PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 31.2

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	3	
Type	FYA 4 - Section	FYA 4 - Section	
Included Phases	-	-	← NOTICE INCLUDED PHASE
Modifier Phases	1	5	
Modifier Overlaps	-	-	
Trail Green	0	0	
Trail Yellow	0.0	0.0	
Trail Red	0.0	0.0	

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOPS 1A & 5A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

1A

Detector	Call Phase	Delay
1	1	3.0
29	0	-

5A

Detector	Call Phase	Delay
15	5	3.0
31	0	-

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP PLAN 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 11 and 51 run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1673T2
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Temporary Design 2 - TMP Phase II
Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150
at
Mooresville Crossing Shopping Center/Target Entrance
Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER NORTH CAROLINA PROFESSIONAL JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. T2-1673T2

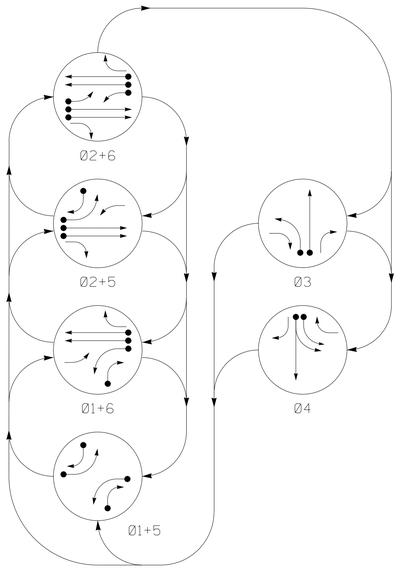
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 32.0

6 Phase Fully Actuated w/ Alternate Phasing NC 150 D12-02_MOORESVILLE CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Reposition existing signal heads numbered #11, 21, 22, 51, 61 and 62.
6. Set all detector units to presence mode.
7. The Division Traffic Engineer will determine hours of use for each phasing plan.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

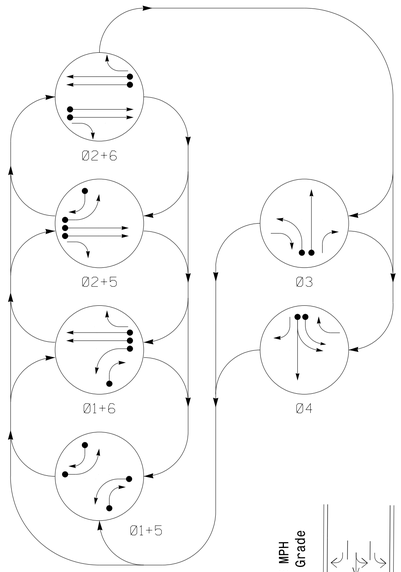
DEFAULT PHASING DIAGRAM



DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3	Ø4	FLASH
11	←	←	F Y	F Y	←R	←R	←R
21	R	R	G	G	R	R	R
22	R	R	G	G	R/←	R	R
31	R	R	R	R	G	R	R
32	R/→	R/→	R	R	G	R	R
41	R	R	R	R	R	G/←	R
42	R/→	R	R/→	R	R	G	R
51	←	F Y	←	F Y	←R	←R	←R
61	R	G	R	G	R	R	R
62	R	G	R	G	R	R/→	R

ALTERNATE PHASING DIAGRAM



ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3	Ø4	FLASH
11	←	←	←R	←R	←R	←R	←R
21	R	R	G	G	R	R	R
22	R	R	G	G	R/←	R	R
31	R	R	R	R	G	R	R
32	R/→	R/→	R	R	G	R	R
41	R	R	R	R	R	G/←	R
42	R/→	R	R/→	R	R	G	R
51	←	←R	←	←R	←R	←R	←R
61	R	G	R	G	R	R	R
62	R	G	R	G	R	R/→	R

MAXTIME DETECTOR INSTALLATION CHART

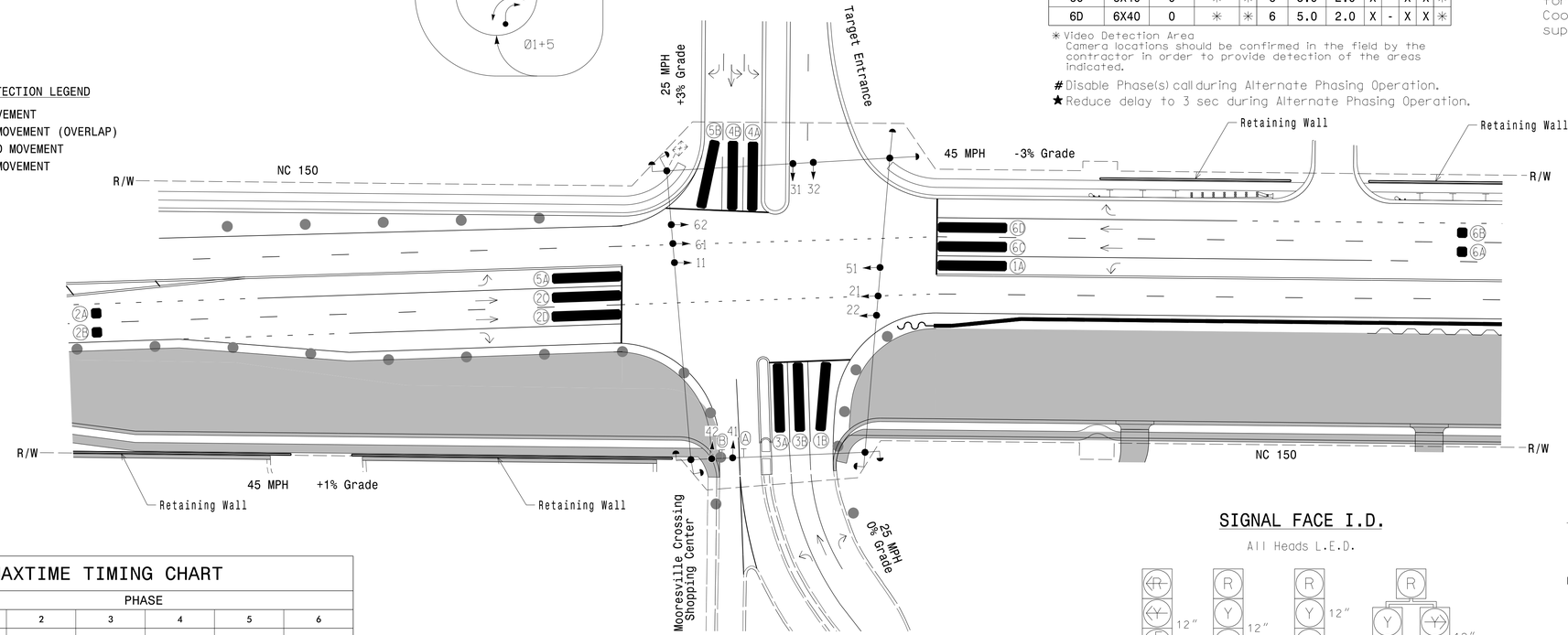
DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	✳	✳	1	15.0★	-	X	-	X	-	✳
					6#	3.0	-	X	-	X	X	✳
1B	6X40	0	✳	✳	1	15.0	-	X	-	X	-	✳
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
3A	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
3B	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
4A	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
4B	6X40	0	✳	✳		-	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	15.0★	-	X	-	X	-	✳
					2#	3.0	-	X	-	X	X	✳
5B	6X40	0	✳	✳	5	15.0	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

Disable Phase(s) call during Alternate Phasing Operation.
★ Reduce delay to 3 sec during Alternate Phasing Operation.

PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

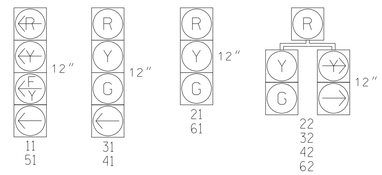


LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	- - -
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	-·-·-·-
N/A	Right of Way	————
→	Directional Arrow	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
● ● ●	Drums	N/A
Ⓐ	Left Arrow "ONLY" Sign (R3-5L)	Ⓐ
Ⓑ	Combined Through and Left Arrow Sign (R3-6L)	Ⓑ

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME TIMING CHART

FEATURE	PHASE					
	1	2	3	4	5	6
Walk *	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–
Min Green	7	12	7	7	7	12
Passage *	2.0	6.0	2.0	2.0	2.0	6.0
Max 1 *	15	90	35	35	15	90
Yellow Change	3.0	4.8	3.2	3.1	3.0	4.8
Red Clear	3.5	2.3	2.6	2.8	3.7	2.3
Added Initial *	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–
Time Before Reduction *	–	15	–	–	–	15
Time To Reduce *	–	30	–	–	–	30
Minimum Gap	–	3.0	–	–	–	3.0
Advance Walk	–	–	–	–	–	–
Non Lock Detector	X	X	X	X	X	X
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL
Dual Entry	–	–	–	–	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

Signal Upgrade
Temporary Design 3 - TMP Phase II - Step 2

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Prepared for the Offices of:
Transportation Mobility and Safety Division
State of North Carolina Department of Transportation
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

NC 150
at
Mooresville Crossing Shopping Center/Target Entrance
Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

SCALE 0 40 1"=40'

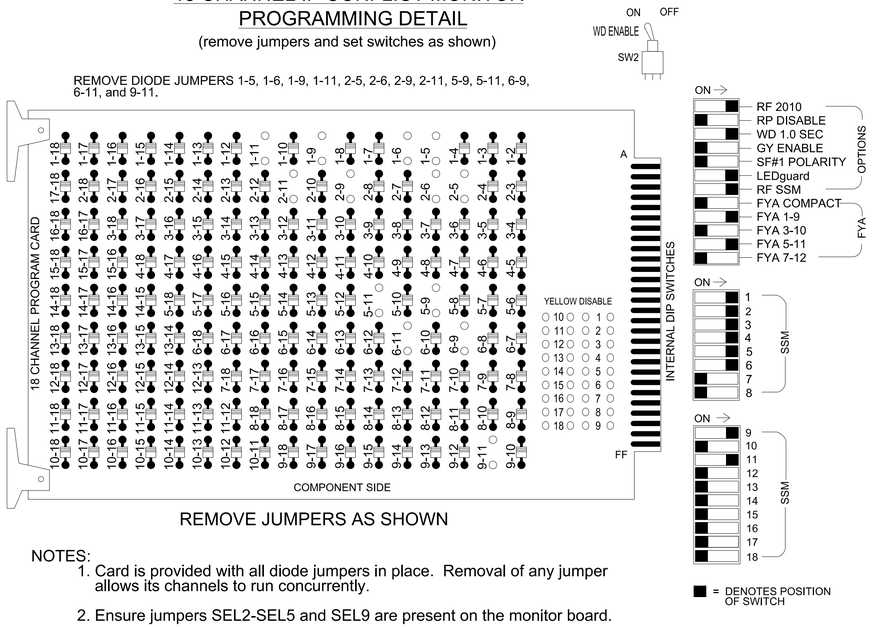
REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 9/17/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-167373

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



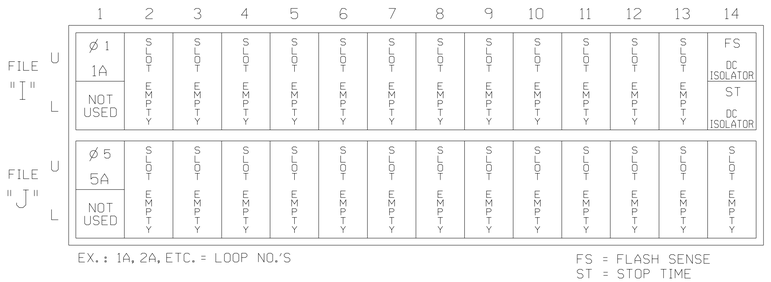
REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

INPUT FILE POSITION LAYOUT

(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1 *	1	15.0		X		X	
				-	29 *	6	3.0		X		X	X
5A	TB3-1,2	J1U	55	17	15 *	5	15.0		X		X	
				-	31 *	2	3.0		X		X	X

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1, S2, S4, S5, S7, S8, AUX S1, AUX S4
Phases Used.....1, 2, 3, 4, 5, 6
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

For Detection Zones 1A and 5A, the equipment placement is typical for a NCDOT installation. Inputs associated wtih these slots are compatible with alternate operation programming located on the following sheets of this electrical detail.

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 32.1

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4			S5			S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3			4			14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3			4			4 PED	5		6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11 ★	32	21,22	NU	22	31	32	41	42	62	NU	42	51 ★	61,62	NU	NU	NU	NU	11 ★	NU	NU	51 ★	NU	NU
RED		*	128			116	116	101	101			*		134										
YELLOW			129			117	117	102	102					135										
GREEN			130			118	118	103	103					136										
RED ARROW																			A121			A114		
YELLOW ARROW		126			117					102		132							A122			A115		
FLASHING YELLOW ARROW																			A123			A116		
GREEN ARROW	127	127			118	118		103		103		133	133											

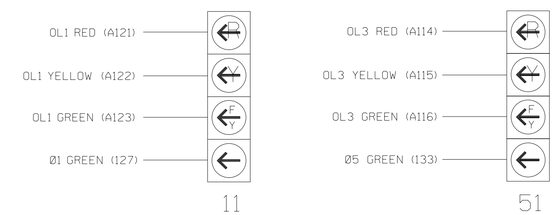
NU = Not Used

* Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail this sheet.

FYA SIGNAL WIRING DETAIL

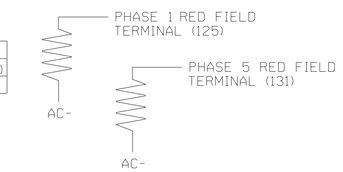
(wire signal heads as shown)



LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1673T3
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

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Temporary Design 3 - TMP Phase II - Step 2
Electrical Detail - Sheet 1 of 2

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 150
at
Mooresville Crossing Shopping Center/Target Entrance

Division 12 Iredell County Mooresville

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON PAUL GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1673T3

5:41:38 PM
User:jgalloway
Use Name:C:\Projects\Design\Electrical Details*Temporary Design\MAXTIME\#R-2307B_sms_ele_12-1673t3.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 32.2

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	3	
Type	FYA 4 - Section	FYA 4 - Section	
Included Phases	-	-	← NOTICE INCLUDED PHASE
Modifier Phases	1	5	
Modifier Overlaps	-	-	
Trail Green	0	0	
Trail Yellow	0.0	0.0	
Trail Red	0.0	0.0	

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOPS 1A & 5A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

1A

Detector	Call Phase	Delay
1	1	3.0
29	0	-

5A

Detector	Call Phase	Delay
15	5	3.0
31	0	-

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP PLAN 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 11 and 51 run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1673T3
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Temporary Design 3 - TMP Phase II - Step 2
Electrical Detail - Sheet 2 of 2

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

NC 150
at
Mooresville Crossing Shopping Center/Target Entrance

Division 12 Iredell County Mooresville

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	R M Muncey	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER NORTH CAROLINA PROFESSIONAL JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. T2-1673T3

5:41:43 PM
User:rgalloway
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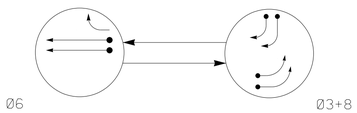
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 33.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

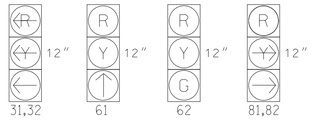
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3+8	PHASE FLASH
31,32	←R	←	←R
61	↑	R	R
62	G	R	R
81,82	R	→R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

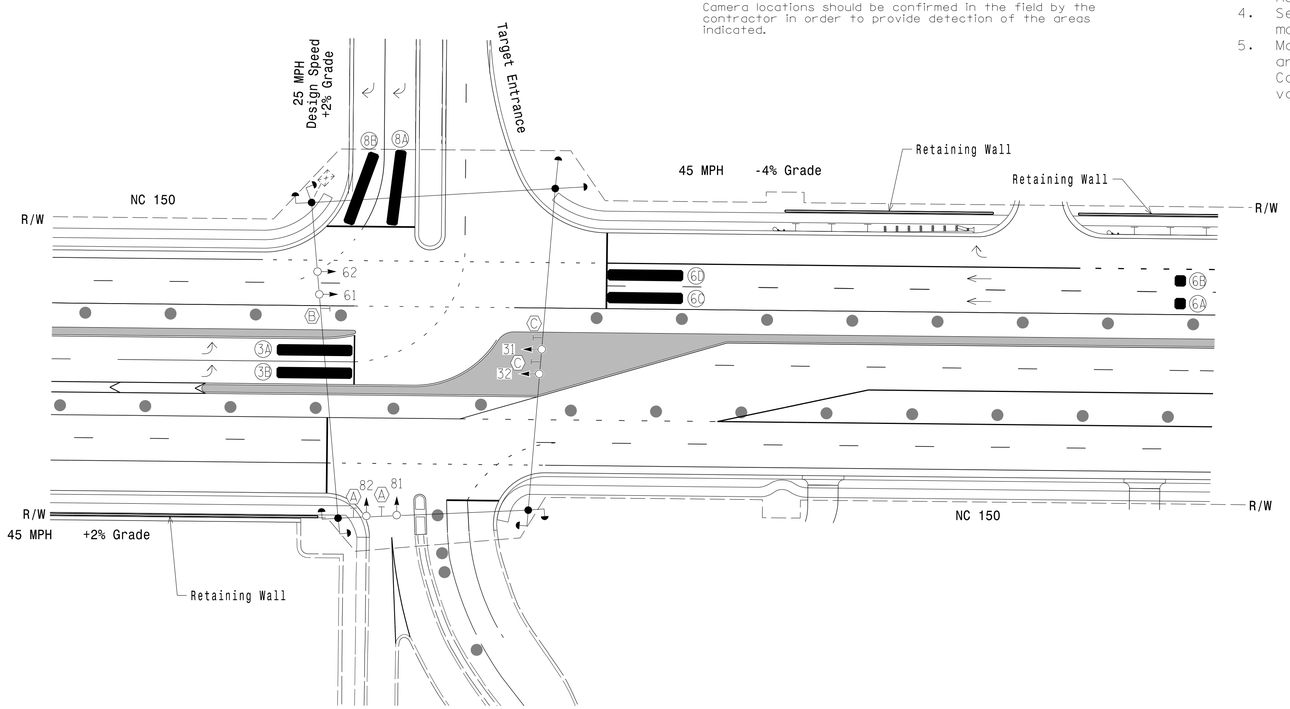
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
3B	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
8A	6X40	0	✳	✳	8	-	-	X	-	X	-	✳
8B	6X40	0	✳	✳	8	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Reposition existing signal head number #62.
4. Set all detector units to presence mode.
5. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6	PHASE 8
Walk *	–	–	–
Ped Clear *	–	–	–
Min Green	7	12	7
Passage *	2.0	6.0	2.0
Max 1 *	30	60	30
Yellow Change	3.0	4.9	3.1
Red Clear	3.3	2.5	2.5
Added Initial *	–	–	–
Maximum Initial *	–	–	–
Time Before Reduction *	–	15	–
Time To Reduce *	–	30	–
Minimum Gap	–	3.0	–
Advance Walk	–	–	–
Non Lock Detector	X	X	X
Vehicle Recall	–	MIN RECALL	–
Dual Entry	X	–	X

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●
○	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊡
□	Junction Box	■
·-·-·	2-in Underground Conduit	·-·-·
N/A	Right of Way	- - - - -
→	Directional Arrow	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
● ● ●	Drums	N/A
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ
Ⓒ	No U-Turn Sign (R3-4)	Ⓒ

Signal Upgrade
Temporary Design 4 - TMP Phase III

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 WB
at
Target Entrance

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 10/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-167314 DATE

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11:43:36 PM
User:jgalloway
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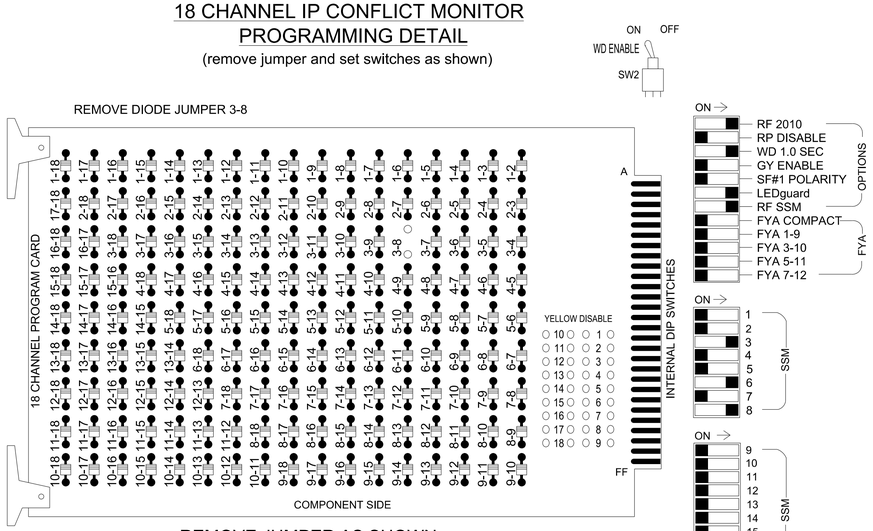
18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



REMOVE JUMPER AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phase 3 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Phase Not On and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S4, S8, S11
Phases Used.....3, 6, 8
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 33.1

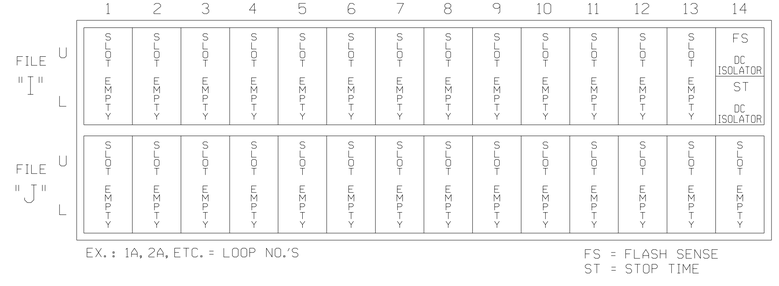
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8		S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6		15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6		6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	NU	NU	31,32	NU	NU	NU	61	62	NU	NU	81,82	NU	NU	NU	NU	NU	NU	NU
RED								134	134			107							
YELLOW								135	135										
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117								108							
FLASHING YELLOW ARROW																			
GREEN ARROW				118				136				109							

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)

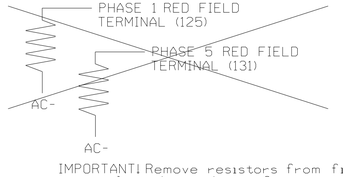


SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown)



ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

IMPORTANT! Remove resistors from field terminal as shown above, if present.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1673T4
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Temporary Design 4 - TMP Phase III
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
Target Entrance

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

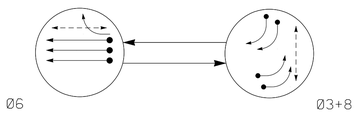
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2840B4B40E... DATE
SIG. INVENTORY NO. T2-1673T4

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 34.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

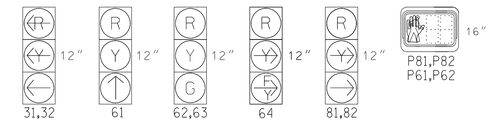
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3+8	PHASE FLASH
31,32	R	R	R
81,82	R	R	R
61	G	R	R
62,63	G	R	R
64	G	R	R
P81,P82	DW	W	DRK
P61,P62	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



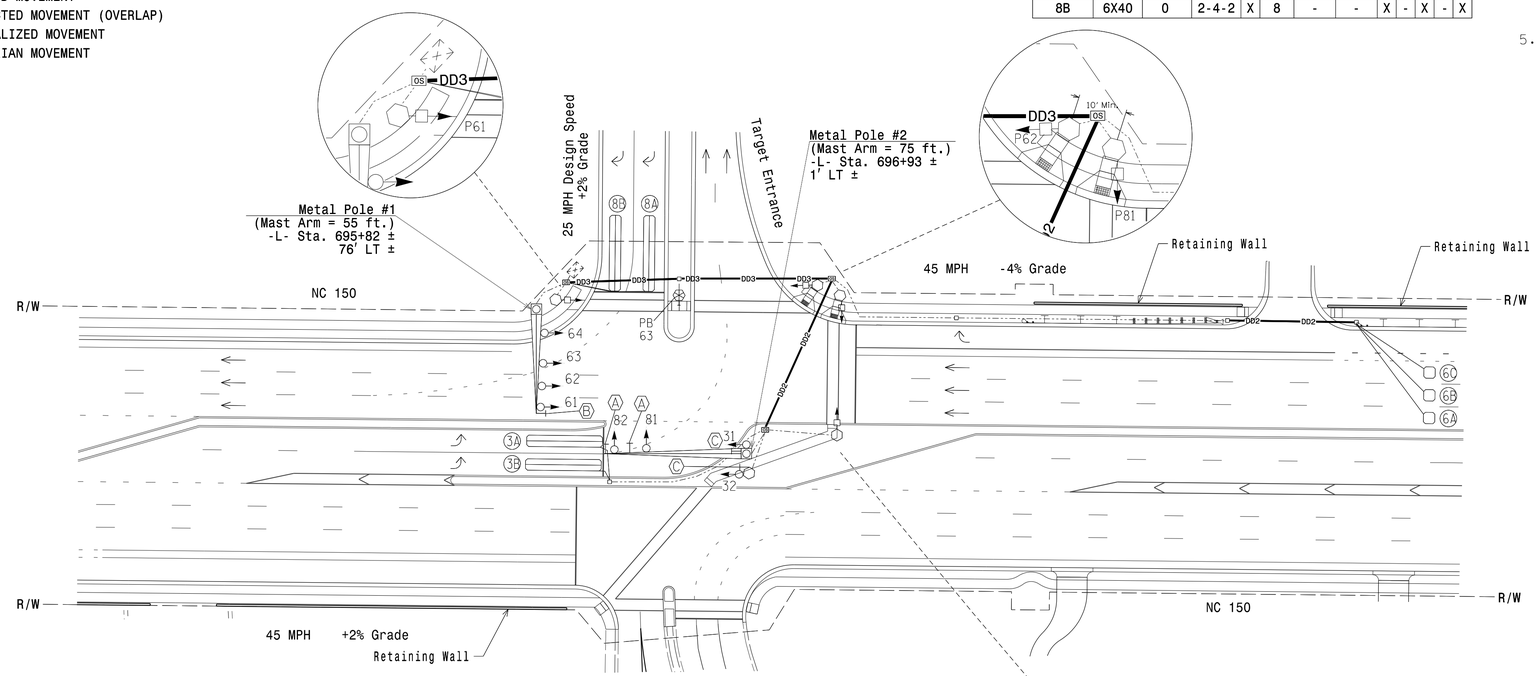
MAXTIME DETECTOR INSTALLATION CHART

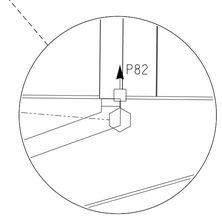
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
3B	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
6A	6X6	300	5	X	6	-	-	X	X	X	-	X
6B	6X6	300	5	X	6	-	-	X	X	X	-	X
6C	6X6	300	5	X	6	-	-	X	X	X	-	X
8A	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X
8B	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
5. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.





LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Pole with Mastarm	
DD#	Directional Drill (#) x 2" Conduit	N/A
	Type I Pushbutton Post	
	Type II Signal Pedestal	
OS	Oversized Junction Box	
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ
Ⓒ	No U-Turn Sign (R3-4) (SEE FIGURES 1 & 2)	Ⓒ

MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6	PHASE 8
Walk *	–	14	4
Ped Clear *	–	28	13
Min Green	7	12	7
Passage *	2.0	6.0	2.0
Max 1 *	30	60	30
Yellow Change	3.0	4.9	3.1
Red Clear	3.4	2.5	2.1
Added Initial *	–	1.0	–
Maximum Initial *	–	34	–
Time Before Reduction *	–	15	–
Time To Reduce *	–	30	–
Minimum Gap	–	3.0	–
Advance Walk	–	7	–
Non Lock Detector	X	–	X
Vehicle Recall	–	MIN RECALL	–
Dual Entry	X	–	X

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

FIGURE 1

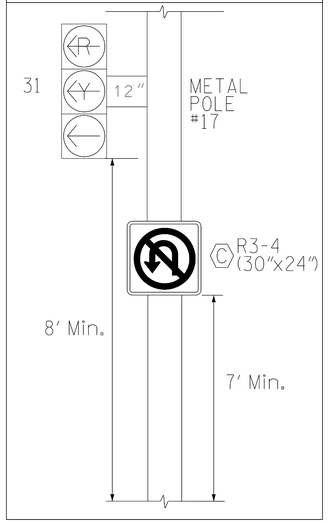
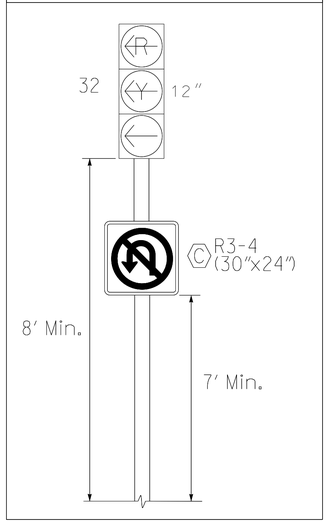


FIGURE 2



Signal Upgrade - Final Design

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Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 WB
at
Target Entrance

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

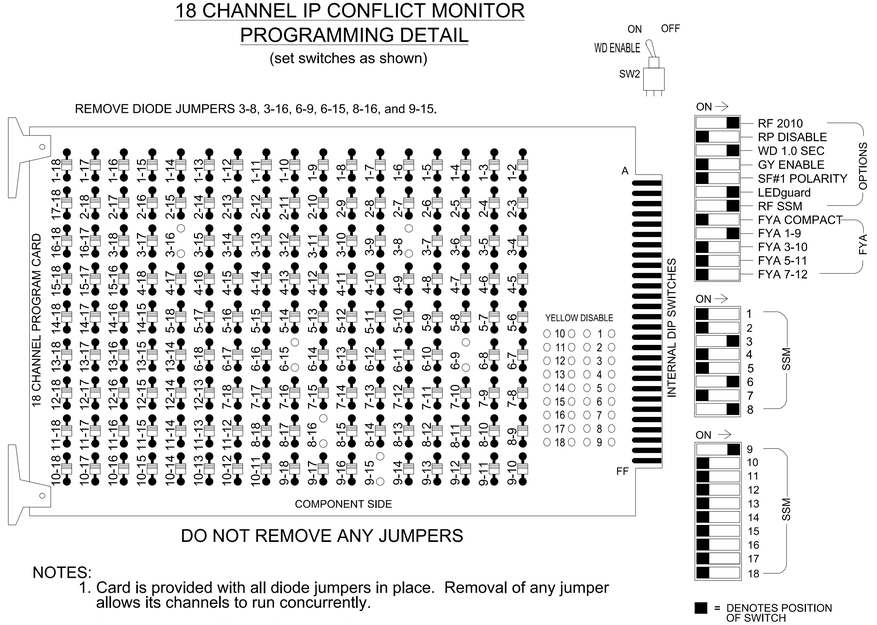
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 10/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1673 DATE

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(set switches as shown)



DO NOT REMOVE ANY JUMPERS

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 3 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Phase Not On and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S4, S8, S9, S11, S12, AUX S1
Phases Used.....3, 6, 6PED, 8, 8PED
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

* See Overlap Programming on this Sheet

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 34.1

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8		S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6		15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6		6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	NU	NU	31,32	NU	NU	NU	61	62,63	P61, P62	NU	81,82	P81, P82	64★	NU	NU	NU	NU	NU
RED								134	134			107		A121					
YELLOW								135	135					A122					
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117								108							
FLASHING YELLOW ARROW														A123					
GREEN ARROW				118				136				109							
✋										119			110						
🚶										121			112						

NU = Not Used

★See pictorial of head wiring in detail this sheet.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

FYA SIGNAL WIRING DETAIL

(wire signal head as shown)

INPUT FILE POSITION LAYOUT

(front view)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I" U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø 3 3A NOT USED	Ø 3 3B NOT USED	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø 6 PED DC ISOLATOR Ø 8 PED DC ISOLATOR	FS DC ISOLATOR ST DC ISOLATOR
FILE "J" L	SLOT EMPTY	Ø 6 6A Ø 6 6B	Ø 6 6C NOT USED	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø 8 8A Ø 8 8B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
3A	TB4-5,6	I5U	58	20	7	3			X		X	
3B	TB4-9,10	I6U	41	3	8	3			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X		X	
6B	TB3-7,8	J2L	44	6	17	6			X		X	
6C	TB3-9,10	J3U	64	30	18	6			X	X	X	
8A	TB5-9,10	J6U	42	4	22	8			X	X	X	
8B	TB5-11,12	J6L	46	8	23	8			X	X	X	
PED PUSH BUTTONS												
P61,P62,PB63	TB8-7,9	I13U	68	34	6	PED 6						
P81,P82	TB8-8,9	I13L	70	36	8	PED 8						

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOT I13.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

MAXTIME OVERLAP PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1
Type	FYA 4 - Section
Included Phases	6
Modifier Phases	-
Modifier Overlaps	-
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1673
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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License No. F-0672

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
Target Entrance

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/17/2024
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T2-1673

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User:jgalloway
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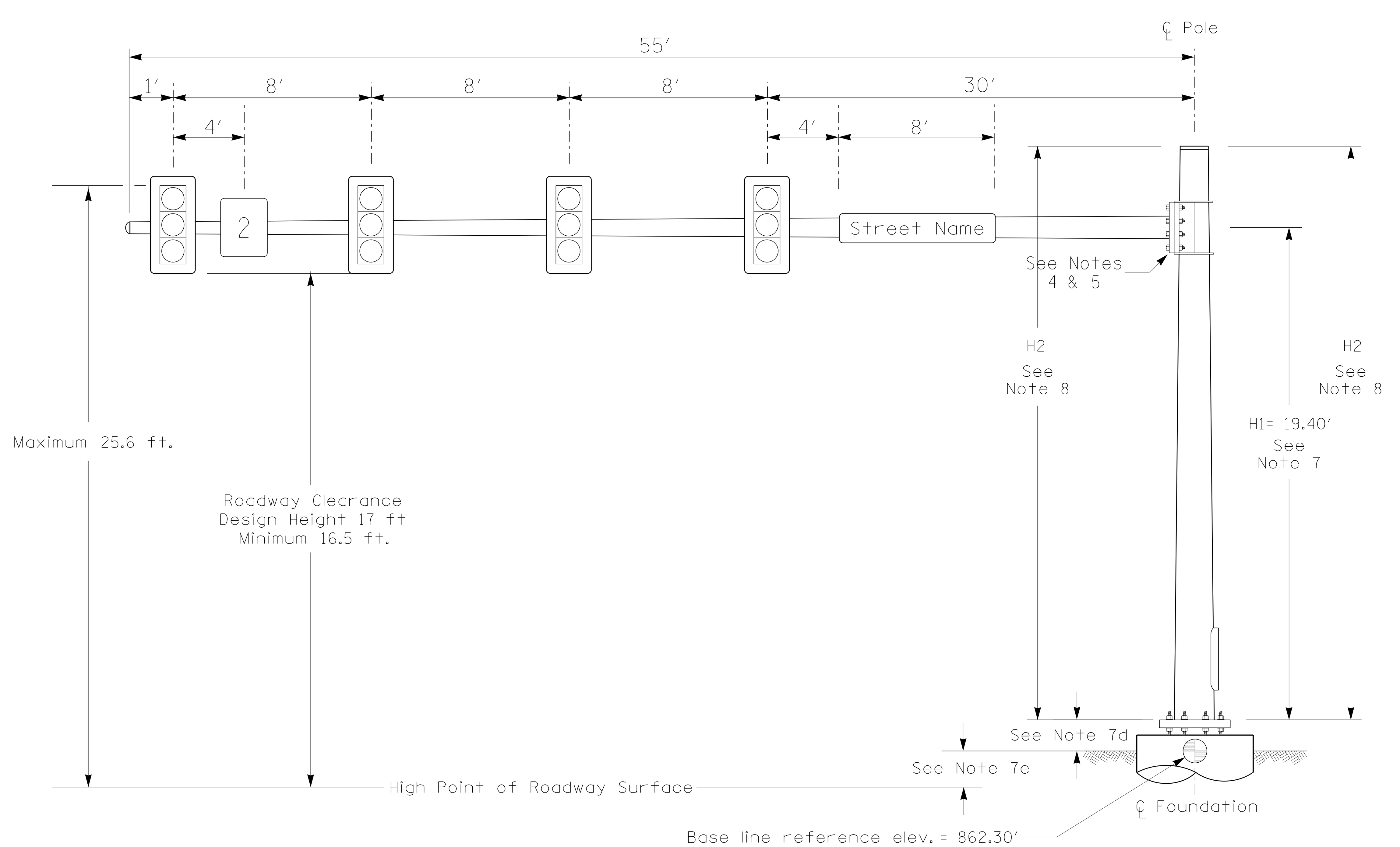
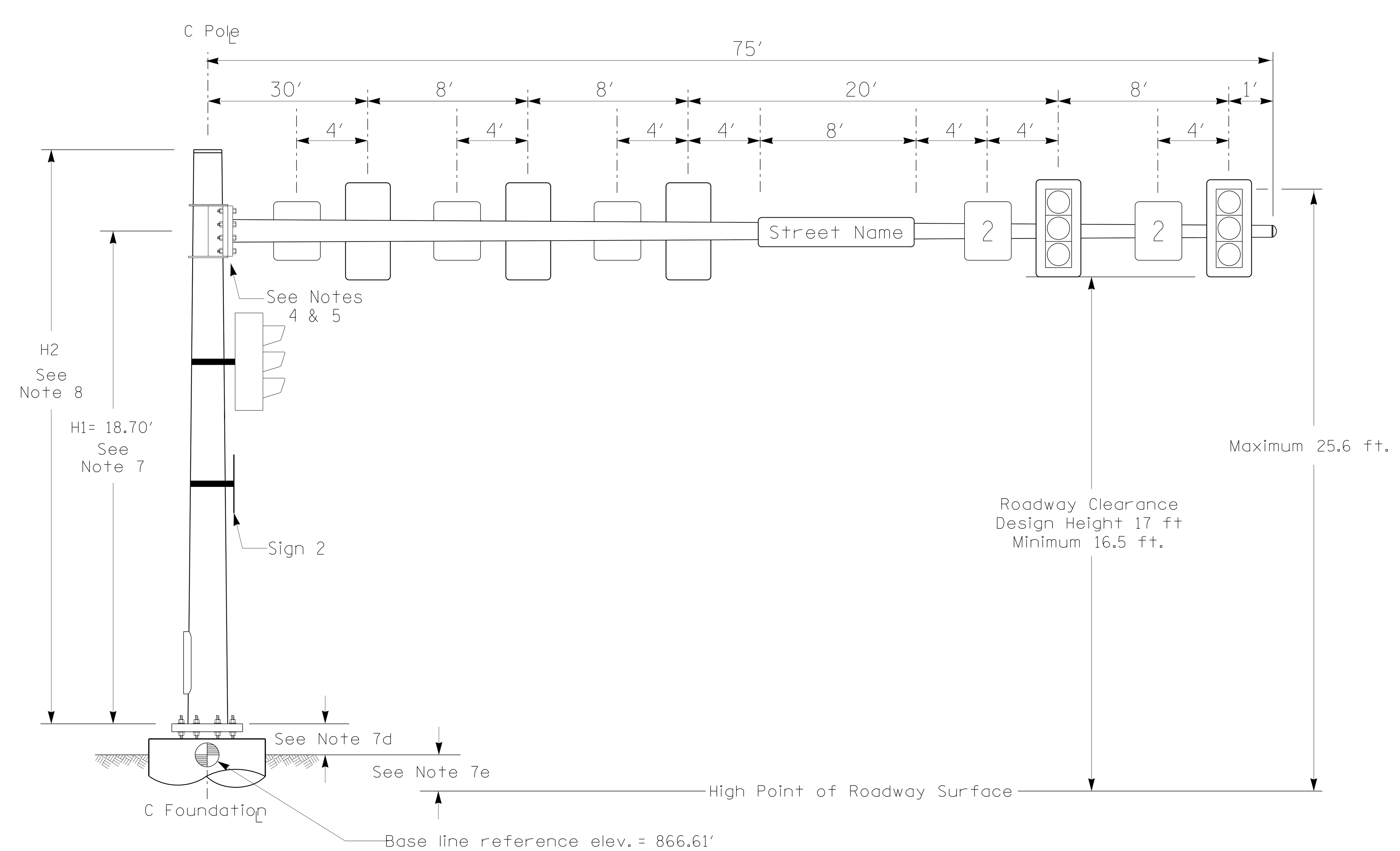
METAL POLE No. 1 and 2

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



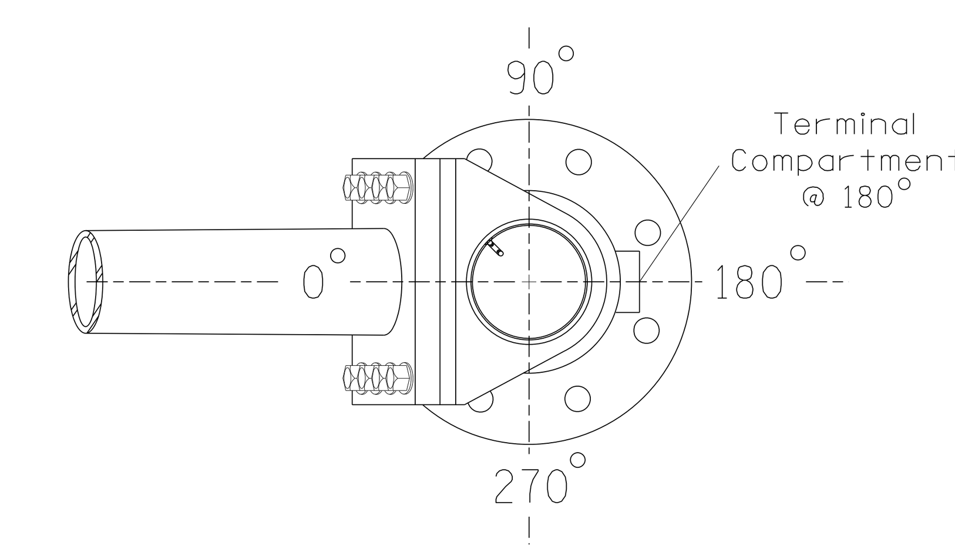
Elevation View

SPECIAL NOTE

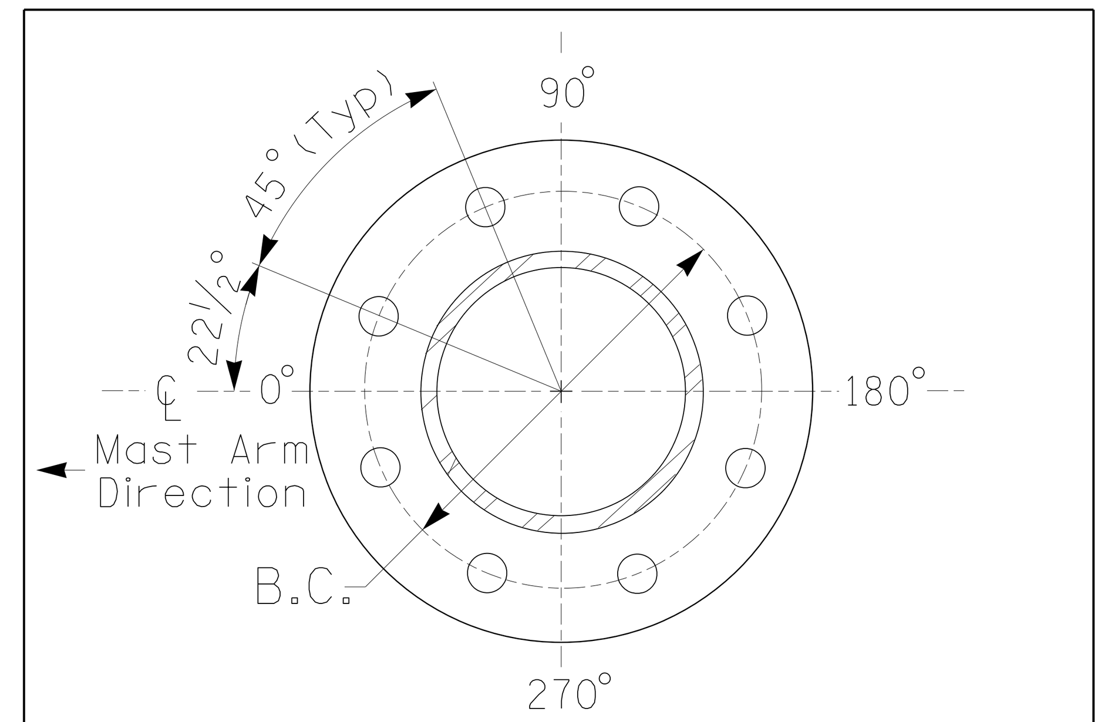
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	862.30 ft.	866.61 ft.
Elevation difference at High point of roadway surface	+0.37 ft.	-0.31 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

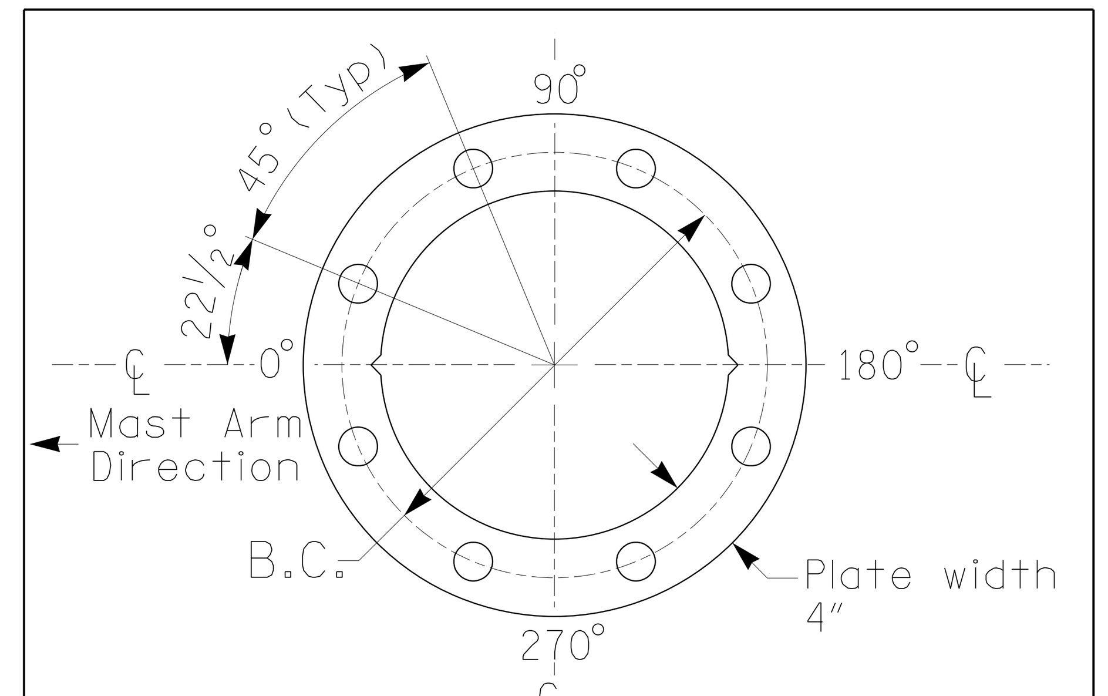


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL
For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
(signal head)	RIGID MOUNTED SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5" W X 52.5" L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0" W X 36.0" L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0" W X 96.0" L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2024 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using force ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 5 (110 mph)

Stantec

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Prepared for the Offices of: Transportation Mobility and Safety Division, Signal Design Section, 750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB at Target Entrance

Division 12 | Iredell County | Mooresville

PLAN DATE: November 2023	REVIEWED BY: J. Galloway, PE
PREPARED BY: J. Hambright	REVIEWED BY: R. Muncey, PE

SCALE 0 N/A

N/A

REVISIONS | INIT. | DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024

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DATE

SIG. INVENTORY NO. 12-1673

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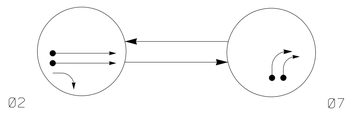
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 35.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

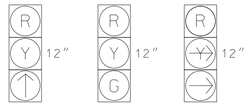
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	PHASE FLASH
21	↑	R	R
22	G	R	R
71,72	R	→	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

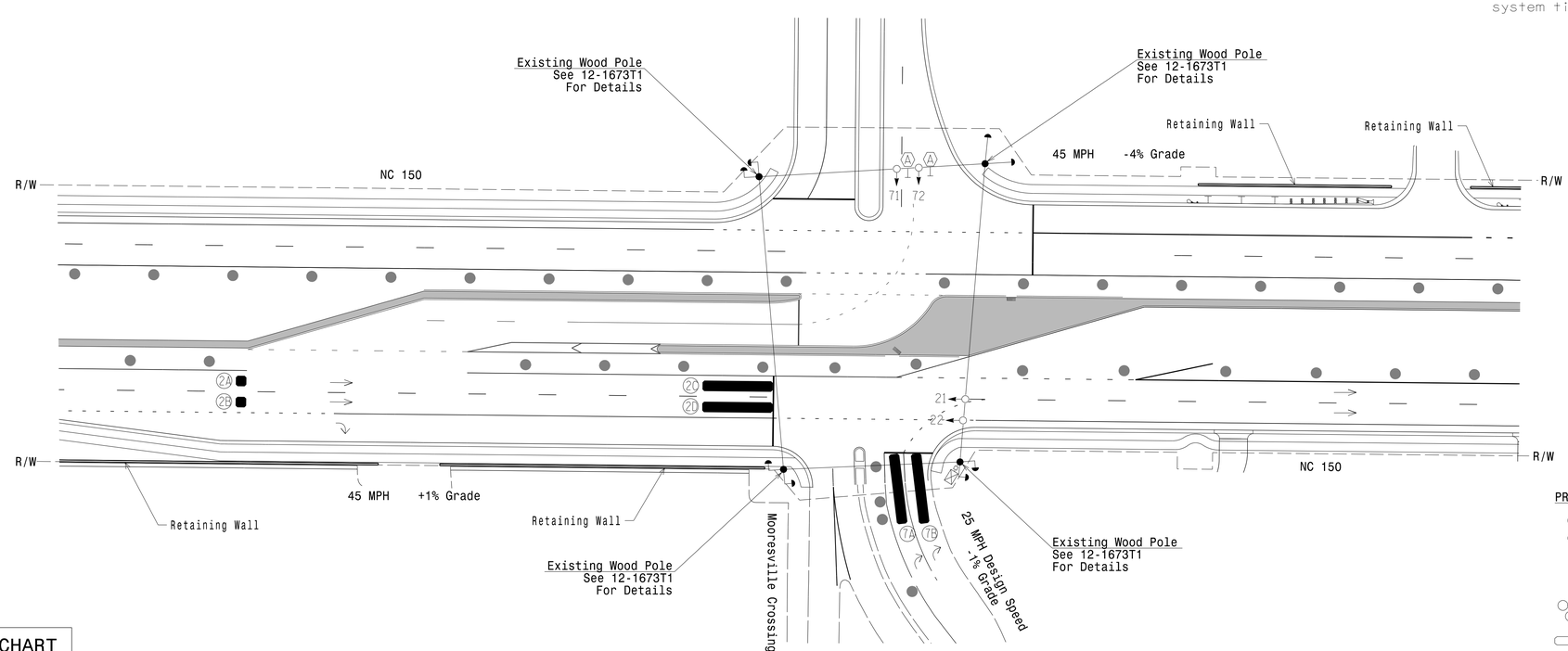
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
7A	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. The cabinet should be designed to include an Auxiliary Output File for future use.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□	Pedestrian Signal Head With Push Button & Sign	■
○	Signal Pole with Guy	●
◐	Signal Pole with Sidewalk Guy	●
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	----------
N/A	Right of Way	----------
→	Directional Arrow	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
● ● ●	Drums	N/A
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 7
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	4.4	3.2
Red Clear	1.6	1.4
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.0	–
Advance Walk	–	–
Non Lock Detector	X	X
Vehicle Recall	MIN RECALL	–
Dual Entry	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 2 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

New Installation
Temporary Design 1 - TMP Phase III

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Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 EB
at
Mooresville Crossing

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
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SIG. INVENTORY NO. 12-1852TI

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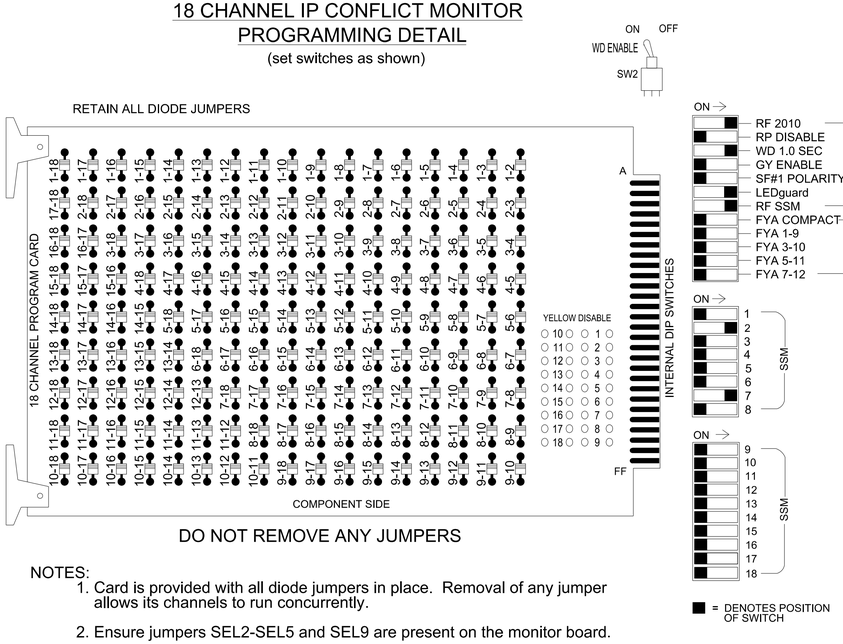
18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(set switches as shown)



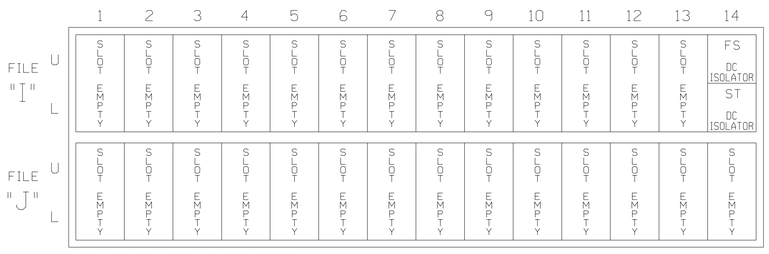
DO NOT REMOVE ANY JUMPERS

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

INPUT FILE POSITION LAYOUT

(front view)



EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Phase Not On.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2, S10
Phases Used.....2, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	2,a,7,b
2	

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 35.1

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2		S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2		13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2		2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22	NU	NU	NU	NU	NU	NU	NU	71,72	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128								122								
YELLOW		129	129																
GREEN			130																
YELLOW ARROW											123								
FLASHING YELLOW ARROW																			
GREEN ARROW		130									124								

NU = Not Used

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1852T1
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Temporary Design 1 - TMP Phase III
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
Mooresville Crossing

Division 12 | Iredell County | Mooresville

PLAN DATE: May 2024 | REVIEWED BY: J Galloway, PE
PREPARED BY: R M Muncey | REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
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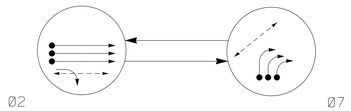
SIG. INVENTORY NO. 12-1852T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 36.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

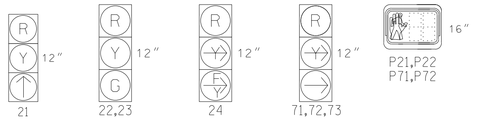
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	FLASH
21	↑	R	R
22,23	G	R	R
24	↱	R	R
71,72,73	R	→	R
P21,P22	W	DW	DRK
P71,P72	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



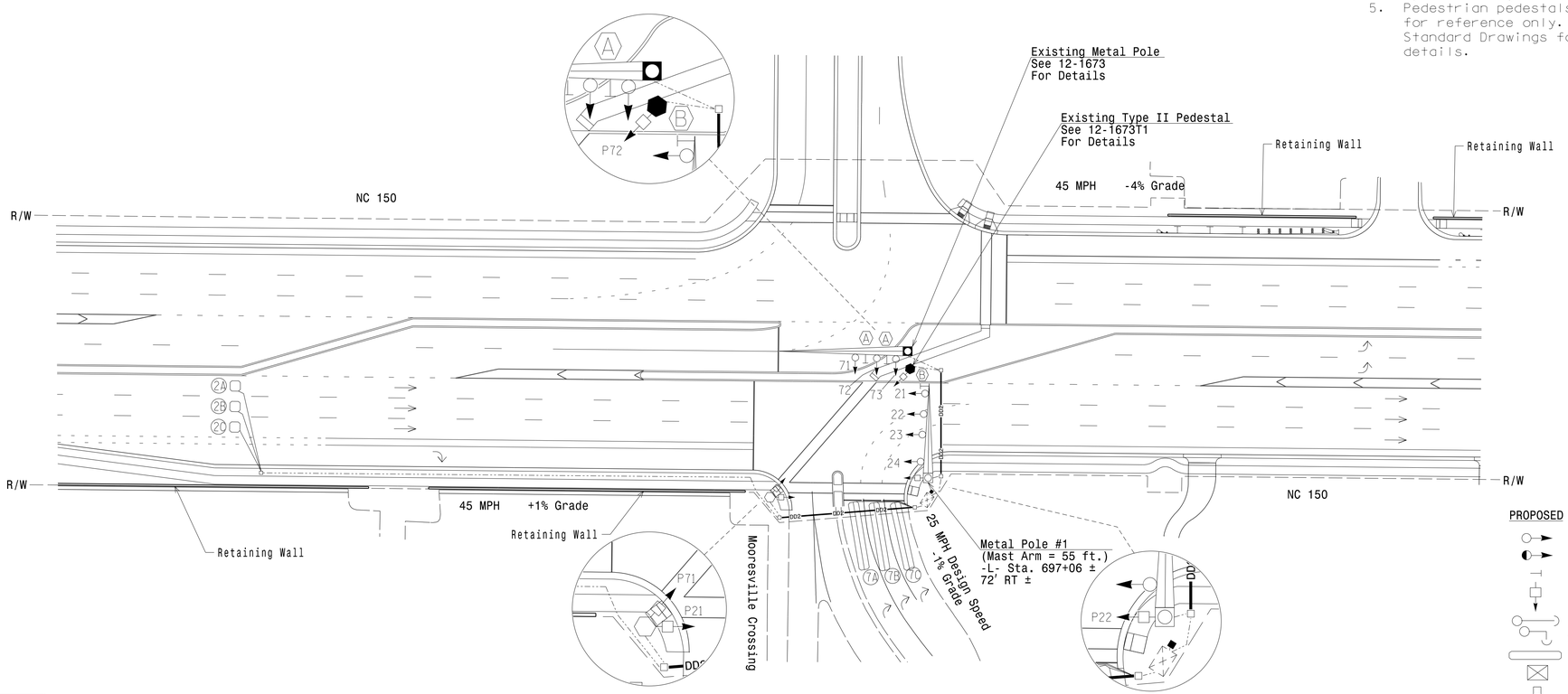
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	4	X	2	-	-	X	X	X	-	X
2B	6X6	300	4	X	2	-	-	X	X	X	-	X
2C	6X6	300	4	X	2	-	-	X	X	X	-	X
7A	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
7B	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
7C	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
5. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.



MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 7
Walk *	12	4
Ped Clear *	16	20
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	4.4	3.2
Red Clear	1.6	2.1
Added Initial *	1.0	–
Maximum Initial *	34	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.0	–
Advance Walk	5	–
Non Lock Detector	–	X
Vehicle Recall	MIN RECALL	–
Dual Entry	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 2 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○→	Signal Pole with Guy	●→
○↷	Signal Pole with Sidewalk Guy	●↷
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
-·-·-·-	2-in Underground Conduit	-·-·-·-
N/A	Right of Way	— — — —
→	Directional Arrow	→
○◁	Metal Pole with Mastarm	■◁
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⊛	Type I Pushbutton Post	✤
⬡	Type II Signal Pedestal	⬢
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ

New Installation - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

NC 150 EB
at
Mooresville Crossing

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON H. GALLOWAY

DocuSigned by: Jason Galloway 12/17/2024
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SIG. INVENTORY NO. 12-1852

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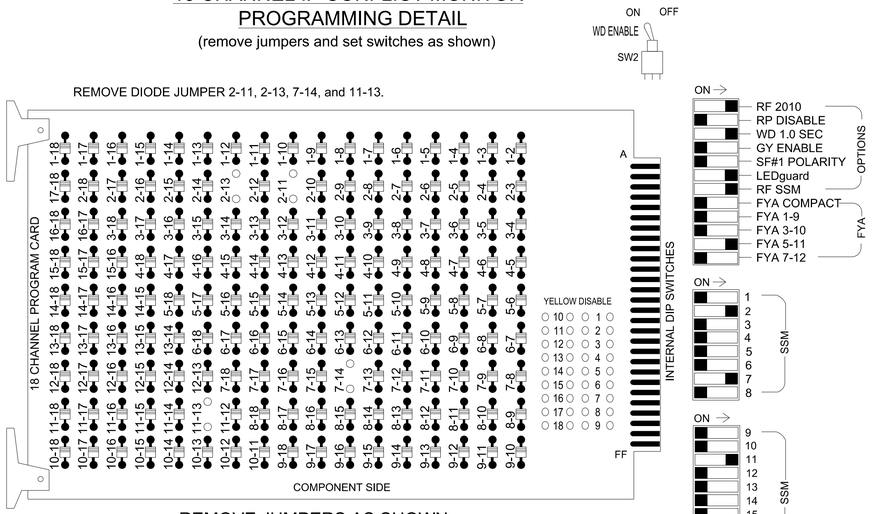
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 36.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Phase Not On.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2, S3, S6, S10, AUX S4
Phases Used.....2, 2PED, 7, 7PED
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2		S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2		13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2		2 PED	3	4	7 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22,23	P21, P22	NU	NU	P71, P72	NU	NU	NU	71,72, 73	NU	NU	NU	NU	NU	24 ★	NU	NU
RED		128	128								122						A114		
YELLOW		129	129																
GREEN			130																
YELLOW ARROW											123						A115		
FLASHING YELLOW ARROW																	A116		
GREEN ARROW		130									124								
✋				113			104												
🚶				115			106												

NU = Not Used

★ See pictorial of head wiring in detail this sheet.

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	ø2 2A	ø2 2C	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø2PED DC ISOLATOR	SLOT EMPTY	FS DC ISOLATOR
	L		ø2 2B	NOT USED									ø7PED DC ISOLATOR		ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	ø7 7A	ø7 7B	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L					NOT USED	ø7 7C								

EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

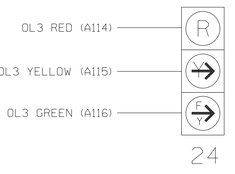
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
2C	TB2-9,10	I3U	63	29	4	2			X	X	X	
7A	TB5-5,6	J5U	57	19	21	7			X		X	
7B	TB5-9,10	J6U	42	4	22	7			X		X	
7C	TB5-11,12	J6L	46	8	23	7			X		X	
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						
P71,P72	TB8-5,6	I12L	69	35	4	PED 7						

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1852
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
Mooresville Crossing

Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. T2-1852

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 36.2

PED 7 PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Detector >Ped Det Plans

Web Interface
Home >Controller >Detector Configuration >Pedestrian Detector

Plan 1

NOTICE PHASE 7 PED ASSIGNED TO DETECTOR 4 PED →

Detector	Descripton	Call Phase	Call Overlap
2		2	0
4		7	0
6		6	0
8		8	0

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

NOTICE CONTROL SOURCE 7 ASSIGNED TO CHANNEL 14 →

Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
1	Phase Vehicle	1		X	X	1
2	Phase Vehicle	2		X		2
3	Phase Vehicle	3		X	X	3
4	Phase Vehicle	4		X		4
5	Phase Vehicle	5		X		5
6	Phase Vehicle	6		X	X	6
7	Phase Vehicle	7		X		7
8	Phase Vehicle	8		X	X	8
9	Overlap	1		X	X	9
10	Overlap	2		X	X	10
11	Overlap	3		X		11
12	Overlap	4		X		12
13	Phase Ped	2				13
14	Phase Ped	7				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

MAXTIME OVERLAP PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	3
Type	FYA 4 - Section
Included Phases	2
Modifier Phases	-
Modifier Overlaps	-
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	2,a,7,b
2	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1852
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
State of North Carolina
Dept. of Transportation
Traffic & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
Mooresville Crossing

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2840B4B46E...
SIG. INVENTORY NO. DATE

T2-1852

5:15:57 PM
User: jgalloway
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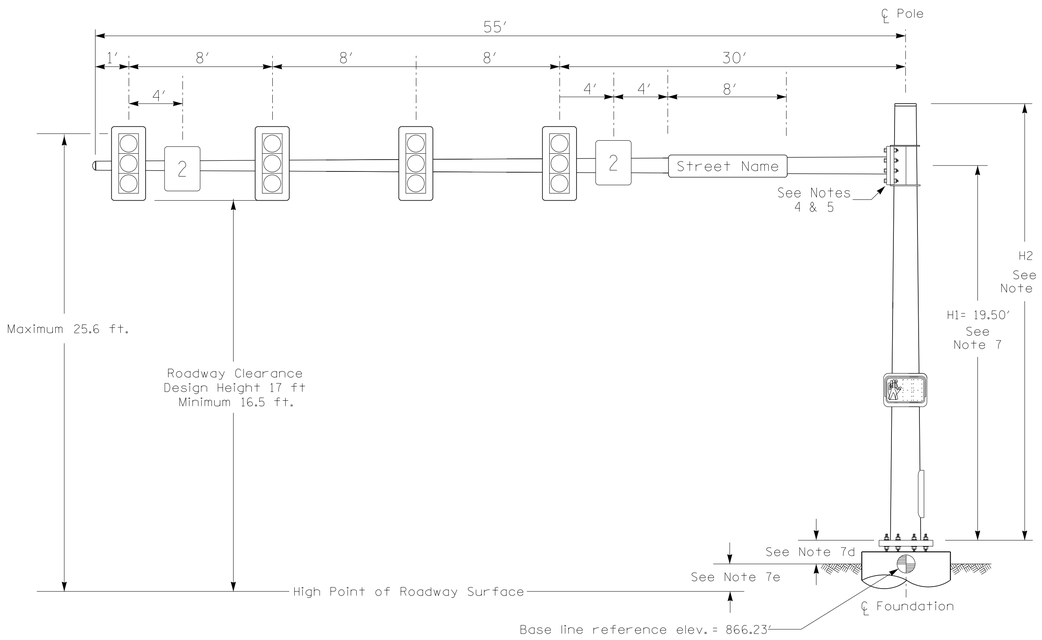
Design Loading for METAL POLE NO. 1



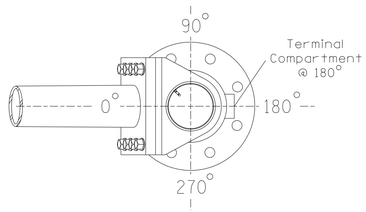
Elevation View

SPECIAL NOTE

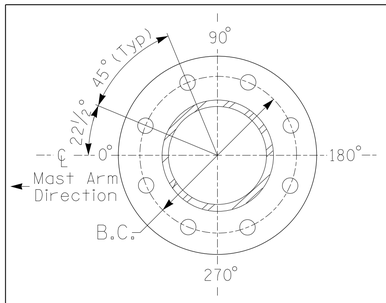
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ℄ Foundation @ ground level	866.23 ft.	
Elevation difference at High point of roadway surface	+0.45 ft.	
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	

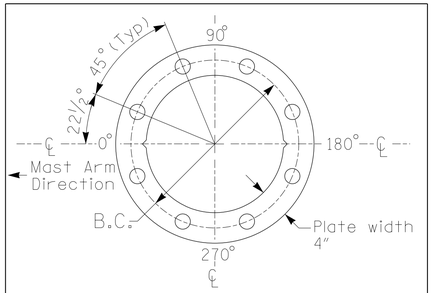


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL
For 8 Bolt Base Plate

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 36.3

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
	PEDESTRIAN SIGNAL HEAD WITH MOUNTING HARDWARE	2.2 S.F.	18.5″W X 17.0″L	21 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2024 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using force ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 5 (110 mph)

Stantec

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N.Greenfield Pkwy.,Garner,NC 27529

NC 150 EB
at
Mooresville Crossing

Division 12 Iredell County Mooresville

PLAN DATE:	November 2023	REVIEWED BY:	J. Galloway, PE
PREPARED BY:	J. Hambright	REVIEWED BY:	R. Muncey, PE

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON W. GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024
10D1E2B40B4B46E...
SIGNATURE DATE

SIG. INVENTORY NO. 12-1852

5/16/2024
1:52:39 PM
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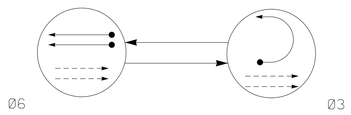
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 37.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

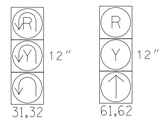
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3	PHASE FLASH
31	R		R
61,62		R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

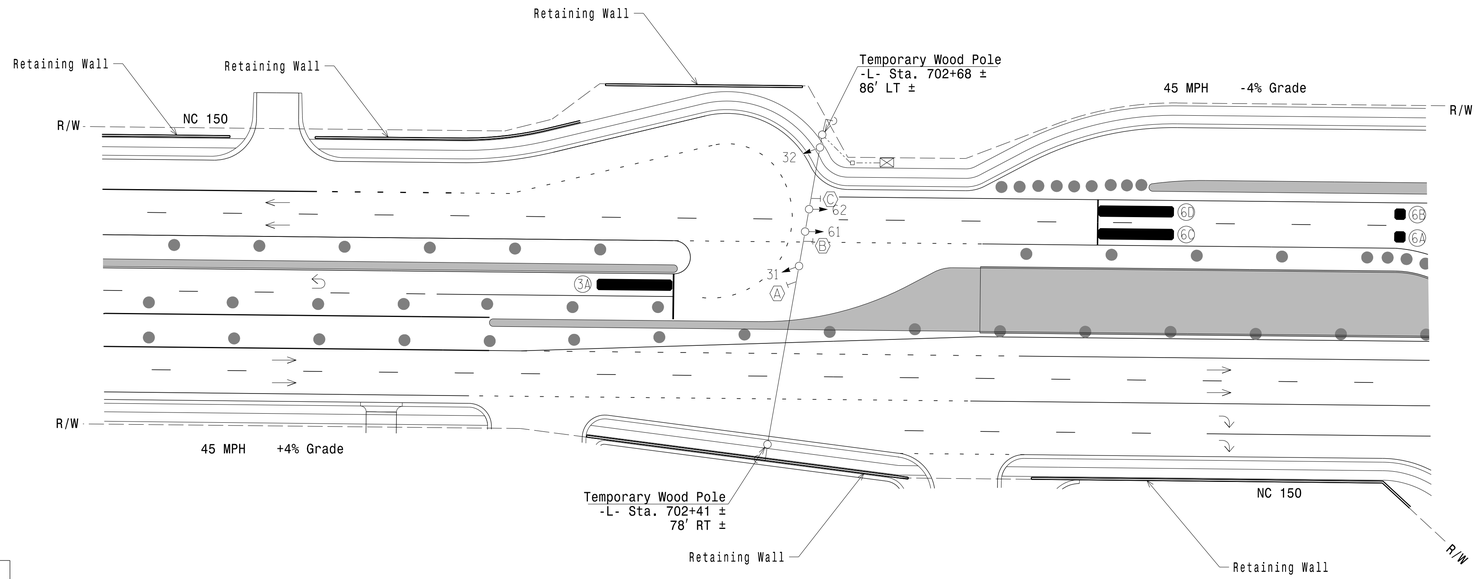
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
6A	6X6	157	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	157	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. The cabinet should be designed to include an Auxiliary Output File for future use.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Field adjust temporary poles as needed.



MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	6.0
Max 1 *	30	60
Yellow Change	3.0	4.9
Red Clear	3.9	3.3
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	–	15
Time To Reduce *	–	30
Minimum Gap	–	3.0
Advance Walk	–	–
Non Lock Detector	X	X
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Metal Pole with Mastarm	
—DD#—	Directional Drill (#) x 2" Conduit	N/A
	Video Detection Area	N/A
	Construction Zone	N/A
	Drums	N/A
Ⓐ	U-Turn "ONLY" Sign	Ⓐ
Ⓑ	No Left Turn Sign (R3-2)	Ⓑ
Ⓒ	No Right Turn Sign (R3-1)	Ⓒ

New Installation
Temporary Design 1 - TMP Phase III

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 WB at Mooresville Crossing U-turn/ SR 1467 (Bluefield Road) CFI Crossover

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

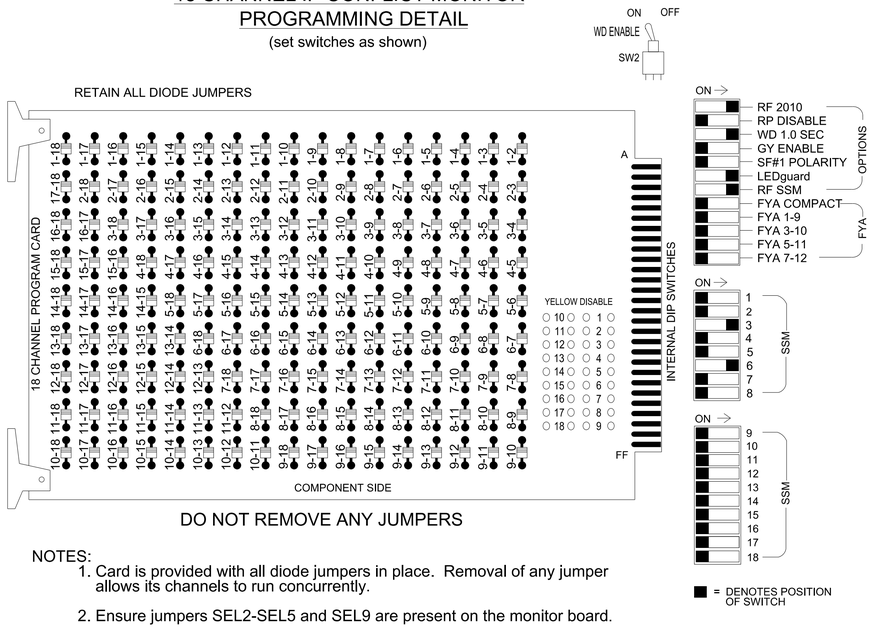
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 9/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. DATE

12-1839T1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(set switches as shown)



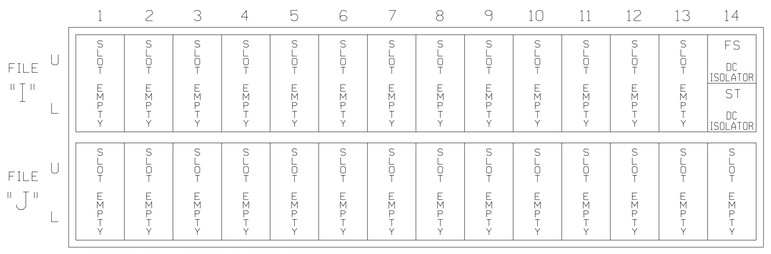
DO NOT REMOVE ANY JUMPERS

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

INPUT FILE POSITION LAYOUT

(front view)



EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal head flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Phase Not On and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S4, S8
Phases Used.....3, 6
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	6,a,3,b
2	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1839TI
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 37.1

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	NU	NU	31,32	NU	NU	NU	61,62	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED								134										
YELLOW								135										
GREEN																		
RED ARROW				116														
YELLOW ARROW				117														
GREEN ARROW				118				136										

NU = Not Used

Temporary Design 1 - TMP Phase III
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Tel. (919) 851-6866
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www.stantec.com
License No. F-0672

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB at Mooresville Crossing U-Turn / SR 1467 (Bluefield Road) CFI Crossing

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER NORTH CAROLINA PROFESSIONAL JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024
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SIG. INVENTORY NO. 12-1839TI

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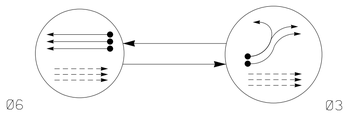
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 38.0

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

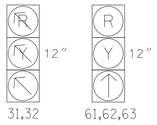
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3	PHASE FLASH
31,32	R	↘	R
61,62,63	↑	R	R

SIGNAL FACE I.D.

All Heads L.E.D.

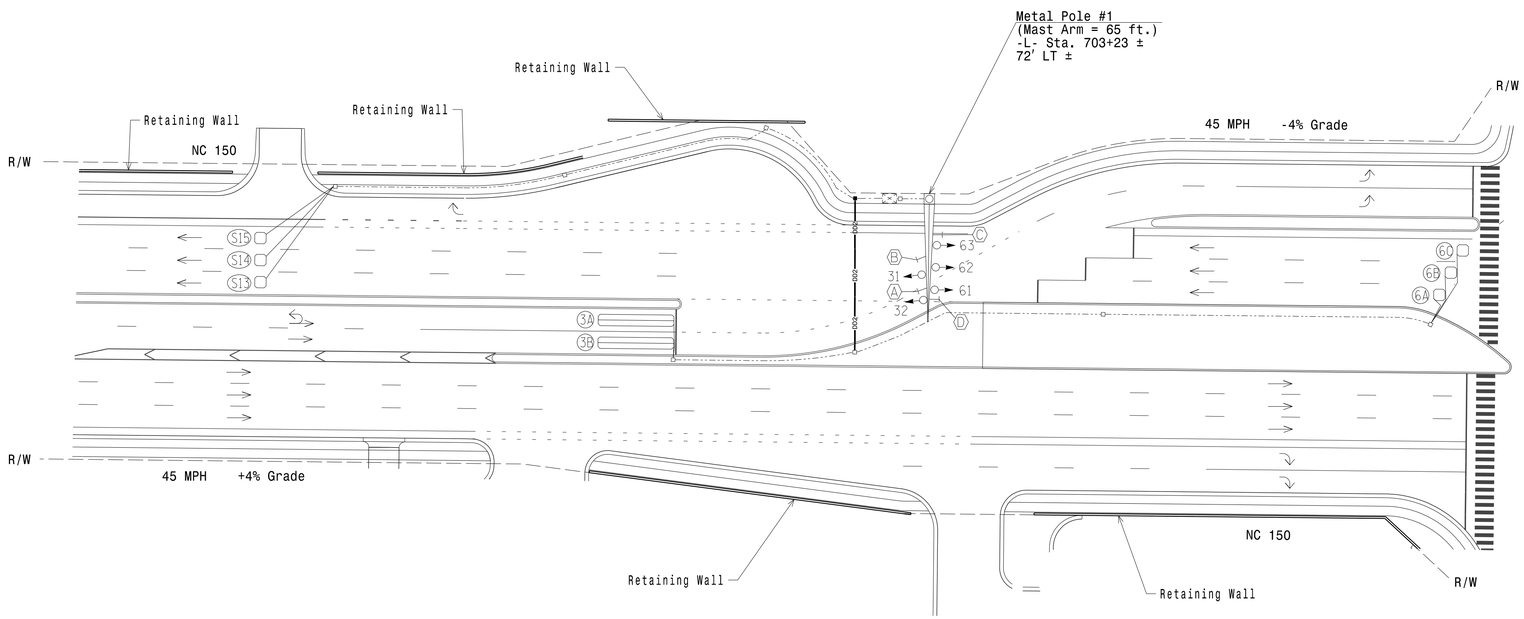


MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
3B	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
6A	6X6	169	4	X	6	-	-	X	X	X	-	X
6B	6X6	169	4	X	6	-	-	X	X	X	-	X
6C	6X6	169	4	X	6	-	-	X	X	X	-	X
S13	6X6	+400	4	X	-	-	-	-	-	-	-	X
S14	6X6	+400	4	X	-	-	-	-	-	-	-	X
S15	6X6	+400	4	X	-	-	-	-	-	-	-	X

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



MAXTIME TIMING CHART

FEATURE	PHASE 3	PHASE 6
Walk *	–	–
Ped Clear *	–	–
Min Green	7	12
Passage *	2.0	6.0
Max 1 *	30	60
Yellow Change	4.2	4.9
Red Clear	3.3	3.4
Added Initial *	–	1.0
Maximum Initial *	–	19
Time Before Reduction *	–	15
Time To Reduce *	–	30
Minimum Gap	–	2.0
Advance Walk	–	–
Non Lock Detector	X	–
Vehicle Recall	–	MIN RECALL
Dual Entry	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

FIGURE 1

(B) (30" x 24")

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○→	Signal Pole with Guy	●→
○↓	Signal Pole with Sidewalk Guy	●↓
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⛶
□	Junction Box	■
-----	2-in Underground Conduit	-----
N/A	Right of Way	------
→	Directional Arrow	→
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⊂→	Metal Pole with Mastarm	⊂→
(A)	Through Arrow "ONLY" Sign (R3-5A)	(A)
(B)	Combined Thru/U-Turn Arrow Sign (SEE FIGURE 1)	(B)
(C)	No Right Turn Sign (R3-1)	(C)
(D)	No Left Turn Sign (R3-2)	(D)

New Installation - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 WB at Mooresville Crossing U-turn / SR 1467 (Bluefield Road) CFI Crossover

