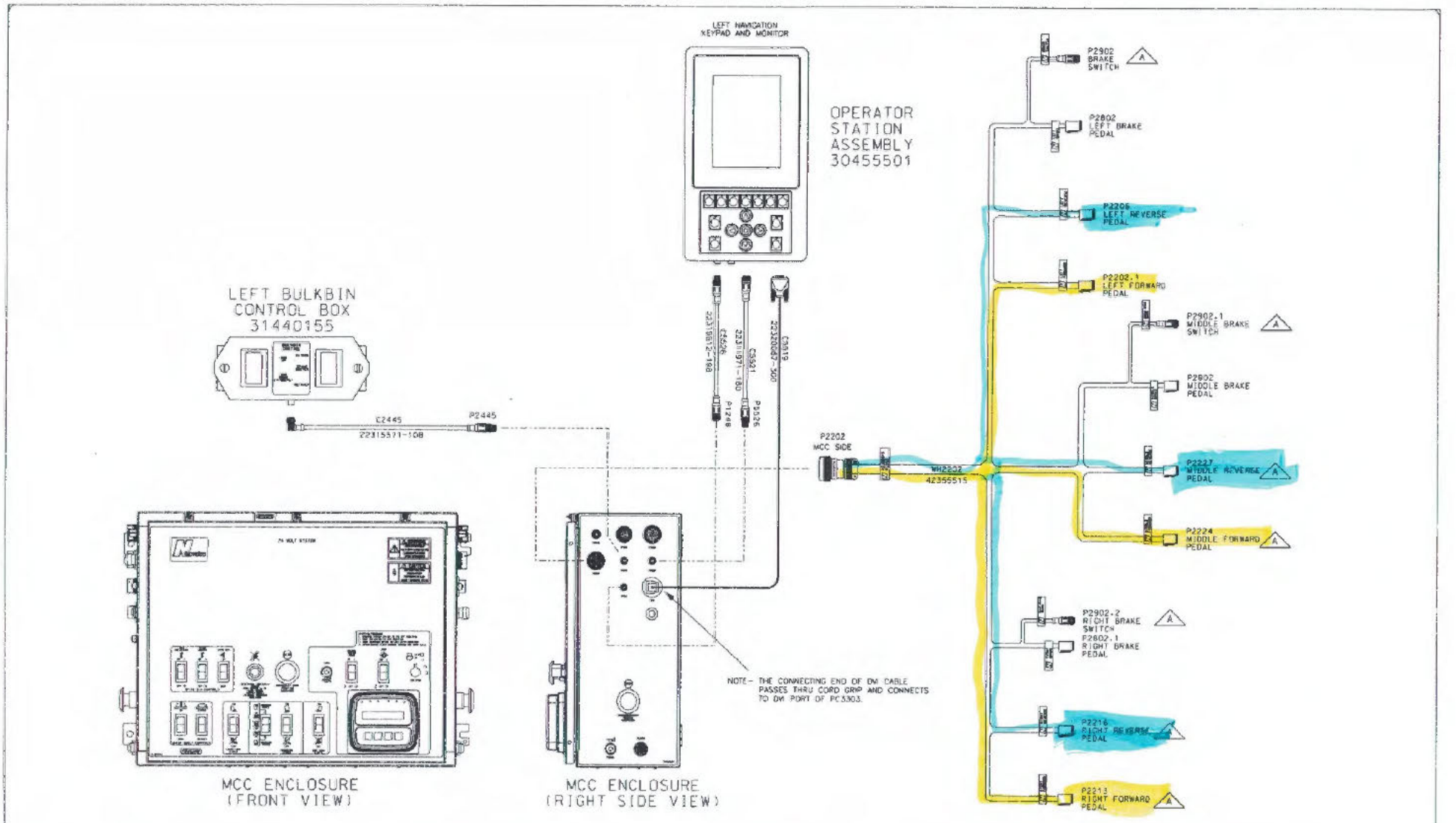
John Manutes
Railroad Accident Investigator
Denver, Colorado
[redacted]
Web: www.ntsb.gov



