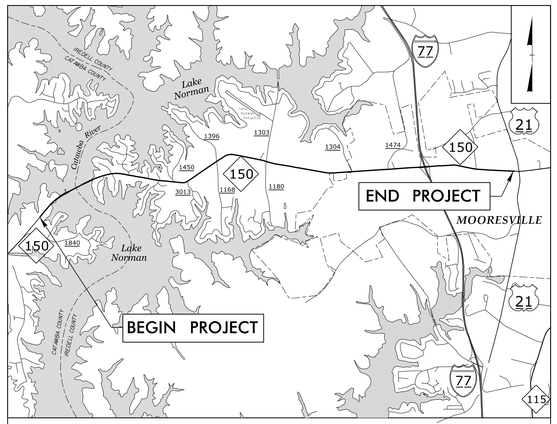
TIP PROJECT: R–2307B

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

Project No.	Sheet No.
R–2307B	Sig. 1.0

CATAWBA & IREDELL COUNTIES

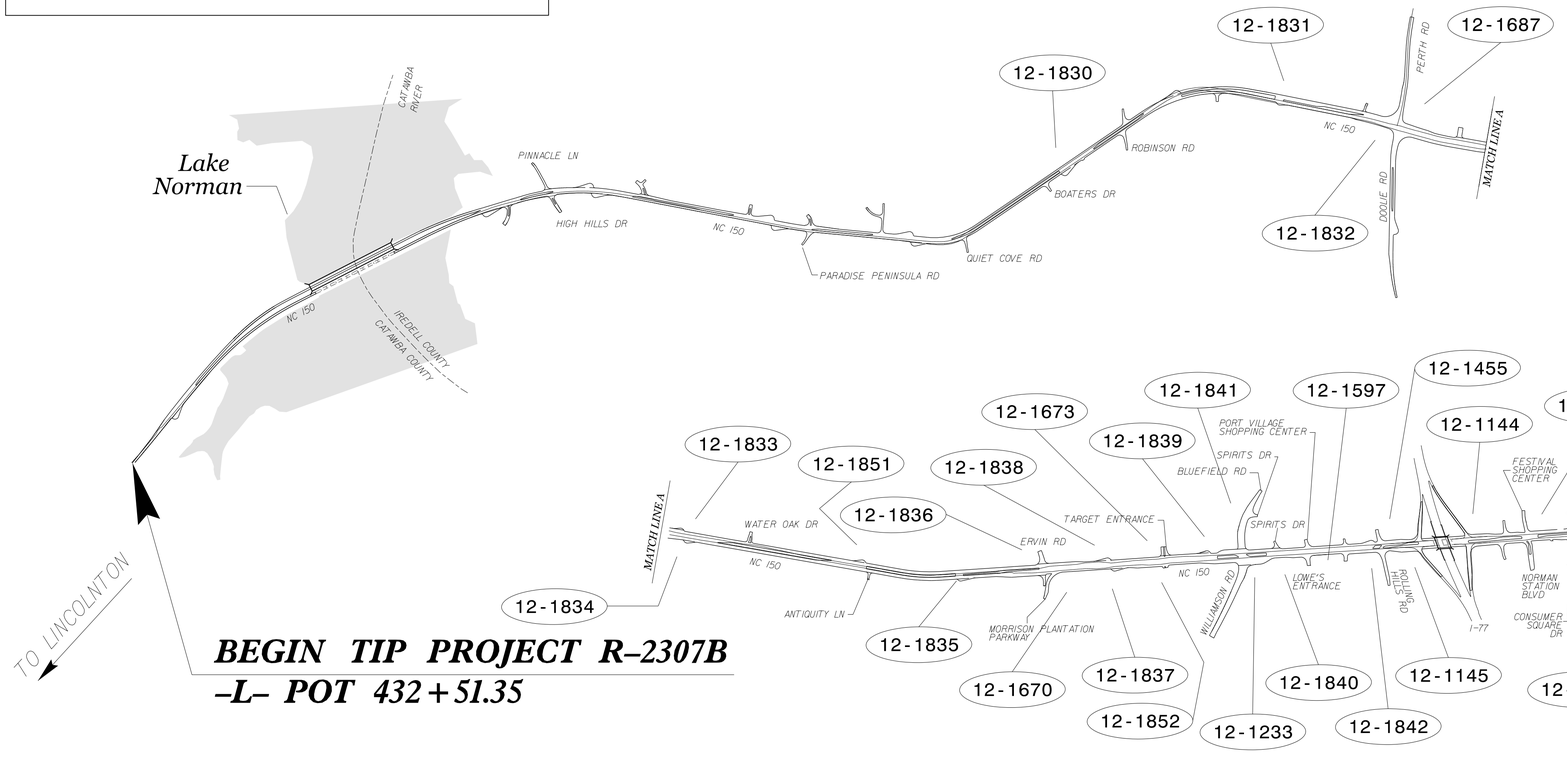


VICINITY MAP

LOCATION: MOORESVILLE – NC 150 FROM SR 1840 (GREENWOOD RD) IN CATAWBA COUNTY TO US 21 IN IREDELL COUNTY

TYPE OF WORK: TRAFFIC SIGNALS

NAD 83/NSRS 2007



END TIP PROJECT R–2307B
–L– STA. 799+10.00

BEGIN TIP PROJECT R–2307B
–L– POT 432+51.35

LEGEND

XX-XXXX – *SIGNAL INVENTORY NUMBER*

INTELLIGENT TRANSPORTATION AND SIGNALS UNIT
Contacts:

Richard N. Zinser, PE
Signals Engineer, Western Region

Todd Joyce, PE
Signal Equipment Design Engineer

Gregory Green
Signal Communication Project Engineer

Plans Prepared for:
DIVISION OF HIGHWAYS
TRANSPORTATION MOBILITY AND SAFETY DIVISION

Transportation Mobility and Safety Division • DEPARTMENT OF TRANSPORTATION • STATE OF NORTH CAROLINA

TSMO UNIT
750 N. Greenfield Parkway, Garner, NC 27529

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801 Jones Franklin Rd-Suite 300
Raleigh, NC 27606

Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com
License No. F-0672

Betsy L. Watson, PE – *Deputy Regional Business Leader*
Regina Muncey, PE – *Senior Transportation Engineer*
Jason Galloway, PE – *Senior Traffic Engineer*
James Hambright – *Senior Transportation Technician*

Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	SIG-1.1

INDEX OF SHEETS

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License No. F-0672

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

NOT TO SCALE

Index of Sheets

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
10D1E2840848466... DATE

SIG. INVENTORY NO.

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User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	SIG-1.2

INDEX OF SHEETS

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Index of Sheets

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.

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	SIG-1.3

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Division 12 Iredell County Mooresville

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

REVISIONS	INIT.	DATE

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029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway
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5/20/2024
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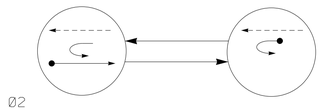
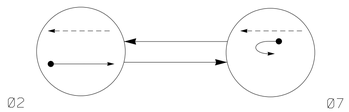
User:jpilloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 2.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

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

DEFAULT PHASING TABLE OF OPERATION

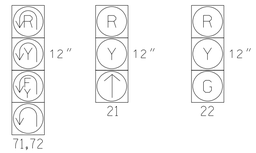
SIGNAL FACE	PHASE Ø2	PHASE Ø7	FLASH
21	↑	R	R
22	G	R	R
71,72	(F Y)	↑	(R)

ALTERNATE PHASING TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	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	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
7A	6X40	0	✳	✳	7	15.0★	-	X	-	X	-	✳

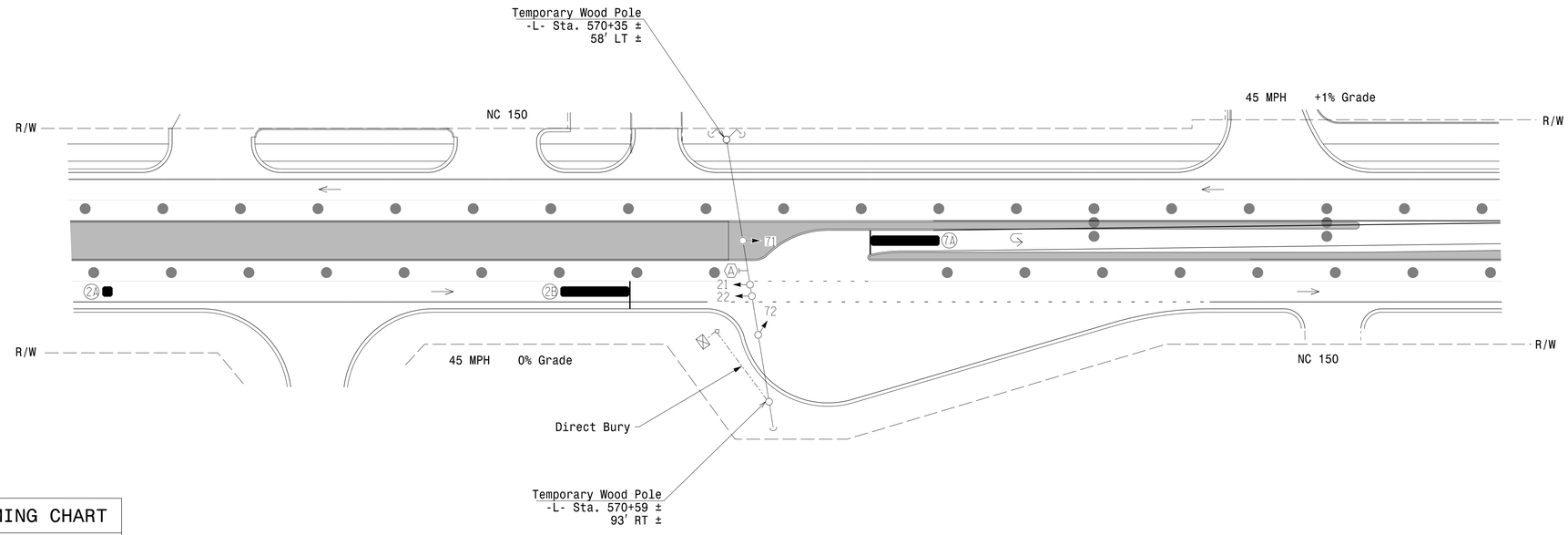
✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

★ Disable delay during Alternate Phasing Operation.

2 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. 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 Division Traffic Engineer will determine the hours of use for each phasing plan.
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 2	PHASE 7
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	4.5	3.0
Red Clear	2.2	3.5
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.

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 Left Turn Sign (R3-2)	Ⓐ

New Installation
Temporary Design 1 - TMP Phase III

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Fax. (919) 851-7024
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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
SR 1396 (Robinson Road) U-turn

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 R GALLOWAY

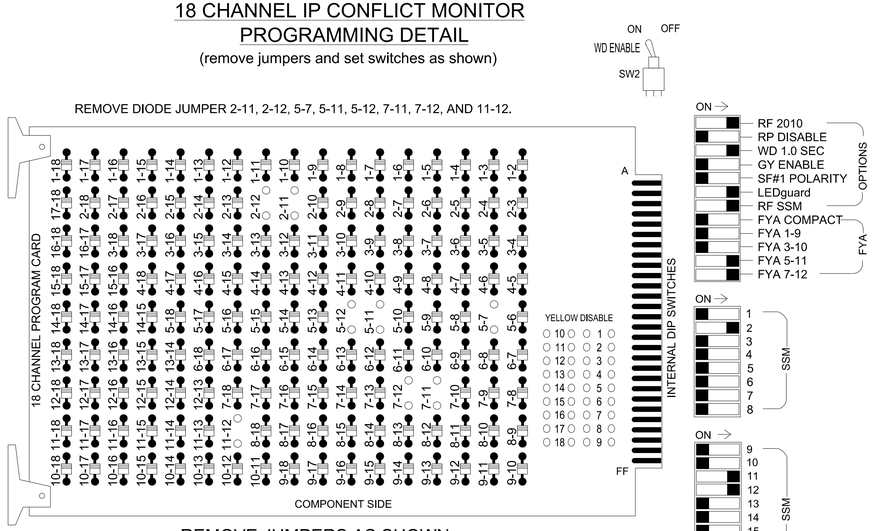
DocuSigned by:
Jason Galloway 12/17/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1830TI

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 2.1

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, S7, S10, AUX S4, AUX S5
Phases Used.....2, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....*

*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	7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22	NU	NU	NU	NU	72★	NU	NU	71★	NU	NU	NU	NU	NU	72★	71★	NU
RED		128	128																
YELLOW		129	129					✳			✳								
GREEN			13Ø																
RED ARROW																	A114	A1Ø1	
YELLOW ARROW																	A115	A1Ø2	
FLASHING YELLOW ARROW																	A116	A1Ø3	
GREEN ARROW		13Ø						133			124								

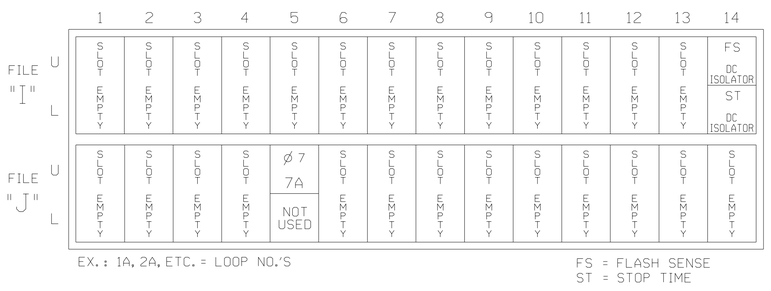
NU = Not Used

✳ 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

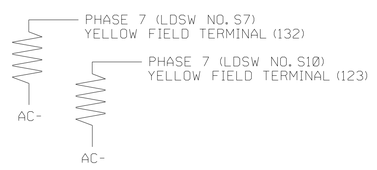
FS = FLASH SENSE
ST = STOP TIME

LOAD RESISTOR INSTALLATION DETAIL

(install resistors as shown below)

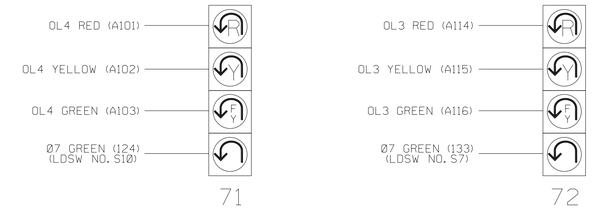
ACCEPTABLE VALUES

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



FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



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
7A	TB5-5,6	J5U	57	19	21 *	7	15.0		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 3.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

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.

For Detection Zone 7A, the equipment placement is typcal for a NCDOT installation. Inputs associated with this slot are compatible with alternate operation programming located on sheets 2 and3 of this electrical detail.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1830T1
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Temporary Design 1 - TMP Phase III
Electrical Detail - Sheet 1 of 3

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801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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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
SR 1396 (Robinson Road) U-turn

Division 12 Iredell County Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Gallaway 5/17/2024
10D1E2B40B4B48E...
SIG. INVENTORY NO. 12-1830T1 DATE

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 2.2

OUTPUT CHANNEL CONFIGURATION

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 5 →

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	7		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	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 7A

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.

7A

Detector	Call Phase	Delay
21	7	0.0

MAXTIME OVERLAP PROGRAMMING DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	3	4
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	2
Modifier Phases	7	7
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	3	4
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	-	-
Modifier Phases	7	7
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

← NOTICE INCLUDED PHASE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1830T1
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

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

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Raleigh, NC 27606
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DEPARTMENT OF TRANSPORTATION
ITS & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
SR 1396 (Robinson Road) U-turn

Division 12 | Iredell County | Mooresville

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PREPARED BY:	J Galloway	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
10D1E2B40B4B48E...
DATE
SIG. INVENTORY NO. 12-1830T1

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 71 and 72 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 7 call on loop 7A to 0 seconds.