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

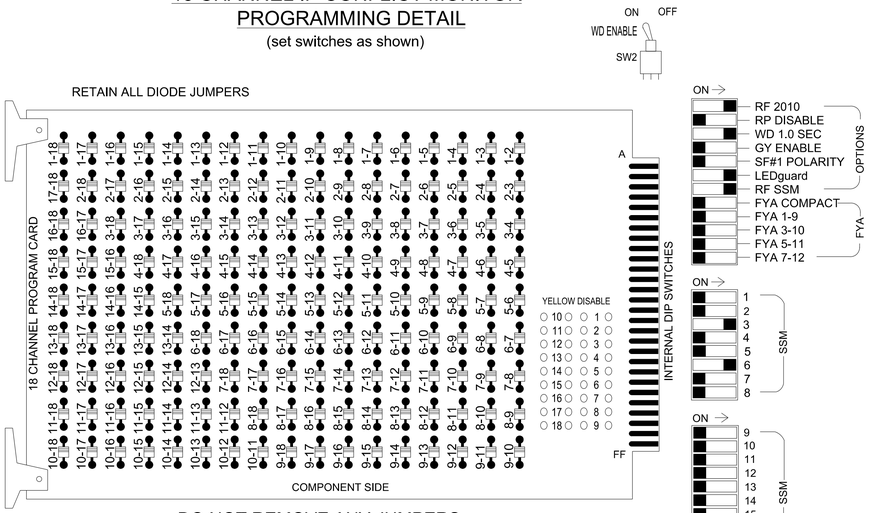
DocuSigned by:
Jason Galloway 12/17/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1839

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 38.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(set switches as shown)



DO NOT REMOVE ANY JUMPERS

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal head flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Phase Not On and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S4, S8
Phases Used.....3, 6
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

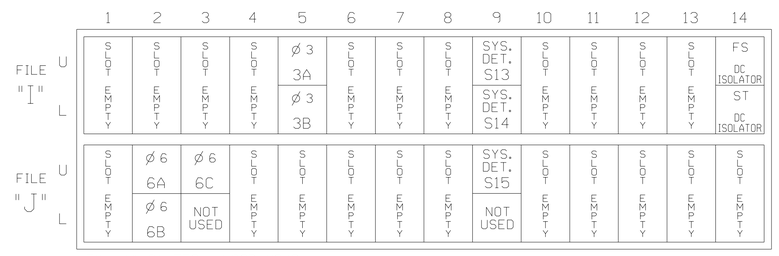
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	NU	NU	NU	31,32	NU	NU	NU	61,62, 63	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED								134										
YELLOW								135										
GREEN																		
RED ARROW				116														
YELLOW ARROW				117														
GREEN ARROW				118				136										

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
3A	TB4-5,6	I5U	58	20	7	3			X		X	
3B	TB4-7,8	I5L	58	20	7	3			X		X	
6A	TB3-5,6	J2U	40	2	16	6			X	X	X	
6B	TB3-7,8	J2L	44	6	17	6			X	X	X	
6C	TB3-9,10	J3U	64	30	18	6			X	X	X	
*S13	TB6-9,10	I9U	60	22	13	SYS						
*S14	TB6-11,12	I9L	62	24	14	SYS						
*S15	TB7-9,10	J9U	59	21	27	SYS						

*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Sequence & Phs Config>Sequences

Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	6,a,3,b
2	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1839
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB at Mooresville Crossing U-Turn / SR 1467 (Bluefield Road) CFI Crossing

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	R M Muncey	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024
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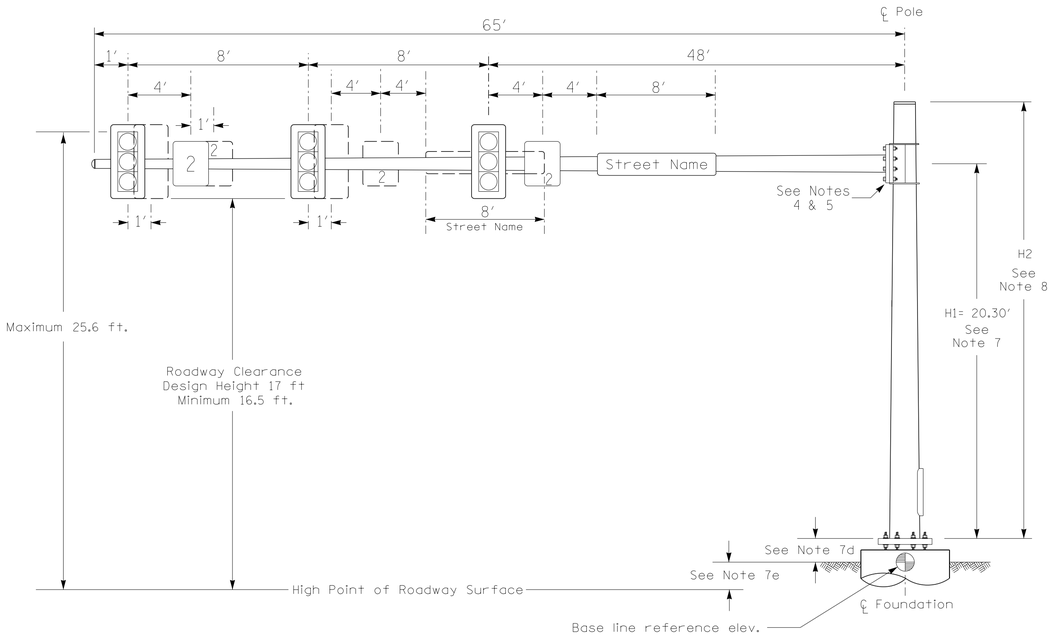
SIG. INVENTORY NO. T2-1839

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 38.2

Design Loading for METAL POLE NO. 1



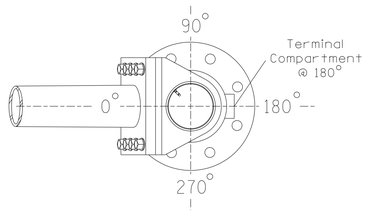
Elevation View

SPECIAL NOTE

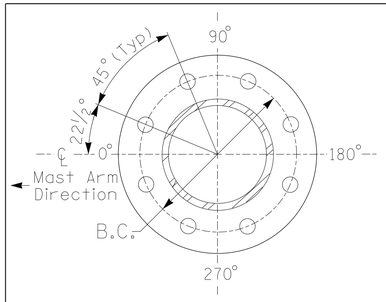
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ⊕ Foundation @ ground level	891.16 ft.	
Elevation difference at High point of roadway surface	+1.22 ft.	
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	

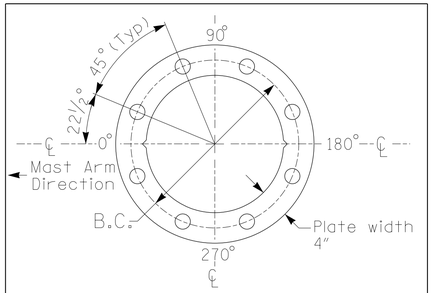


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL
For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2024 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using force ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 5 (110 mph)

Stantec

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Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section

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NC 150 WB at Mooresville
Crossing U-turn / SR 1467
(Bluefield Road) CFI Crossover

Division 12 | Iredell County | Mooresville

PLAN DATE:	November 2023	REVIEWED BY:	J. Galloway, PE
PREPARED BY:	J. Hambright	REVIEWED BY:	R. Muncey, PE

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON M. GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024
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SIG. INVENTORY NO. 12-1839

5/16/2024
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J:\Projects\Signals\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1839.dgn
User:jgalloway

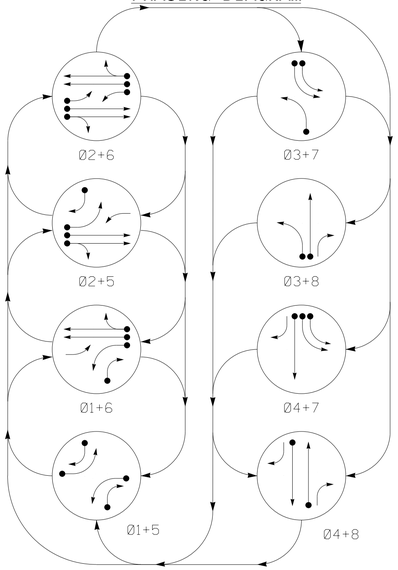
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 39.0

8 Phase Fully Actuated w/ Alternate Phasing NC 150 D12-02_MOORESVILLE CLS

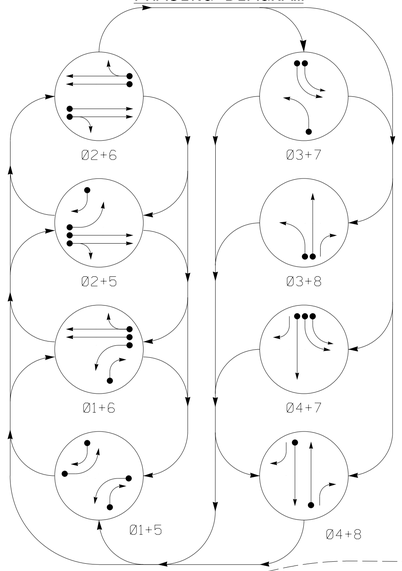
NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
7. The Division Traffic Engineer will determine the hours of use for each phasing plan.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Field adjust temporary poles as needed.

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE 01+05	01+06	02+05	02+06	03+07	03+08	04+07	04+08	FLASH
11	←	←	F Y	F Y	R	R	R	R	R
21,22	R	R	G	G	R	R	R	R	R
31	R	R	R	R	←	←	R	R	R
41	R	R	R	R	R	R	G	G	R
42	R/→	R	R/→	R	R	R	G	G	R
51	←	F Y	←	F Y	R	R	R	R	R
61,62	R	G	R	G	R	R	R	R	R
71,72	R	R	R	R	←	R	←	R	R
81	R	R	R	R	R	G	R	G	R
82	R/→	R/→	R	R	R	G	R	G	R

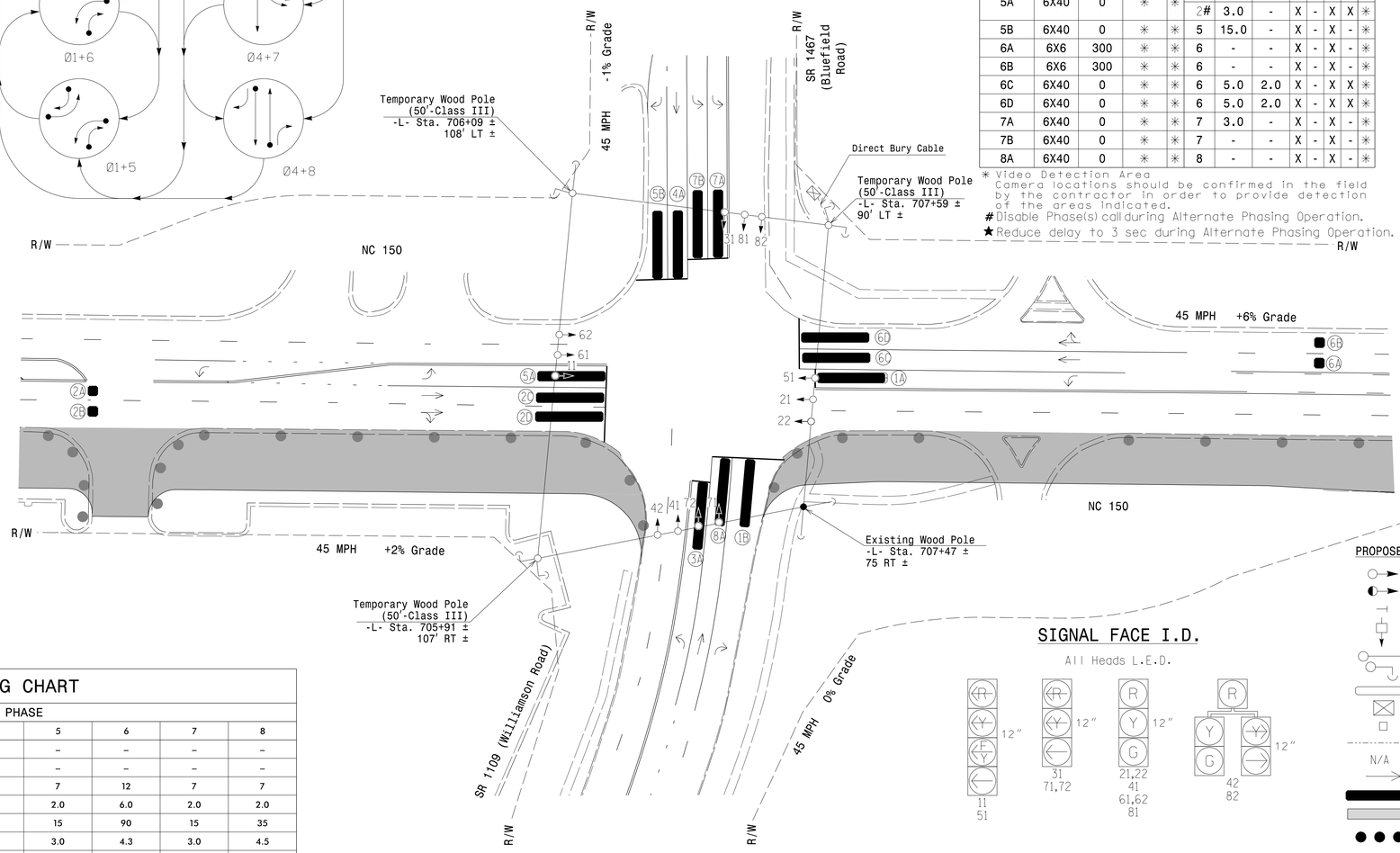
ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE 01+05	01+06	02+05	02+06	03+07	03+08	04+07	04+08	FLASH
11	←	←	R	R	R	R	R	R	R
21,22	R	R	G	G	R	R	R	R	R
31	R	R	R	R	←	←	R	R	R
41	R	R	R	R	R	R	G	G	R
42	R/→	R	R/→	R	R	R	G	G	R
51	←	R	←	R	R	R	R	R	R
61,62	R	G	R	G	R	R	R	R	R
71,72	R	R	R	R	←	R	←	R	R
81	R	R	R	R	R	G	R	G	R
82	R/→	R/→	R	R	R	G	R	G	R

MAXTIME DETECTOR INSTALLATION CHART

DETECTOR: LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING: CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	✳	✳	1	15.0★	-	X	-	X	-	✳
					6#	3.0	-	X	-	X	X	✳
1B	6X40	0	✳	✳	1	15.0	-	X	-	X	-	✳
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
3A	6X40	0	✳	✳	3	3.0	-	X	-	X	-	✳
4A	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	15.0★	-	X	-	X	-	✳
					2#	3.0	-	X	-	X	X	✳
5B	6X40	0	✳	✳	5	15.0	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
7A	6X40	0	✳	✳	7	3.0	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
8A	6X40	0	✳	✳	8	-	-	X	-	X	-	✳

✳ Video Detection Area Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.
Disable Phase(s) call during Alternate Phasing Operation.
★ Reduce delay to 3 sec during Alternate Phasing Operation.



SIGNAL FACE I.D.

All Heads L.E.D.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▽	Pedestrian Signal Head With Push Button & Sign	■
○→	Signal Pole with Guy	●→
○→	Signal Pole with Sidewalk Guy	●→
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	----------
N/A	Right of Way	----------
→	Directional Arrow	→
▬	Video Detection Area	N/A
▭	Construction Zone	N/A
● ● ●	Drums	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Walk *	–	–	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–	–	–
Min Green	7	12	7	7	7	12	7	7
Passage *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max 1 *	15	90	15	35	15	90	15	35
Yellow Change	3.0	4.3	3.0	4.6	3.0	4.3	3.0	4.5
Red Clear	2.8	1.7	2.8	1.4	2.8	1.7	3.4	1.3
Added Initial *	–	–	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–	–	–
Time Before Reduction *	–	15	–	–	–	15	–	–
Time To Reduce *	–	30	–	–	–	30	–	–
Minimum Gap	–	3.0	–	–	–	3.0	–	–
Advance Walk	–	–	–	–	–	–	–	–
Non Lock Detector	X	X	X	X	X	X	X	X
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL	–	–
Dual Entry	–	–	–	–	–	–	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

Signal Upgrade
Temporary Design 1 - TMP Phase I

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Prepared for the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

NC 150 at SR 1467 (Bluefield Road)/ SR 1109 (Williamson Road)

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SCALE 0 40 1"=40'

SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON CALLOWAY

DocuSigned by: Jason Galloway 5/20/2024 DATE
10D1E2B40B4B46E...

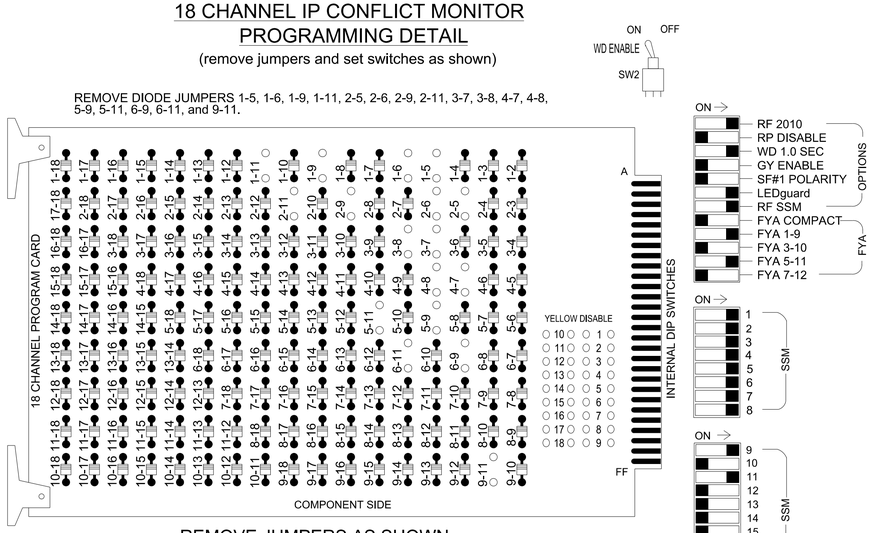
SIG. INVENTORY NO. 12-1233TI

$$$$$$$SYSDATE$$$$$$
5:58:52 PM
I:\Projects\Signals\Designs\Signal Design\Temporary Design\Phase 1 TEMP\R-2307B_sig_dsn_12-1233TI.dgn
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 39.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1, S2, S4, S5, S7, S8, S10, S11, AUX S1, AUX S4
Phases Used.....1, 2, 3, 4, 5, 6, 7, 8
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4	S5	S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3	4	14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11 ★	82	21,22	NU	31	41,42	NU	51 ★	42	61,62	NU	71,72	81,82	NU	11 ★	NU	NU	51 ★	NU	NU
RED	✳		128			101		✳		134			107							
YELLOW			129			102				135			108							
GREEN			130			103				136			109							
RED ARROW					116							122			A121			A114		
YELLOW ARROW		126			117				132			123			A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127	127			118			133	133			124								

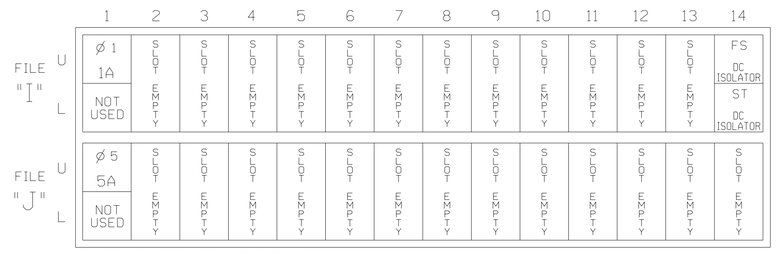
NU = Not Used

✳ Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

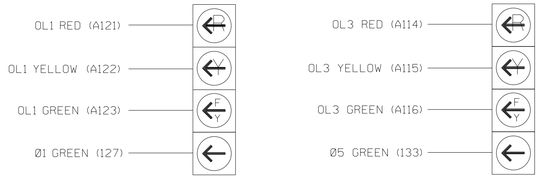
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1 *	1	15.0		X		X	
				-	29 *	6	3.0		X		X	X
5A	TB3-1,2	J1U	55	17	15 *	5	15.0		X		X	
				-	31 *	2	3.0		X		X	X

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



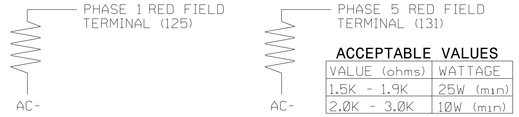
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

For Detection Zones 1A and 5A, the equipment placement is typical for a NCDOT installation. Inputs associated wtih these slots are compatible with alternate operation programming located on the following sheets of this electrical detail.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)



ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1233T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 1 - TMP Phase I
Electrical Detail - Sheet 1 of 2

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 at
SR 1467 (Bluefield Road)/
SR 1109 (Williamson Road)

Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/GBS	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

STD. NUMBER NO. 12-1233T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 39.2

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	-	-
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

← NOTICE INCLUDED PHASE

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOPS 1A & 5A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

1A

Detector	Call Phase	Delay
1	1	3.0
29	0	-

5A

Detector	Call Phase	Delay
15	5	3.0
31	0	-

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP PLAN 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 11 and 51 to run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1233T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 1 - TMP Phase I
Electrical Detail - Sheet 2 of 2

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750 N. Greenfield Pkwy, Garner, NC 27529

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Division 12 — Iredell County — Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/GBS	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 029904 JASON P. GALLOWAY

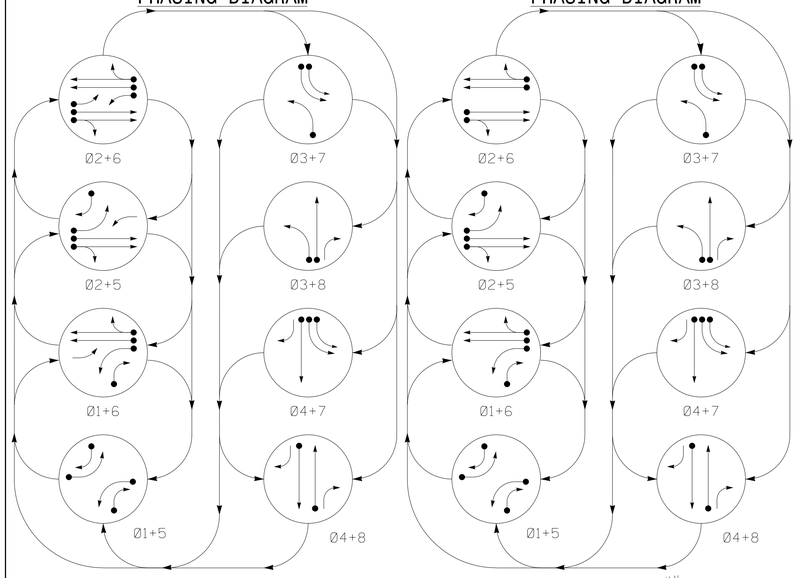
DocuSigned by:
Jason Galloway 5/20/2024
DATE
10D1E2B40B4B46E...

SIG. INVENTORY NO. 12-1233T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 40.0

8 Phase Fully Actuated w/ Alternate Phasing NC 150 D12-02_MOORESVILLE CLS

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM

PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11	←	←	F Y	F Y	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	R	R	R	R
31	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
41	R	R	R	R	R	R	G	G	R
42	R→	R	R→	R	R	R	G	G	R
51	←	F Y	←	F Y	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	R	R	R	R
71,72	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	~~R~~	~~R~~
81	R	R	R	R	R	G	R	G	R
82	R→	R→	R	R	R	G	R	G	R

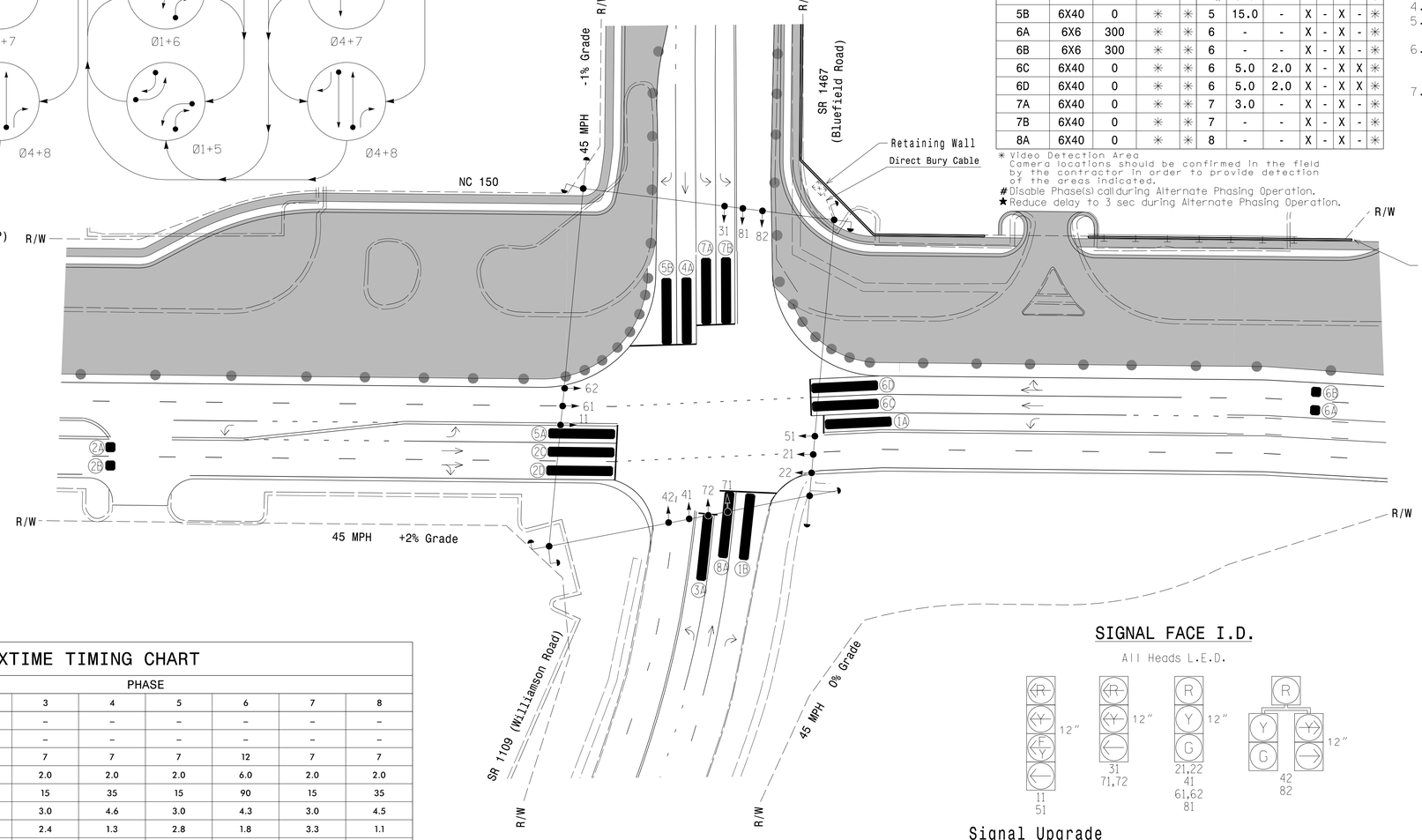
ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	R	R	R	R
31	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
41	R	R	R	R	R	R	G	G	R
42	R→	R	R→	R	R	R	G	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	R	R	R	R
71,72	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	~~R~~	~~R~~
81	R	R	R	R	R	G	R	G	R
82	R→	R→	R	R	R	G	R	G	R

MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	✳	✳	1	15.0★	-	X	-	X	-	✳
					6#	3.0	-	X	-	X	X	✳
1B	6X40	0	✳	✳	1	15.0	-	X	-	X	-	✳
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
3A	6X40	0	✳	✳	3	3.0	-	X	-	X	-	✳
4A	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	15.0★	-	X	-	X	-	✳
					2#	3.0	-	X	-	X	X	✳
5B	6X40	0	✳	✳	5	15.0	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
7A	6X40	0	✳	✳	7	3.0	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
8A	6X40	0	✳	✳	8	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.
Disable Phase(s) call during Alternate Phasing Operation.
★ Reduce delay to 3 sec during Alternate Phasing Operation.



NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Reposition existing signal heads numbered 11, 21, 22, 51, 61, and 62.
6. The Division Traffic Engineer will determine the hours of use for each phasing plan.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Walk *	–	–	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–	–	–
Min Green	7	12	7	7	7	12	7	7
Passage *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max 1 *	15	90	15	35	15	90	15	35
Yellow Change	3.0	4.3	3.0	4.6	3.0	4.3	3.0	4.5
Red Clear	2.9	1.8	2.4	1.3	2.8	1.8	3.3	1.1
Added Initial *	–	–	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–	–	–
Time Before Reduction *	–	15	–	–	–	15	–	–
Time To Reduce *	–	30	–	–	–	30	–	–
Minimum Gap	–	3.0	–	–	–	3.0	–	–
Advance Walk	–	–	–	–	–	–	–	–
Non Lock Detector	X	X	X	X	X	X	X	X
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL	–	–
Dual Entry	–	–	–	–	–	–	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

SIGNAL FACE I.D.

All Heads L.E.D.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○~	Signal Pole with Sidewalk Guy	●~
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·-·-·	2-in Underground Conduit	·-·-·
N/A	Right of Way	– – –
→	Directional Arrow	→
▬	Video Detection Area	N/A
▬	Construction Zone	N/A
● ● ●	Drums	N/A

Signal Upgrade
Temporary Design 2 - TMP Phase II

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NC 150 at
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Division 12 Iredell County Mooresville

PLAN DATE: May 2024
PREPARED BY: J Hambright
REVIEWED BY: J Galloway, PE
REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON F GALLOWAY

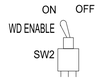
DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. I-2133T2

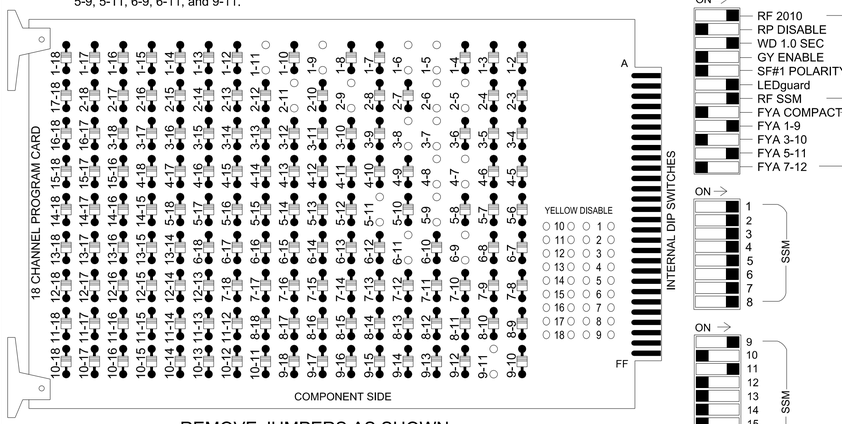
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 40.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 3-7, 3-8, 4-7, 4-8, 5-9, 5-11, 6-9, 6-11, and 9-11.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

■ = DENOTES POSITION OF SWITCH

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1, S2, S4, S5, S7, S8, S10, S11, AUX S1, AUX S4
Phases Used.....1, 2, 3, 4, 5, 6, 7, 8
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4	S5	S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3	4	14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11 ★	82	21,22	NU	31	41,42	NU	51 ★	42	61,62	NU	71,72	81,82	NU	11 ★	NU	NU	51 ★	NU	NU
RED	✳		128			101		✳		134			107							
YELLOW			129			102				135			108							
GREEN			130			103				136			109							
RED ARROW					116							122			A121			A114		
YELLOW ARROW		126			117				132			123			A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127	127			118			133	133			124								

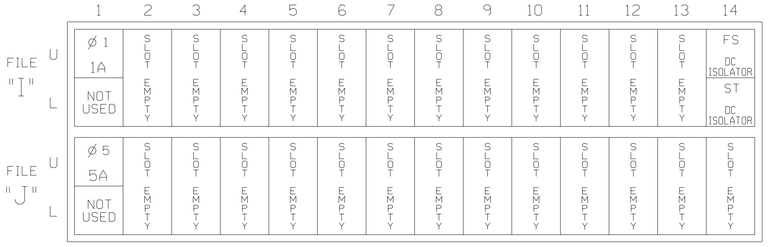
NU = Not Used

✳ Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

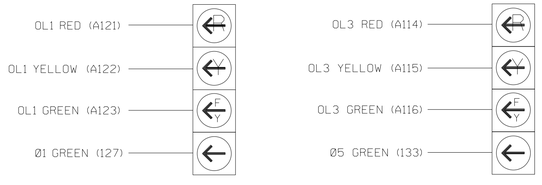
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1 *	1	15.0		X		X	
				-	29 *	6	3.0		X		X	X
5A	TB3-1,2	J1U	55	17	15 *	5	15.0		X		X	
				-	31 *	2	3.0		X		X	X

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



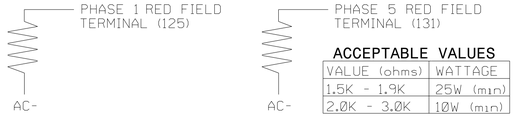
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

For Detection Zones 1A and 5A, the equipment placement is typical for a NCDOT installation. Inputs associated wtih these slots are compatible with alternate operation programming located on the following sheets of this electrical detail.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)



ACCEPTABLE VALUES

VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1233T2
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 2 - TMP Phase II
Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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License No. F-0672

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 at
SR 1467 (Bluefield Road)/
SR 1109 (Williamson Road)

Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/GBS	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

STD. NUMBER NO. EC1233T2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 40.2

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	3	
Type	FYA 4 - Section	FYA 4 - Section	
Included Phases	-	-	← NOTICE INCLUDED PHASE
Modifier Phases	1	5	
Modifier Overlaps	-	-	
Trail Green	0	0	
Trail Yellow	0.0	0.0	
Trail Red	0.0	0.0	

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOPS 1A & 5A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

1A

Detector	Call Phase	Delay
1	1	3.0
29	0	-

5A

Detector	Call Phase	Delay
15	5	3.0
31	0	-

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP PLAN 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 11 and 51 to run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1233T2
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 2 - TMP Phase II
Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared for the Offices of:
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Department of Transportation
Traffic Engineering Branch
Traffic & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 at
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Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/GBS	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. CALLOWAY

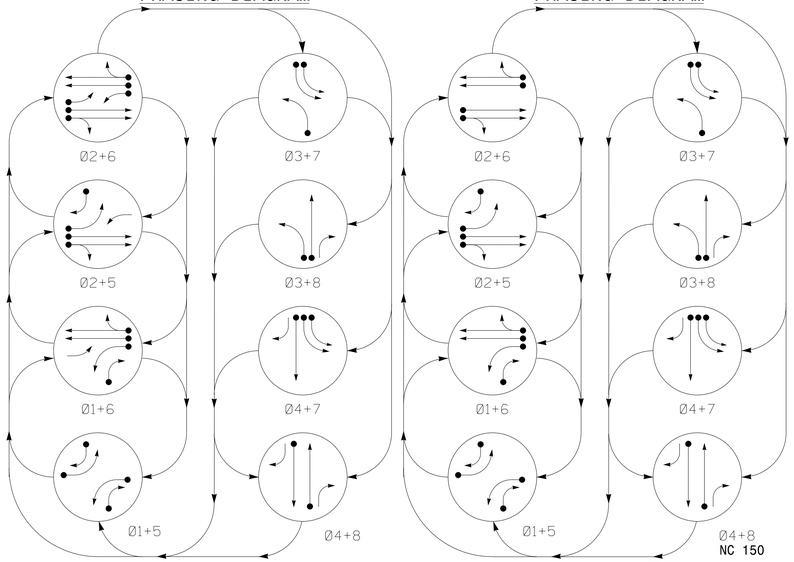
DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...

STD. NUMBER NO. E-1233T2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 41.0

8 Phase Fully Actuated w/ Alternate Phasing NC 150 D12-02_MOORESVILLE CLS

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11	↚	↚	F̸	F̸	R̸	R̸	R̸	R̸	R̸
21,22	R	R	G	G	R	R	R	R	R
31	R̸	R̸	R̸	R̸	↚	R̸	R̸	R̸	R̸
41	R	R	R	R	R	G	G	R	
42	R̸	R	R̸	R	R	G	G	R	
51	↚	F̸	↚	F̸	R̸	R̸	R̸	R̸	R̸
61,62	R	G	R	G	R	R	R	R	
71,72	R̸	R̸	R̸	R̸	↚	R̸	R̸	R̸	
81	R	R	R	R	R	G	R	G	
82	R̸	R̸	R	R	R	G	R	G	

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11	↚	↚	R̸	R̸	R̸	R̸	R̸	R̸	R̸
21,22	R	R	G	G	R	R	R	R	
31	R̸	R̸	R̸	R̸	↚	↚	R̸	R̸	R̸
41	R	R	R	R	R	R	G	G	R
42	R̸	R	R̸	R	R	R	G	G	R
51	↚	R̸	↚	R̸	R̸	R̸	R̸	R̸	R̸
61,62	R	G	R	G	R	R	R	R	
71,72	R̸	R̸	R̸	R̸	↚	↚	R̸	R̸	
81	R	R	R	R	R	G	R	G	
82	R̸	R̸	R	R	R	G	R	G	

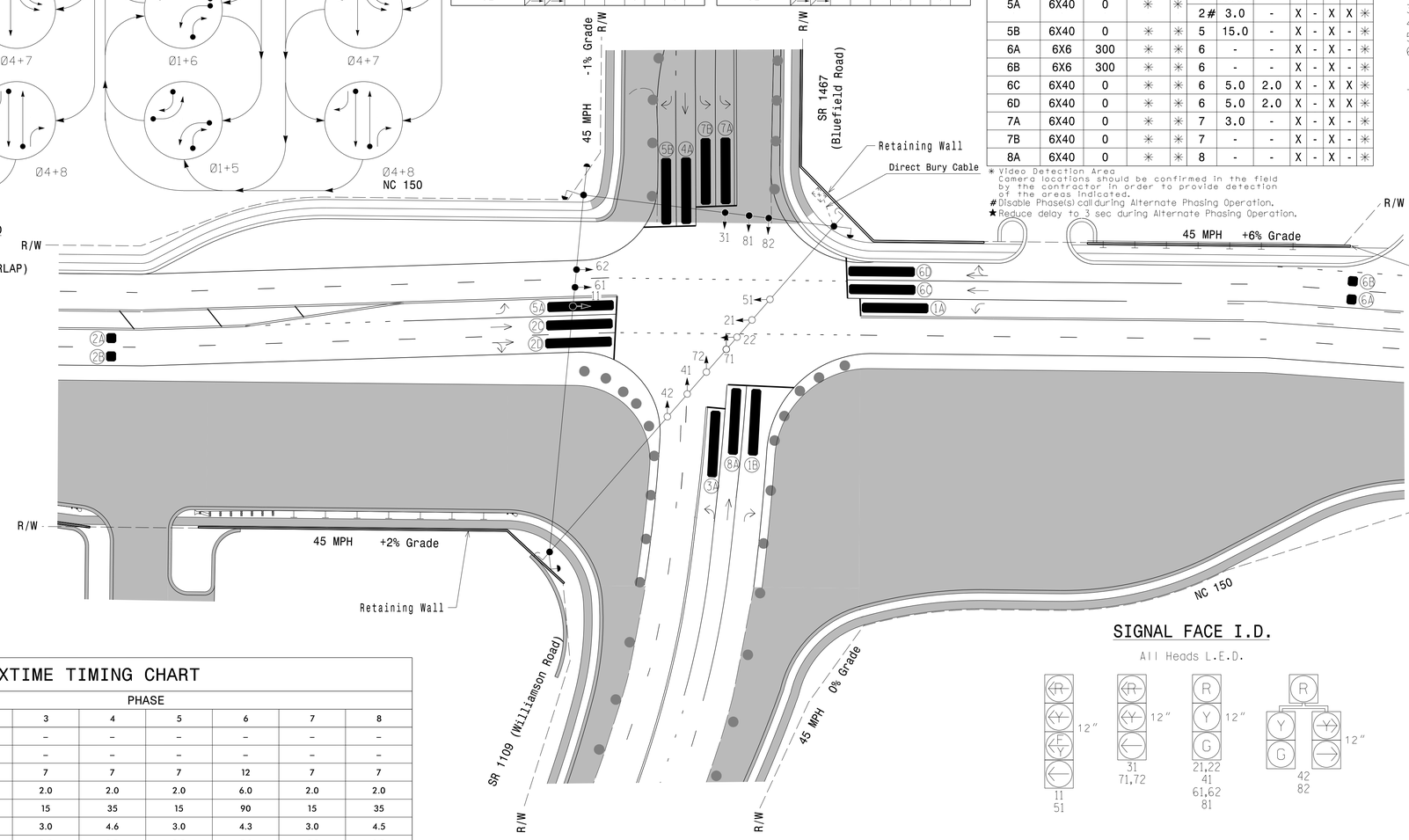
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	✳	✳	1	15.0★	-	X	-	X	-	✳
					6#	3.0	-	X	-	X	X	✳
1B	6X40	0	✳	✳	1	15.0	-	X	-	X	-	✳
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X6	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X6	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
3A	6X40	0	✳	✳	3	3.0	-	X	-	X	-	✳
4A	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	15.0★	-	X	-	X	-	✳
					2#	3.0	-	X	-	X	X	✳
5B	6X40	0	✳	✳	5	15.0	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
7A	6X40	0	✳	✳	7	3.0	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
8A	6X40	0	✳	✳	8	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.
Disable Phase(s) call during Alternate Phasing Operation.
★ Reduce delay to 3 sec during Alternate Phasing Operation.

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Reposition all existing signal heads.
6. The Division Traffic Engineer will determine the hours of use for each phasing plan.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Walk *	–	–	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–	–	–
Min Green	7	12	7	7	7	12	7	7
Passage *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max 1 *	15	90	15	35	15	90	15	35
Yellow Change	3.0	4.3	3.0	4.6	3.0	4.3	3.0	4.5
Red Clear	3.2	2.1	2.8	1.2	2.8	2.1	3.1	1.2
Added Initial *	–	–	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–	–	–
Time Before Reduction *	–	15	–	–	–	15	–	–
Time To Reduce *	–	30	–	–	–	30	–	–
Minimum Gap	–	3.0	–	–	–	3.0	–	–
Advance Walk	–	–	–	–	–	–	–	–
Non Lock Detector	X	X	X	X	X	X	X	X
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL	–	–
Dual Entry	–	–	–	–	–	–	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

SIGNAL FACE I.D.

All Heads L.E.D.

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Video Detection Area	N/A
	Construction Zone	N/A
	Drums	N/A

Signal Upgrade
Temporary Design 3 - TMP Phase II - Step 2

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Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

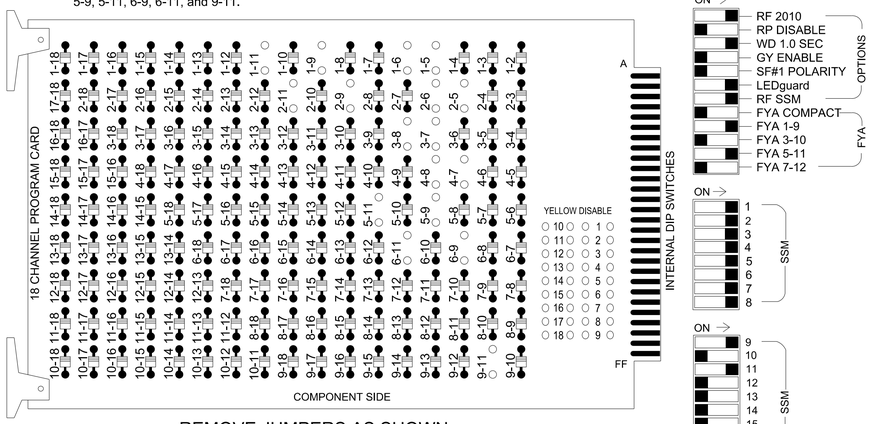
SIG. INVENTORY NO. 12-1233T3

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 41.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 3-7, 3-8, 4-7, 4-8, 5-9, 5-11, 6-9, 6-11, and 9-11.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1, S2, S4, S5, S7, S8, S10, S11, AUX S1, AUX S4
Phases Used.....1, 2, 3, 4, 5, 6, 7, 8
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4	S5	S6	S7		S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3	4	14	5		6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3	4	4 PED	5		6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11 ★	82	21,22	NU	31	41,42	NU	51 ★	42	61,62	NU	71,72	81,82	NU	11 ★	NU	NU	51 ★	NU	NU
RED	✳		128			101		✳		134			107							
YELLOW			129			102				135			108							
GREEN			130			103				136			109							
RED ARROW					116							122			A121			A114		
YELLOW ARROW		126			117				132			123			A122			A115		
FLASHING YELLOW ARROW															A123			A116		
GREEN ARROW	127	127			118			133	133			124								

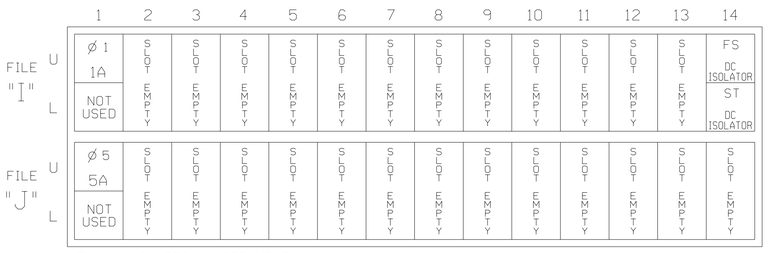
NU = Not Used

✳ Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)



EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1 *	1	15.0		X		X	
				-	29 *	6	3.0		X		X	X
5A	TB3-1,2	J1U	55	17	15 *	5	15.0		X		X	
				-	31 *	2	3.0		X		X	X

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

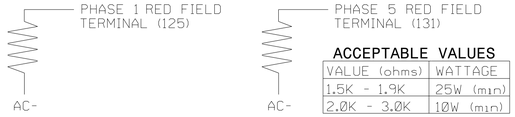
SPECIAL DETECTOR NOTE

Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

For Detection Zones 1A and 5A, the equipment placement is typical for a NCDOT installation. Inputs associated wtih these slots are compatible with alternate operation programming located on the following sheets of this electrical detail.

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)



ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1233T3
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 3 - TMP Phase II - Step 2
Electrical Detail - Sheet 1 of 2

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 at
SR 1467 (Bluefield Road)/
SR 1109 (Williamson Road)

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/GBS	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

STD. NUMBER NO. 12-1233T3

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 41.2

MAXTIME OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1	3
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	6
Modifier Phases	1	5
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	3	
Type	FYA 4 - Section	FYA 4 - Section	
Included Phases	-	-	← NOTICE INCLUDED PHASE
Modifier Phases	1	5	
Modifier Overlaps	-	-	
Trail Green	0	0	
Trail Yellow	0.0	0.0	
Trail Red	0.0	0.0	

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOPS 1A & 5A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

1A

Detector	Call Phase	Delay
1	1	3.0
29	0	-

5A

Detector	Call Phase	Delay
15	5	3.0
31	0	-

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP PLAN 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for heads 11 and 51 to run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

Disables phase 2 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3 seconds.

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1233T3
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 3 - TMP Phase II - Step 2
Electrical Detail - Sheet 2 of 2

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State of North Carolina
Traffic Engineering Branch
Traffic Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 at
SR 1467 (Bluefield Road)/
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Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/GBS	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. CALLOWAY

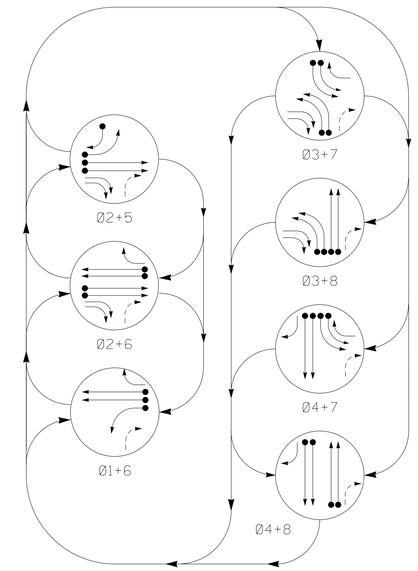
DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

STD. DRAWING NO. E-1233T3

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 42.0

7 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

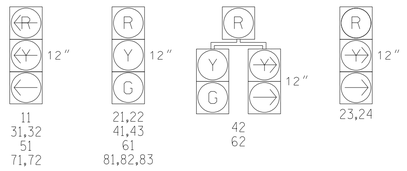
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 01+06	02+06	02+05	03+07	03+08	04+07	04+08	FLASH
11	←~~R~~	←~~R~~	←~~R~~	←~~R~~	←~~R~~	←~~R~~	←~~R~~	←~~R~~
21,22	R	G	G	R	R	R	R	R
23,24	R	→	→	→	→	R	R	R
31,32	←~~R~~	←~~R~~	←~~R~~	←	←	←~~R~~	←~~R~~	←~~R~~
41,43	R	R	R	R	R	G	G	R
42	R	R	R/	R	R	G	G	R
51	←~~R~~	←~~R~~	←	←~~R~~	←~~R~~	←~~R~~	←~~R~~	←~~R~~
61	G	G	R	R	R	R	R	R
62	G	G	R	R/	R	R/	R	R
71,72	←~~R~~	←~~R~~	←~~R~~	←	←~~R~~	←	←~~R~~	←~~R~~
81,82,83	R	R	R	R	G	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



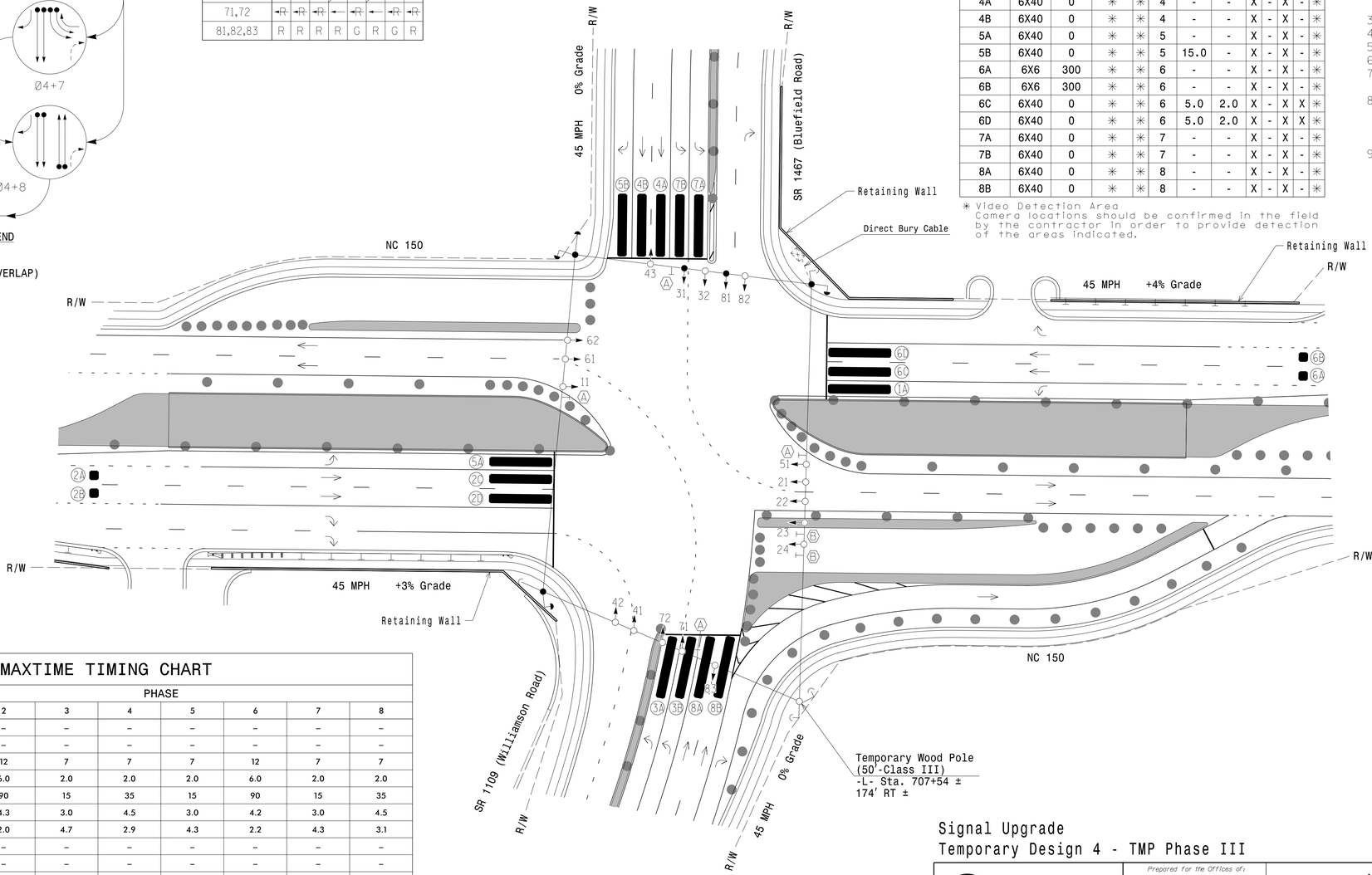
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	✳	✳	1	-	-	X	-	X	-	✳
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
3A	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
3B	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
4A	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
4B	6X40	0	✳	✳	4	-	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	-	-	X	-	X	-	✳
5B	6X40	0	✳	✳	5	15.0	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6D	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
7A	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
8A	6X40	0	✳	✳	8	-	-	X	-	X	-	✳
8B	6X40	0	✳	✳	8	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 may lag.
4. Phase 5 may lead.
5. Phase 3 and/or phase 7 may be lagged.
6. Reposition all existing signal heads.
7. Set all detector units to presence mode.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Field adjust temporary poles as needed.



LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Video Detection Area	N/A
	Construction Zone	N/A
	Drums	N/A
A	No U-Turn Sign (R3-4)	A
B	"NO TURN ON RED" Sign (R10-11)	B

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Walk *	–	–	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–	–	–
Min Green	7	12	7	7	7	12	7	7
Passage *	2.0	6.0	2.0	2.0	2.0	6.0	2.0	2.0
Max 1 *	15	90	15	35	15	90	15	35
Yellow Change	3.0	4.3	3.0	4.5	3.0	4.2	3.0	4.5
Red Clear	4.4	2.0	4.7	2.9	4.3	2.2	4.3	3.1
Added Initial *	–	–	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–	–	–
Time Before Reduction *	–	15	–	–	–	15	–	–
Time To Reduce *	–	30	–	–	–	30	–	–
Minimum Gap	–	3.0	–	–	–	3.0	–	–
Advance Walk	–	–	–	–	–	–	–	–
Non Lock Detector	X	X	X	X	X	X	X	X
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL	–	–
Dual Entry	–	–	–	–	–	–	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

Signal Upgrade
Temporary Design 4 - TMP Phase III

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Prepared for the Offices of:
Transportation Mobility and Safety Division
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 at
SR 1467 (Bluefield Road)/
SR 1109 (Williamson Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

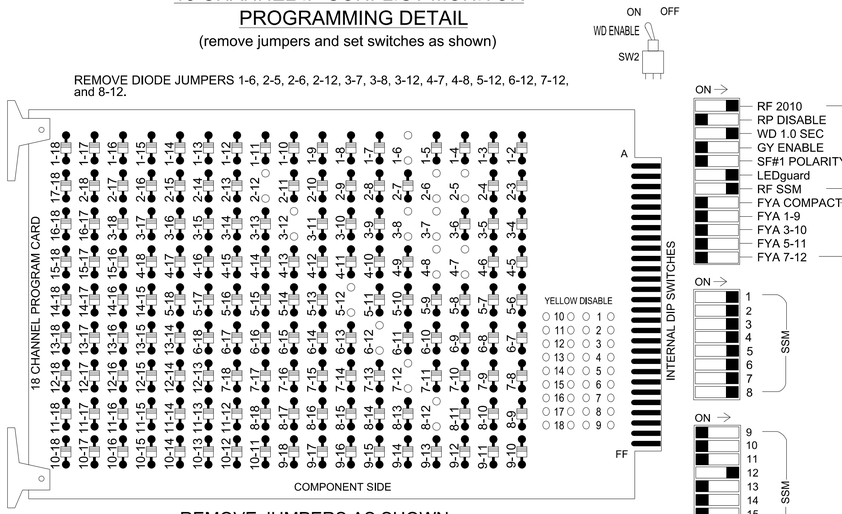
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B4084B46E... DATE

SIG. INVENTORY NO. T2-1233T4

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 42.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L														ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L														

EX. : 1A, 2A, ETC. = LOOP NO.'S

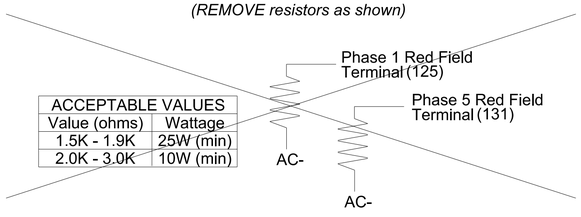
FS = FLASH SENSE
ST = STOP TIME

DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer -approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

LOAD RESISTOR INSTALLATION DETAIL

(REMOVE resistors as shown)



ACCEPTABLE VALUES	
Value (ohms)	Wattage
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Return controller to Factory Defaults before programming per this electrical detail.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1, S2, S4, S5, S7, S8, S10, S11, AUX S5
Phases Used.....1, 2, 3, 4, 5, 6, 7, 8
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....*

*See overlap programming detail on this sheet

LEAD-LAG PROGRAMMING

Front Panel
Main Menu >Controller >Sequence & Phs Config >Sequences

Web Interface
Home >Controller >Sequence

Sequence 1

Ring	Sequence Data
1	1,2,a,3,4,b
2	6,5,a,7,8,b

Front Panel
Main Menu >Controller >Sequence & Phs Config >No Served Phase Plans

Web Interface
Home >Controller >Phase Configuration >No Served Phase Plans

Sequence 1

Phase	No Serve Phase
1	5
5	1

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7		S8	S9	S10		S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5		6	15	7		8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5		6	6 PED	7		8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11	21,22	NU	31,32	41,42 43	NU	51	42	61,62	NU	71,72	62	81,82 83	NU	NU	NU	NU	NU	23,24	NU
RED		128			101				134				107						A101	
YELLOW		129			102				135				108							
GREEN		130			103				136				109							
RED ARROW	125			116		131					122									
YELLOW ARROW	126			117		132	132				123	123							A102	
FLASHING YELLOW ARROW																				
GREEN ARROW	127			118		133	133				124	124							A103	

NU = Not Used

OVERLAP PROGRAMMING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	4
Type	Normal
Included Phases	2,3
Modifier Phases	-
Modifier Overlaps	-
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1233T4
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 4 - TMP Phase III
Electrical Detail

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PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/GBS	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

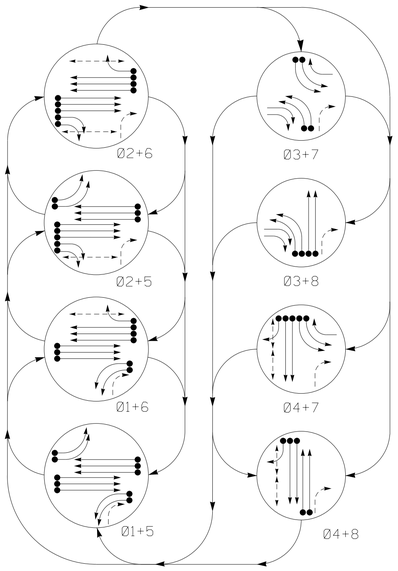
DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

STD. NUMBER NO. E-1233T4

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 43.0

8 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

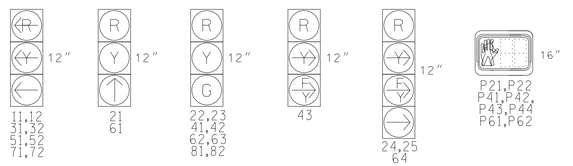
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø3+7	Ø3+8	Ø4+7	Ø4+8	FLASH
11,12	←	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
21	↑	↑	↑	↑	R	R	R	R	R
22,23	G	G	G	G	R	R	R	R	R
24,25	R	R	F	F	→	→	R	R	R
31,32	~~R~~	~~R~~	~~R~~	~~R~~	←	←	~~R~~	~~R~~	~~R~~
41,42	R	R	R	R	R	R	G	G	R
43	R	R	R	R	R	R	F	F	R
51,52	←	~~R~~	←	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~	~~R~~
61	↑	↑	↑	↑	R	R	R	R	R
62,63	G	G	G	G	R	R	R	R	R
64	R	F	R	F	→	R	→	R	R
71,72	~~R~~	~~R~~	~~R~~	~~R~~	←	~~R~~	←	~~R~~	~~R~~
81,82	R	R	R	R	R	G	R	G	R
P21,P22	DW	DW	W	W	DW	DW	DW	DW	DRK
P41,P42, P43,P44	DW	DW	DW	DW	DW	DW	W	W	DRK
P61,P62	DW	W	DW	W	DW	DW	DW	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



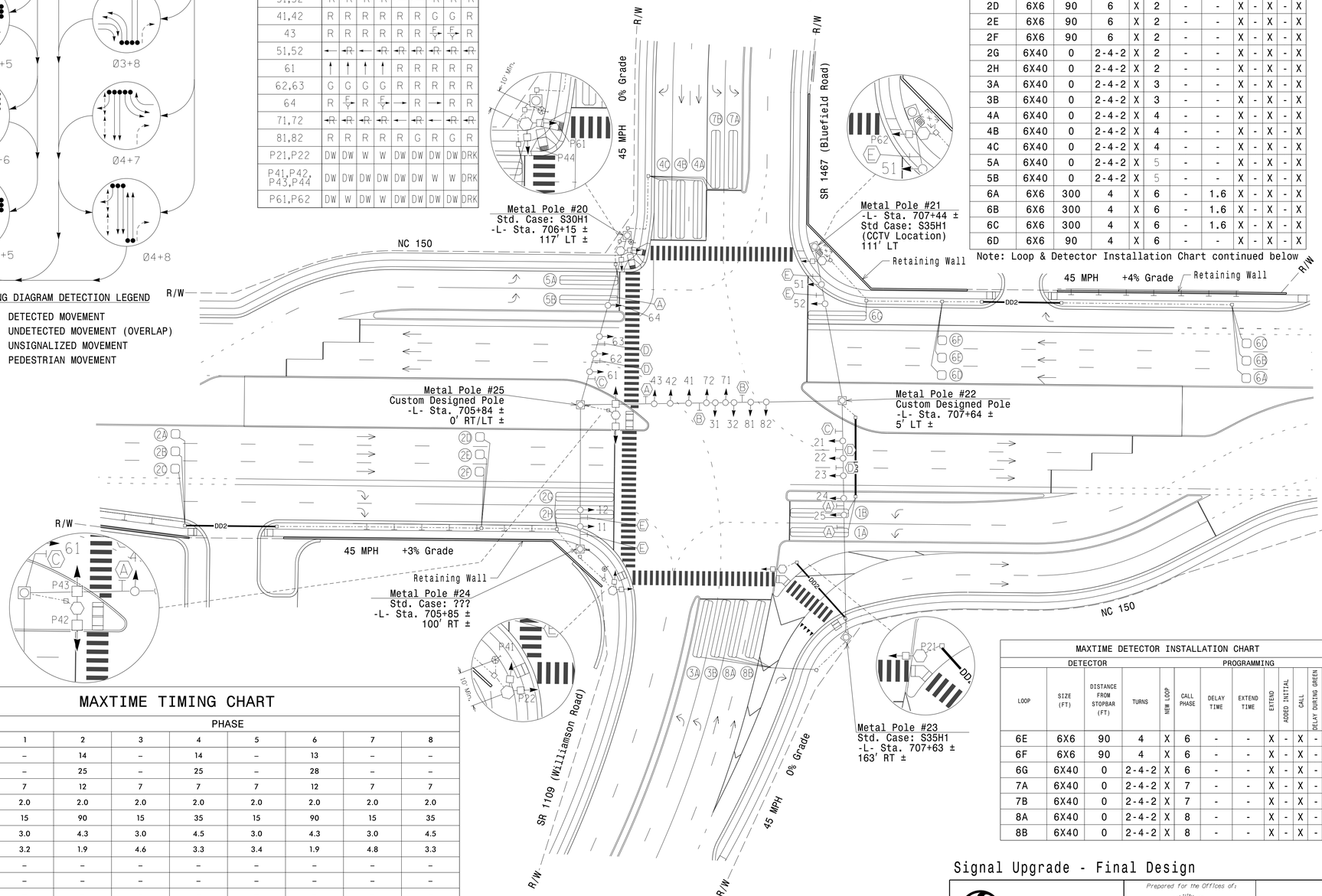
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR				PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	2-4-2	X	1	-	-	X	-	X	-	X
1B	6X40	0	2-4-2	X	1	-	-	X	-	X	-	X
2A	6X6	300	6	X	2	-	1.6	X	-	X	-	X
2B	6X6	300	6	X	2	-	1.6	X	-	X	-	X
2C	6X6	300	6	X	2	-	1.6	X	-	X	-	X
2D	6X6	90	6	X	2	-	-	X	-	X	-	X
2E	6X6	90	6	X	2	-	-	X	-	X	-	X
2F	6X6	90	6	X	2	-	-	X	-	X	-	X
2G	6X40	0	2-4-2	X	2	-	-	X	-	X	-	X
2H	6X40	0	2-4-2	X	2	-	-	X	-	X	-	X
3A	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
3B	6X40	0	2-4-2	X	3	-	-	X	-	X	-	X
4A	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
4C	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
5A	6X40	0	2-4-2	X	5	-	-	X	-	X	-	X
5B	6X40	0	2-4-2	X	5	-	-	X	-	X	-	X
6A	6X6	300	4	X	6	-	1.6	X	-	X	-	X
6B	6X6	300	4	X	6	-	1.6	X	-	X	-	X
6C	6X6	300	4	X	6	-	1.6	X	-	X	-	X
6D	6X6	90	4	X	6	-	-	X	-	X	-	X

Note: Loop & Detector Installation Chart continued below

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Set all detector units to presence mode.
6. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
7. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.
10. Tether all signal heads.



MAXTIME TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6	7	8
Walk *	–	14	–	14	–	13	–	–
Ped Clear *	–	25	–	25	–	28	–	–
Min Green	7	12	7	7	7	12	7	7
Passage *	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Max 1 *	15	90	15	35	15	90	15	35
Yellow Change	3.0	4.3	3.0	4.5	3.0	4.3	3.0	4.5
Red Clear	3.2	1.9	4.6	3.3	3.4	1.9	4.8	3.3
Added Initial *	–	–	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–	–	–
Time Before Reduction *	–	–	–	–	–	–	–	–
Time To Reduce *	–	–	–	–	–	–	–	–
Minimum Gap	–	–	–	–	–	–	–	–
Advance Walk	–	7	–	7	–	6	–	–
Non Lock Detector	X	–	X	X	X	–	X	X
Vehicle Recall	–	MIN RECALL	–	–	–	MIN RECALL	–	–
Dual Entry	–	–	–	–	–	–	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

MAXTIME DETECTOR INSTALLATION CHART

DETECTOR				PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
6E	6X6	90	4	X	6	-	-	X	-	X	-	X
6F	6X6	90	4	X	6	-	-	X	-	X	-	X
6G	6X40	0	2-4-2	X	6	-	-	X	-	X	-	X
7A	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
7B	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
8A	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X
8B	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▯↓	Pedestrian Signal Head With Push Button & Sign	■↓
○	Signal Pole with Guy	●
○↓	Signal Pole with Sidewalk Guy	●↓
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·····	2-in Underground Conduit	·····
N/A	Right of Way	———
→	Directional Arrow	→
○	Metal Strain Pole	◘
—DD#—	Directional Drill (#) x 2" Conduit	N/A
OS	Oversized Junction Box	■
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	No U-Turn Sign (R3-4)	Ⓑ
Ⓒ	No Left/No U-Turn Sign (R3-18)	Ⓒ
Ⓓ	Through Arrow "ONLY" Sign (R3-5A)	Ⓓ
Ⓔ	Left Arrow "ONLY" Sign (R3-5L)	Ⓔ

Signal Upgrade - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 at
SR 1467 (Bluefield Road)/
SR 1109 (Williamson Road)

Division 12 | Iredell County | Mooresville

PLAN DATE: May 2024 | REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright | REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

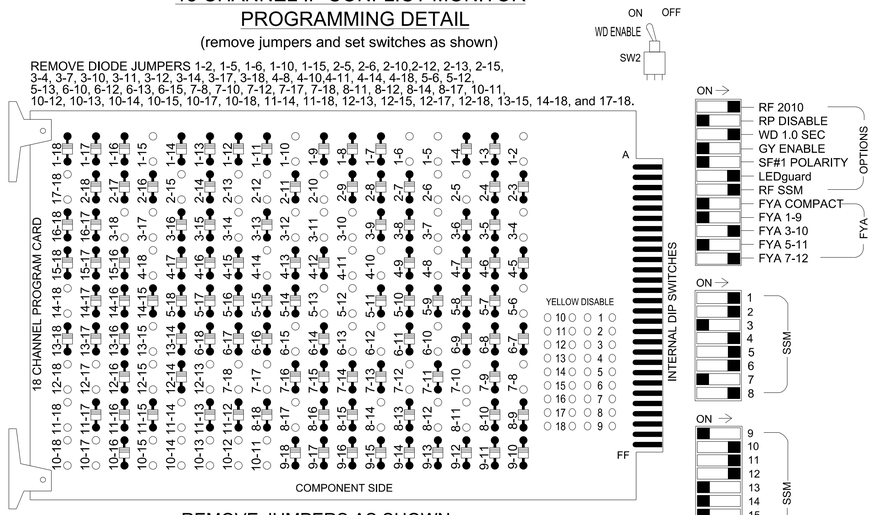
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-1233

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS 1-2, 1-5, 1-6, 1-10, 1-15, 2-5, 2-6, 2-10,2-12, 2-13, 2-15, 3-4, 3-7, 3-10, 3-11, 3-12, 3-14, 3-17, 3-18, 4-8, 4-10,4-11, 4-14, 4-18, 5-6, 5-12, 5-13, 6-10, 6-12, 6-13, 6-15, 7-8, 7-10, 7-12, 7-17, 7-18, 8-11, 8-12, 8-14, 8-17, 10-11, 10-12, 10-13, 10-14, 10-15, 10-17, 10-18, 11-14, 11-18, 12-13, 12-15, 12-17, 12-18, 13-15, 14-18, and 17-18.



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1, S2, S3, S4, S5, S6, S7, S8, S9
S10, S11, AUX S2, AUX S3, AUX S4
AUX S5, AUX S6
Phases Used.....1, 2, 2PED, 3, 4, 4PED, 5, 6, 6PED, 7, 8
Overlap "1".....NOT USED
Overlap "2".....*
Overlap "3".....*
Overlap "4".....*
Overlap "7".....*
Overlap "8".....*
Overlap "9".....*
Overlap "10".....*

*See overlap programming detail on sheet 2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 43.1

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2		S3	S4	S5	S6	S7	S8		S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2		13	3	4	14	5	6		15	7	8	16	9	10	17	11	12	18
PHASE	1	OL9		2 PED	OL7	4	4 PED	5	OL10		6 PED	OL8	8	8 PED	OL1	OL2	3	OL3	OL4	7
SIGNAL HEAD NO.	11,12	21	22,23	P21, P22	64★	41,42	P41,P42 P43,P44	51,52	61	62,63	P61, P62	24,25★	81,82	NU	NU	64★	31,32	43★	24,25★	71,72
RED		128	128			101			134	134			107			A124		A114	A101	
YELLOW		129	129		*	102			135	135		*	108							
GREEN			130			103				136			109							
RED ARROW	125							131									A111			A104
YELLOW ARROW	126							132								A125	A112	A115	A102	A105
FLASHING YELLOW ARROW																A126		A116	A103	
GREEN ARROW	127	130			118			133	136			124					A113			A106
✋				113			104				119									
🚶				115			106				121									

NU = Not Used
* Denotes install load resistor. See load resistor installation detail this sheet.
★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I" U	Ø1 1A	Ø2 2A	Ø2 2C	Ø2 2E	Ø3 3A	Ø4 4A	Ø4 4C	SLOT EMPTY	Ø2 2G	SLOT EMPTY	SLOT EMPTY	Ø2 PED DC ISOLATOR	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
FILE "I" L	Ø1 1B	Ø2 2B	Ø2 2D	Ø2 2F	Ø3 3B	Ø4 4B	NOT USED		Ø2 2H			Ø4 PED DC ISOLATOR	NOT USED	ST DC ISOLATOR
FILE "J" U	Ø5 5A	Ø6 6A	Ø6 6C	Ø6 6E	Ø7 7A	Ø8 8A	SLOT EMPTY	SLOT EMPTY	Ø6 6G	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
FILE "J" L	Ø5 5B	Ø6 6B	Ø6 6D	Ø6 6F	Ø7 7B	Ø8 8B			NOT USED			SLOT EMPTY	SLOT EMPTY	SLOT EMPTY

EX.: 1A, 2A, ETC. = LOOP NO.'S

FS = FLASH SENSE
ST = STOP TIME

INPUT FILE CONNECTION & PROGRAMMING CHART

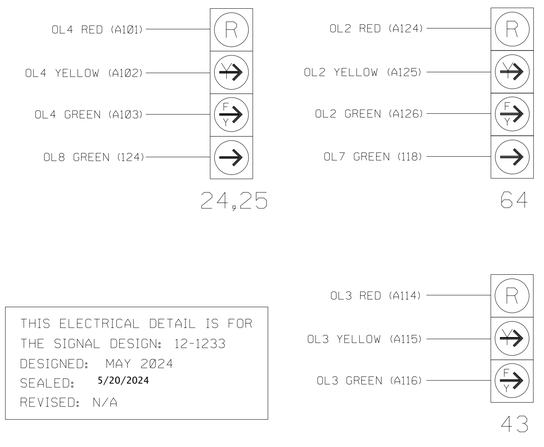
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1	1			X		X	
1B	TB2-3,4	I1L	56	18	1	1			X		X	
2A	TB2-5,6	I2U	39	1	2	2		1.6	X		X	
2B	TB2-7,8	I2L	43	5	3	2		1.6	X		X	
2C	TB2-9,10	I3U	63	29	4	2		1.6	X		X	
2D	TB2-11,12	I3L	76	42	5	2			X		X	
2E	TB4-1,2	I4U	47	9	6	2			X		X	
2F	TB4-3,4	I4L	47	9	6	2			X		X	
2G	TB6-9,10	I9U	60	22	13	2			X		X	
2H	TB6-11,12	I9L	62	24	14	2			X		X	
3A	TB4-5,6	I5U	58	20	7	3			X		X	
3B	TB4-7,8	I5L	58	20	7	3			X		X	
4A	TB4-9,10	I6U	41	3	8	4			X		X	
4B	TB4-11,12	I6L	45	7	9	4			X		X	
4C	TB6-1,2	I7U	65	31	10	4			X		X	
5A	TB3-1,2	J1U	55	17	15	5			X		X	
5B	TB3-3,4	J1L	55	17	15	5			X		X	
6A	TB3-5,6	J2U	40	2	16	6		1.6	X		X	
6B	TB3-7,8	J2L	44	6	17	6		1.6	X		X	
6C	TB3-9,10	J3U	64	30	18	6		1.6	X		X	
6D	TB3-11,12	J3L	77	43	19	6			X		X	
6E	TB5-1,2	J4U	48	10	20	6			X		X	
6F	TB5-3,4	J4L	48	10	20	6			X		X	
6G	TB7-9,10	J9U	59	21	27	6			X		X	
7A	TB5-5,6	J5U	57	19	21	7			X		X	
7B	TB5-7,8	J5L	57	19	21	7			X		X	
8A	TB5-9,10	J6U	42	4	22	8			X		X	
8B	TB5-11,12	J6L	46	8	23	8			X		X	
PED PUSH BUTTONS												
P21,P22	TB8-4,6	I12U	67	33	2	PED 2						
P41,P42,P43,P44	TB8-5,6	I12L	69	35	4	PED 4						
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						

NOTE:
INSTALL DC ISOLATORS IN INPUT FILE SLOTS I12 AND I13.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

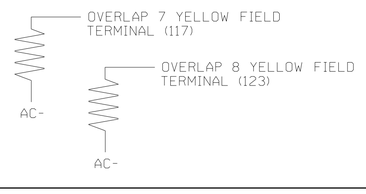


THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1233
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

ACCEPTABLE VALUES	
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)



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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Traffic Engineering Branch
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 at
SR 1467 (Bluefield Road) /
SR 1109 (Williamson Road)

Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/GBS	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

STD. INTERSECTION NO. 12-1233

Final Design
Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

OUTPUT CHANNEL CONFIGURATION

Front Panel
Main Menu >Controller >More>Channels>Channels Config

Web Interface
Home >Controller >Advanced IO>Channels>Channels Configuration

Channel Configuration

	Channel	Control Type	Control Source	Flash Yellow	Flash Red	Flash Alt	MMU Channel
	1	Phase Vehicle	1		X	X	1
NOTE ➡	2	Overlap	9		X		2
NOTE ➡	3	Overlap	7		X	X	3
	4	Phase Vehicle	4		X		4
	5	Phase Vehicle	5		X		5
NOTE ➡	6	Overlap	10		X	X	6
NOTE ➡	7	Overlap	8		X		7
	8	Phase Vehicle	8		X	X	8
	9	Overlap	1		X	X	9
	10	Overlap	2		X	X	10
	11	Overlap	3		X		11
	12	Overlap	4		X		12
	13	Phase Ped	2				13
	14	Phase Ped	4				14
	15	Phase Ped	6				15
	16	Phase Ped	8				16
NOTE ➡	17	Phase Vehicle	3		X	X	17
NOTE ➡	18	Phase Vehicle	7		X		18

MAXTIME OVERLAP PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	2	3	4	7	8	9	10
Type	FYA 4 - Section	FYA 4 - Section	FYA 4 - Section	Normal	Normal	Normal	Normal
Included Phases	6	4	2	7	3	1,2	5,6
Modifier Phases	-	-	-	-	-	-	-
Modifier Overlaps	7	-	8	-	-	-	-
Trail Green	0	0	0	0	0	0	0
Trail Yellow	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Trail Red	0.0	0.0	0.0	0.0	0.0	0.0	0.0

COUNTDOWN PEDESTRIAN SIGNAL OPERATION

Countdown Ped Signals are required to display timing only during Ped Clearance Interval. Consult Ped Signal Module user's manual for instructions on selecting this feature.

FLASHER CIRCUIT MODIFICATION DETAIL

IN ORDER TO INSURE THAT SIGNALS FLASH CONCURRENTLY ON THE SAME APPROACH, MAKE THE FOLLOWING FLASHER CIRCUIT CHANGES:

1. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-4 AND TERMINATE ON T2-2.
2. ON REAR OF PDA - REMOVE WIRE FROM TERM. T2-5 AND TERMINATE ON T2-3.
3. REMOVE FLASHER UNIT 2.

THE CHANGES LISTED ABOVE TIES ALL PHASES AND OVERLAPS TO FLASHER UNIT 1.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1233
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
State of North Carolina Department of Transportation
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 at
SR 1467 (Bluefield Road) /
SR 1109 (Williamson Road)

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: G B Spell REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

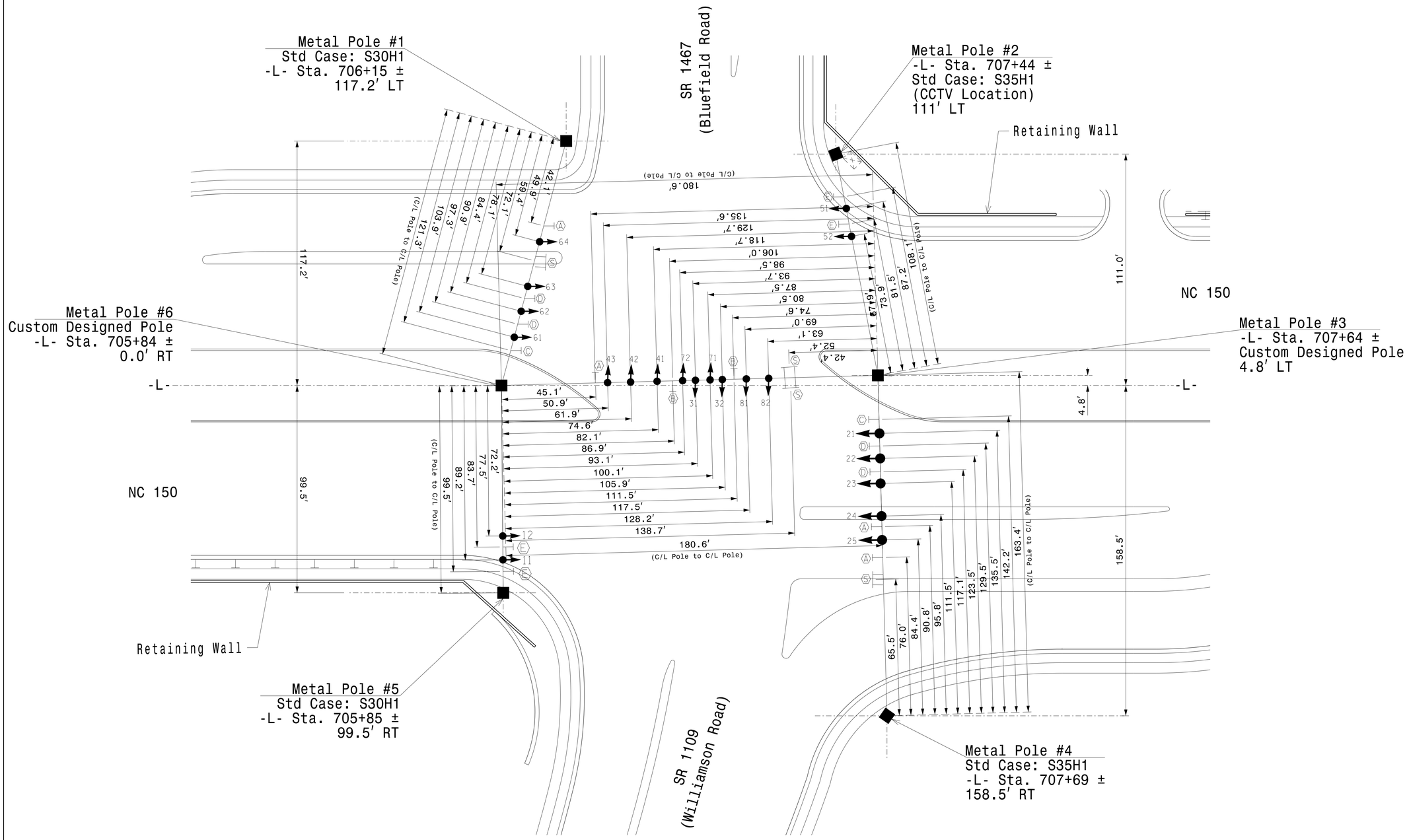
SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
DATE
10D1E2B40B4B46E...