Nordco
OAK CREEK WISCONSIN

REV	DESCRIPTION	BY	DATE	CHECKED BY: DATE APPROVED BY: DATE	ECO #

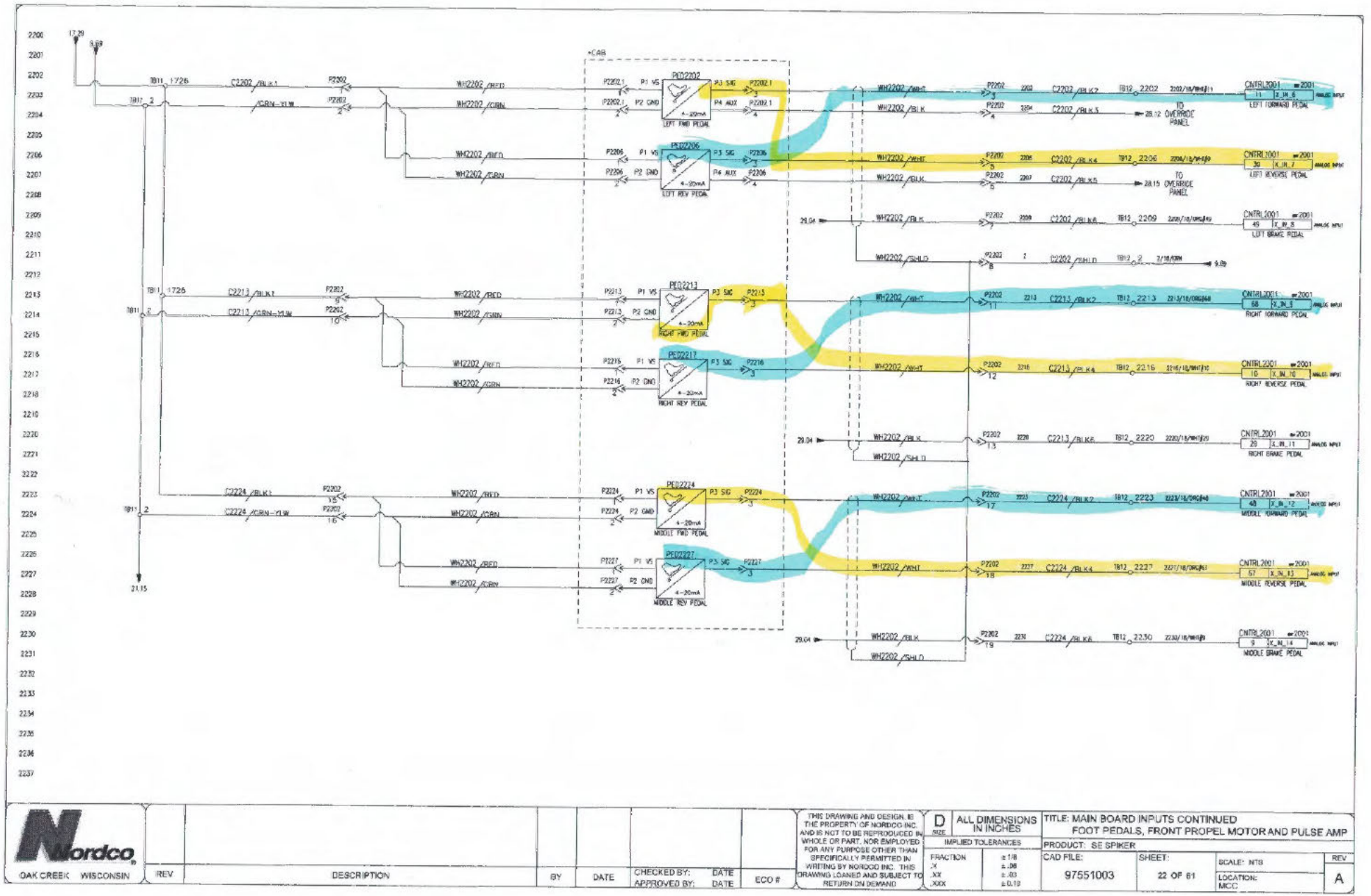
D SIZE	ALL DIMENSIONS IN INCHES	TITLE: CAB/OPERATOR SEAT CABLING			
	IMPLIED TOLERANCES	PRODUCT: SE SPIKER			
	FRACTION ± 1/8 .X ± .06 .XX ± .03 .XXX ± 0.10	CAD FILE: 97551011DWG	SHEET: 22 OF 24	SCALE: NTS LOCATION:	REV A



Nordco OAK CREEK WISCONSIN	REV	DESCRIPTION	BY	DATE	CHECKED BY: DATE / APPROVED BY: DATE	ECO #

SIZE	ALL DIMENSIONS IN INCHES	TITLE: MCC ENCLOSURE CONNECTIONS			
D	IMPLIED TOLERANCES	PRODUCT: SE SPIKER			
	FRACTION ± 1/8 / .X ± .06 / .XX ± .03 / .XXX ± 0.10	CAD FILE: 97551011DWG	SHEET: 7 OF 24	SCALE: NTS / LOCATION:	REV: A