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	

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: 12-1830T1
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Temporary Design 1 - TMP Phase III
Electrical Detail - Sheet 3 of 3

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Traffic Signal & Signals Management Section

750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
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Division 12 Iredell County Mooresville

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PREPARED BY:	J Galloway	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

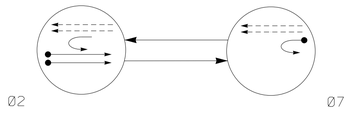
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B48E DATE

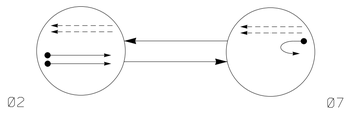
SIG. INVENTORY NO. 12-1830T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 3.0

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

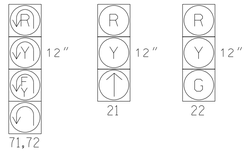
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

DEFAULT PHASING TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø2	PHASE Ø7	FLASH
21	↑	R	R
22	G	R	R
71,72	Y	↷	R

ALTERNATE PHASING TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø2	PHASE Ø7	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

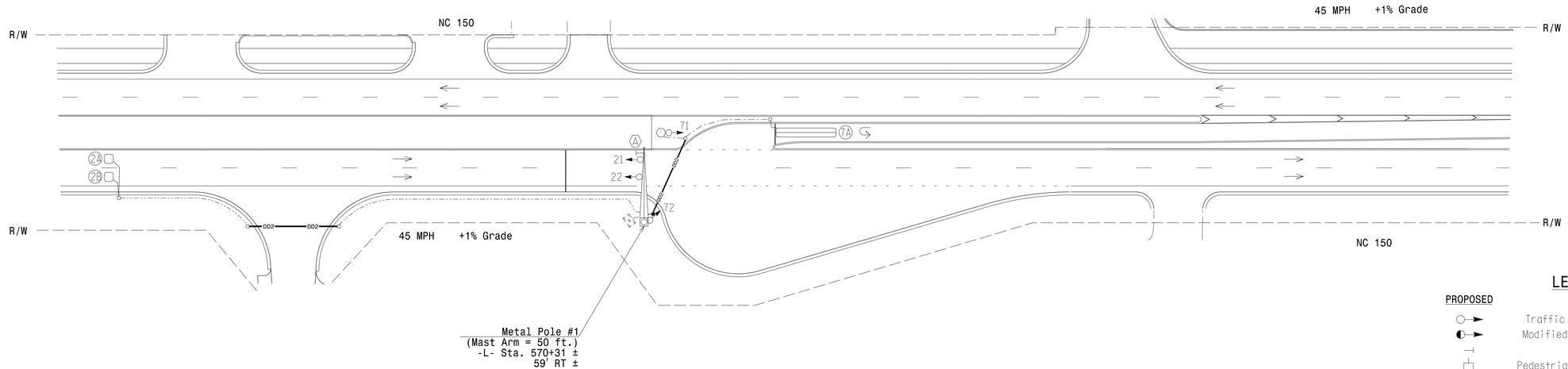
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	4	X	2	-	-	X	X	X	-	X
2B	6X6	300	4	X	2	-	-	X	X	X	-	X
7A	6X40	0	2-4-2	X	7	★15.0	-	X	-	X	-	X

★ Disable delay during Alternate Phasing Operation.

2 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. Set all detector units to presence mode.
4. The Division Traffic Engineer will determine the hours of use for each phasing plan.
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 2	PHASE 7
Walk *	–	–
Ped Clear *	–	–
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	4.4	3.0
Red Clear	2.2	3.5
Added Initial *	1.5	–
Maximum Initial *	34	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.0	–
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 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 II Signal Pedestal	⬢
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ

New Installation - Final Design

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Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
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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 1396 (Robinson Road) U-turn

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 B. GALLOWAY

DocuSigned by:
Jason Galloway 10/17/2024
10D1E2B40B4B46E...
DATE
SIG. INVENTORY NO. 12-1830

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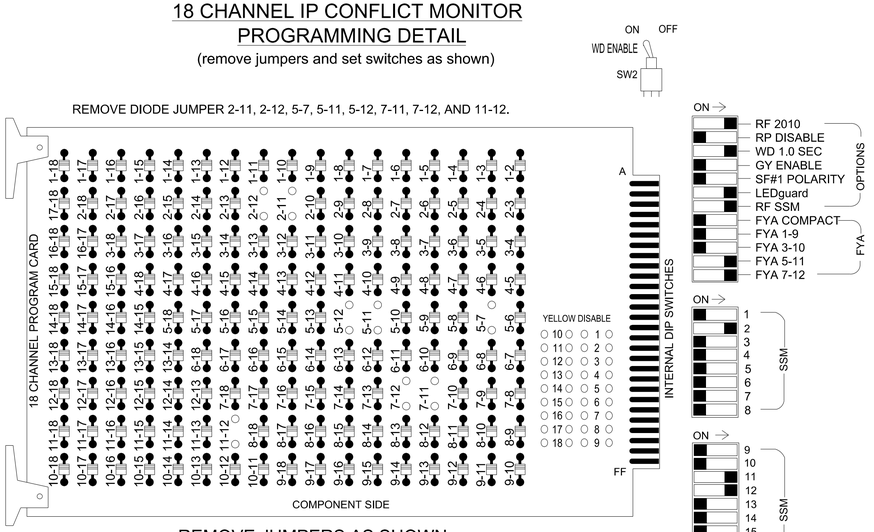
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 3.1

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, S7, S10, AUX S4, AUX S5
Phases Used.....2, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....*
Overlap "4".....*

*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	7	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22	NU	NU	NU	NU	72★	NU	NU	71★	NU	NU	NU	NU	NU	72★	71★	NU
RED		128	128																
YELLOW		129	129					✳			✳								
GREEN			130																
RED ARROW																	A114	A101	
YELLOW ARROW																	A115	A102	
FLASHING YELLOW ARROW																	A116	A103	
GREEN ARROW		130						133			124								

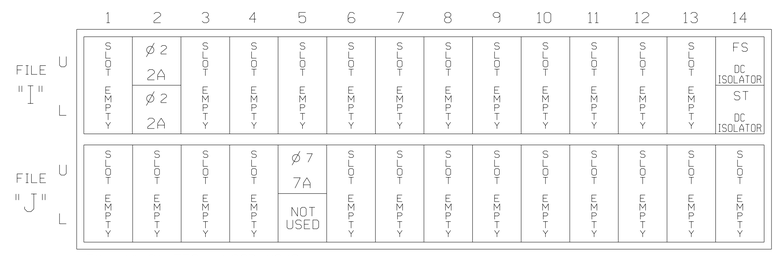
NU = Not Used

✳ 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

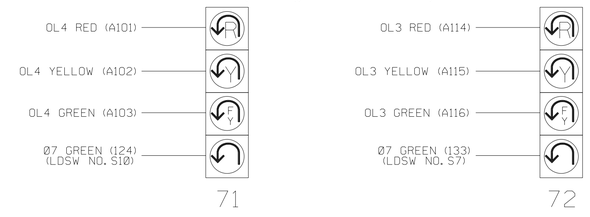
LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	INPUT POINT	DETECTOR NO.	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN
2A/S01	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B/S02	TB2-7,8	I2L	43	5	3	2			X	X	X	
7A	TB5-5,6	J5U	57	19	21 *	7	15.0		X		X	

* For the detectors to work as shown on the signal design plan, see the Detector Programming Detail for Alternate Phasing on sheet 2 of 3.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

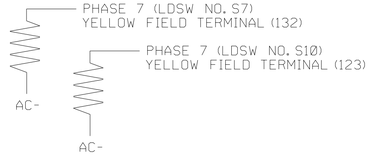


LOAD RESISTOR INSTALLATION DETAIL

(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: 12-1830
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 1 of 3

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Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
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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
SR 1396 (Robinson Road) U-turn

Division 12 Iredell County Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. CALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B48E... DATE

SIG. INVENTORY NO. 12-1830

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 3.2

OUTPUT CHANNEL CONFIGURATION

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 5 →

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	7		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	4				14
15	Phase Ped	6				15
16	Phase Ped	8				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

MAXTIME DETECTOR PROGRAMMING DETAIL FOR ALTERNATE PHASING LOOP 7A

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.

7A

Detector	Call Phase	Delay
21	7	0.0

MAXTIME OVERLAP PROGRAMMING DEFAULT PHASING

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

Web Interface
Home >Controller >Overlap Configuration >Overlaps

Overlap Plan 1

Overlap	3	4
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	2	2
Modifier Phases	7	7
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	3	4
Type	FYA 4 - Section	FYA 4 - Section
Included Phases	-	-
Modifier Phases	7	7
Modifier Overlaps	-	-
Trail Green	0	0
Trail Yellow	0.0	0.0
Trail Red	0.0	0.0

← NOTICE INCLUDED PHASE

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1830
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 2 of 3

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Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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ITS & Signals Management Section
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NC 150 EB
at
SR 1396 (Robinson Road) U-turn

Division 12 | Iredell County | Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL SEAL

DocuSigned by: Jason Gallaway 5/17/2024
10D1E2B40B4B46E... DATE
SIG. INVENTORY NO. 12-1830

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 3.3

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 71 and 72 to run protected turns only.

VEH DET PLAN 2: Reduces delay time for phase 7 call on loop 7A to 0 seconds.

SEQUENCE DETAIL

Front Panel
Main Menu >Controller >Coordination >Sequences

Web Interface
Home >Controller >Coordination >Sequence

Sequence 1

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

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: 12-1830
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail - Sheet 3 of 3

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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 150 EB
at
SR 1396 (Robinson Road) U-turn

Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Galloway	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. 12-1830

4:23:30 PM
User:jgalloway
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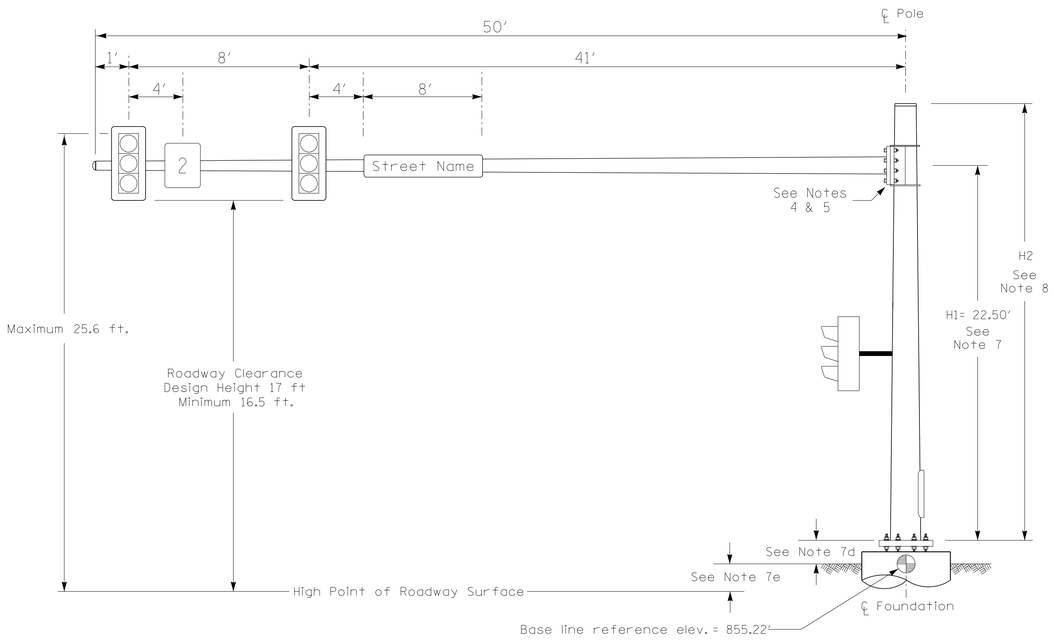
Design Loading for METAL POLE NO. 1



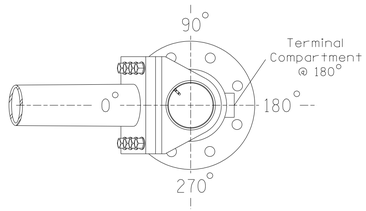
Elevation View

SPECIAL NOTE

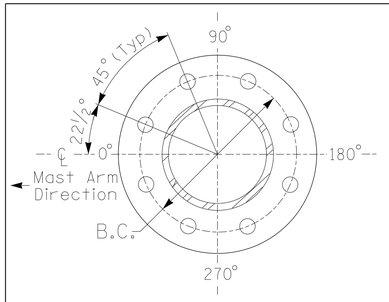
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ⊕ Foundation @ ground level	855.22 ft.	
Elevation difference at High point of roadway surface	+3.45 ft.	
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	

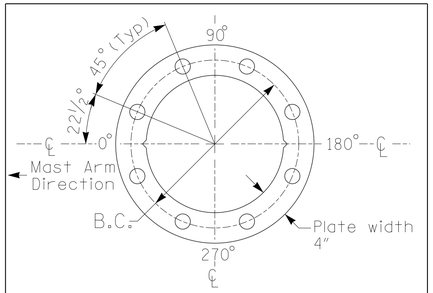


POLE RADIAL ORIENTATION



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. 3.4

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)

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Signal Design Section

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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

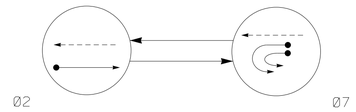
DocuSigned by: Jason Galloway 5/17/2024
DATE

SIG. INVENTORY NO. 12-1830

5/16/2024
4:30:13 PM
J:\Projects\Signals\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1830.dgn
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 4.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

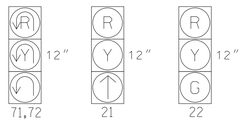
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

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

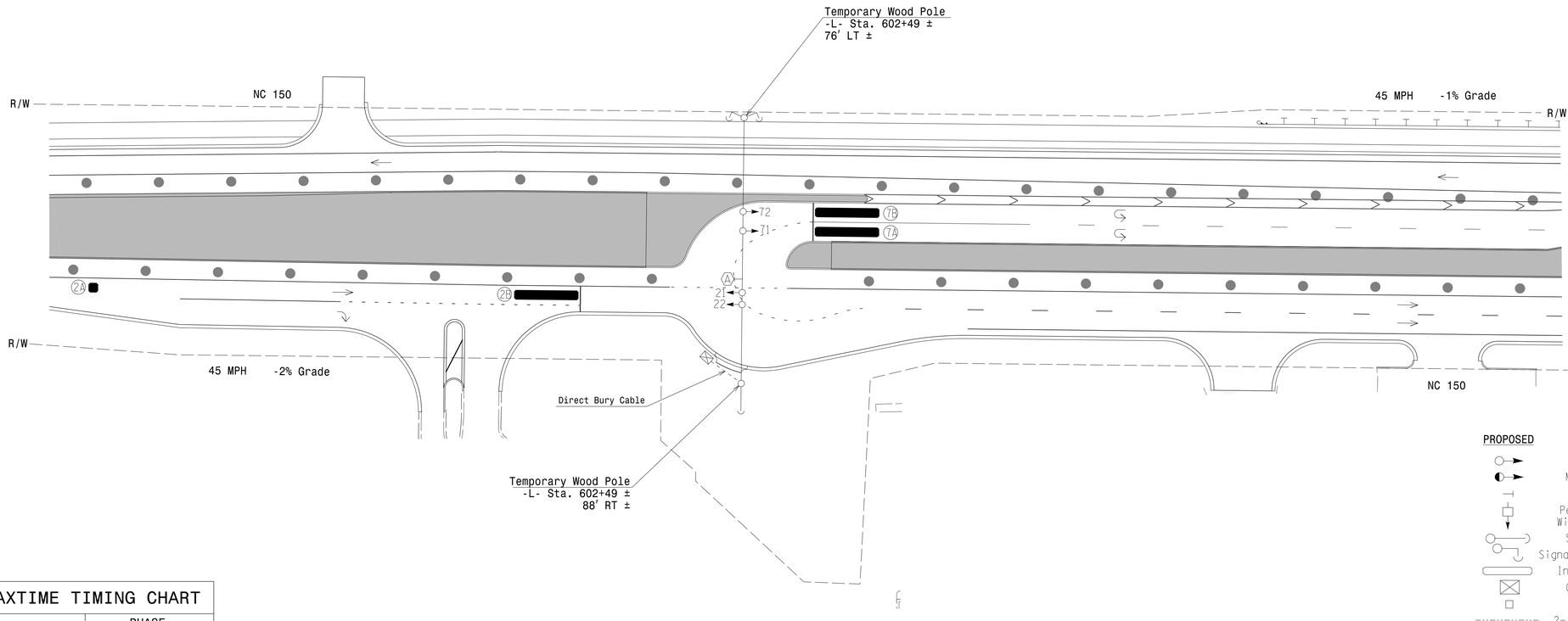
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
7A	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳

✳ 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.
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 Left Turn Sign (R3-2)	Ⓐ

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	4.7	3.0
Red Clear	2.0	4.9
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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Raleigh, NC 27606
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Fax. (919) 851-7024
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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 1303 (Perth Road) U-turn

Division 12 Iredell County Mooresville

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

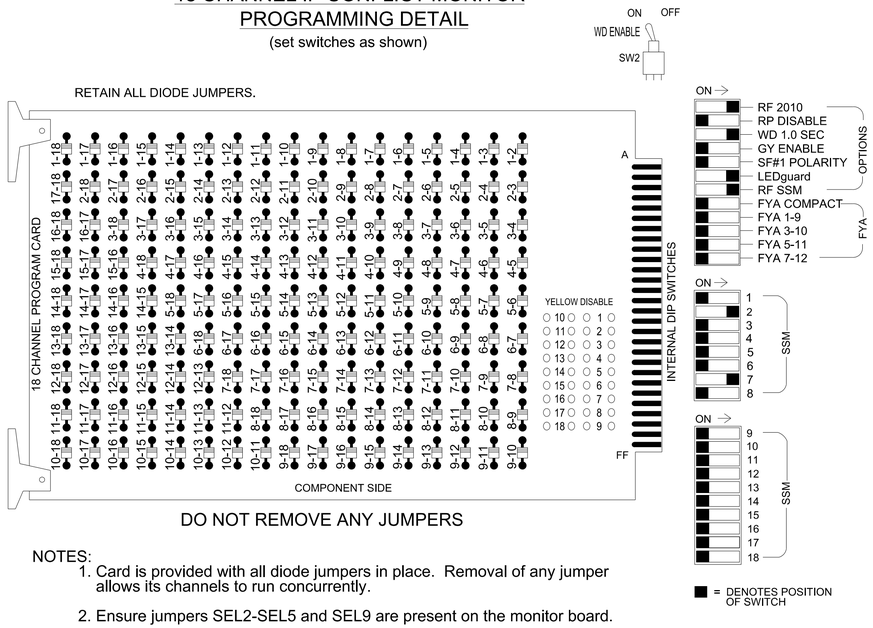
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 7/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1831T1

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.