SIG. INVENTORY NO. 12-1233

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 43.3

Design Loading for METAL STRAIN POLE NO. 3 & 6



LOADING DIAGRAM for 12-1233 NCDOT Wind Zone 5 (110 mph)

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Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE: 0 N/A

NC 150
at
SR 1467 (Bluefield Road)/
SR 1109 (Williamson Road)
Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1233

$$$$$$$YSDATE$$$$$$
8:44:16 AM
C:\Users\jhambright\Desktop\Design\Metal Poles\Loading Diagrams\Strain Poles\12-1233_Metal Strain Poles_12-1233_Loading Diagram.dgn
User:jgalloway

SPECIAL NOTE

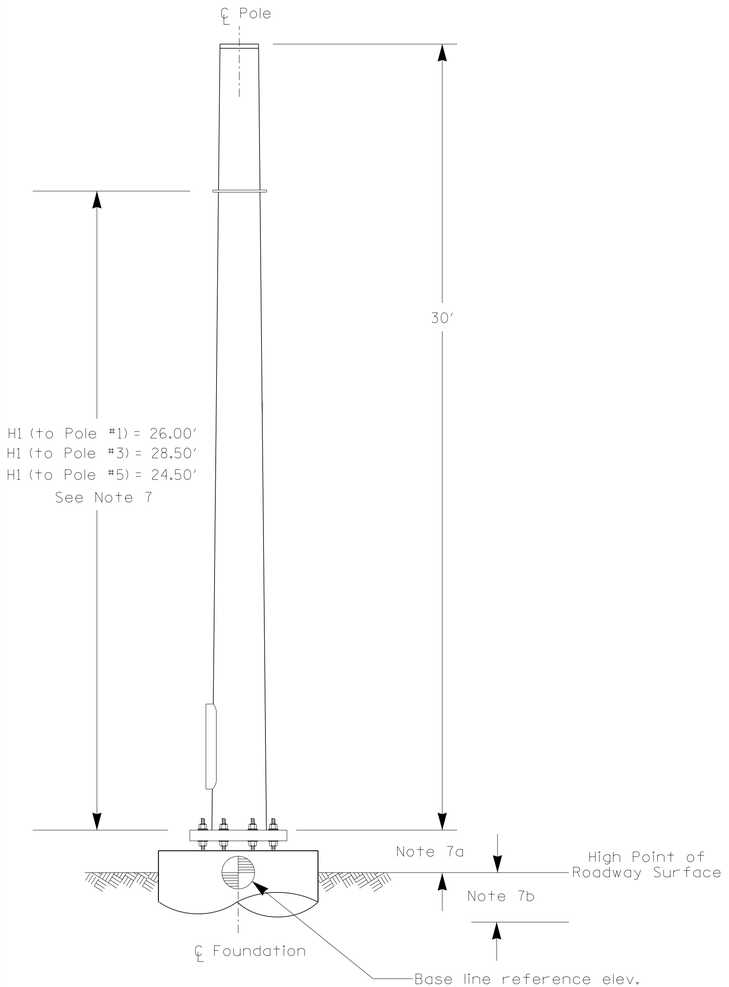
The contractor is responsible for verifying that the attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Span Wire Attachment (H1)

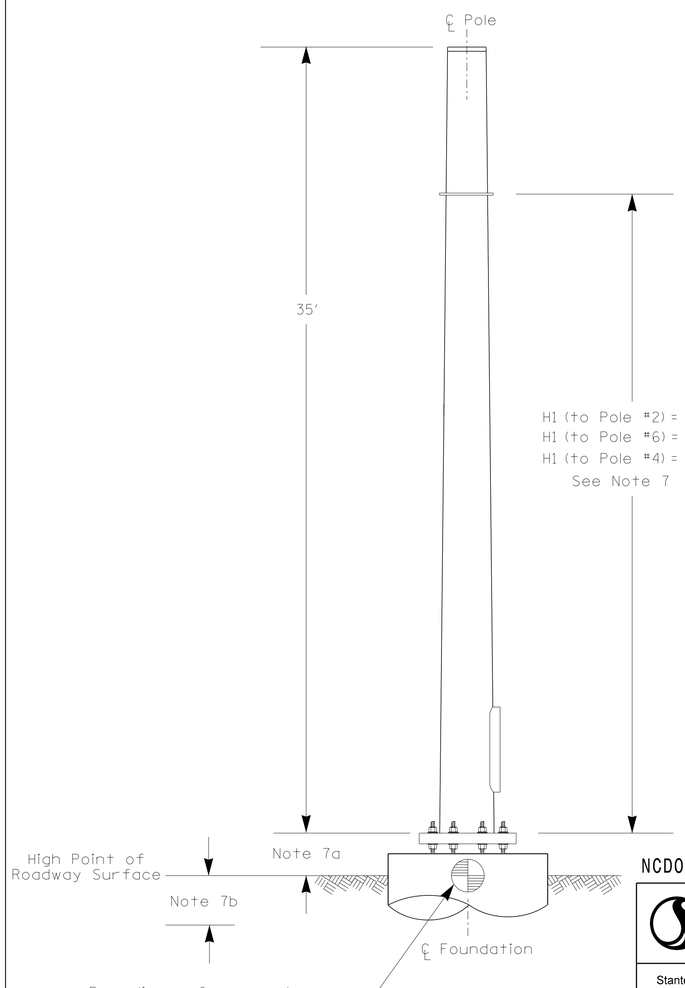
Elevation Differences for:	Pole 3	Pole 6
Baseline reference point at ℄ Foundation @ ground level	894.96′ ft.	
Elevation difference at high point of roadway surface to Pole #2	- 0.58 ft.	
Elevation difference at high point of roadway surface to Pole #6	+ 2.76 ft.	
Elevation difference at high point of roadway surface to Pole #4	- 0.46 ft.	
Baseline reference point at ℄ Foundation @ ground level		897.92 ft.
Elevation difference at high point of roadway surface to Pole #1		- 0.69 ft.
Elevation difference at high point of roadway surface to Pole #3		- 0.20 ft.
Elevation difference at high point of roadway surface to Pole #5		- 0.74 ft.

NOTE: SEE SHEET SIG-43.3 FOR INTERSECTION LOADING DIAGRAM

Elevation View - Strain Pole #6



Elevation View - Strain Pole #3



METAL STRAIN POLE No. 3 and 6

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 43.4

STRAIN POLE LOADING SCHEDULE

SIGNAL HEAD NUMBER	LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
24, 25, 64		SIGNAL HEAD 12"-4 SECTION-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER	11.5 S.F.	25.5"W X 66.0"L	74 LBS
11, 12, 21, 22, 23 31, 32, 41, 42, 43 51, 52, 61, 62, 63 71, 72, 81, 82		SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER	9.3 S.F.	25.5"W X 52.5"L	60 LBS
(A)(B)(C)(D)(E)		SIGN WITH HANGER	7.5 S.F.	30.0"W X 36.0"L	14 LBS
(S)		STREET NAME SIGN WITH HANGER	16.0 S.F.	24.0"W X 96.0"L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2024 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/Specifications/Pages/default.aspx

DESIGN REQUIREMENTS

2. Fabricate Metal Strain Poles #3 & #6 using design loadings shown. The contractor may revise attachment heights and radial orientations of wire entrances with the approval of the Engineer. Any modifications to the original location of accessories must be reflected on the shop drawings when they are submitted for review and approval.

3. All signal heads are to be tethered at the bottom of the signal head housing.

4. Design a drilled pier foundation that conforms to the requirements of ITSS Project Special Provisions (Version 18.2) included with and as part of these plans.

5. Comply with NEC code 230.2(E) concerning service equipment disconnect.

6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.

7. The attachment height (H1) shown is based on the following design assumptions:

   a. The top of the pole base plate is 0.75 feet above the ground elevation.
   b. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway below the spans between adjacent pole attachment points.

8. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.

9. The contractor is responsible for verifying that the attachment heights shown will allow for proper positioning of the signal heads over the roadway.

10. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 5 (110 mph)

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE 0 N/A

NC 150
at
SR 1467 (Bluefield Road)/
SR 1109 (Williamson Road)

Division 12 | Iredell County | Mooresville

PLAN DATE: May 2024 | REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright | REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

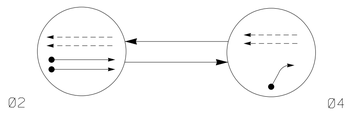
DocuSigned by: Jason Galloway 10D1E2B40B4B46E... 5/20/2024 DATE

SIG. INVENTORY NO. 12-1233

$$$$$$$SYSDATE$$$$$$
01:44:19 AM
User:rmuncey
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 44.0

PHASING DIAGRAM



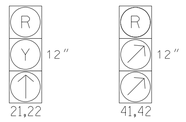
PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø2	PHASE Ø4	PHASE FLASH
21,22	↑	R	R
41,42	R	↗	R

SIGNAL FACE I.D.

All Heads L.E.D.



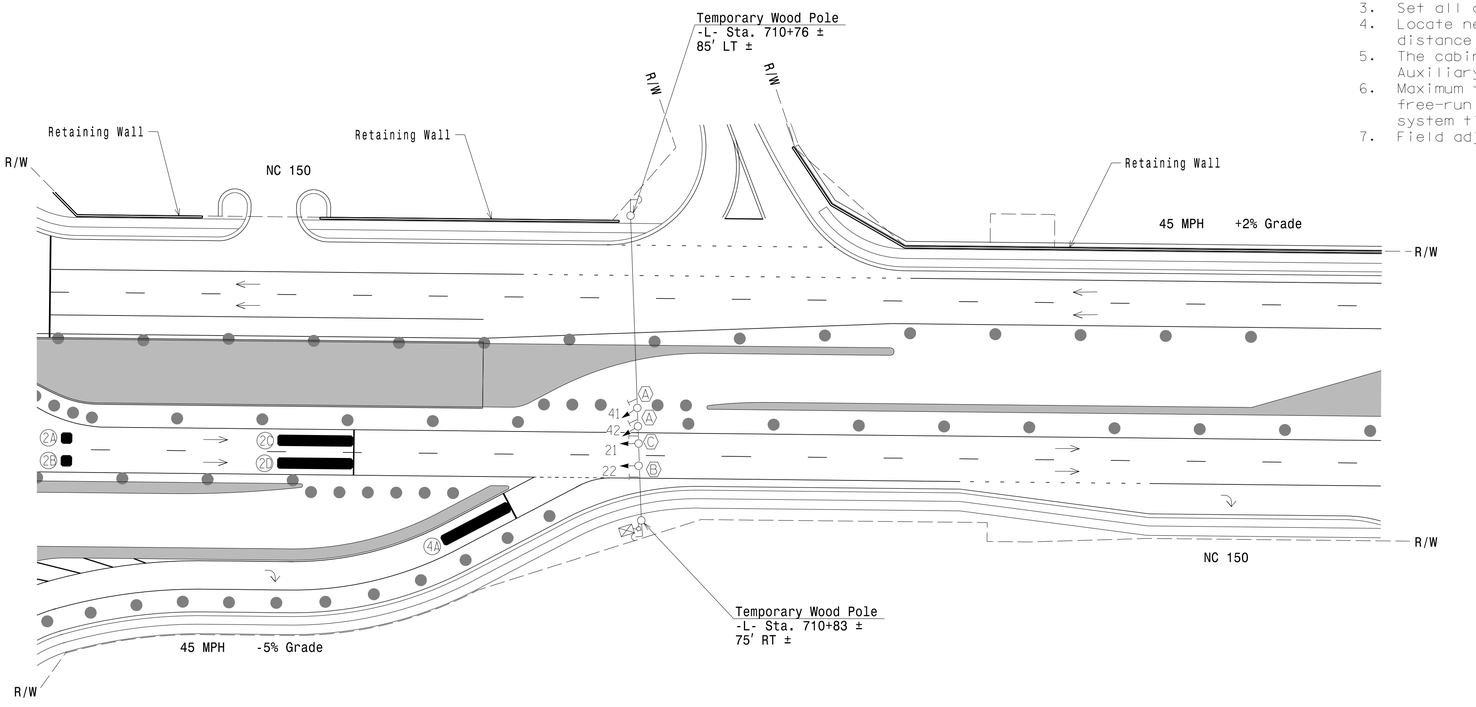
MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	137	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	137	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
4A	6X40	0	✳	✳	4	-	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

2 Phase
Fully Actuated
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
5. The cabinet should be designed to include an Auxiliary Output File for future use.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Field adjust temporary poles as needed.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○→	Signal Pole with Guy	●→
○↓	Signal Pole with Sidewalk Guy	●↓
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
-----	2-in Underground Conduit	-----
N/A	Right of Way	-----
→	Directional Arrow	→
▬	Video Detection Area	N/A
▬	Construction Zone	N/A
● ● ●	Drums	N/A
Ⓐ	"NO TURN ON RED" Sign (R10-11)	Ⓐ
Ⓑ	No Right Turn Sign (R3-1)	Ⓑ
Ⓒ	No Left Turn Sign (R3-2)	Ⓒ

MAXTIME TIMING CHART		
FEATURE	PHASE 2	PHASE 4
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	5.0	3.8
Red Clear	2.6	2.0
Added Initial *	–	–
Maximum Initial *	–	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.0	–
Advance Walk	–	–
Non Lock Detector	X	X
Vehicle Recall	MIN RECALL	–
Dual Entry	–	–

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 2 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

New Installation
Temporary Design 1 - TMP Phase III

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Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy,Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 EB
at SR 1109 (Williamson Road)
CFI Crossover

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Hambright	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

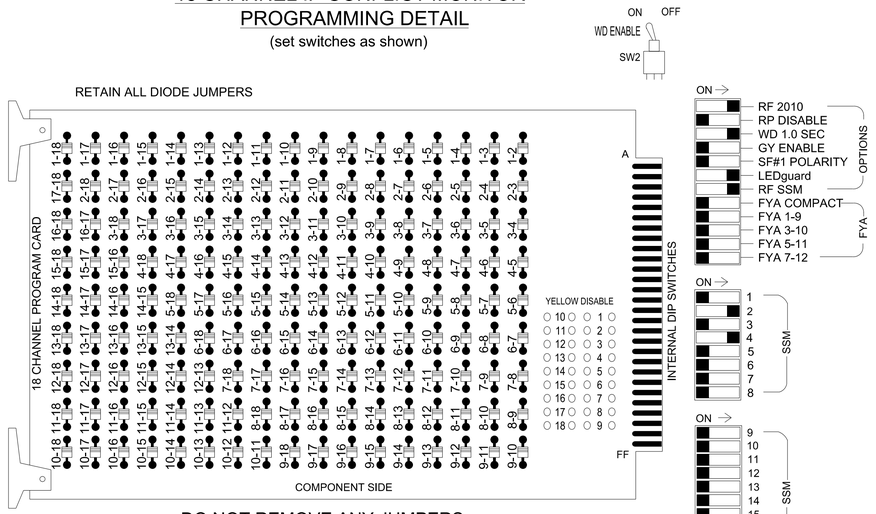
SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1840T1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(set switches as shown)



DO NOT REMOVE ANY JUMPERS

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program controller to start up in phase 2 Green No Walk and 6 Phase Not On.
3. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
4. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 44.1

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22	NU	NU	41,42	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101													
YELLOW		129																
GREEN																		
RED ARROW																		
YELLOW ARROW					102													
GREEN ARROW		130			103													

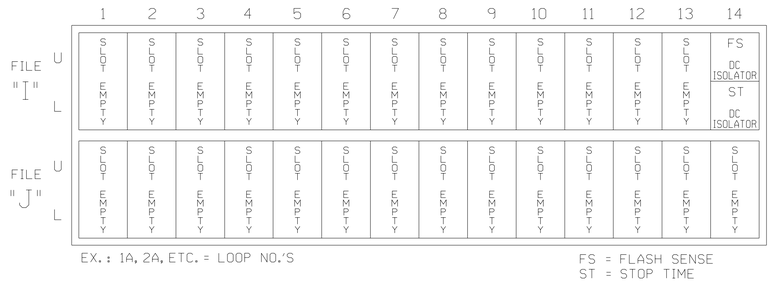
NU = Not Used

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2, S5
Phases Used.....2, 4
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

INPUT FILE POSITION LAYOUT

(front view)



SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1840T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 1 - TMP Phase III
Electrical Detail

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at SR 1109 (Williamson Road)
CFI Crossover

Division 12 | Iredell County | Mooresville

PLAN DATE: May 2024 | REVIEWED BY: J Galloway, PE
PREPARED BY: J Galloway, PE | REVIEWED BY: R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E... DATE

STD. INVENTORY NO. 12-1840TI

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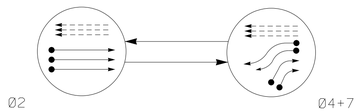
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 45.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

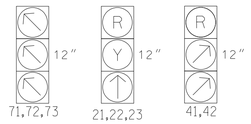
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø4+7	PHASE FLASH
21,22,23	↑	R	R
41,42	R	↗	R
71,72,73	~~R~~	↘	~~R~~

SIGNAL FACE I.D.

All Heads L.E.D.



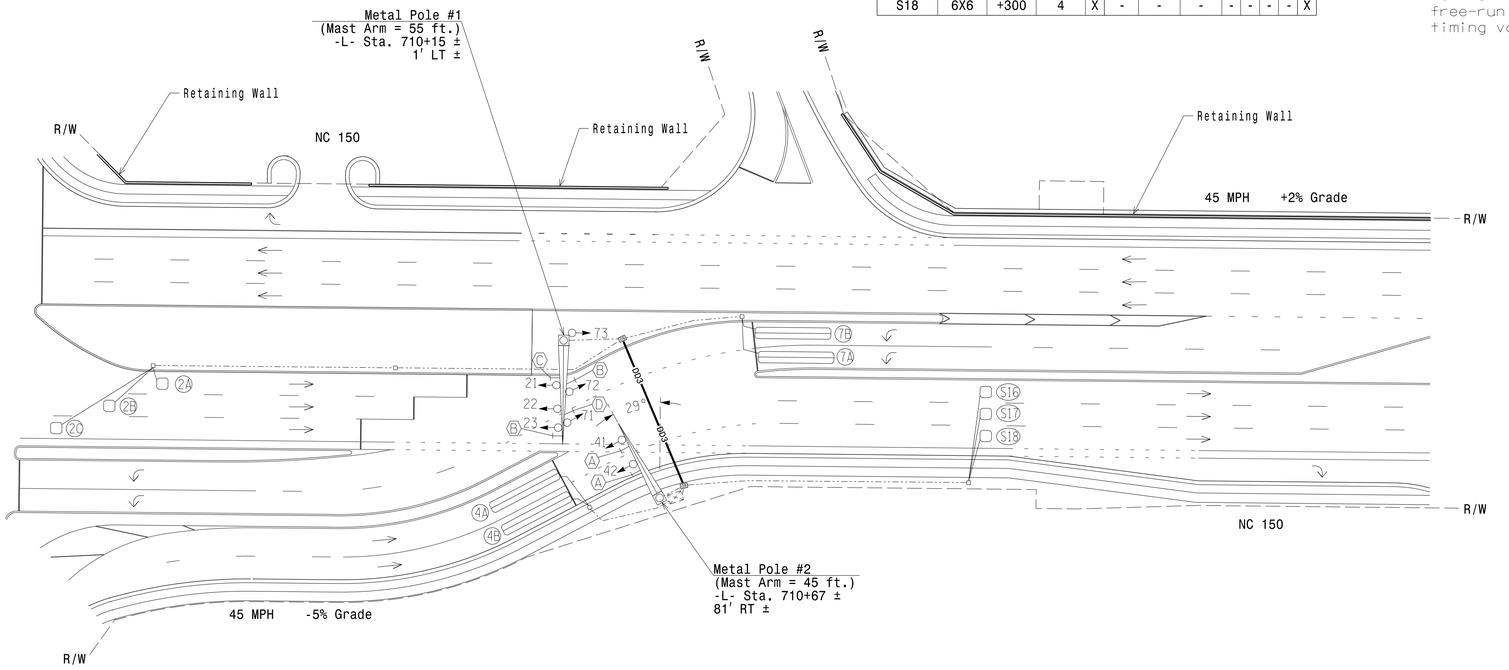
MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	158	4	X	2	-	-	X	X	X	-	X
2B	6X6	158	4	X	2	-	-	X	X	X	-	X
2C	6X6	158	4	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	-	-	X	-	X	-	X
7A	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
7B	6X40	0	2-4-2	X	7	-	-	X	-	X	-	X
S16	6X6	+300	4	X	-	-	-	-	-	-	-	X
S17	6X6	+300	4	X	-	-	-	-	-	-	-	X
S18	6X6	+300	4	X	-	-	-	-	-	-	-	X

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Set all detector units to presence mode.
4. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.



LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
▭↓	Pedestrian Signal Head With Push Button & Sign	■↓
○→	Signal Pole with Guy	●◗
○→	Signal Pole with Sidewalk Guy	●◗
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
----------	2-in Underground Conduit	----------
N/A	Right of Way	----------
→	Directional Arrow	→
○▷	Metal Pole with Mastarm	○▷
—DD#—	Directional Drill (#) x 2" Conduit	N/A
OS	Oversized Junction Box	■
Ⓐ	"NO RIGHT TURN ON RED" Sign (R3-4)	Ⓐ
Ⓑ	No Right Turn Sign (R3-1)	Ⓑ
Ⓒ	No Left Turn Sign (R3-2)	Ⓒ
Ⓓ	No U-Turn Sign (R3-4)	Ⓓ

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 7
Walk *	–	–	–
Ped Clear *	–	–	–
Min Green	12	7	7
Passage *	6.0	2.0	2.0
Max 1 *	60	30	30
Yellow Change	5.0	3.8	3.0
Red Clear	3.1	2.7	4.2
Added Initial *	1.0	–	–
Maximum Initial *	20	–	–
Time Before Reduction *	15	–	–
Time To Reduce *	30	–	–
Minimum Gap	3.0	–	–
Advance Walk	–	–	–
Non Lock Detector	–	X	X
Vehicle Recall	MIN RECALL	–	–
Dual Entry	–	X	X

* These values may be field adjusted. Do not adjust Min Green and Extension times for phase 2 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

New Installation - Final Design

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NC 150 EB
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CFI Crossover

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

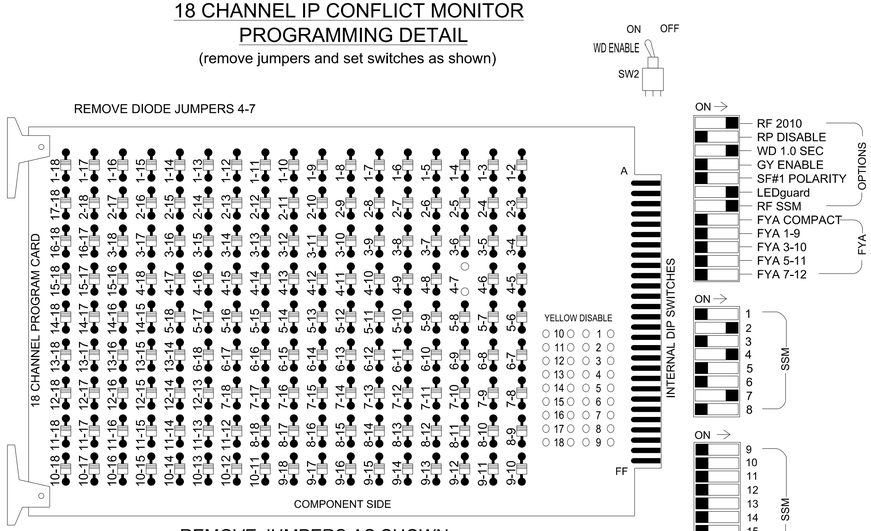
DocuSigned by: Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

SIG. INVENTORY NO. 12-1840

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 45.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 7 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Phase Not On.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S2, S5, S10
Phases Used.....2, 4, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

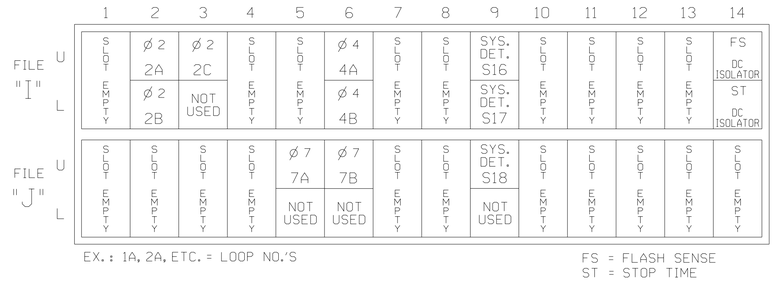
SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21,22, 23	NU	NU	41,42	NU	NU	NU	NU	71,72, 73	NU	NU	NU	NU	NU	NU	NU	NU
RED		128			101													
YELLOW		129																
GREEN																		
RED ARROW										122								
YELLOW ARROW					102					123								
GREEN ARROW		130			103					124								

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	2			X	X	X	
2C	TB2-9,10	I3U	63	29	4	2			X	X	X	
4A	TB4-9,10	I6U	41	3	8	4			X		X	
4B	TB4-11,12	I6L	45	7	9	4			X		X	
7A	TB5-5,6	J5U	57	19	21	7			X		X	
7B	TB5-9,10	J6U	42	4	22	7			X		X	
*S16	TB6-9,10	I9U	60	22	13	SYS						
*S17	TB6-11,12	I9L	62	24	14	SYS						
*S18	TB7-9,10	J9U	59	21	27	SYS						

*System detector only. Remove any assigned vehicle phase.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1840
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Final Design
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Engineering Branch
Traffic & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at SR 1109 (Williamson Road)
CFI Crossover

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER NORTH CAROLINA PROFESSIONAL JASON P. CALLOWAY

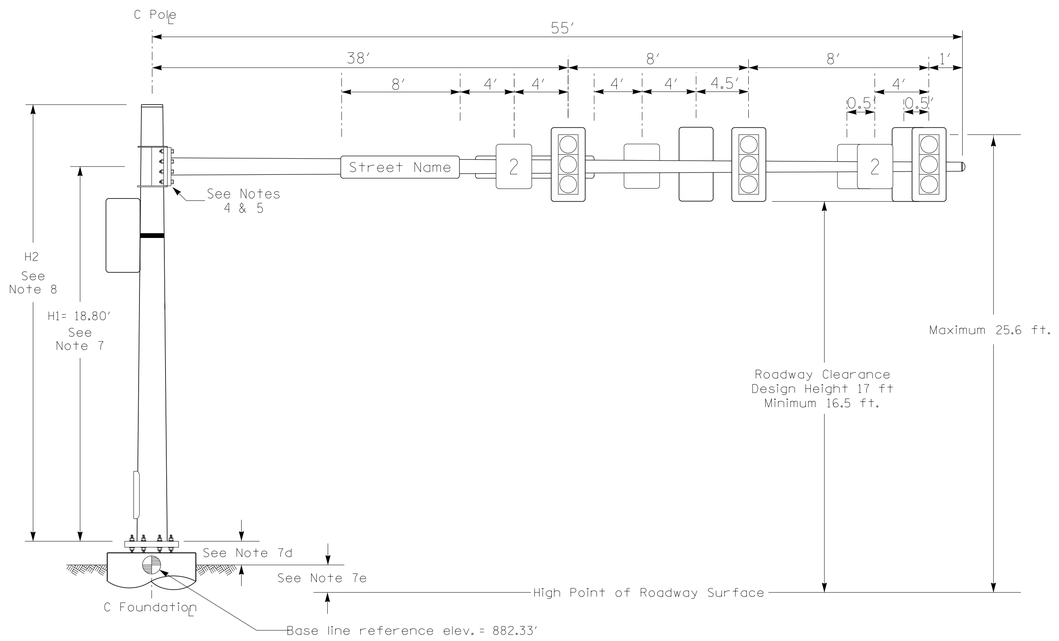
DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...