Observed Function / config



Nordco OAK CREEK WISCONSIN	REV	DESCRIPTION	BY	DATE	CHECKED BY: / APPROVED BY:	DATE / DATE	ECO #

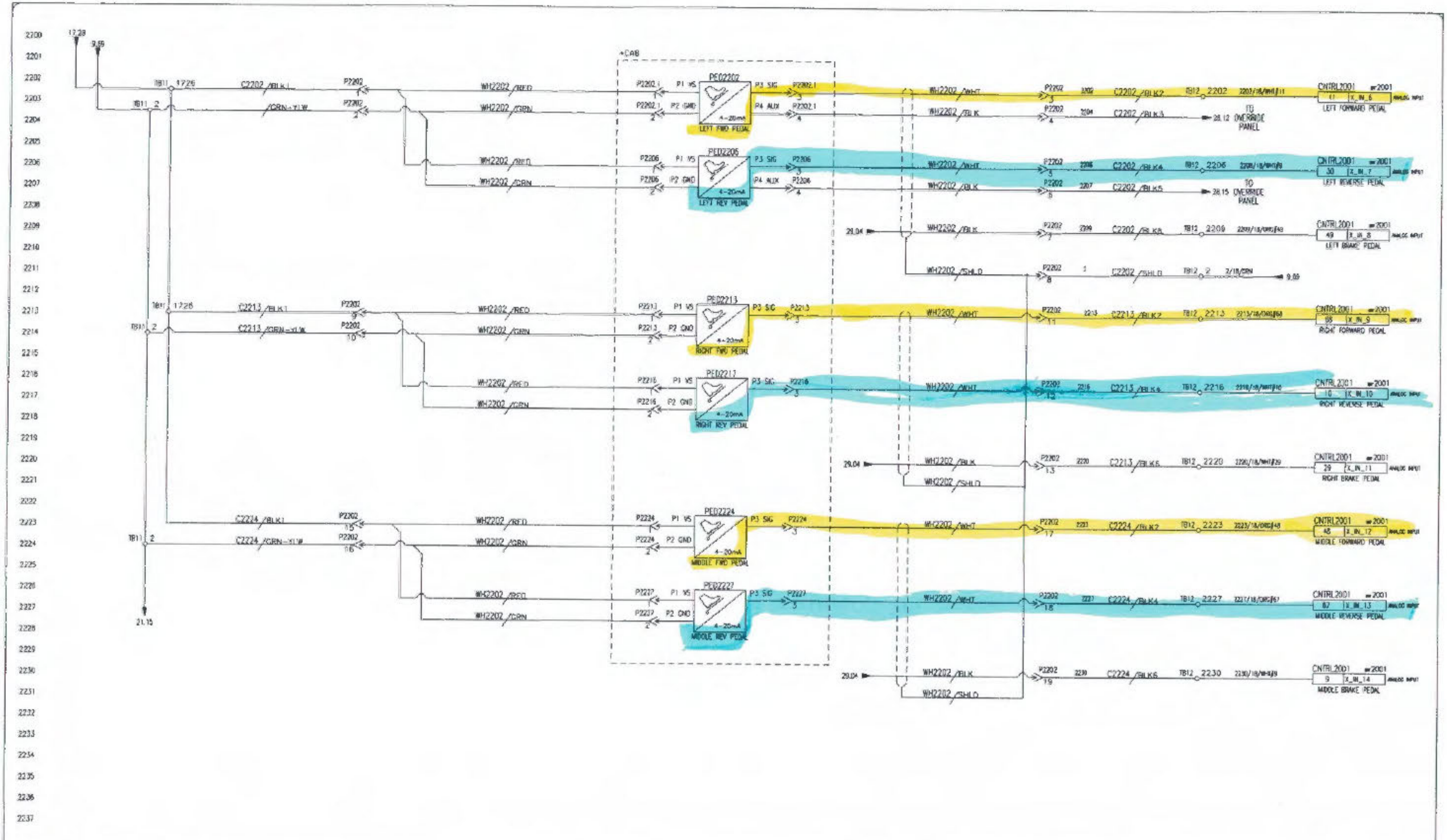
D SIZE	ALL DIMENSIONS IN INCHES	IMPLIED TOLERANCES	
		FRACTION	± 1/8
		.X	± .06
		.XX	± .03
		.XXX	± 0.10

TITLE: MAIN BOARD INPUTS CONTINUED
FOOT PEDALS, FRONT PROPEL MOTOR AND PULSE AMP

PRODUCT: SE SPIKER

CAD FILE:	SHEET:	SCALE: NTS	REV
97551003	22 OF 61	LOCATION: MCC	A

Intended Function / config



Nordco® OAK CREEK WISCONSIN	REV	DESCRIPTION	BY	DATE	CHECKED BY: DATE APPROVED BY: DATE	ECO #

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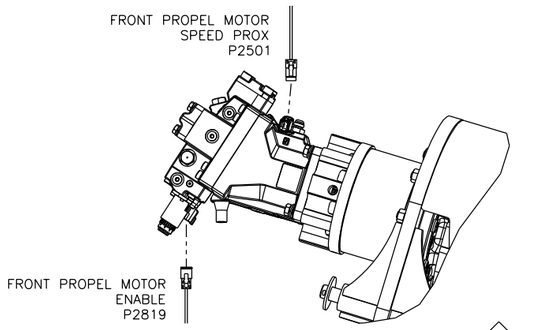
D SIZE	ALL DIMENSIONS IN INCHES	
IMPLIED TOLERANCES		
FRACTION	± 1/8	
.X	± .06	
.XX	± .03	
.XXX	± 0.10	

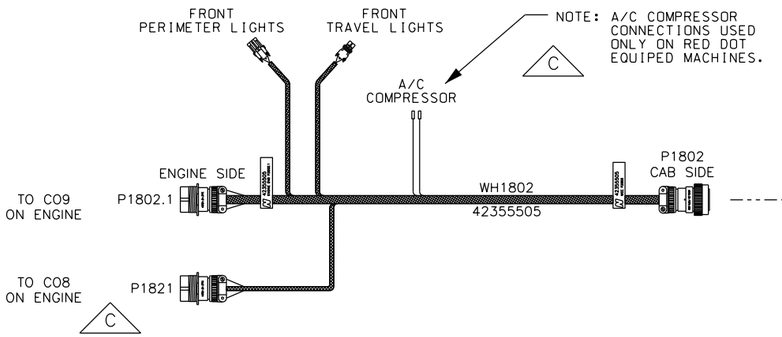
TITLE: MAIN BOARD INPUTS CONTINUED FOOT PEDALS, FRONT PROPEL MOTOR AND PULSE AMP