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

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 4.1

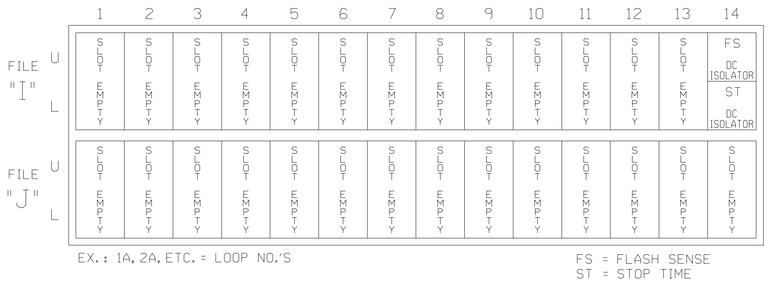
SIGNAL HEAD HOOK-UP CHART

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																
YELLOW		129	129																
GREEN			130																
RED ARROW											122								
YELLOW ARROW											123								
GREEN ARROW		130									124								

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.

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: 12-1831T1
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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801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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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
SR 1303 (Perth Road) U-Turn

Division 12 Iredell County Mooresville

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

REVISIONS	INIT.	DATE

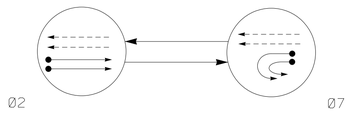
SEAL 029904 ENGINEER JASON P. CALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B48E... DATE
SIG. INVENTORY NO. 12-1831T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 5.0

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

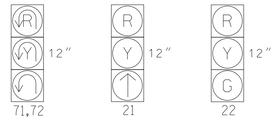
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE 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.

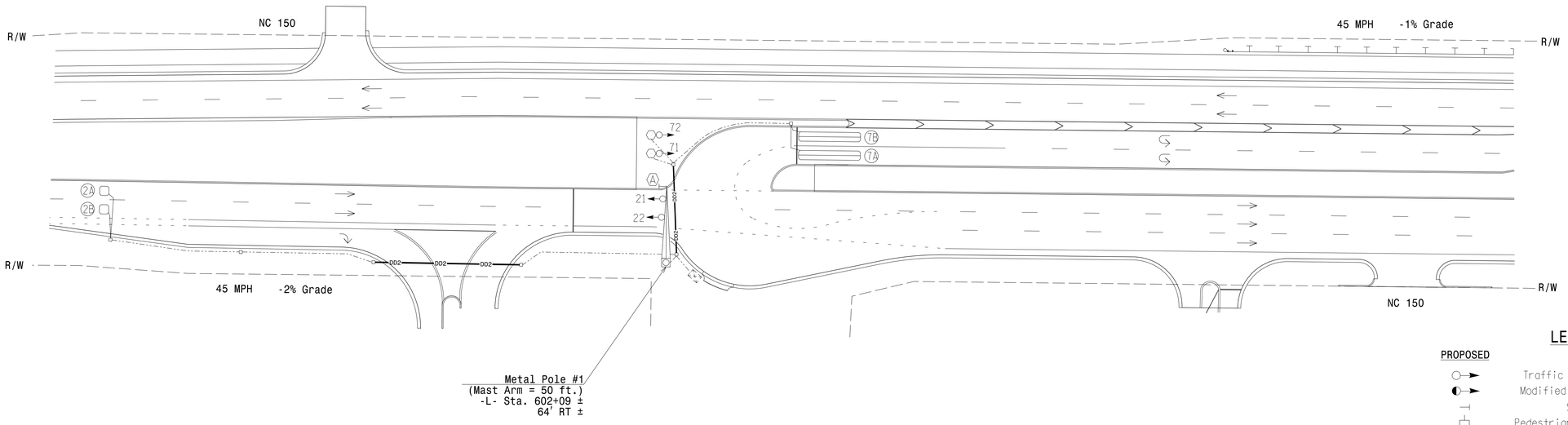


MAXTIME DETECTOR INSTALLATION CHART

	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	4	X	2	-	-	X	X	X	-	X
2B	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

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
⬡	Type II Signal Pedestal	⬢
(A)	No Left Turn Sign (R3-2)	(A)

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	4.7	3.0
Red Clear	2.0	4.9
Added Initial *	1.5	–
Maximum Initial *	34	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.0	–
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 2 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

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 EB
at
SR 1303 (Perth Road) U-turn

Division 12 Iredell County Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

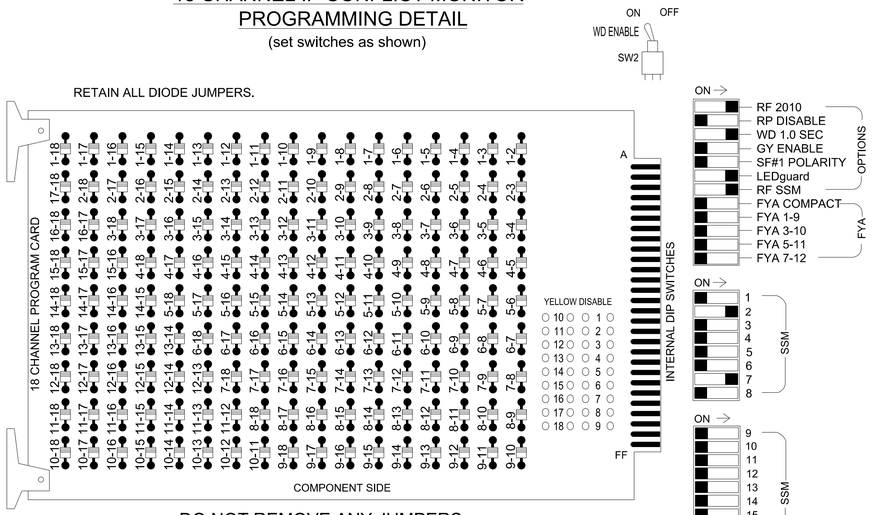
DocuSigned by: Jason Galloway 12/17/2024
10D1E2B40B4B46E...

SIG. INVENTORY NO. 12-1831

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 5.1

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 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, S7
Phases Used.....2, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

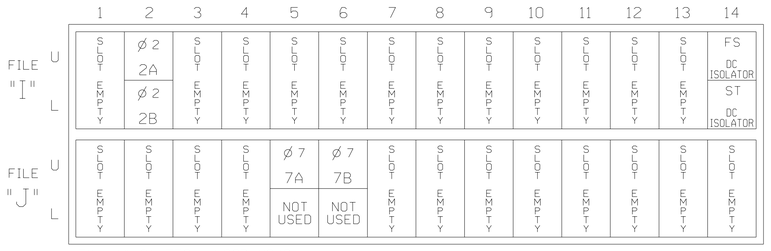
SIGNAL HEAD HOOK-UP CHART

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	NU	NU	NU	NU	NU	NU	NU	71,72	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128																
YELLOW		129	129																
GREEN			130																
RED ARROW											122								
YELLOW ARROW											123								
GREEN ARROW		130									124								

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
2A	TB2-5,6	I2U	39	1	2	2			X	X	X	
2B	TB2-7,8	I2L	43	5	3	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	

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	2,a,7,b
2	

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1831
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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NC 150 EB
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Division 12 Iredell County Mooresville

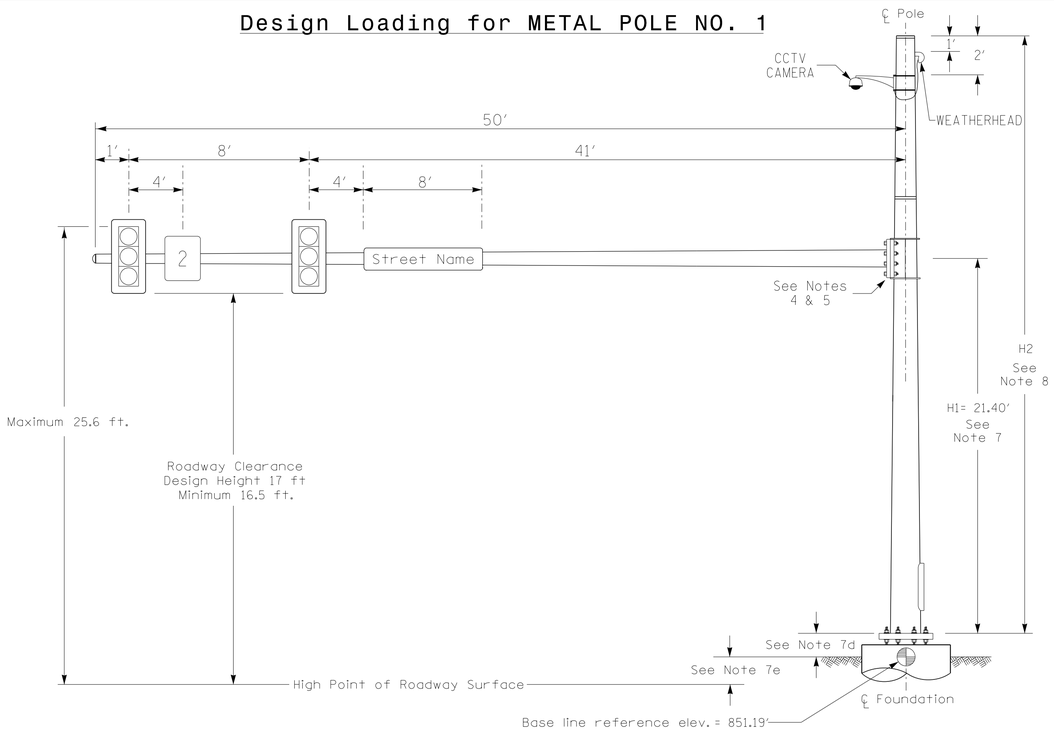
PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	R M Muncey	REVIEWED BY:	R Muncey, PE

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B48E... DATE
SIG. INVENTORY NO. 12-1831

Design Loading for METAL POLE NO. 1



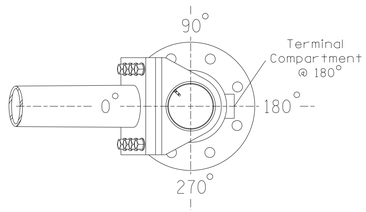
Elevation View

SPECIAL NOTE

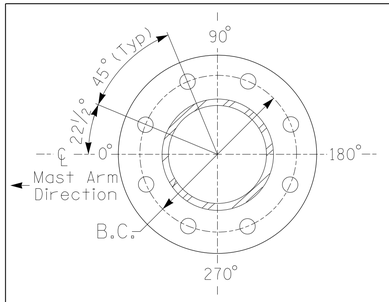
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ℄ Foundation @ ground level	851.19 ft.	
Elevation difference at High point of roadway surface	+2.39 ft.	
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	

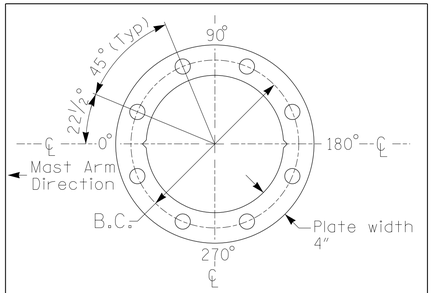


POLE RADIAL ORIENTATION



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. 5.2

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
	CCTV CAMERA ARM-MOUNTED	1.0 S.F.	11.0″ W X 11.0″ L	30 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 following: Mast arm attachment height (H1) plus 10 feet.
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.
12. Install the CCTV camera 2 feet below top of pole.
13. Install the weatherhead 1 foot below top of pole.

NCDOT Wind Zone 5 (110 mph)

Stantec

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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 1303 (Perth Road) U-turn

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
DATE

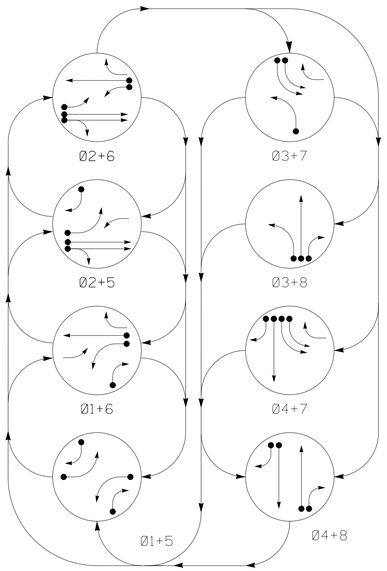
SIG. INVENTORY NO. 12-1831

5/16/2024
4:35:04 PM
J:\Traffic\Projects\Signals\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1831.dgn
User:jgalloway

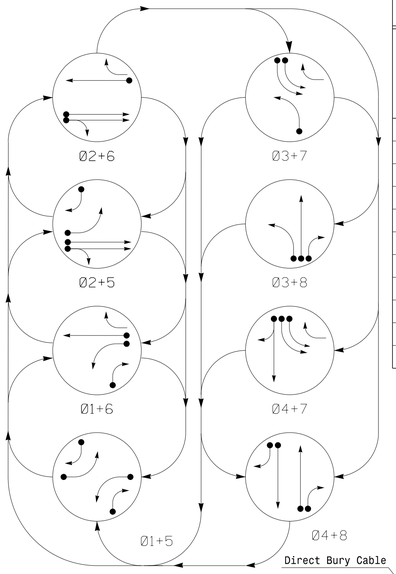
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 6.0

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

DEFAULT PHASING DIAGRAM



ALTERNATE PHASING DIAGRAM

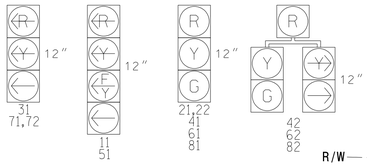


PHASING DIAGRAM DETECTION LEGEND

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

SIGNAL FACE I.D.

All Heads L.E.D.



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	R	G	R	G	R	R	R	R	R
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 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	R	G	R	G	R	R	R	R	R
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					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	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2C	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	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6C	6X40	0	✳	✳	6	-	-	X	-	X	-	✳
7A	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
8A	6X40	0	✳	✳	8	-	-	X	-	X	-	✳

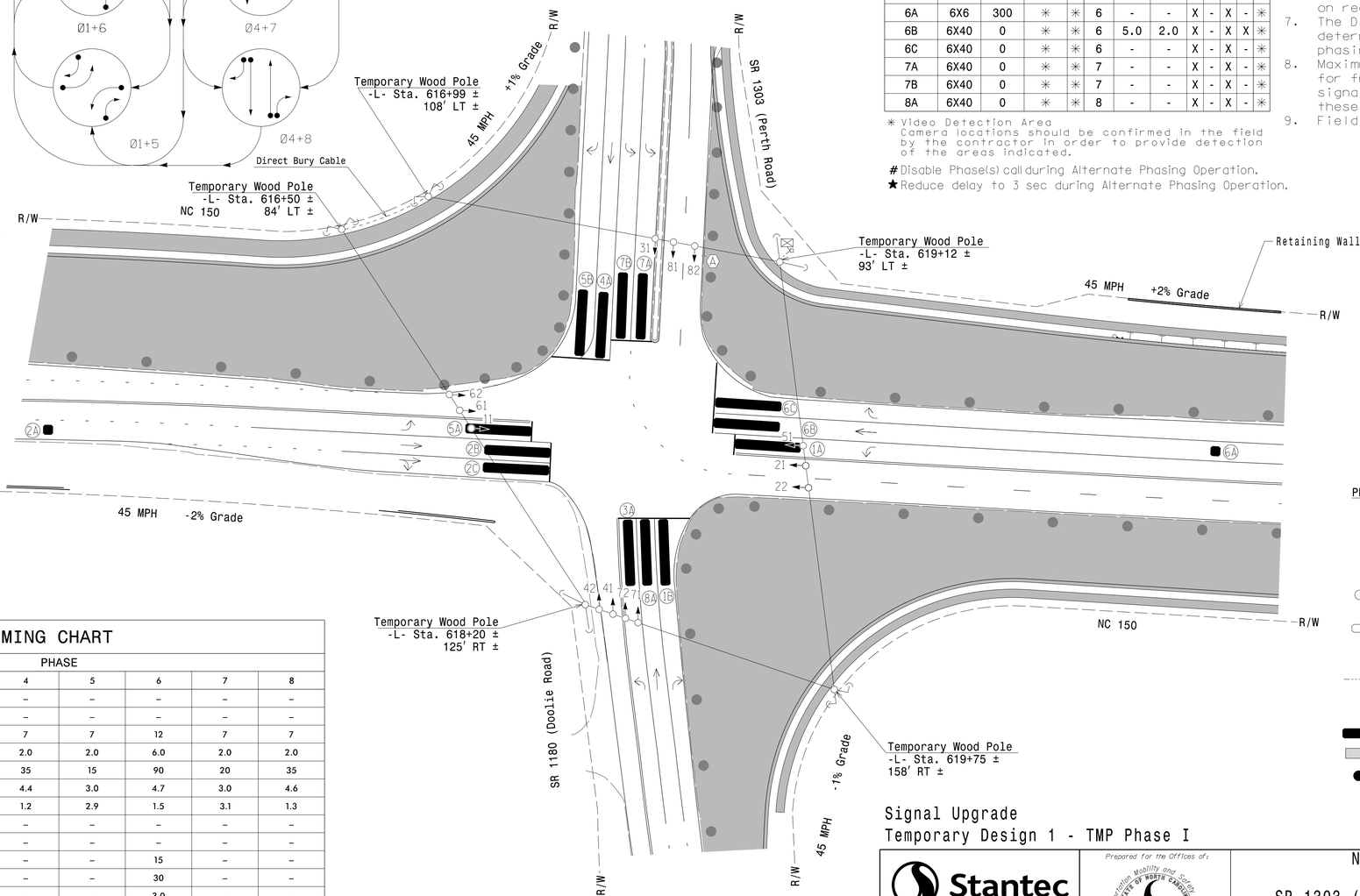
✳ Video Detection Area
Camera locations should be confirmed in the field by the contractor in order to provide detection of the areas indicated.