STD. NUMBER NO. 12-1840

METAL POLE No. 1 and 2

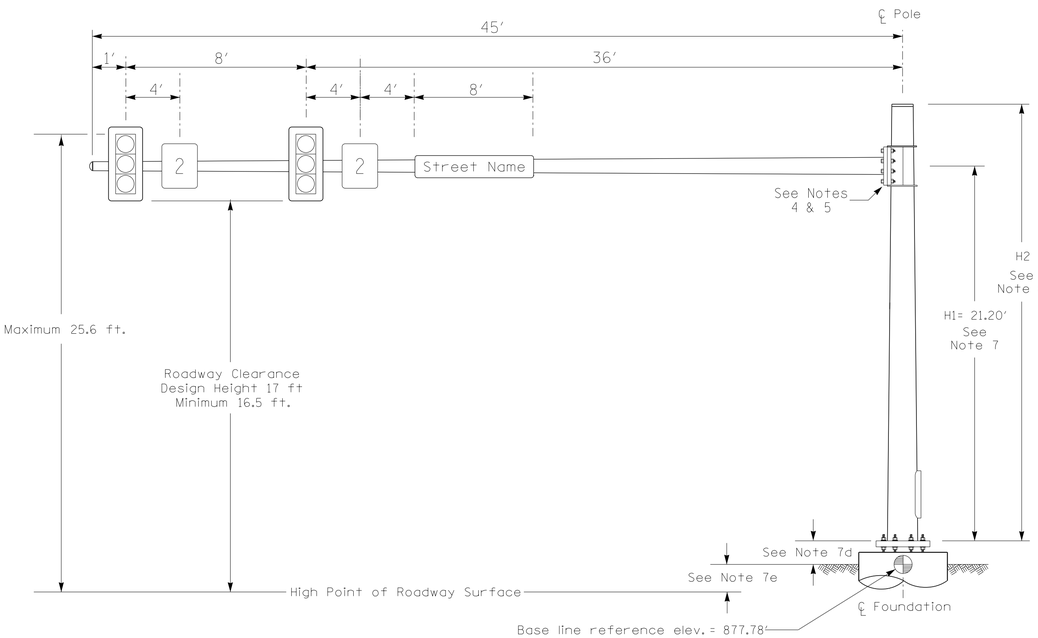
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 45.2

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



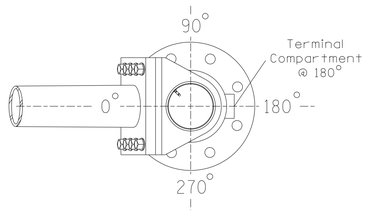
Elevation View

SPECIAL NOTE

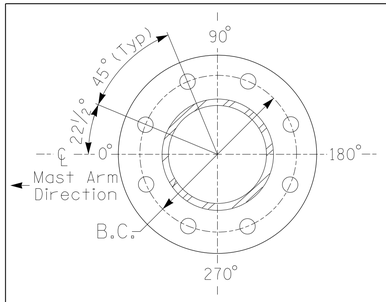
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	882.33 ft.	877.78 ft.
Elevation difference at High point of roadway surface	-0.29 ft.	+2.15 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

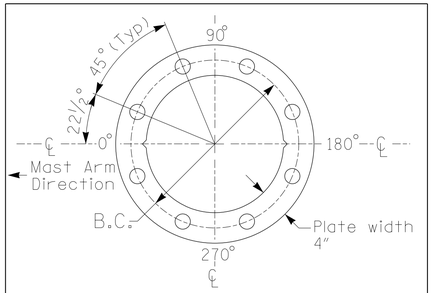


POLE RADIAL ORIENTATION



8 BOLT BASE PLATE DETAIL

See Note 6



BASE PLATE TEMPLATE & ANCHOR BOLT LOCK PLATE DETAIL
For 8 Bolt Base Plate

MAST ARM LOADING SCHEDULE

LOADING SYMBOL	DESCRIPTION	AREA	SIZE	WEIGHT
	RIGID MOUNTED SIGNAL HEAD 12″-3 SECTION-WITH BACKPLATE	9.3 S.F.	25.5″W X 52.5″L	60 LBS
2	SIGN RIGID MOUNTED	7.5 S.F.	30.0″W X 36.0″L	14 LBS
Street Name	STREET NAME SIGN RIGID MOUNTED	16.0 S.F.	24.0″W X 96.0″L	36 LBS

NOTES

DESIGN REFERENCE MATERIAL

1. Design the traffic signal structure and foundation in accordance with:
   - The 1st Edition 2015 AASHTO LRFD "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, including all of the latest interim revisions.
   - The 2024 NCDOT "Standard Specifications for Roads and Structures." The latest addenda to the specifications can be found in the traffic signal project special provisions.
   - The 2024 NCDOT Roadway Standard Drawings.
   - The traffic signal project plans and special provisions.
   - The NCDOT "Metal Pole Standards" located at the following NCDOT website: https://connect.ncdot.gov/resources/safety/Pages/ITS-Design-Resources.aspx

DESIGN REQUIREMENTS

2. Design the traffic signal structure using the loading conditions shown in the elevation views. These are anticipated worst case "design loads" and may not represent the actual loads that will be applied at the time of the installation. The contractor should refer to the traffic signal plans for the actual loads that will be applied at the time of the installation.
3. Design all signal supports using force ratios that do not exceed 0.9.
4. The camber design for the mast arm deflection should provide an appearance of a low pitched arch where the tip or the free end of the mast arm does not deflect below horizontal when fully loaded.
5. A clamp-type bolted mast arm-to-pole connection may be used instead of the welded ring stiffened box connection shown as long as the connection meets all of the design requirements.
6. Design base plate with 8 anchor bolt holes. Provide 2 inch x 60 inch anchor bolts.
7. The mast arm attachment height (H1) shown is based on the following design assumptions:
   a. Mast arm slope and deflection are not considered in determining the arm attachment height as they are assumed to offset each other.
   b. Signal heads are rigidly mounted and vertically centered on the mast arm.
   c. The roadway clearance height for design is as shown in the elevation views.
   d. The top of the pole base plate is 0.75 feet above the ground elevation.
   e. Refer to the Elevation Data Chart for the elevation differences between the proposed foundation ground level and the high point of the roadway.
8. The pole manufacturer will determine the total height (H2) of each pole using the greater of the following:
   - Mast arm attachment height (H1) plus 2 feet, or
   - H1 plus 1/2 of the total height of the mast arm attachment assembly plus 1 foot.
9. If pole location adjustments are required, the contractor must gain approval from the Engineer as this may affect the mast arm lengths and arm attachment heights. The contractor may contact the Signal Design Section Senior Structural Engineer for assistance at (919) 814-5000.
10. The contractor is responsible for verifying that the mast arm length shown will allow proper positioning of the signal heads over the roadway.
11. The contractor is responsible for providing soil penetration testing data (SPT) to the pole manufacturer so site specific foundations can be designed.

NCDOT Wind Zone 5 (110 mph)

Stantec

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Prepared for the Offices of:
Transportation Mobility and Safety Division
North Carolina Department of Transportation
Signal Design Section

750 N.Greenfield Pkwy.,Garner,NC 27529

NC 150 EB
at
SR 1109 (Williamson Road)
CFI Crossover

Division 12 Iredell County Mooresville

PLAN DATE: November 2023 REVIEWED BY: J. Galloway, PE
PREPARED BY: J. Hambright REVIEWED BY: R. Muncey, PE

SCALE: 0 N/A N/A

REVISIONS	INIT.	DATE

NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON W. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
10D1E284084B46E...
SIGNATURE DATE

SIG. INVENTORY NO. 12-1840

5/16/2024
8:13:29 PM
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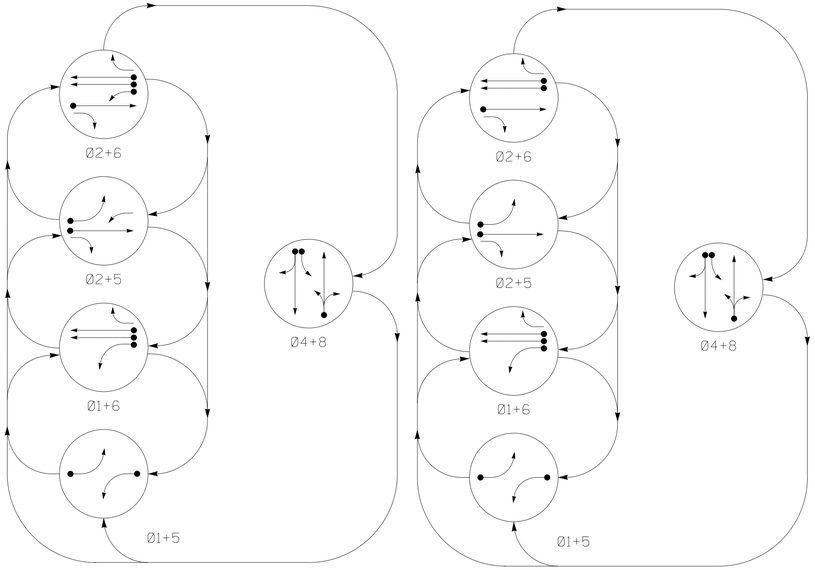
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 46.0

5 Phase Fully Actuated w/ Alternate Phasing NC 150 D12-02_MOORESVILLE CLS

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM

DEFAULT PHASING TABLE OF OPERATION

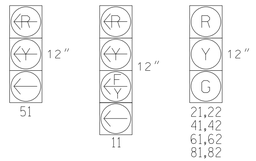
SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	~~F~~ Y	~~F~~ Y	~~R~~	~~R~~
21,22	R	R	G	G	R	R
41,42	R	R	R	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	R
81,82	R	R	R	R	G	R

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←	←	~~R~~	~~R~~	~~R~~	~~R~~
21,22	R	R	G	G	R	R
41,42	R	R	R	R	G	R
51	←	~~R~~	←	~~R~~	~~R~~	~~R~~
61,62	R	G	R	G	R	R
81,82	R	R	R	R	G	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	✳	✳	1	15.0★	-	X	-	X	-	✳
					6#	3.0	-	X	-	X	X	✳
2A	6X40	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	5.0	2.0	X	-	X	X	✳
4A	6X40	0	✳	✳	4	3.0	-	X	-	X	-	✳
4B	6X40	0	✳	✳	4	10.0	-	X	-	X	-	✳
5A	6X40	0	✳	✳	5	-	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6C	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
8A	6X40	0	✳	✳	8	10.0	-	X	-	X	-	✳

✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

Disable Phase(s) call during Alternate Phasing Operation.

★ Reduce delay to 3 sec during Alternate Phasing Operation.

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
6. The Division Traffic Engineer will determine the hours of use for each phasing plan.
7. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
8. Field adjust temporary poles as needed.

PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

LEGEND

PROPOSED		EXISTING
	Traffic Signal Head	
	Modified Signal Head	N/A
	Sign	
	Pedestrian Signal Head With Push Button & Sign	
	Signal Pole with Guy	
	Signal Pole with Sidewalk Guy	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	
	Video Detection Area	N/A
	Construction Zone	N/A
	Drums	N/A

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Walk *	–	–	–	–	–	–
Ped Clear *	–	–	–	–	–	–
Min Green	7	12	7	7	12	7
Passage *	2.0	6.0	2.0	2.0	6.0	2.0
Max 1 *	15	90	35	15	90	35
Yellow Change	3.0	4.6	4.0	3.0	4.6	3.6
Red Clear	3.3	1.4	2.1	2.4	1.7	2.3
Added Initial *	–	–	–	–	–	–
Maximum Initial *	–	–	–	–	–	–
Time Before Reduction *	–	15	–	–	15	–
Time To Reduce *	–	30	–	–	30	–
Minimum Gap	–	3.0	–	–	3.0	–
Advance Walk	–	–	–	–	–	–
Non Lock Detector	X	X	X	X	X	X
Vehicle Recall	–	MIN RECALL	–	–	MIN RECALL	–
Dual Entry	–	–	X	–	–	X

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

New Installation
Temporary Design 1 - TMP Phase III

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Prepared for the Offices of:
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Special Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SR 1467 (Bluefield Road) at Spirits Drive

Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/20/2024
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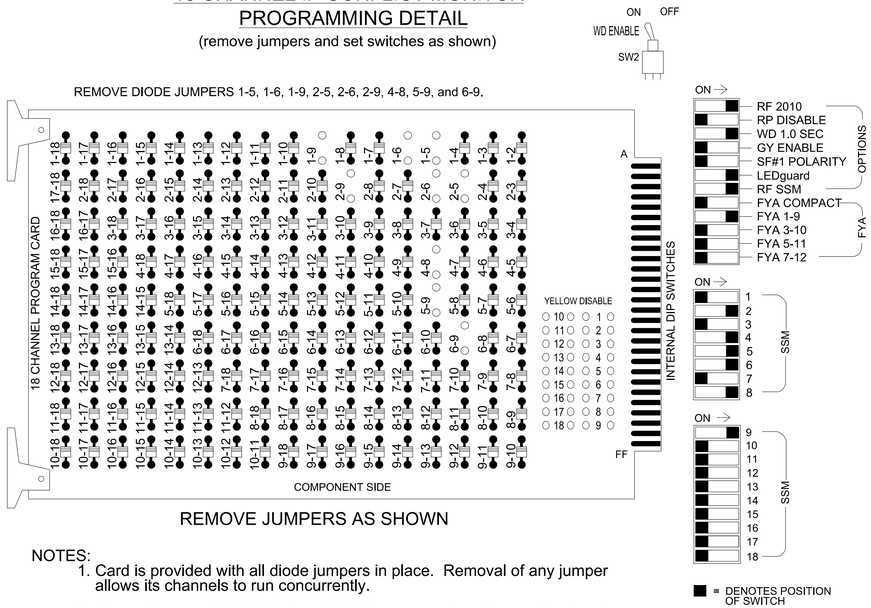
SIG. INVENTORY NO. 12-184ITI

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

NOTES:

1. Card is provided with all diode jumpers in place. Removal of any jumper allows its channels to run concurrently.
2. Ensure jumpers SEL2-SEL5 and SEL9 are present on the monitor board.
3. Ensure that the Red Enable is active at all times during normal operation.
4. Integrate monitor with Ethernet network in cabinet.

NOTES

1. To prevent "flash-conflict" problems, insert red flash program blocks for all unused vehicle load switches in the output file. The installer shall verify that signal heads flash in accordance with the signal plan.
2. Program phases 4 and 8 for Dual Entry.
3. Program controller to start up in phase 2 Green No Walk and 6 Green No Walk.
4. If this signal will be managed by an ATMS software, enable controller and detector logging for all detectors used at this location.
5. The cabinet and controller are part of the NC 150 D12-02_Mooresville CLS.

EQUIPMENT INFORMATION

Controller.....2070LX
Cabinet.....332 w/ Aux
Software.....Q-Free MAXTIME
Cabinet Mount.....Base
Output File Positions.....18 With Aux. Output File
Load Switches Used.....S1, S2, S5, S7, S8, S11, AUX S1
Phases Used.....1, 2, 4, 5, 6, 8
Overlap "1".....*
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

*See overlap programming detail on sheet 2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 46.1

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1	2	13	3	4	14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1	2	2 PED	3	4	4 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	11 ★	21,22	NU	NU	41,42	NU	51	61,62	NU	NU	81,82	NU	11 ★	NU	NU	NU	NU	NU
RED		128			101			134			107							
YELLOW	✳	129			102			135			108							
GREEN		130			103			136			109							
RED ARROW							131						A121					
YELLOW ARROW							132						A122					
FLASHING YELLOW ARROW													A123					
GREEN ARROW	127						133											

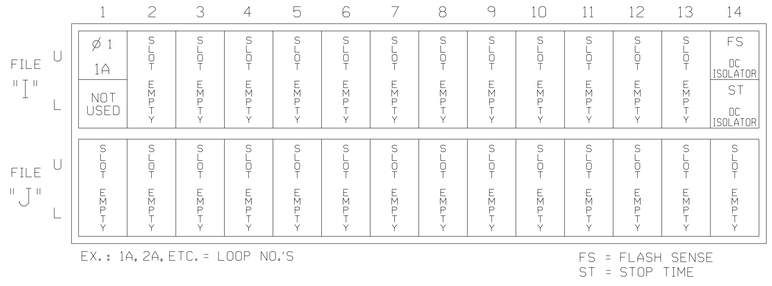
NU = Not Used

✳ Denotes install load resistor. See load resistor installation detail this sheet.

★ See pictorial of head wiring in detail this sheet.

INPUT FILE POSITION LAYOUT

(front view)



INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
1A	TB2-1,2	I1U	56	18	1 *	1	15.0		X		X	
				-	29 *	6	3.0		X		X	X

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 2.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

ACCEPTABLE VALUES

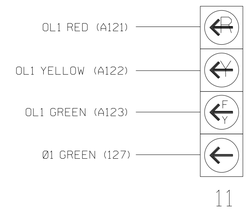
VALUE (ohms)	WATTAGE
1.5K - 1.9K	25W (min)
2.0K - 3.0K	10W (min)

SPECIAL DETECTOR NOTE

Install a video detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1841T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 1 - TMP Phase III
Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
North Carolina Department of Transportation
Traffic Engineering Branch
Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1467 (Bluefield Road)
at
Spirits Drive

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B40B4B46E...
DATE

STD. INVENTORY NO. 12-1841T1

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User:JGalloway
Pw:\\Projects\Design\Electrical Details\Temporary Design\MAXTIME\R-2307B_sample_12-1841T1.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 46.2

MAXTIME ALTERNATE PHASING ACTIVATION DETAIL

To run alternate phasing, select a Pattern that is programmed to run Overlap Plan 2 and Detector Plan 2.
A Pattern can be selected through the scheduler or manually by changing the Operational Mode.

PHASING	OVERLAP PLAN	VEH DET PLAN
ACTIVE PLAN REQUIRED TO RUN DEFAULT PHASING	1	1
ACTIVE PLAN REQUIRED TO RUN ALTERNATE PHASING	2	2

ALTERNATE PHASING CHANGE SUMMARY

THE FOLLOWING IS A SUMMARY OF WHAT TAKES PLACE WHEN OVERLAP PLAN 2 AND VEHICLE DETECTOR PLAN 2 ACTIVATE TO CALL THE "ALTERNATE PHASING":

OVERLAP PLAN 2: Modifies overlap included phases for head 11 run protected turns only.

VEH DET PLAN 2: Disables phase 6 call on loop 1A and reduces delay time for phase 1 call on loop 1A to 3 seconds.

OVERLAP PROGRAMMING DETAIL FOR DEFAULT PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	1
Type	FYA 4 - Section
Included Phases	2
Modifier Phases	1
Modifier Overlaps	-
Trail Green	0
Trail Yellow	0.0
Trail Red	0.0

MAXTIME OVERLAP PROGRAMMING DETAIL FOR ALTERNATE PHASING

Front Panel
Main Menu >Controller >Overlap >Overlap Parameters/Overlap Timings

Web Interface
Home >Controller >Overlap Configuration >Overlaps

In the table view of the web interface, right click on "Overlap" in the top left corner of the table. Copy the entire contents of Overlap Plan 1. Paste Overlap Plan 1 into Overlap Plan 2. Modify Overlap Plan 2 as shown below and save changes.

Overlap Plan 2

Overlap	1	
Type	FYA 4 - Section	
Included Phases	-	← NOTICE INCLUDED PHASE
Modifier Phases	1	
Modifier Overlaps	-	
Trail Green	0	
Trail Yellow	0.0	
Trail Red	0.0	

MAXTIME ALTERNATE PHASING PATTERN PROGRAMMING DETAIL

Front Panel
Main Menu >Controller >Coordination >Patterns

Web Interface
Home >Controller >Coordination >Patterns

Pattern Parameters

Pattern	Veh Det Plan	Overlap Plan
*	2	2

* The Pattern number(s) are to be determined by the Division and/or City Traffic Engineer.

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 1A

Front Panel
Main Menu >Controller >Detector >Veh Det Plans

Web Interface
Home >Controller >Detector Configuration >Vehicle Detectors

In the table view of web interface right click on "Detector" in the top left corner of the table. Copy the entire contents of Detector Plan 1. Paste Detector Plan 1 into Detector Plan 2. Modify Detector Plan 2 as shown below and save changes.

Plan 2

1A

Detector	Call Phase	Delay
1	1	3.0
29	0	-

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1841T1
DESIGNED: MAY 2024
SEALED: 5/20/2024
REVISED: N/A

Temporary Design 1 - TMP Phase III
Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Transportation Mobility and Safety Division
State of North Carolina Department of Transportation
Traffic Engineering & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

SR 1467 (Bluefield Road)
at
Spirits Drive

Division 12 Iredell County Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	JPG/RMM	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

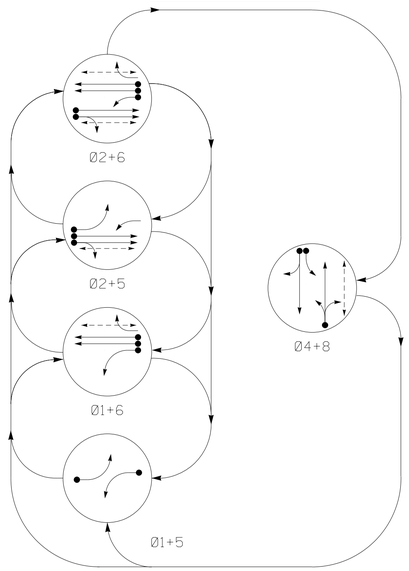
SEAL 029904 ENGINEER JASON PATRICK GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by:
Jason Galloway 5/20/2024
10D1E2B4084B46E...
DATE
SIGNATURE REGISTRATION NO. 12-1841T1

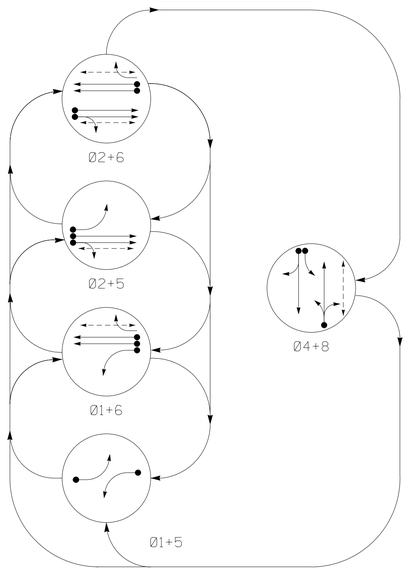
6:15:51 PM
User:jgalloway
U:\Traffic\PROJECTS\Signals\Design\Electrical Details\Temporary Design\MAXTIME\R-2307B_sm_ele_12-1841t1.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 47.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

DEFAULT PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←●	←●	F Y	F Y	←R	←R
21,22	R	R	G	G	R	R
41,42	R	R	R	R	G	R
51	←●	←R	←●	←R	←R	←R
61,62	R	G	R	G	R	R
63	R	F Y ←	R	F Y ←	R	R
81,82	R	R	R	R	G	R
P21,P22	DW	DW	W	W	DW	DRK
P61,P62	DW	W	DW	W	DW	DRK
P81,P82	DW	DW	DW	DW	W	DRK

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø1+5	Ø1+6	Ø2+5	Ø2+6	Ø4+8	FLASH
11	←●	←●	←R	←R	←R	←R
21,22	R	R	G	G	R	R
41,42	R	R	R	R	G	R
51	←●	←R	←●	←R	←R	←R
61,62	R	G	R	G	R	R
63	R	F Y ←	R	F Y ←	R	R
81,82	R	R	R	R	G	R
P61,P62	DW	DW	W	W	DW	DRK
P61,P62	DW	W	DW	W	DW	DRK
P81,P82	DW	DW	DW	DW	W	DRK

MAXTIME DETECTOR INSTALLATION CHART

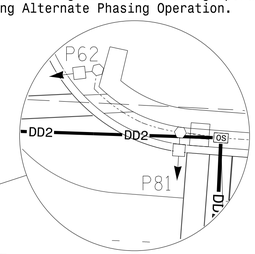
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	PROGRAMMING CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
1A	6X40	0	2-4-2	X	1	15.0★	-	X	-	X	-	X
				-	6#	3.0	-	X	-	X	X	X
2A	6X6	300	5	X	2	-	-	X	X	X	-	X
2B	6X6	300	5	X	2	-	-	X	X	X	-	X
4A	6X40	0	2-4-2	X	4	3.0	-	X	-	X	-	X
4B	6X40	0	2-4-2	X	4	10.0	-	X	-	X	-	X
5A	6X40	0	2-4-2	X	5	-	-	X	-	X	-	X
6A	6X6	300	5	X	6	-	-	X	X	X	-	X
8A	6X40	0	2-4-2	X	8	3.0	-	X	-	X	-	X

Disable Phase(s) call during Alternate Phasing Operation.
★ Disable delay during Alternate Phasing Operation.

5 Phase
Fully Actuated w/
Alternate Phasing
NC 150 D12-02_MOORESVILLE
CLS

NOTES

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Set all detector units to presence mode.
5. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
6. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
7. The Division Traffic Engineer will determine the hours of use for each phasing plan.
8. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
9. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.



SIGNAL FACE I.D.

All Heads L.E.D.

LEGEND

PROPOSED		EXISTING
○→	Traffic Signal Head	●→
◐→	Modified Signal Head	N/A
⊣	Sign	⊣
□↓	Pedestrian Signal Head With Push Button & Sign	■↓
○—	Signal Pole with Guy	●—
○↓	Signal Pole with Sidewalk Guy	●↓
▭	Inductive Loop Detector	▭
⊠	Controller & Cabinet	⊠
□	Junction Box	■
·-·-·-·	2-in Underground Conduit	·-·-·-·
N/A	Right of Way	– – – –
→	Directional Arrow	→
◎	Metal Strain Pole	◘
—DD#—	Directional Drill (#) x 2" Conduit	N/A
⊛	Type I Pushbutton Post	✤
⬡	Type II Signal Pedestal	⬢
OS	Oversized Junction Box	■

MAXTIME TIMING CHART

FEATURE	PHASE 1	2	4	5	6	8
Walk *	–	14	–	–	14	13
Ped Clear *	–	23	–	–	13	23
Min Green	7	12	7	7	12	7
Passage *	2.0	6.0	2.0	2.0	6.0	2.0
Max 1 *	15	90	35	15	90	35
Yellow Change	3.0	4.6	4.0	3.0	4.6	3.6
Red Clear	3.2	1.6	2.3	2.6	1.6	2.3
Added Initial *	–	1.5	–	–	15	–
Maximum Initial *	–	34	–	–	34	–
Time Before Reduction *	–	15	–	–	15	–
Time To Reduce *	–	30	–	–	30	–
Minimum Gap	–	3.0	–	–	3.0	–
Advance Walk	–	7	–	–	7	6
Non Lock Detector	X	–	X	X	–	X
Vehicle Recall	–	MIN RECALL	–	–	MIN RECALL	–
Dual Entry	–	–	X	–	–	X

* These values may be field adjusted. Do not adjust Min Green and Extension times for phases 2 and 6 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

New Installation - Final Design

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Division 12 Iredell County Mooresville

PLAN DATE: May 2024 REVIEWED BY: J Galloway, PE
PREPARED BY: J Hambright REVIEWED BY: R Muncey, PE

SCALE 0 40 1"=40'

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
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ENGINEER
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DocuSigned by: Jason Galloway 5/20/2024
10D1E2B4064B46E...
SIG. INVENTORY NO. 12-1841