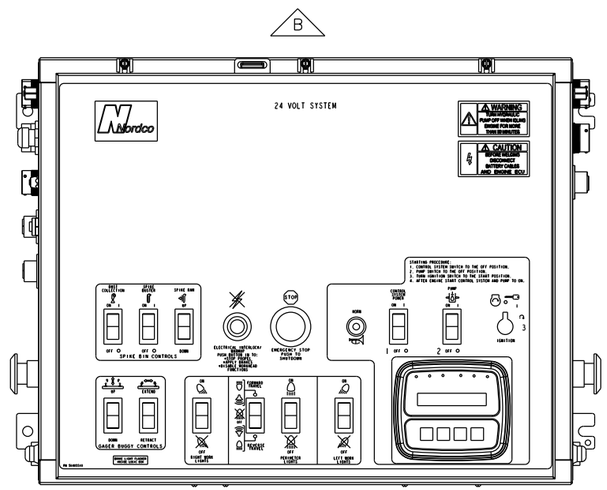
PRODUCT: SE SPIKER

CAD FILE:	SHEET:	SCALE: NTS	REV
97551003	22 OF 61	LOCATION: MCC	A

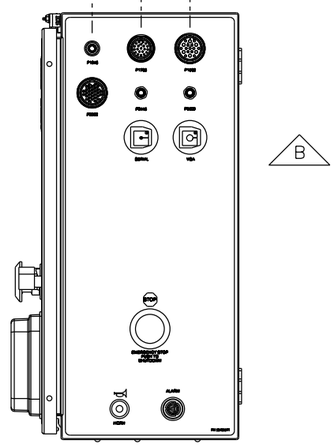


FRONT PROPEL MOTOR

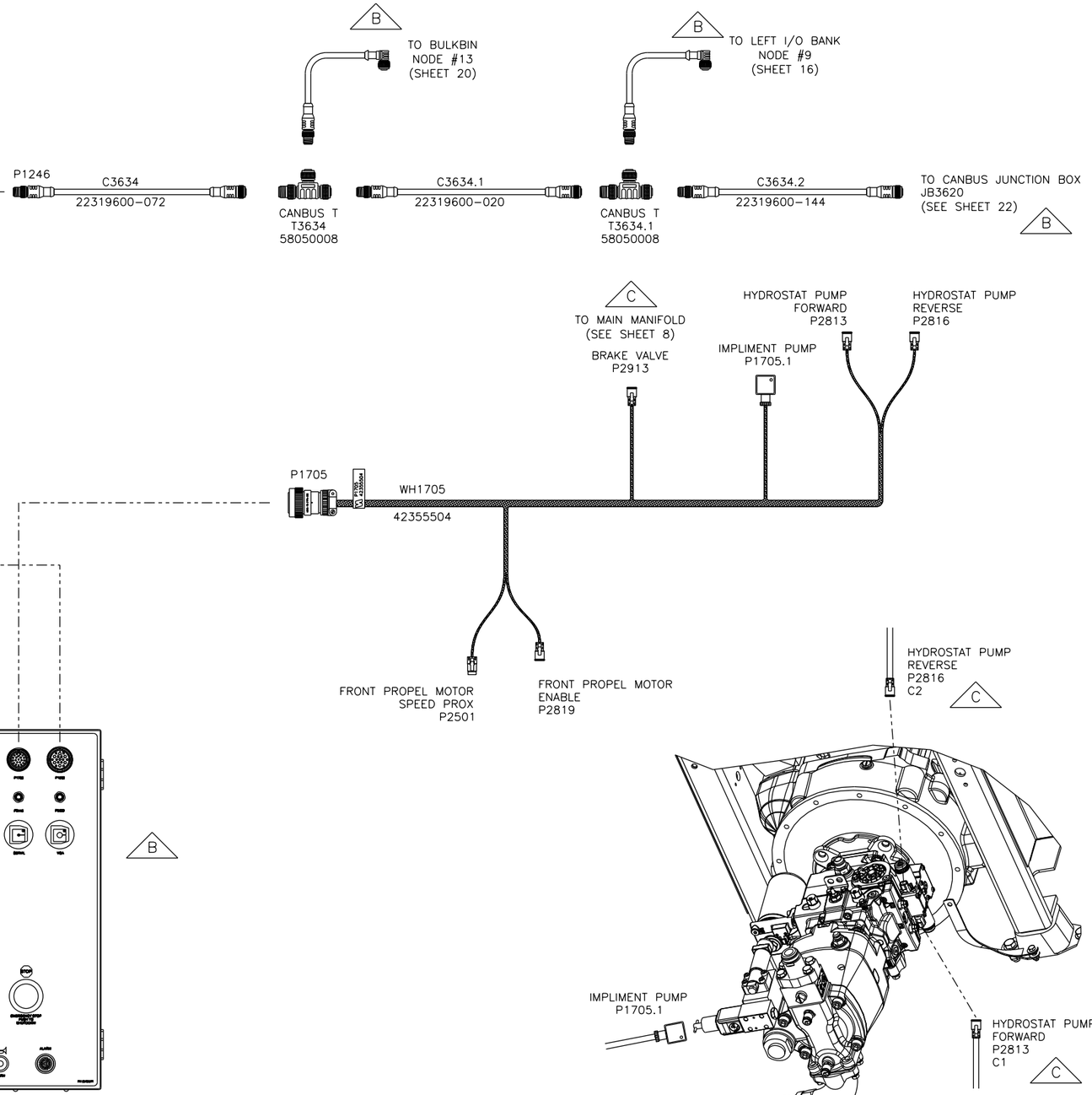




MCC ENCLOSURE
(FRONT VIEW)



MCC ENCLOSURE
(RIGHT SIDE VIEW)