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. 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.



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	20	35
Yellow Change	3.0	4.7	3.0	4.4	3.0	4.7	3.0	4.6
Red Clear	2.8	1.5	2.3	1.2	2.9	1.5	3.1	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.

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
Ⓐ	Right Arrow "ONLY" Sign (R3-5R)	Ⓐ

Signal Upgrade
Temporary Design 1 - TMP Phase I

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Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

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
SR 1303 (Perth Road) /
SR 1180 (Doolie 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 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 12/17/2024
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DATE

SIG. INVENTORY NO. 12-1687TI

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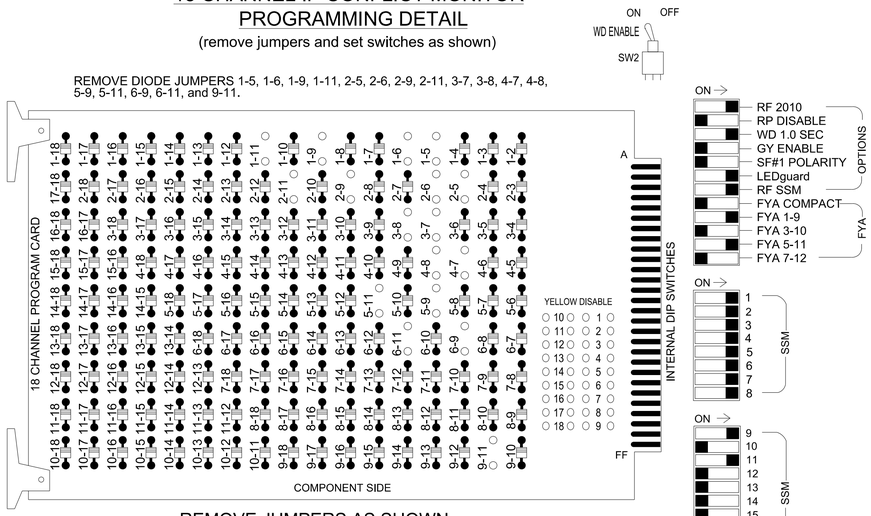
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 6.1

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	42	51 ★	61,62	NU	62	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	123			A122			A115		
FLASHING YELLOW ARROW																A123			A116		
GREEN ARROW	127	127			118			133	133			124	124								

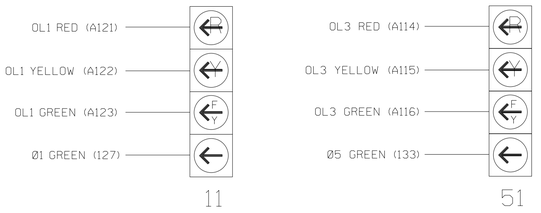
NU = Not Used

✳ 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)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1	SLOT EMPTY	FS DC ISOLATOR	
	L	1A													ST DC ISOLATOR
		NOT USED													
FILE "J"	U	Ø5	SLOT EMPTY												
	L	5A													
		NOT USED													

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	115 *	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

SPECIAL DETECTOR NOTE

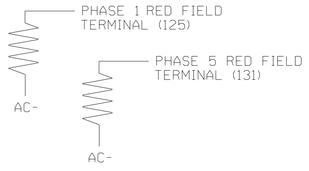
Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

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: 12-1687T1
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

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

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Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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, Traffic Engineering & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150
at
SR 1303 (Perth Road)/
SR 1180 (Doolie Road)
Division 12 Iredell County Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON E GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024
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SIG. INVENTORY NO. 12-1687T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 6.2

MAXTIME OVERLAP PROGRAMMING 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 3.0 seconds.

Disables phase 5 call on loop 5A and reduces delay time for phase 5 call on loop 5A to 3.0 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: 12-1687T1
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

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Traffic Engineering & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150
at
SR 1303 (Perth Road)/
SR 1180 (Doolie Road)

Division 12 Iredell County Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL SEAL

DocuSigned by: Jason Galloway 5/17/2024
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SIG. INVENTORY NO. 12-1687T1

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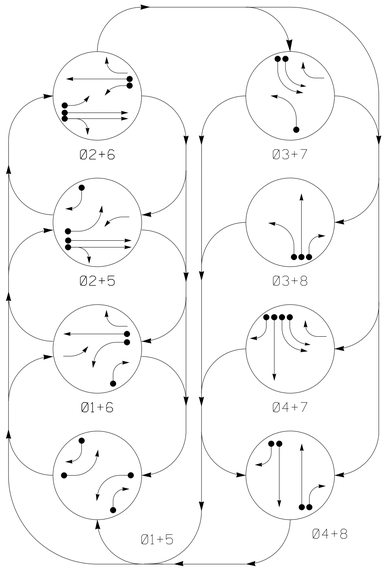
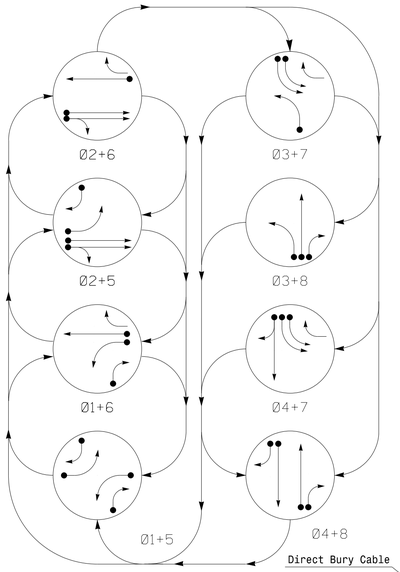
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 7.0

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 01+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11,12	←-	←-	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	-R
41,43	R	R	R	R	R	G	G	R	R
42	R/	R	R/	R	R	G	G	R	R
51	←-	F Y	←-	F Y	-R	-R	-R	-R	-R
61,63	R	G	R	G	R	R	R	R	R
62	R	G	R	G	R→	R	R/	R	R
71,72,73	-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+5	01+6	02+5	02+6	03+7	03+8	04+7	04+8	FLASH
11,12	←-	←-	-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	-R
41,43	R	R	R	R	R	G	G	R	R
42	R/	R	R/	R	R	G	G	R	R
51	←-	-R	←-	-R	-R	-R	-R	-R	-R
61,63	R	G	R	G	R	R	R	R	R
62	R	G	R	G	R→	R/	R→	R	R
71,72,73	-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	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2C	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	6X40	0	✳	✳	6	5.0	2.0	X	-	X	X	✳
6C	6X40	0	✳	✳	6	-	-	X	-	X	-	✳
7A	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
7B	6X40	0	✳	✳	7	-	-	X	-	X	-	✳
8A	6X40	0	✳	✳	8	3.0	-	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

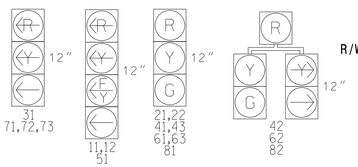
1. Refer to "Roadway Standard Drawings NCDOT" dated January 2024 and "Standard Specifications for Roads and Structures" dated January 2024.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. Phase 3 and/or phase 7 may be lagged.
5. Reposition all existing signal heads.
6. Set all detector units to presence mode.
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.

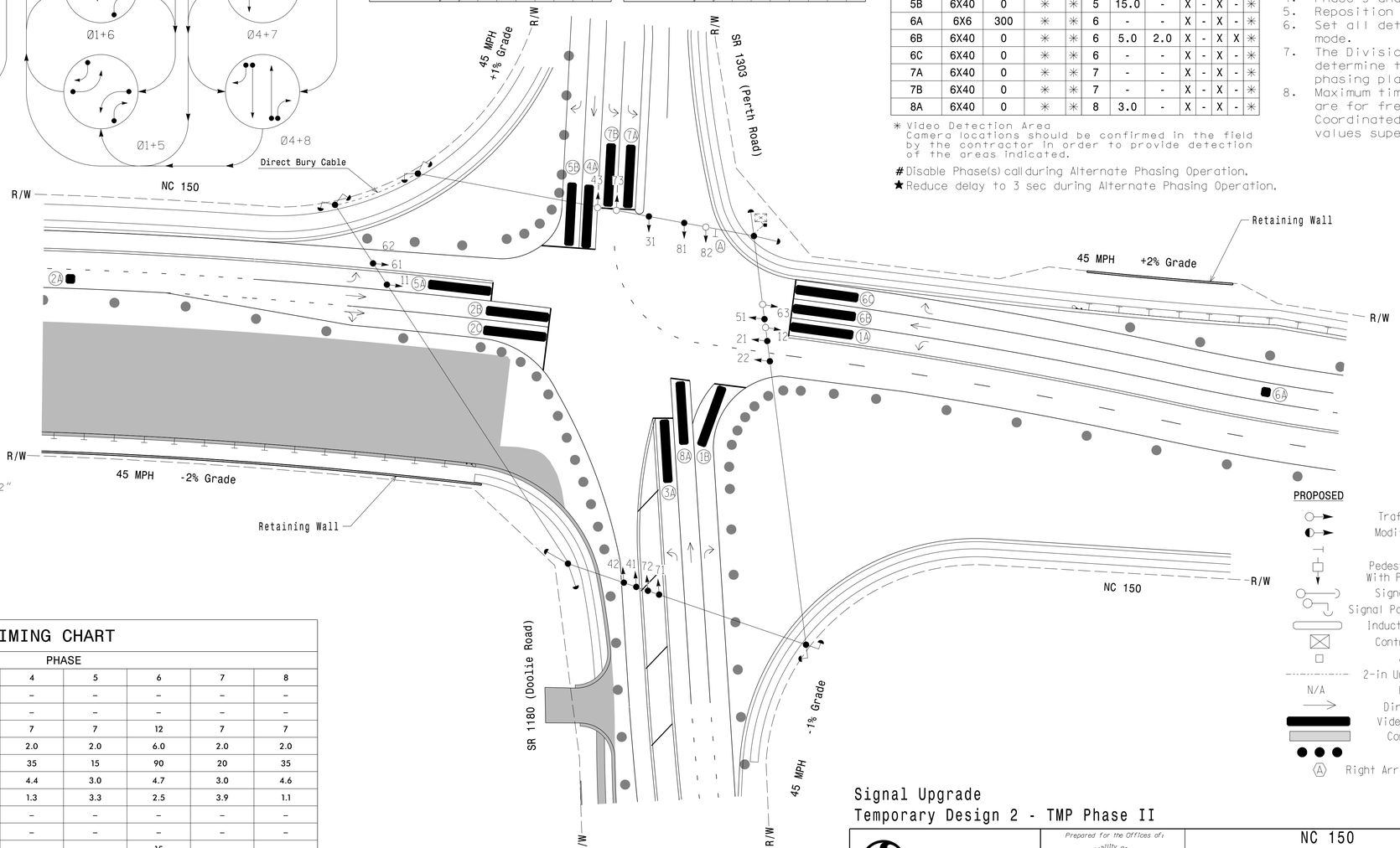
PHASING DIAGRAM DETECTION LEGEND

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

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
Ⓐ	Right Arrow "ONLY" Sign (R3-5R)	Ⓐ

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	20	35
Yellow Change	3.0	4.7	3.0	4.4	3.0	4.7	3.0	4.6
Red Clear	3.3	2.5	3.6	1.3	3.3	2.5	3.9	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 Upgrade
Temporary Design 2 - TMP Phase II

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Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

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
at
SR 1303 (Perth Road)/
SR 1180 (Doolie 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'

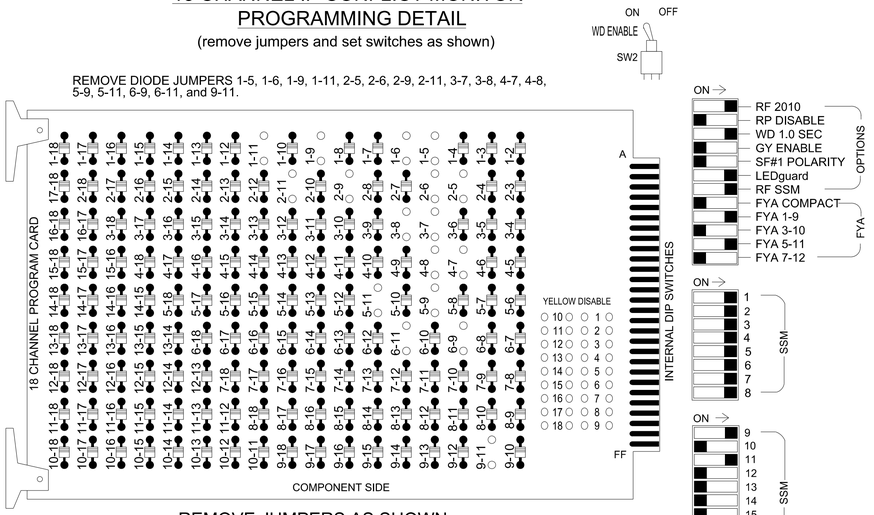
SEAL NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON W. GALLOWAY

DocuSigned by: Jason Galloway 12/17/2024
40D1E2B40B4B46E...
SIG. INVENTORY NO. 12-168772

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 7.1

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.

■ = 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.	11,12 ★	82	21,22	NU	31	41,42, 43	NU	42	51 ★	61,62, 63	NU	62	71,72, 73	81,82	NU	11,12 ★	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	123			A122			A115		
FLASHING YELLOW ARROW																A123			A116		
GREEN ARROW	127	127			118			133	133			124	124								

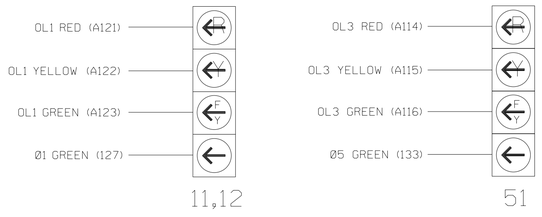
NU = Not Used

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

★ See pictorial of head wiring in detail this sheet.

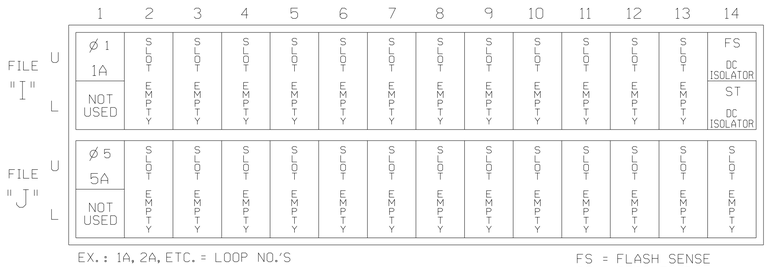
FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)



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	
				1	29 *	6	3.0		X		X	X
5A	TB3-1,2	J1U	55	17	115 *	5	15.0		X		X	
				1	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

SPECIAL DETECTOR NOTE

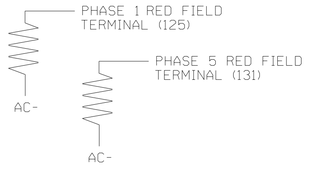
Install a loop emulation detection system for vehicle detection. Perform installation according to manufacturer's directions and NCDOT engineer-approved mounting locations to accomplish the detection schemes shown on the Signal Design Plans.