B HYDROSTAT AND
IMPLEMENT PUMP

REV	DESCRIPTION	BY	DATE	CHECKED BY: / APPROVED BY:	DATE / DATE	ECO #
	SEE LAST SHEET FOR REVISION HISTORY					

D SIZE — ALL DIMENSIONS IN INCHES

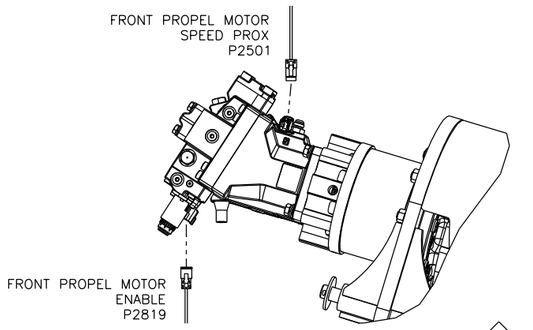
IMPLIED TOLERANCES

FRACTION	± 1/8
.X	± .06
.XX	± .03
.XXX	± 0.10

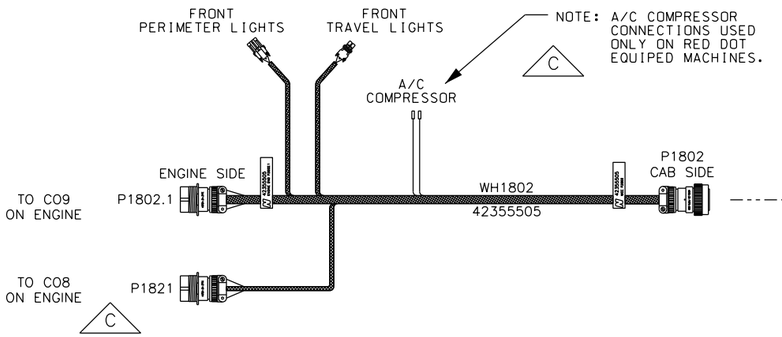
TITLE: MCC ENCLOSURE CONNECTIONS

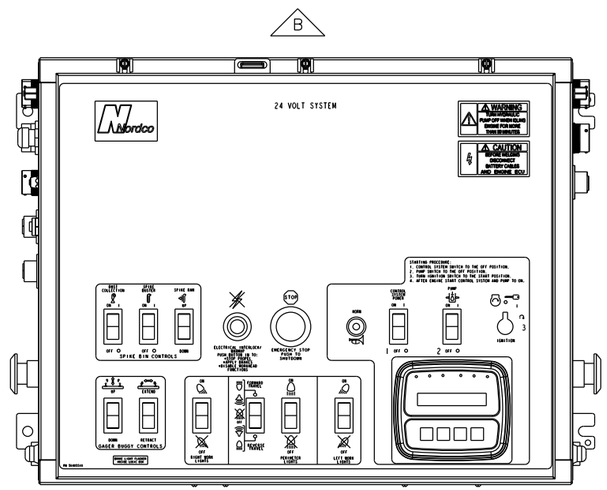
PRODUCT: SE SPIKER

CAD FILE:	SHEET:	SCALE: NTS	REV
97551011DWG	6 OF 24	LOCATION:	C

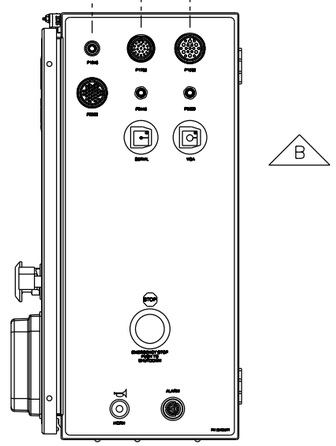


FRONT PROPEL MOTOR

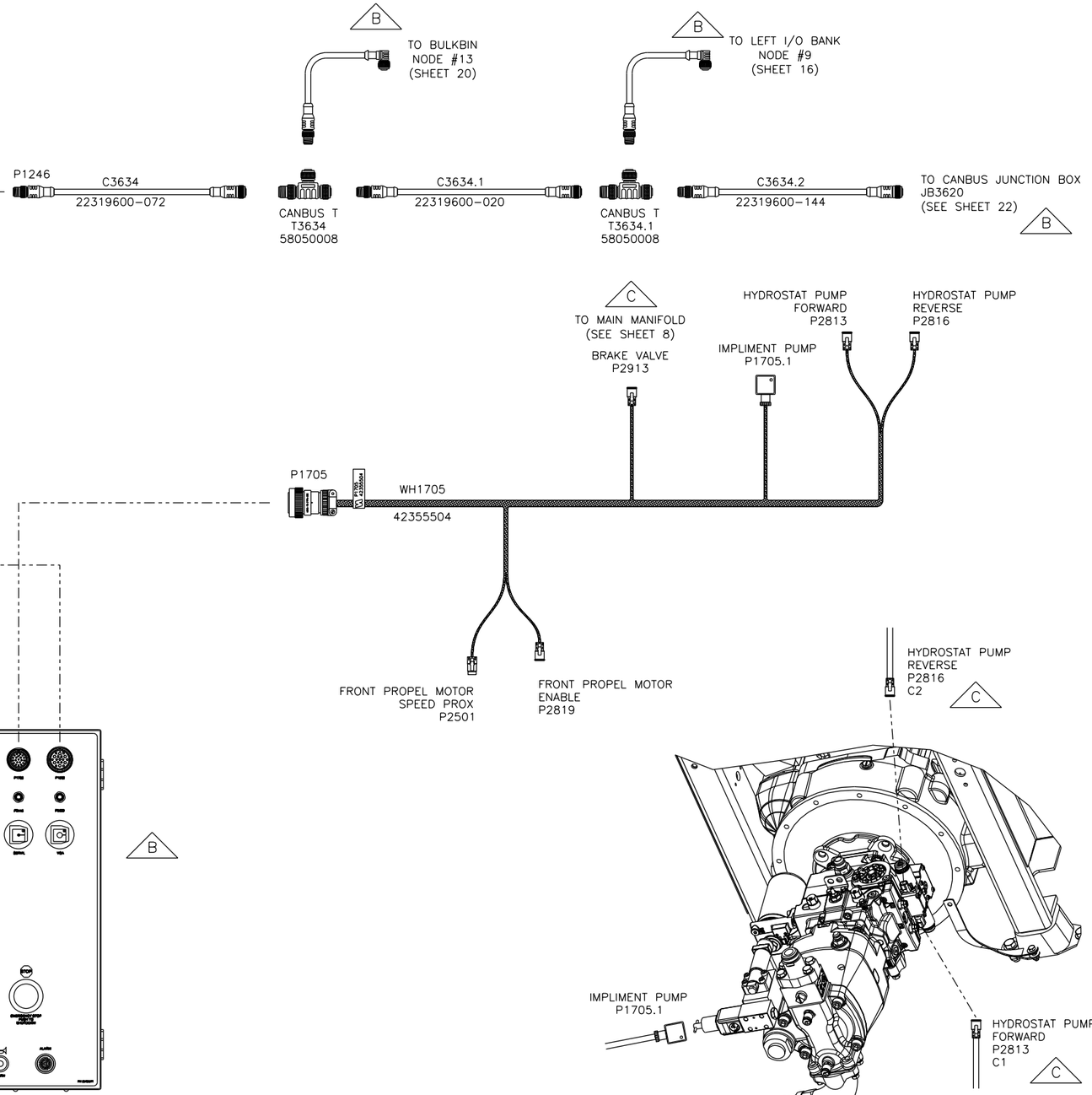




MCC ENCLOSURE
(FRONT VIEW)



MCC ENCLOSURE
(RIGHT SIDE VIEW)



B HYDROSTAT AND
IMPLEMENT PUMP

REV	DESCRIPTION	BY	DATE	CHECKED BY: / APPROVED BY:	DATE / DATE	ECO #
	SEE LAST SHEET FOR REVISION HISTORY					

D SIZE — ALL DIMENSIONS IN INCHES

IMPLIED TOLERANCES

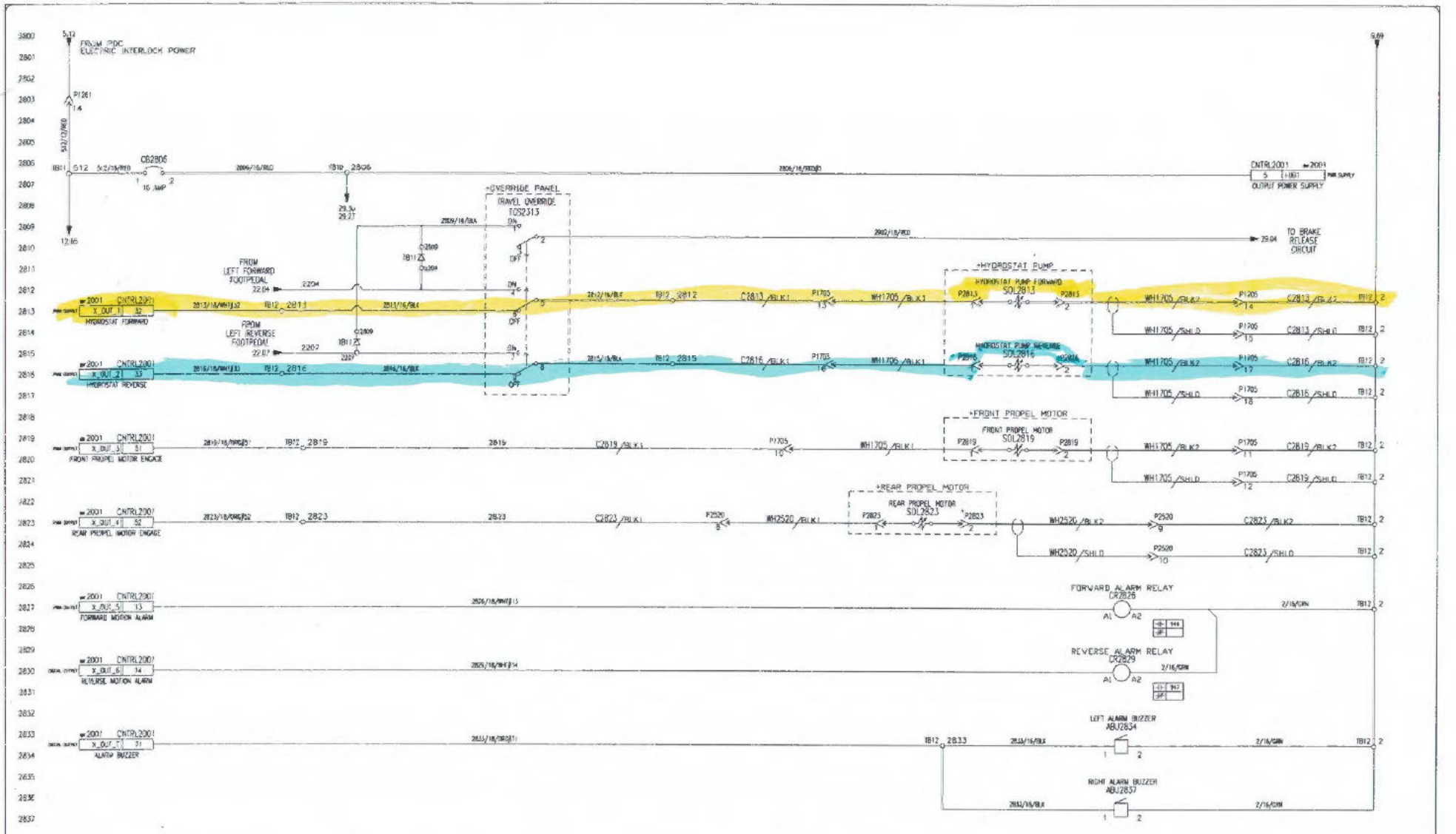
FRACTION	± 1/8
.X	± .06
.XX	± .03
.XXX	± 0.10