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: 12-1687T2
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

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

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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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 1303 (Perth Road)/
SR 1180 (Doolie Road)

Division 12 | Iredell County | Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON D GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024
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SIG. INVENTORY NO. 12-1687T2

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 7.2

MAXTIME OVERLAP PROGRAMMING 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 5 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: 12-1687T2
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

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

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Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
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NC 150
at
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Division 12 | Iredell County | Mooresville

PLAN DATE:	May 2024	REVIEWED BY:	J Galloway, PE
PREPARED BY:	J Galloway	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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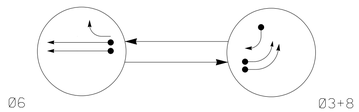
SIG. INVENTORY NO. 12-1687T2

4:39:47 PM
J:\Projects\Design\Electrical Details\Temporary Design\MAXTIME\R-2307B_sm_ele_12-1687t2.dgn
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 8.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

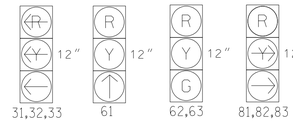
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3+8	FLASH
31,32,33	←R	←	←R
61	↑	R	R
62,63	G	R	R
81,82,83	R	→	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

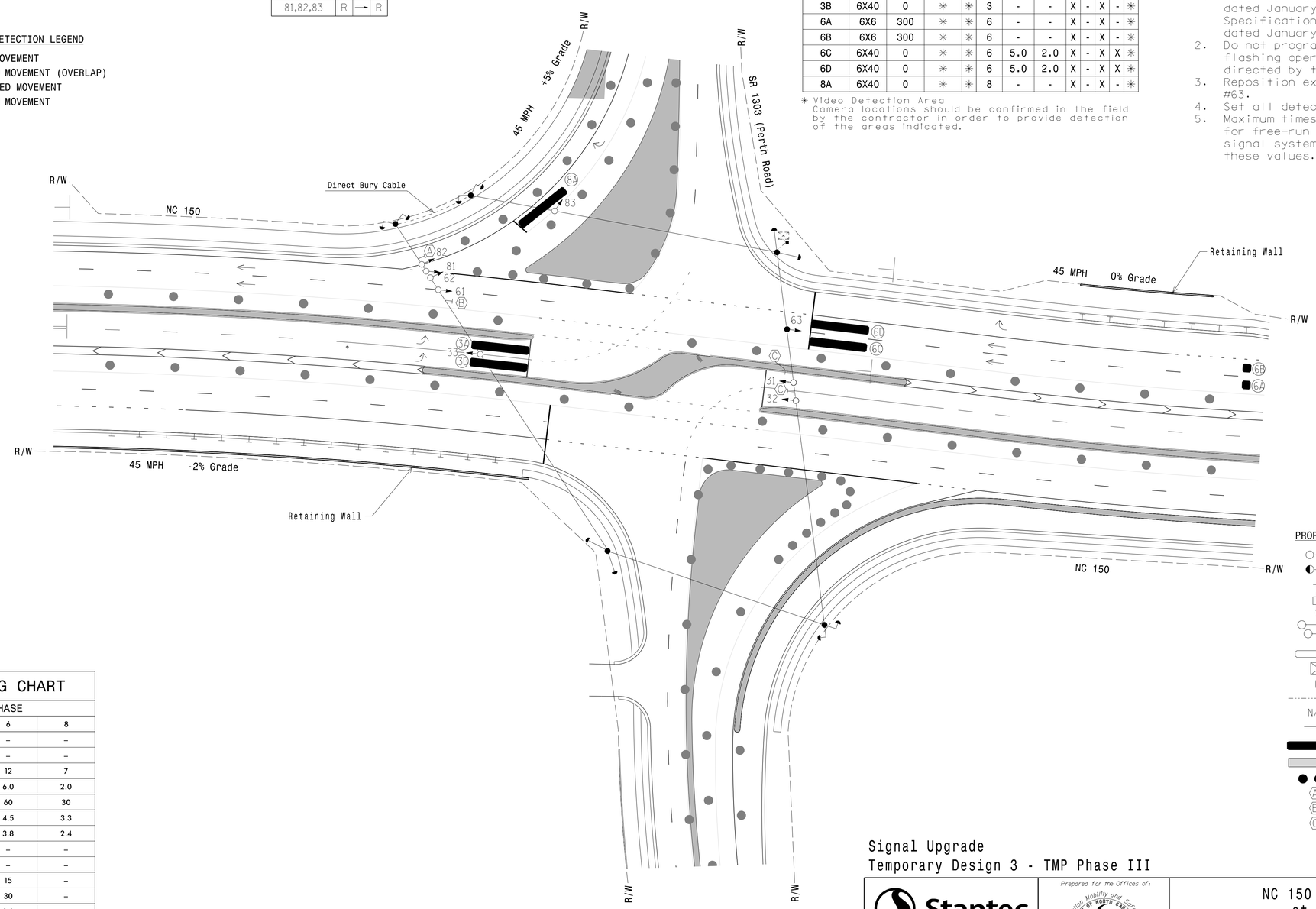
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
3B	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C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

✳ 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 #63.
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.



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)	Ⓒ

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	4.5	3.3
Red Clear	4.0	3.8	2.4
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.

Signal Upgrade
Temporary Design 3 - TMP Phase III

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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Tel. (919) 851-6866
Fax. (919) 851-7024
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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
SR 1303 (Perth 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 9/17/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-16877T3

$$$$$$SYSDATE$$$$$$
4:42:09 PM
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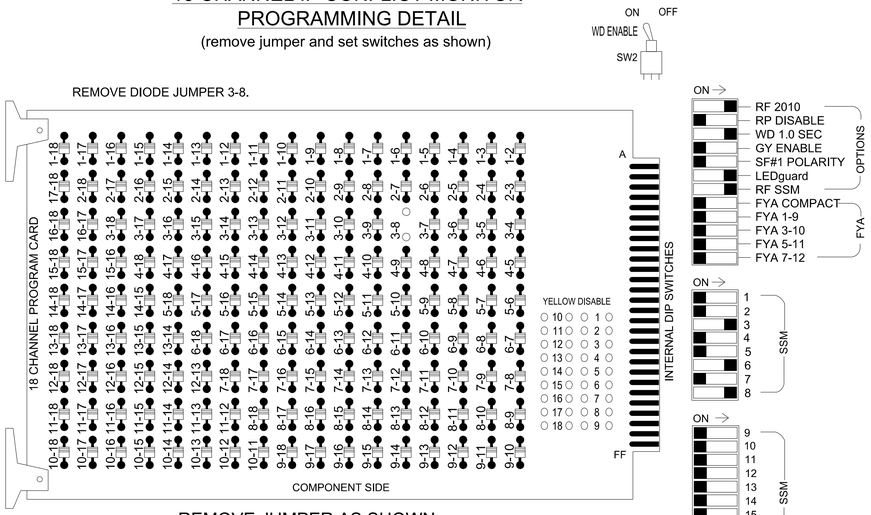
User:jpilloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 8.1

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 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, S11
Phases Used.....3, 6, 8
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

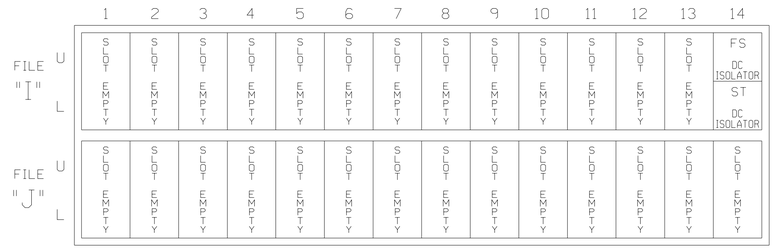
SIGNAL HEAD HOOK-UP CHART

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	NU	NU	31,32, 33	NU	NU	NU	61	62,63	NU	NU	81,82 83	NU	NU	NU	NU	NU	NU	NU
RED								134	134			107							
YELLOW								135	135										
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117								108							
GREEN ARROW				118				136				109							

NU = Not Used

INPUT FILE POSITION LAYOUT

(front view)



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

FS = FLASH SENSE
ST = STOP TIME

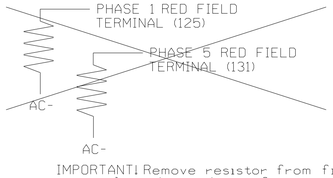
SPECIAL DETECTOR NOTE

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.

Remove "Wired Inputs" from rear of input file to prevent unwanted calls to Phases 2 and 6.

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 resistor from field terminal as shown above, if present.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1687T3
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Temporary Design 3 - TMP Phase III
Electrical Detail

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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 & Signals Management Section
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 WB
at
SR 1303 (Perth Road)

Division 12 Iredell County Mooresville

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

REVISIONS	INIT.	DATE

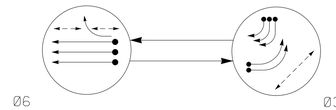
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B48E... DATE
SIG. INVENTORY NO. 12-1687T3

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 9.0

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

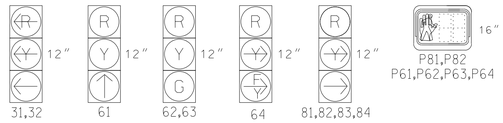
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3+8	FLASH
31,32	←R	←R	←R
61	↑	R	R
62,63	G	R	R
64	F	R	R
81,82,83,84	R	→R	R
P81,P82	DW	W	DRK
P61,P62, P63,P64	W	DW	DRK

SIGNAL FACE I.D.

All Heads L.E.D.

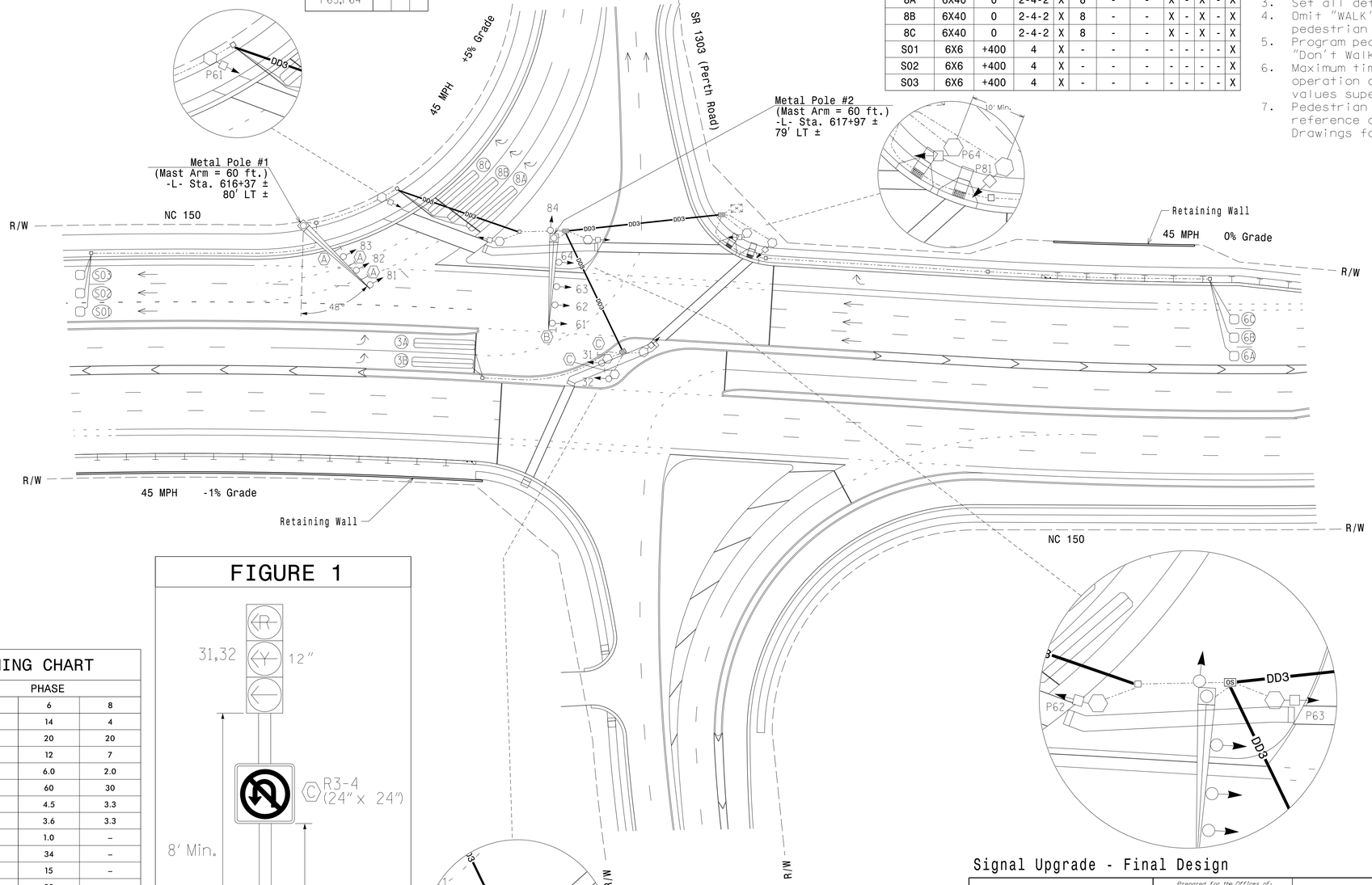


MAXTIME DETECTOR INSTALLATION CHART

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	4	X	6	-	-	X	X	X	-	X
6B	6X6	300	4	X	6	-	-	X	X	X	-	X
6C	6X6	300	4	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
8C	6X40	0	2-4-2	X	8	-	-	X	-	X	-	X
S01	6X6	+400	4	X	-	-	-	-	-	-	-	X
S02	6X6	+400	4	X	-	-	-	-	-	-	-	X
S03	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. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. 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 3	PHASE 6	PHASE 8
Walk *	–	14	4
Ped Clear *	–	20	20
Min Green	7	12	7
Passage *	2.0	6.0	2.0
Max 1 *	30	60	30
Yellow Change	3.0	4.5	3.3
Red Clear	3.9	3.6	3.3
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

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 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 FIGURE 1)	Ⓒ

Signal Upgrade - Final Design

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Raleigh, NC 27606
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Fax. (919) 851-7024
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Prepared for the Offices of:
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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
Signal Design Section
750 N.Greenfield Pkwy.Garner,NC 27529

SCALE 0 40 1"=40'

NC 150 WB
at
SR 1303 (Perth 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 12/17/2024
10D1E2B40B4B46E... DATE

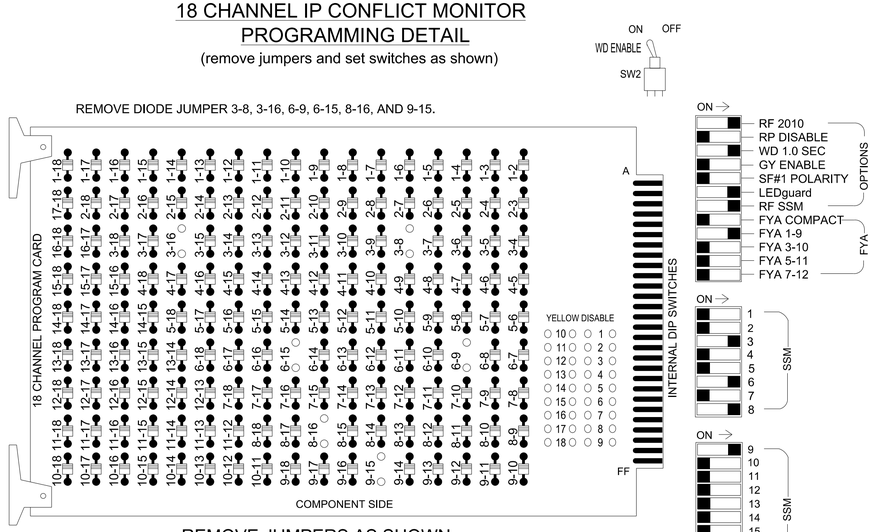
SIG. INVENTORY NO. 12-1687

$$$$$$SYSDATE$$$$$$
01:44:13 PM
User:jgalloway
\\Design\Signal Design\Final Design\R-2307B_sig_dsn_12-1687.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 9.1

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 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 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.	NU	NU	NU	31,32	NU	NU	NU	61	62,63	P61, P62, P63, P64	NU	81,82, 83,84	P81, P82	64 ★	NU	NU	NU	NU	NU
RED								134	134			107		A121					
YELLOW								135	135										
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117								108		A122					
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.

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	Ø3 3A	Ø3 3B	SLOT EMPTY	SLOT EMPTY	SYS. DET. S01	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø6 PED DC ISOLATOR	FS DC ISOLATOR
	L					NOT USED	NOT USED			SYS. DET. S02				Ø8 PED DC ISOLATOR	ST DC ISOLATOR
FILE "J"	U	SLOT EMPTY	Ø6 6A	Ø6 6C	SLOT EMPTY	SLOT EMPTY	Ø8 8A	Ø8 8C	SLOT EMPTY	SYS. DET. S03	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L		Ø6 6B	NOT USED			Ø8 8B	NOT USED		NOT USED					

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	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	
8A	TB5-9,10	J6U	42	4	22	8			X		X	
8B	TB5-11,12	J6L	46	8	23	8			X		X	
8C	TB7-1,2	J7U	66	32	24	8			X		X	
*S01	TB6-9,10	I9U	60	22	13	SYS						
*S02	TB6-11,12	I9L	62	24	14	SYS						
*S03	TB7-9,10	J9U	59	21	27	SYS						
PED PUSH BUTTONS												
P61,P62	TB8-7,9	I13U	68	34	6	PED 6						
P81,P82	TB8-8,9	I13L	70	36	8	PED 8						

*System detector only. Remove any assigned vehicle phase.