TITLE: MCC ENCLOSURE CONNECTIONS

PRODUCT: SE SPIKER

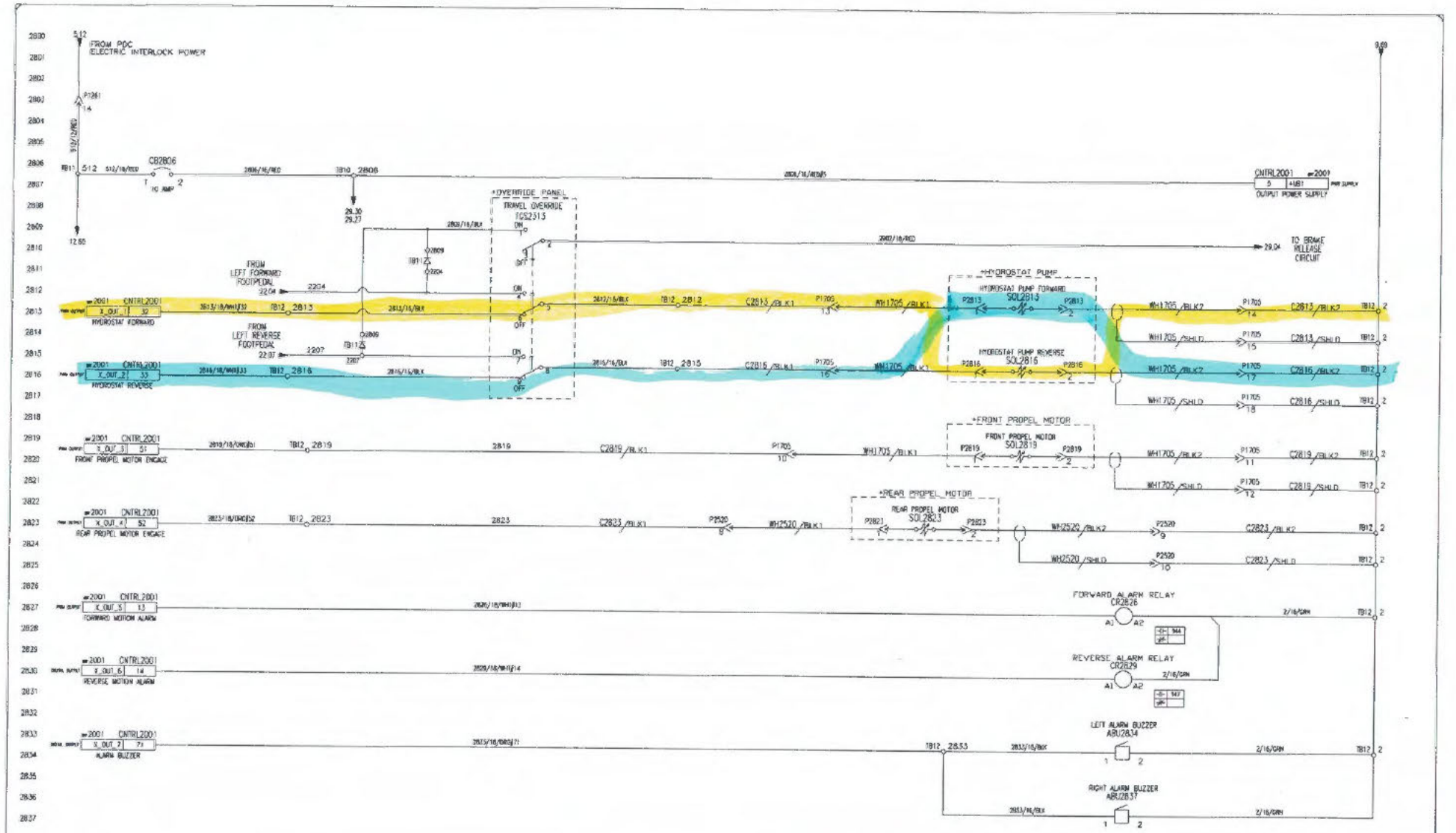
CAD FILE:	SHEET:	SCALE: NTS	REV
97551011DWG	6 OF 24	LOCATION:	C

Intended Function/config



Nordco OAK CREEK WISCONSIN	REV	DESCRIPTION	BY	DATE	CHECKED BY: DATE APPROVED BY: DATE	ECO #	THIS DRAWING AND DESIGN, IS THE PROPERTY OF NORDCO INC. AND IS NOT TO BE REPRODUCED IN WHOLE OR PART, NOR EMPLOYED FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY NORDCO INC. THIS DRAWING LOANED AND SUBJECT TO RETURN ON DEMAND	D SIZE	ALL DIMENSIONS IN INCHES IMPLIED TOLERANCES FRACTION ±.1/8 .X ±.05 .XX ±.03 .XXX ±.010	TITLE: MOBILE CONTROLLER OUTPUTS - MAIN BOARD PRODUCT: SE SPIKER CAD FILE: 97551003 SHEET: 28 OF 61 SCALE: NTS LOCATION: MCC	REV A

Observed Function/Condition



Nordco OAK CREEK WISCONSIN	REV	DESCRIPTION	BY	DATE	CHECKED BY: DATE APPROVED BY: DATE	ECO #	THIS DRAWING AND DESIGN IS THE PROPERTY OF NORDCO INC. AND IS NOT TO BE REPRODUCED IN WHOLE OR PART, NOR EMPLOYED FOR ANY PURPOSE OTHER THAN SPECIFICALLY PERMITTED IN WRITING BY NORDCO INC. THIS DRAWING LOANED AND SUBJECT TO RETURN ON DEMAND	D SIZE ALL DIMENSIONS IN INCHES IMPLIED TOLERANCES FRACTION ± 1/8 .X ± .05 .XX ± .03 .XXX ± 0.10	TITLE: MOBILE CONTROLLER OUTPUTS - MAIN BOARD PRODUCT: SE SPIKER CAD FILE: 97551003 SHEET: 28 OF 61 SCALE: NTS LOCATION: MCC	REV A