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

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1687
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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Final Design
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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
SR 1303 (Perth Road)

Division 12 | Iredell County | Mooresville

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

REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL
029904
ENGINEER
JASON R GALLOWAY

DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1687 DATE

4:45:03 PM
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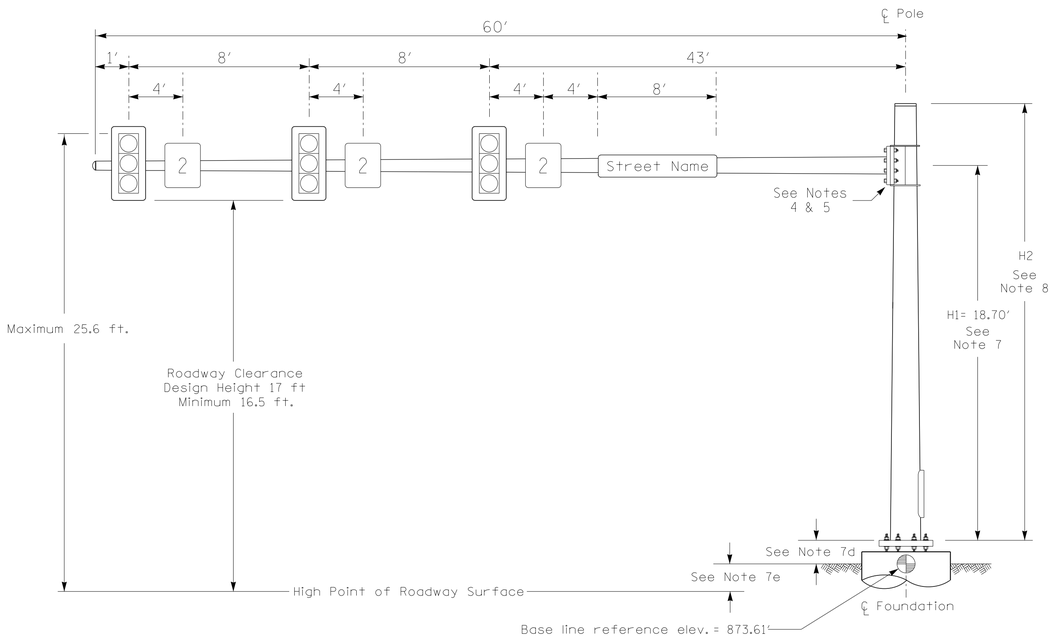
User:jgalloway

METAL POLES No. 1 & 2

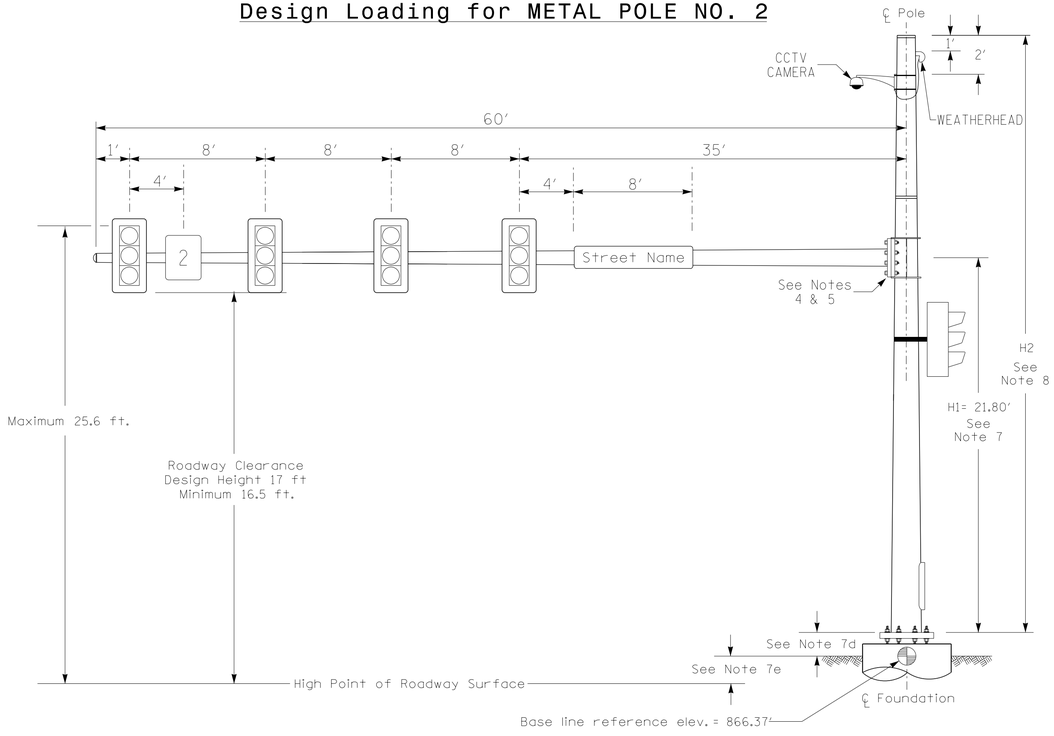
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 9.2

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



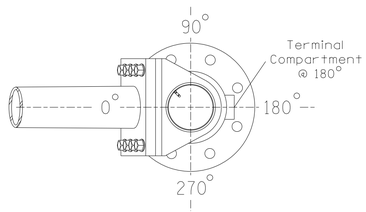
Elevation View

SPECIAL NOTE

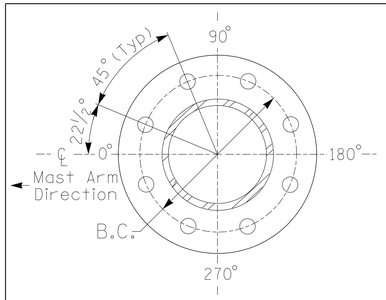
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	873.61 ft.	866.37 ft.
Elevation difference at High point of roadway surface	-0.37 ft.	+ 2.77 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

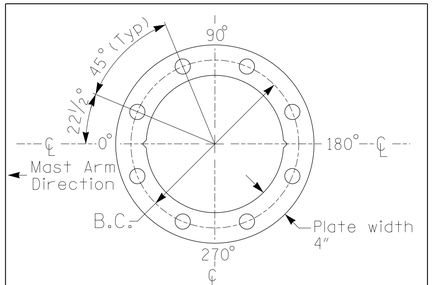


POLE RADIAL ORIENTATION



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
	CCTV CAMERA ARM-MOUNTED	1.0 S.F.	11.0″ W X 11.0″ L	30 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.
   - If the pole assembly includes a CCTV camera, the total height of the pole (H2) will be the calculated value of the mast arm attachment height (H1) plus 10 feet.
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 WB
at
SR 1303 (Perth Road)

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

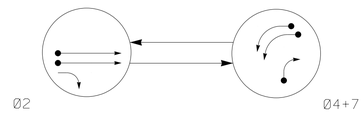
DocuSigned by: Jason Galloway 5/17/2024 DATE

SIG. INVENTORY NO. 12-1687

5/16/2024
1:45:41 PM
J:\Projects\Signals\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1687.dgn
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 10.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

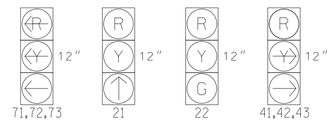
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø4+7	FLASH
21	↑	R	R
22	G	R	R
41,42,43	R	→	R
71,72,73	R	←	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

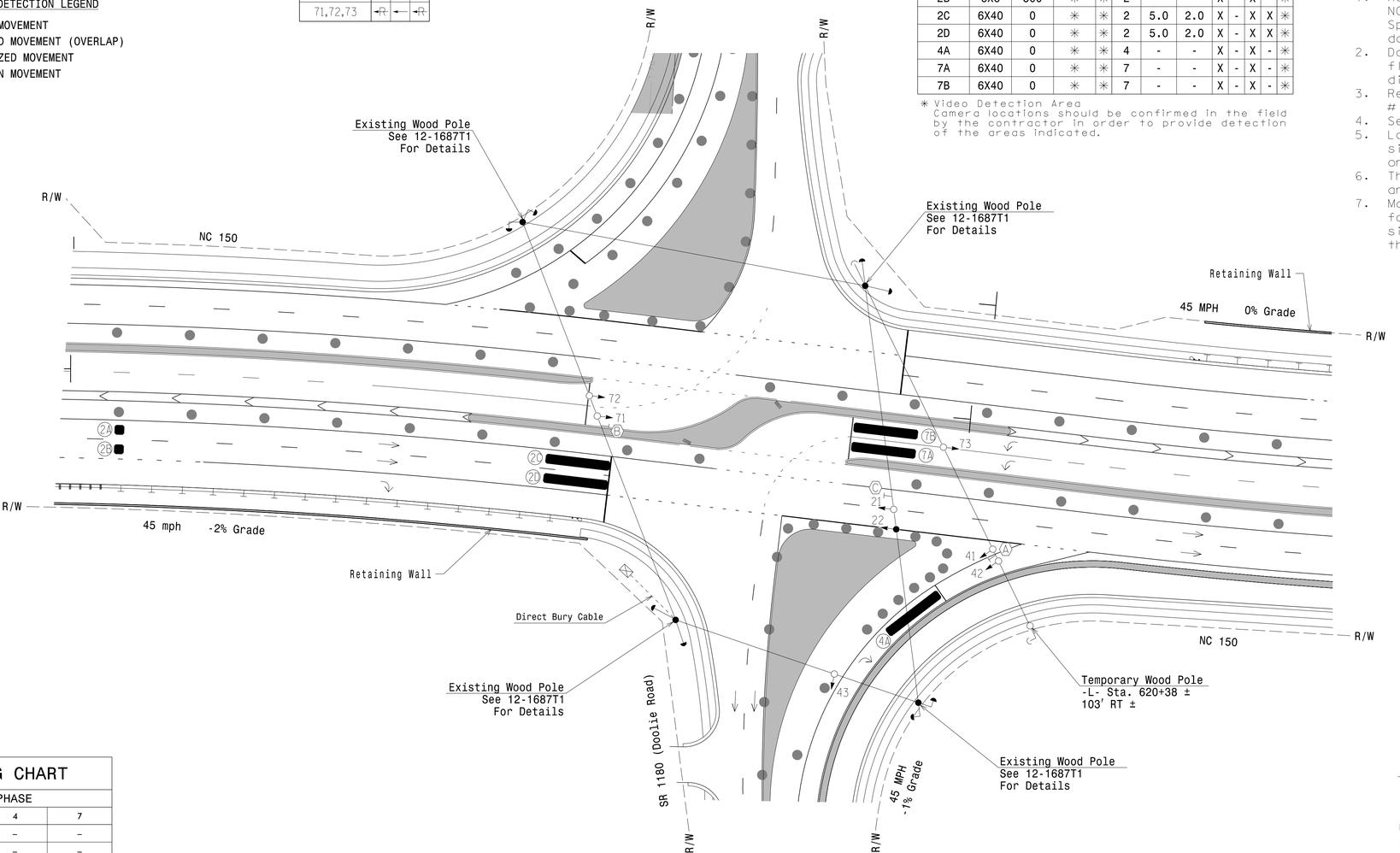
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
4A	6X40	0	✳	✳	4	-	-	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. Reposition existing signal heads numbered # 21 and 22.
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 cabinet should be designed to include an Auxiliary Output File for future use.
7. 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)	Ⓐ
Ⓑ	No U-Turn Sign (R3-4)	Ⓑ
Ⓒ	No Left/U-Turn Sign (R3-18)	Ⓒ

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	4.7	3.6	3.0
Red Clear	3.6	2.8	2.9
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 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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Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

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 1180 (Doolie Road)

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'

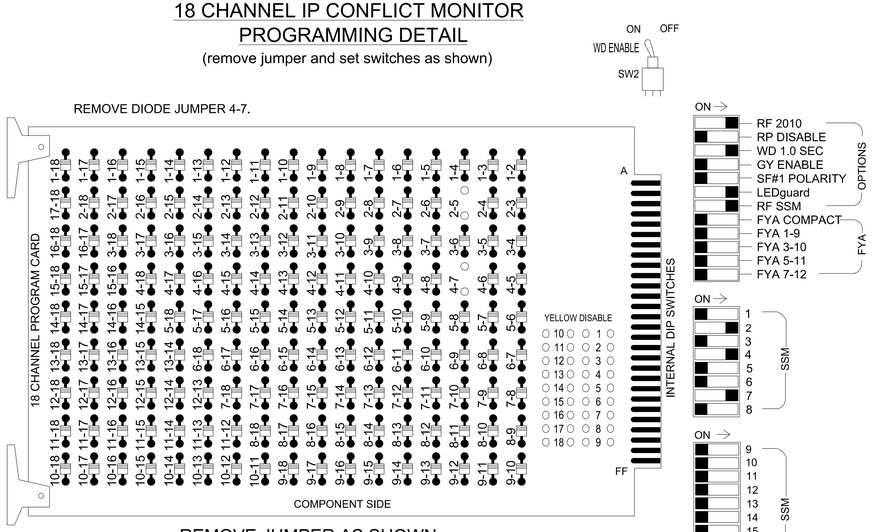
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON K. GALLOWAY

DocuSigned by:
Jason Galloway 12/17/2024
40D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1832TI

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 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

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 10.1

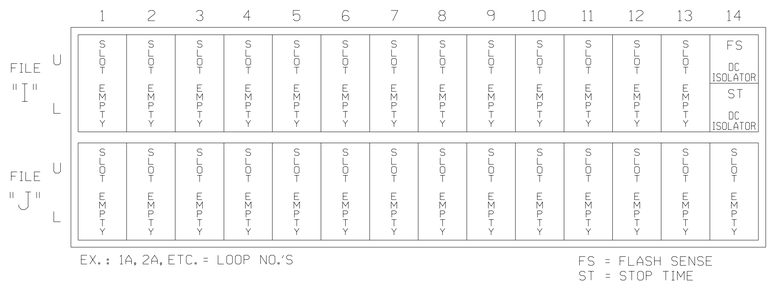
SIGNAL HEAD HOOK-UP CHART

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, 43	NU	NU	NU	NU	71,72, 73	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128			101												
YELLOW		129	129															
GREEN			130															
RED ARROW										122								
YELLOW ARROW						102				123								
GREEN ARROW		130				103				124								

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.

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1832T1
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

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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 EB
at
SR 1180 (Doolie Road)

Division 12 Iredell County Mooresville

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

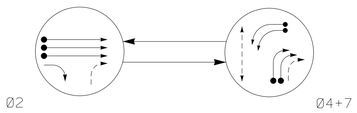
REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON P. GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024
10D1E2B40B4B48E... DATE
SIG. INVENTORY NO. 12-1832T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 11.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

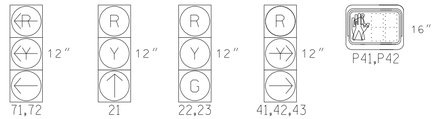
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø4+7	PHASE FLASH
21	↑	R	R
22,23	G	R	R
41,42,43	R	→	R
71,72	~~R~~	~~←~~	~~R~~
P41,P42	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
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
S04	6X6	+400	4	X	-	-	-	-	-	-	-	X
S05	6X6	+400	4	X	-	-	-	-	-	-	-	X
S06	6X6	+400	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. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. Pedestrian pedestals are conceptual and shown for reference only. See 2024 NCDOT Roadway Standard Drawings for push button location details.

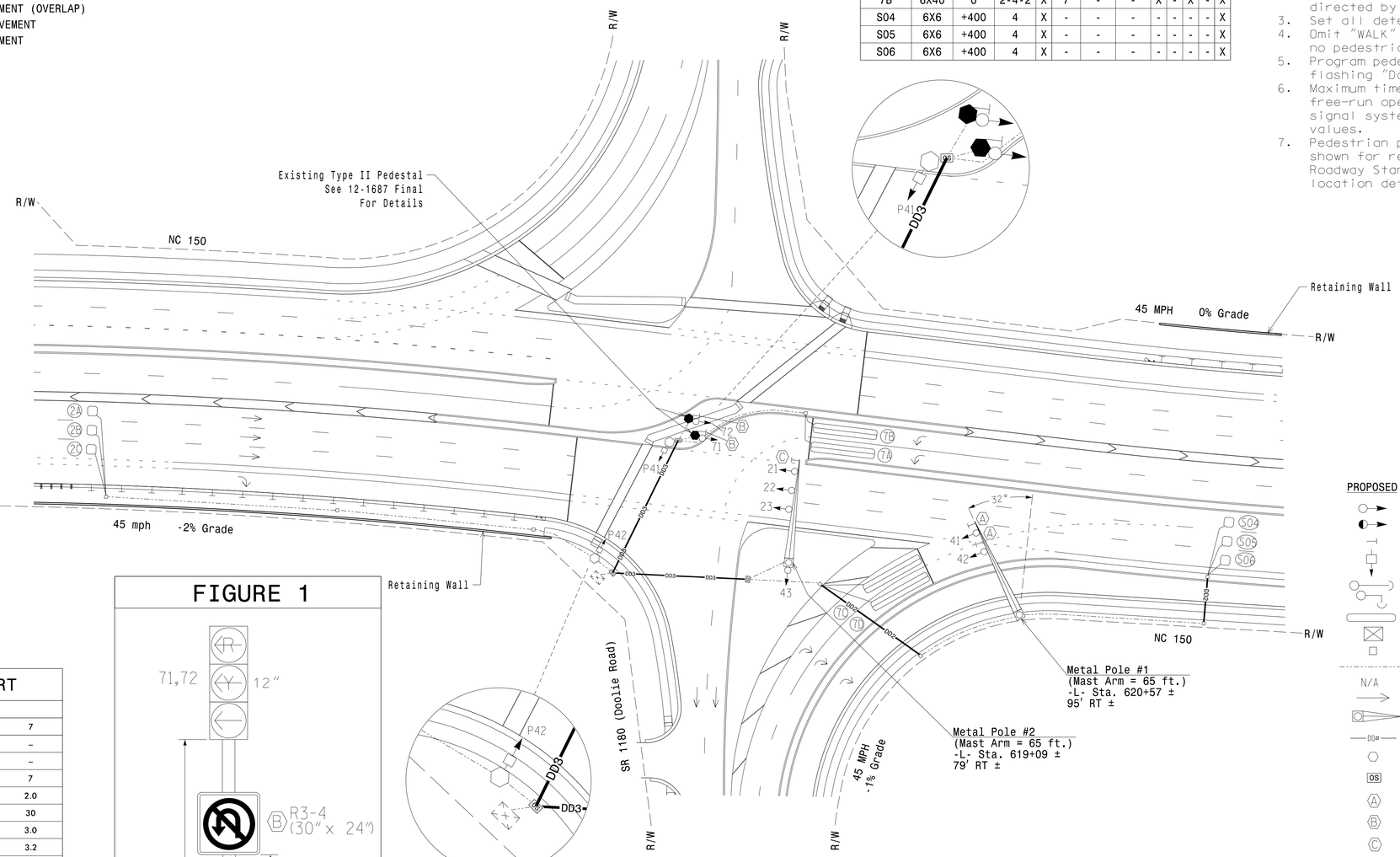


FIGURE 1

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 4	PHASE 7
Walk *	–	4	–
Ped Clear *	–	15	–
Min Green	12	7	7
Passage *	6.0	2.0	2.0
Max 1 *	60	30	30
Yellow Change	4.7	3.6	3.0
Red Clear	3.4	3.3	3.2
Added Initial *	1.0	–	–
Maximum Initial *	34	–	–
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.

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 II Signal Pedestal	
OS	Oversized Junction Box	
(A)	"NO TURN ON RED" Sign (R10-11)	(A)
(B)	No U-Turn Sign (R3-4) (SEE FIGURE 1)	(B)
(C)	No Left Turn Sign (R3-2)	(C)

New Installation - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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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
SR 1180 (Doolie 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

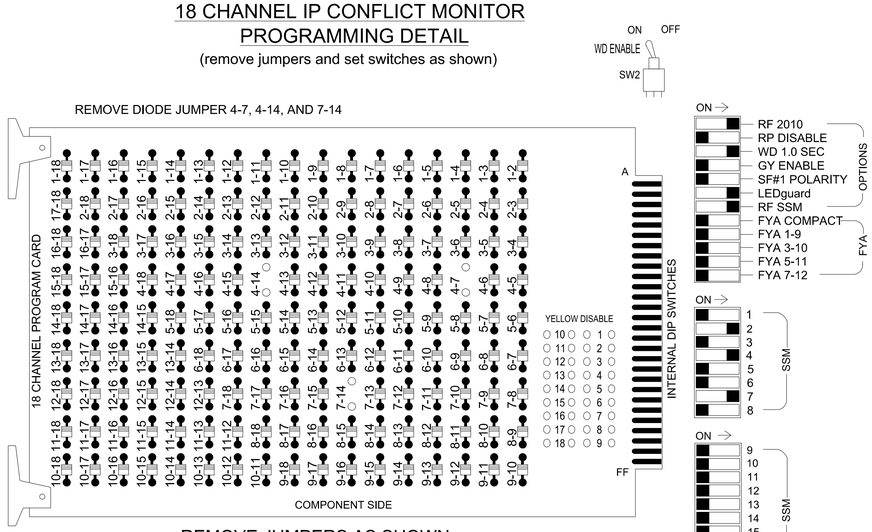
DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B46E... DATE

SIG. INVENTORY NO. 12-1832

$$$$$$$SYSDATE$$$$$$
4:49:04 PM
User:tpollowa
C:\Users\tpollowa\Documents\Projects\Design\Signal Design\Final Design\R-2307B_sig_dsn_12-1832.dgn

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)



REMOVE JUMPERS AS SHOWN

■ = DENOTES POSITION OF SWITCH

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.
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, S5, S6, S10
Phases Used.....2, 4, 4PED, 7
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 11.1

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	22,23	NU	NU	41,42, 43	P41, P42	NU	NU	NU	71,72	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128			101													
YELLOW		129	129																
GREEN			130																
RED ARROW											122								
YELLOW ARROW						102					123								
GREEN ARROW		130				103					124								
✋							104												
🚶							106												

NU = Not Used

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	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SYS. DET. SØ4	SLOT EMPTY	SLOT EMPTY	NOT USED	SLOT EMPTY	FS DC ISOLATOR
FILE "I" L		Ø2 2B	NOT USED			Ø4 4B			SYS. DET. SØ5			Ø4 PED DC ISOLATOR		ST DC ISOLATOR
FILE "J" U	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø7 7A	Ø7 7B	SLOT EMPTY	SLOT EMPTY	SYS. DET. SØ6	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
FILE "J" L					NOT USED	NOT USED			NOT USED					

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	
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	
*S04	TB6-9,10	I9U	60	22	13	SYS						
*S05	TB6-11,12	I9L	62	24	14	SYS						
*S06	TB7-9,10	J9U	59	21	27	SYS						
PED PUSH BUTTONS												
P41,P42	TB8-5,6	I12L	69	35	4	PED 4						

NOTE:
INSTALL DC ISOLATOR IN INPUT FILE SLOT I12.

*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: 12-1832
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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
Traffic Engineering & Safety Systems Branch
Signals & Signal Management Section
Department of Transportation
750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB
at
SR 1180 (Doolie Road)

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
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON R GALLOWAY

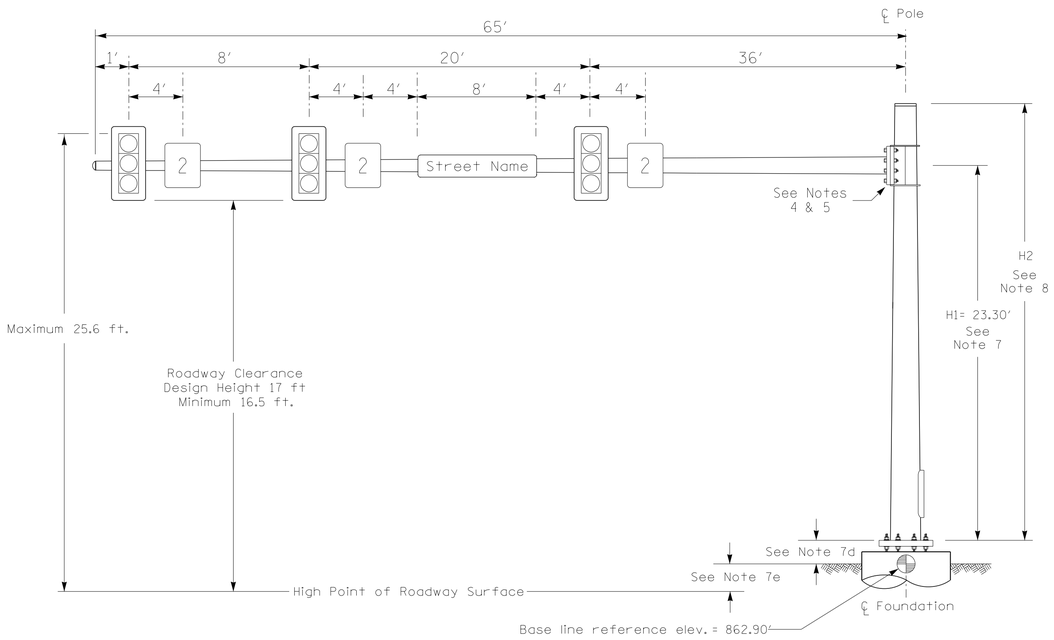
DocuSigned by:
Jason Galloway 5/17/2024
10D1E2B40B4B46E...
DATE

SIG. INVENTORY NO. 12-1832

METAL POLE No. 1 and 2

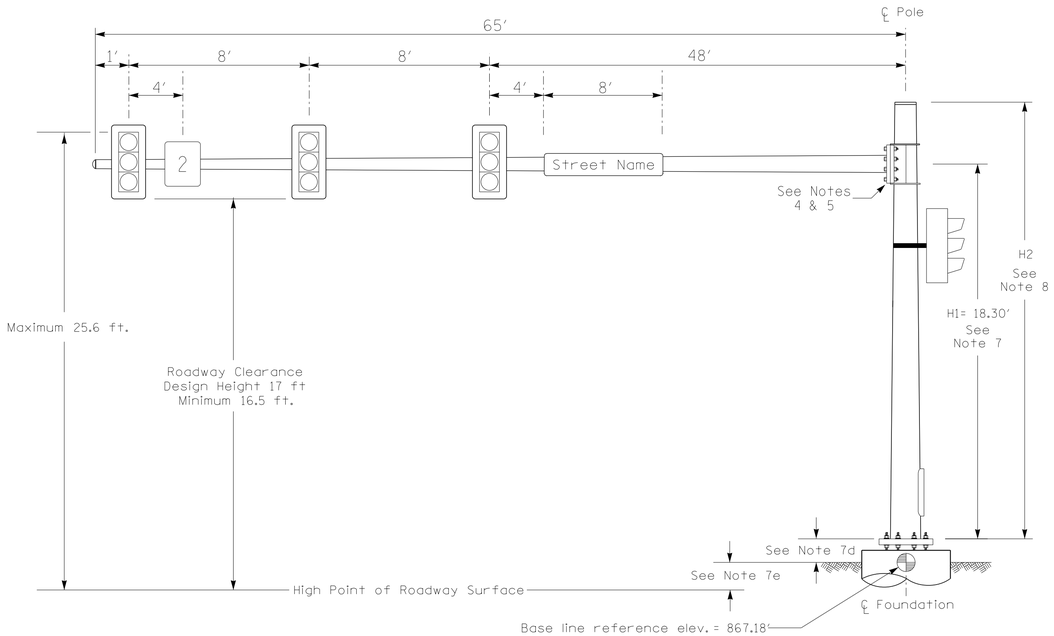
PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 11.2

Design Loading for METAL POLE NO. 1



Elevation View

Design Loading for METAL POLE NO. 2



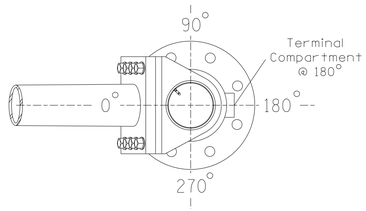
Elevation View

SPECIAL NOTE

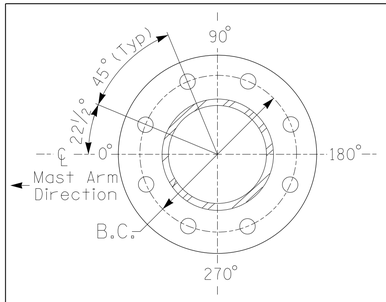
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	Pole 2
Baseline reference point at ℄ Foundation @ ground level	862.84	867.18 ft.
Elevation difference at High point of roadway surface	+4.26 ft.	-0.72 ft.
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	+/-0.0 ft.

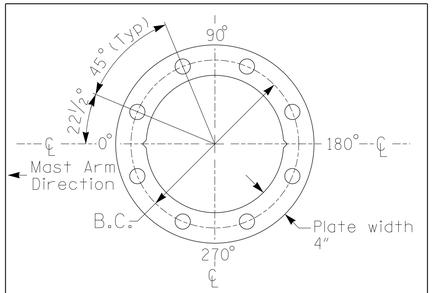


POLE RADIAL ORIENTATION



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 1180 (Doolie Road)

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

SIG. INVENTORY NO. 12-1832

5/16/2024
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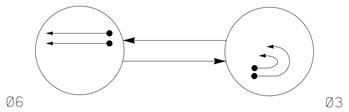
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 12.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

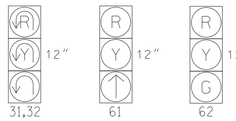
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3	PHASE FLASH
31,32	R		R
61		R	R
62	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



MAXTIME DETECTOR INSTALLATION CHART

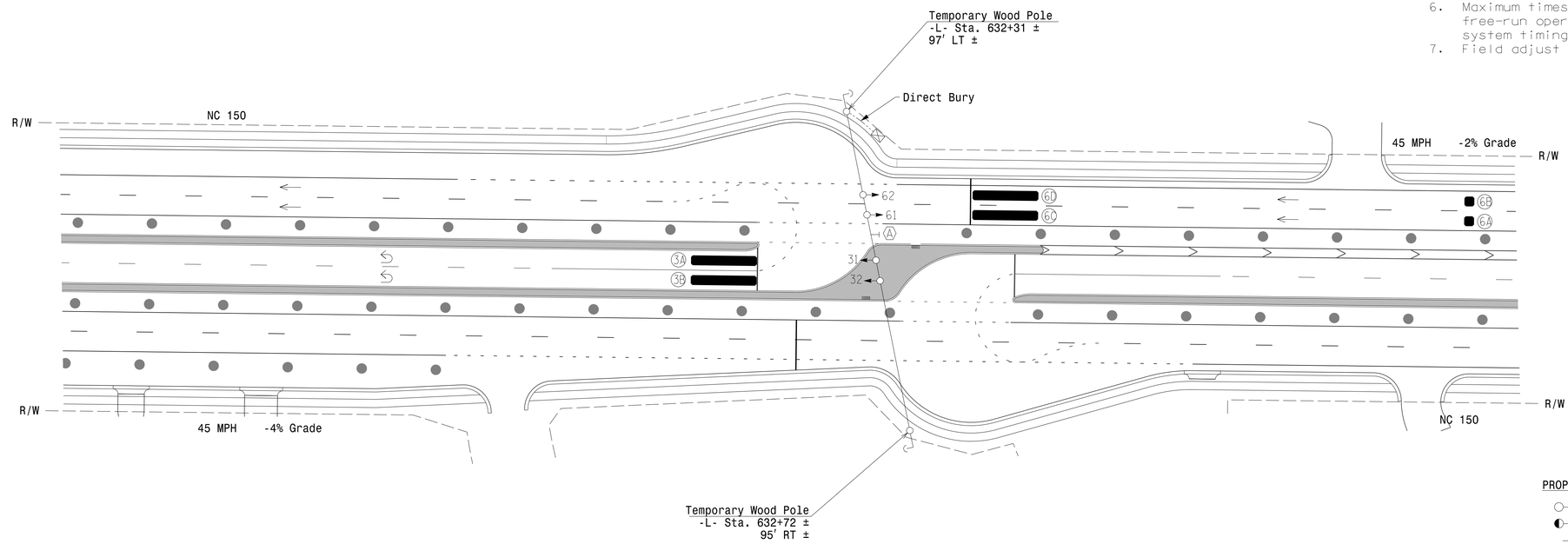
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
3B	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6B	6X6	300	✳	✳	6	-	-	X	-	X	-	✳
6C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

✳ 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 Left Turn Sign (R3-2)	Ⓐ

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	4.7
Red Clear	4.2	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 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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Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

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
SR 1180 (Doolie Road) U-turn

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 R GALLOWAY

DocuSigned by: Jason Galloway 12/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-18331I

$$$$$$$$$DATE$$$$$$
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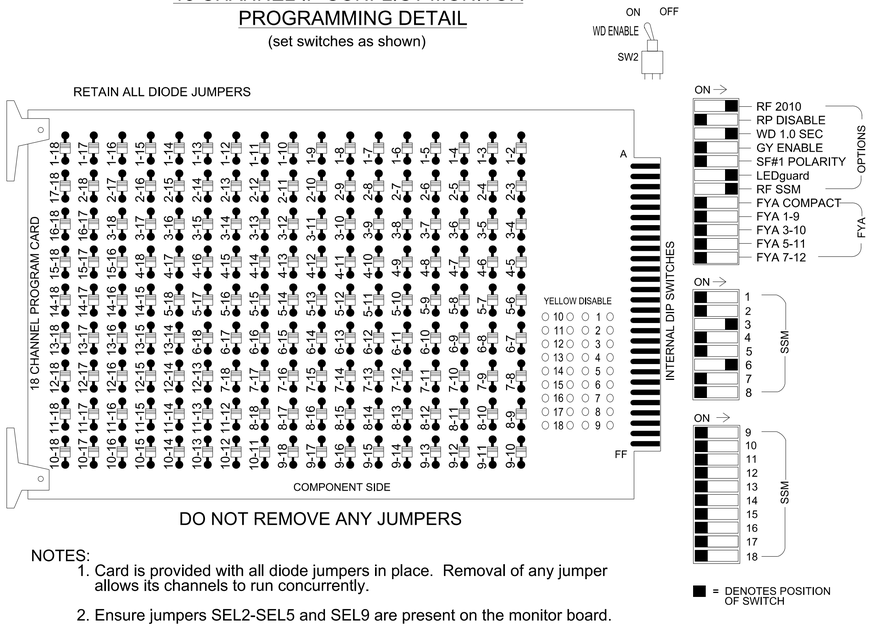
J:\Projects\Signals\Design\Signal Design\Temporary Design\Phase 3 TEMP\R-2307B_sig_dsn_12-18331I.dgn
User:jgalloway

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 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.