CNTRL2001

1		18	X8_IN_3	35	X2_IN_7	52	X_OUT_4	69	X_IN_5
			2619		2504		2823		2149
2	GND	19	X8_OUT_7	36	X2_IN_3	53	X2_IN_12	70	X_IN_1
	2104		3025		2416		2433		2128
3	+UB_IN	20	X8_OUT_3	37	X8_IN_4	54	X2_IN_8	71	X_OUT_7
	2402		3009		2623		2502		2834
4	EBGND	21		38	X8_OUT_8	55	X2_IN_4	72	X_OUT_8
	2607				3029		2419		3001
5	+UB1	22		39	X8_OUT_4	56	X2_OUT_1	73	X2_IN_9
	2807				3013		2902		2522
6	+UE	23		40	+UB_IN	57	X8_IN_1	74	X2_IN_5
	2102				2603		2611		2422
7	CAN1_H	24		41		58	X8_OUT5	75	X2_IN_1
	2112						3017		2406
8	CAN3_H	25	D+	42		59	X8_OUT_1	76	X8_IN_2
	2120		2106				2925		2615
9	X_IN_14	26	CAN1_L	43		60		77	X8_OUT_6
	2230		2114						3021
10	X_IN_10	27	CAN3_L	44	TXD	61		78	X8_OUT_2
	2217		2122		2110				3005
11	X_IN_5	28	X_IN_15	45	CAN2_H	62		79	
	2203		2155		2116				
12	X_IN_2	29	X_IN_11	46	CAN4_H	63	RXD	80	
	2130		2220		2124		2108		
13	X_OUT_5	30	X_IN_7	47	AGND	64	CAN2_L	81	
	2827		2206		2142		2118		
14	X_OUT_6	31	X_IN_3	48	X_IN_12	65	CAN4_L		
	2830		2132		2223		2126		
15	X2_IN_10	32	X_OUT_1	49	X_IN_8	66	Uext1		
	2520		2813		2209		2142		
16	X2_IN_6	33	X_OUT_2	50	X_IN_4	67	X_IN_13		
	2426		2816		2134		2227		
17	X2_IN_2	34	X2_IN_11	51	X_OUT_3	68	X_IN_9		
	2411		2430		2820		2213		

51550025

PIN NO.	FUNCTION
1	
2	GROUND
3	POWER SUPPLY SLOT A
4	GROUND SLOT B
5	OUTPUT POWER SUPPLY
6	POWER SUPPLY
7	CANBUS 1 HIGH
8	CANBUS 3 HIGH
9	MIDDLE BRAKE PEDAL
10	RIGHT REVERSE PEDAL
11	LEFT FORWARD PEDAL
12	MCC FRONT E-STOP PRESSED
13	FORWARD MOTION ALARM
14	REVERSE MOTION ALARM
15	REAR PROPEL SPEED PULSE 2
16	REVERSE TRAVEL SWITCH
17	SPIKE BUSTER SWITCH
18	SPARE INPUT
19	SPARE OUTPUT
20	SPARE OUTPUT
21	
22	
23	
24	
25	IGNITION
26	CANBUS 1 LOW
27	CANBUS 3 LOW
28	GAUGER BUGGY RETRACT
29	RIGHT BRAKE PEDAL
30	LEFT REVERSE PEDAL
31	MCC LEFT E-STOP PRESSED
32	HYDROSTAT FORWARD

PIN NO.	FUNCTION
33	HYDROSTAT REVERSE
34	GAUGER BUGGY UP
35	FRONT PROPEL SPEED PULSE 1
36	SPIKE RAM EXTEND SWITCH
37	SPARE INPUT
38	SPARE OUTPUT
39	SPARE OUTPUT
40	POWER SUPPLY SLOT B
41	
42	
43	
44	RS232 TX
45	CANBUS 2 HIGH
46	CANBUS 4 HIGH
47	ANALOG GROUND
48	MIDDLE FORWARD PEDAL
49	LEFT BRAKE PEDAL
50	MCC RIGHT E-STOP PRESSED
51	FRONT PROPEL MOTOR ENGAGE
52	REAR PROPEL MOTOR ENGAGE
53	GAUGER BUGGY DOWN
54	FRONT PROPEL SPEED PULSE 2
55	SPIKE RAM RETRACT SWITCH
56	BRAKE RELEASE
57	SPARE INPUT
58	SPARE OUTPUT
59	AT GAUGE LIGHTS
60	
61	
62	
63	RS232 RX
64	CANBUS 2 LOW

PIN NO.	FUNCTION
65	CANBUS 4 LOW
66	SENSOR SUPPLY 1
67	MIDDLE REVERSE PEDAL
68	RIGHT FORWARD PEDAL
69	ELECTRIC INTERLOCK READY
70	E-STOPS READY
71	ALARM BUZZER
72	HYDROSTATIC BRAKING ACTIVE
73	REAR PROPEL SPEED PULSE 1
74	FORWARD TRAVEL SWITCH
75	DUST COLLECTION ON SWITCH
76	SPARE INPUT
77	SPARE OUTPUT
78	AIR COMPRESSOR BYPASS VALVE
79	
80	
81	

Nordco
OAK CREEK WISCONSIN

REV	DESCRIPTION	BY	DATE	CHECKED BY: / APPROVED BY:	DATE / DATE	ECO #

SIZE	ALL DIMENSIONS IN INCHES	TITLE: MOBILE CONTROLLER LAYOUT			
D	IMPLIED TOLERANCES	PRODUCT: SE SPIKER			
	FRACTION ± 1/8 / .X ± .05 / .XX ± .03 / .XXX ± 0.10	CAD FILE: 97551003	SHEET: 20 OF 81	SCALE: NTS / LOCATION: MCC	REV A