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 12.1

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	134										
YELLOW								135	135										
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117															
GREEN ARROW				118				136											

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.....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

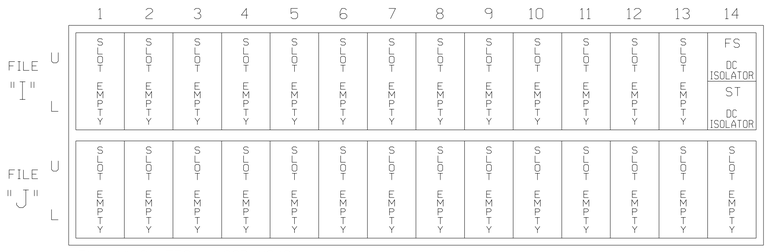
Web Interface
Home >Controller >Sequence

Sequence 1

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

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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1833T1
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

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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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
SR 1180 (Doolie Road) U-turn

Division 12 | Iredell County | Mooresville

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

REVISIONS	INIT.	DATE

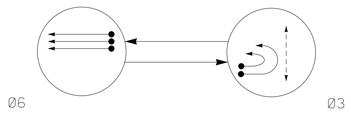
SEAL 029904 ENGINEER JASON P. CALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/17/2024
10D1E2B40B4B48E DATE
SIG. INVENTORY NO. 12-1833T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 13.0

2 Phase
Fully Actuated
NC 150 D12-02 MOORESVILLE
CLS

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

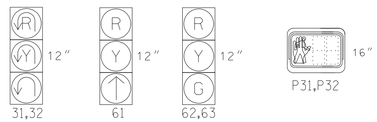
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø6	PHASE Ø3	PHASE FLASH
31,32	R		R
61	↑	R	R
62,63	G	R	R
P31,P32	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.

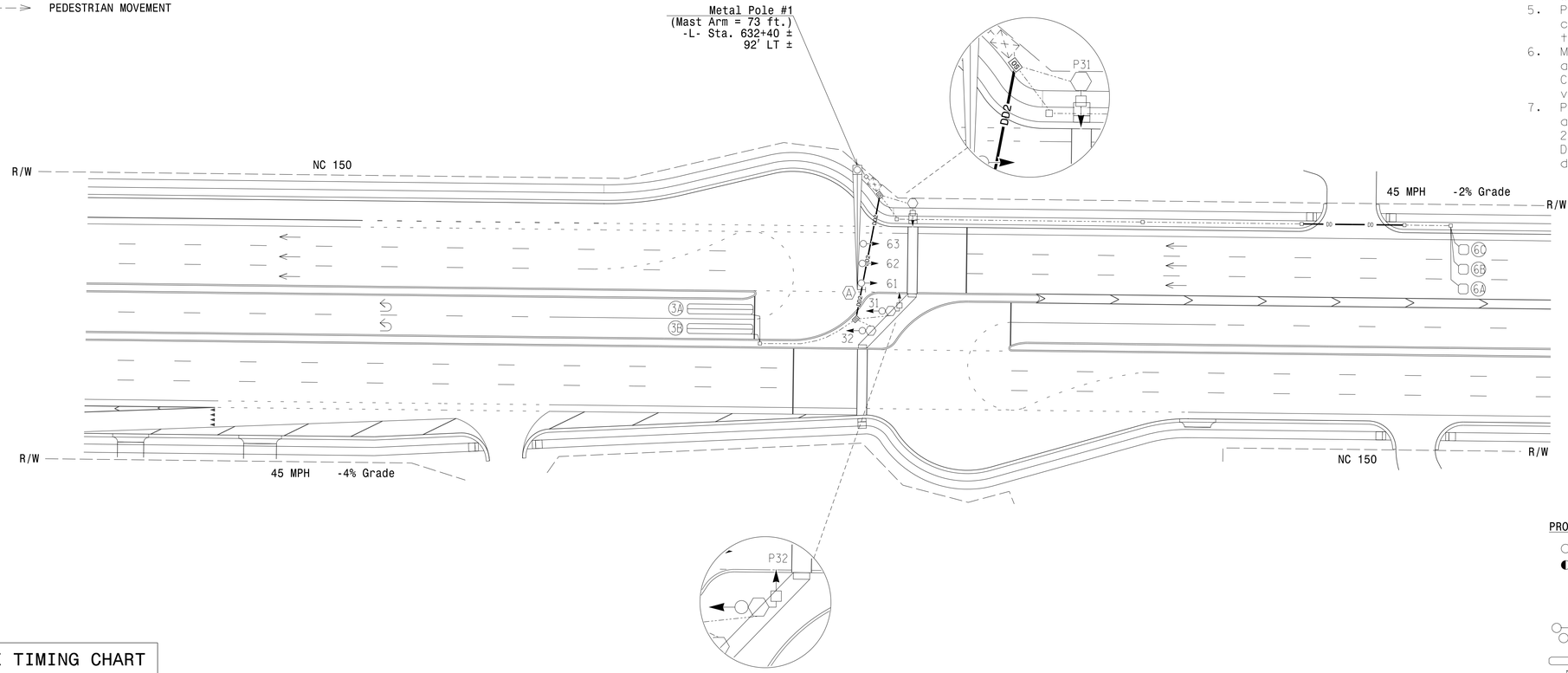


MAXTIME DETECTOR INSTALLATION CHART

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
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	4	X	6	-	-	X	X	X	-	X
6B	6X6	300	4	X	6	-	-	X	X	X	-	X
6C	6X6	300	4	X	6	-	-	X	X	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. Omit "WALK" and Flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. 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 3	PHASE 6
Walk *	4	–
Ped Clear *	9	–
Min Green	7	12
Passage *	2.0	6.0
Max 1 *	30	60
Yellow Change	3.0	4.7
Red Clear	5.2	2.0
Added Initial *	–	1.0
Maximum Initial *	–	34
Time Before Reduction *	–	15
Time To Reduce *	–	30
Minimum Gap	–	3.0
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.

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 II Signal Pedestal	⬢
OS	Oversized Junction Box	■
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ

New Installation - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

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801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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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 WB
at
SR 1180 (Doolie Road) U-turn

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 10/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1833

$$$$$$SYSDATE$$$$$
4:54:25 PM
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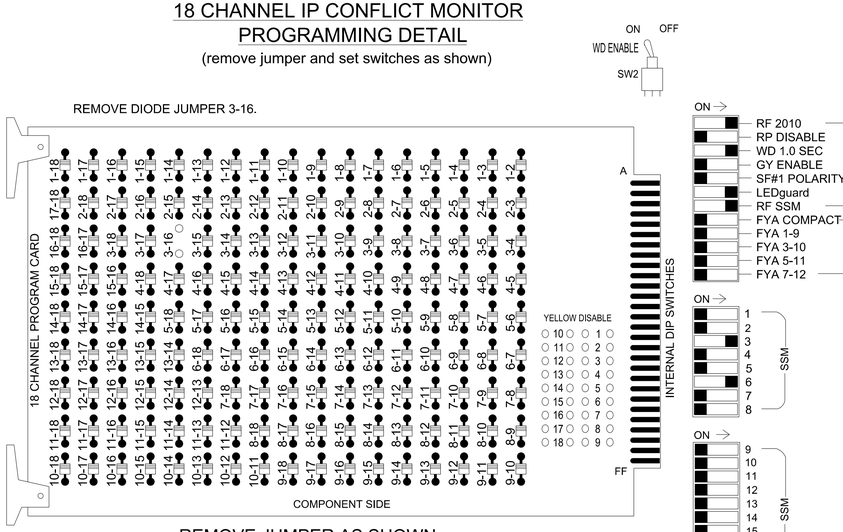
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 13.1

18 CHANNEL IP CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumper and set switches as shown)



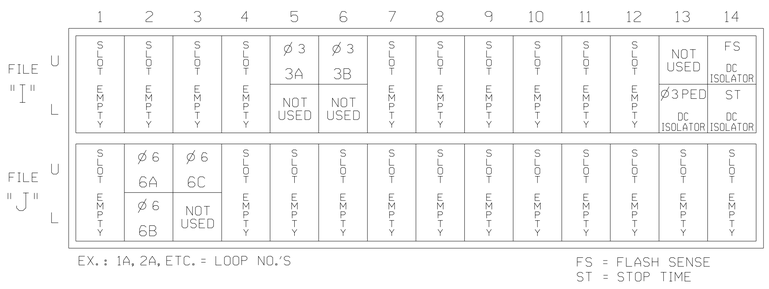
REMOVE JUMPER AS SHOWN

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.

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
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	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	
PED PUSH BUTTONS												
P31,P32	TB8-8,9	I13L	70	36	8	PED 3						

NOTE: INSTALL DC ISOLATOR IN INPUT FILE SLOT I13.

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 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, S12
Phases Used.....3, 3PED, 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	3 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	NU	NU	31,32	NU	NU	NU	61	62,63	NU	NU	NU	P31, P32	NU	NU	NU	NU	NU	NU
RED								134	134										
YELLOW								135	135										
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117															
GREEN ARROW				118				136											
													110						
													112						

NU = Not Used

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.

PED 3 PROGRAMMING DETAIL

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

Web Interface
Home >Controller >Detector Configuration >Pedestrian Detector

Plan 1

Detector	Descripton	Call Phase	Call Overlap
2		2	0
4		4	0
6		6	0
8		3	0

NOTICE PHASE 3 PED ASSIGNED TO DETECTOR 8 PED →

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
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	4				14
15	Phase Ped	6				15
16	Phase Ped	3				16
17	Overlap	5		X	X	17
18	Overlap	6		X		18

NOTICE PHASE 3 PED ASSIGNED TO CHANNEL 16 →

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: 12-1833
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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ELECTRICAL AND PROGRAMMING DETAILS FOR:

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

NC 150 WB at SR 1180 (Doolie Road) U-Turn

Division 12 | Iredell County | Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 NORTH CAROLINA PROFESSIONAL ENGINEER JASON GALLOWAY

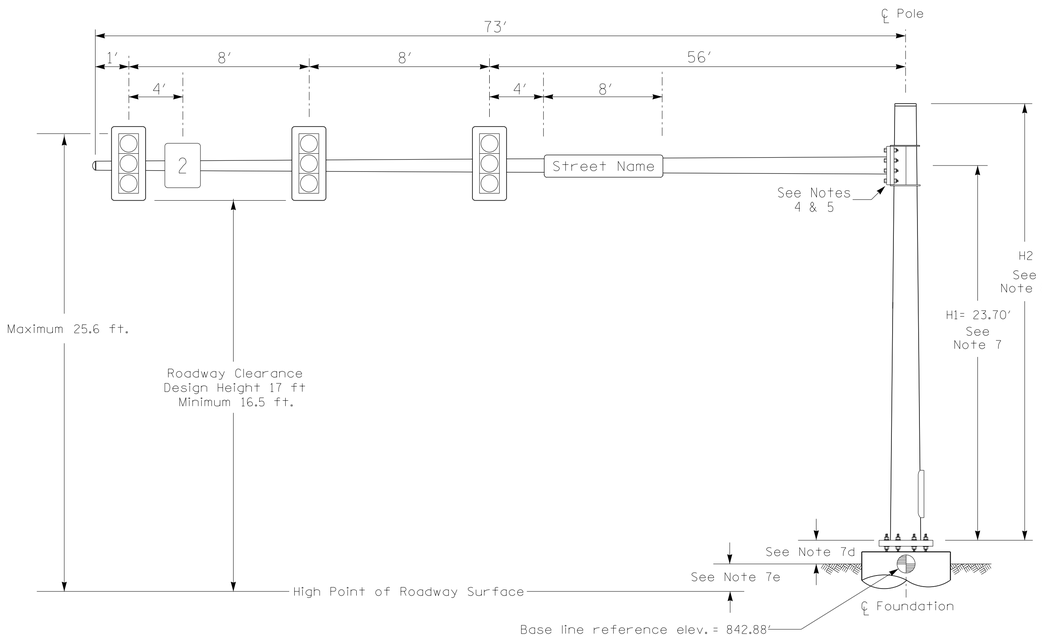
DocuSigned by: Jason Galloway 5/17/2024
10D1E2B40B4B46E... SIG. DATE

INVENTORY NO. 12-1833

METAL POLE No. 1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 13.2

Design Loading for METAL POLE NO. 1



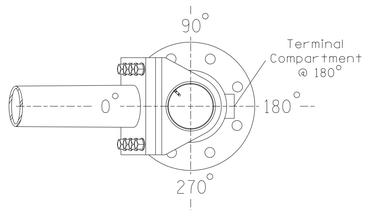
Elevation View

SPECIAL NOTE

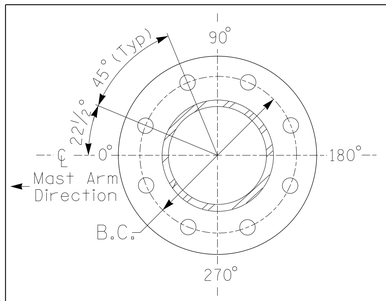
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ⊕ Foundation @ ground level	842.88 ft.	
Elevation difference at High point of roadway surface	+4.62 ft.	
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	

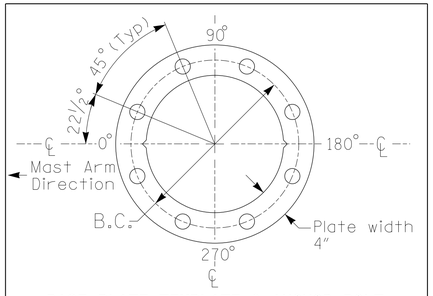


POLE RADIAL ORIENTATION



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
	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" 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)

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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 WB
at
SR 1180 (Doolie Road) U-turn

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 P. GALLOWAY

DocuSigned by: Jason Galloway 5/17/2024
DATE

SIG. INVENTORY NO. 12-1833

5/16/2024
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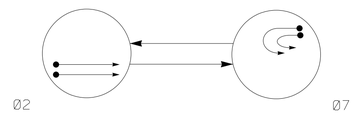
User:jgalloway
N:\Traffic\Signals\Design\Metal Poles\Loading Diagrams\Loading Diagram_Single Mast Arm_12-1833.dgn

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 14.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

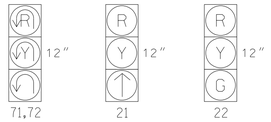
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

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

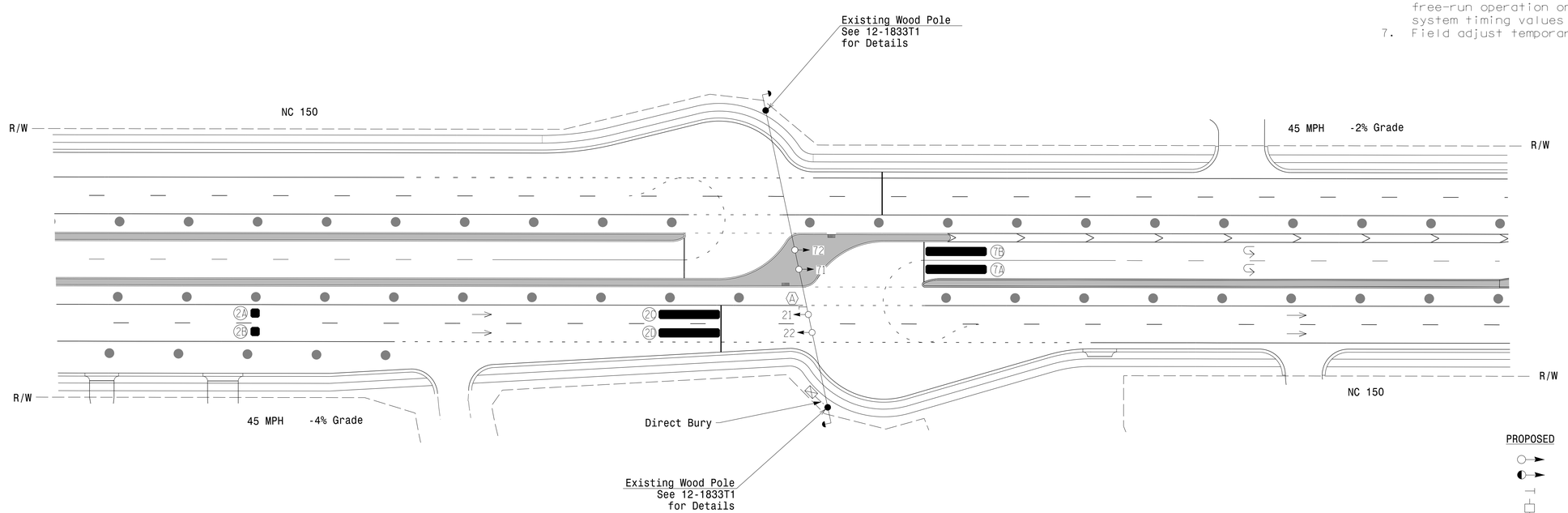
DETECTOR					PROGRAMMING						
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
2A	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2B	6X6	300	✳	✳	2	-	-	X	-	X	-	✳
2C	6X40	0	✳	✳	2	5.0	2.0	X	-	X	X	✳
2D	6X40	0	✳	✳	2	5.0	2.0	X	-	X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



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	4.9	3.0
Red Clear	2.1	3.9
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.

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 Left Turn Sign (R3-2)	Ⓐ

New Installation
Temporary Design 1 - TMP Phase III

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Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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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 EB
at
Water Oak Drive U-turn

Division 12 Iredell County Mooresville

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

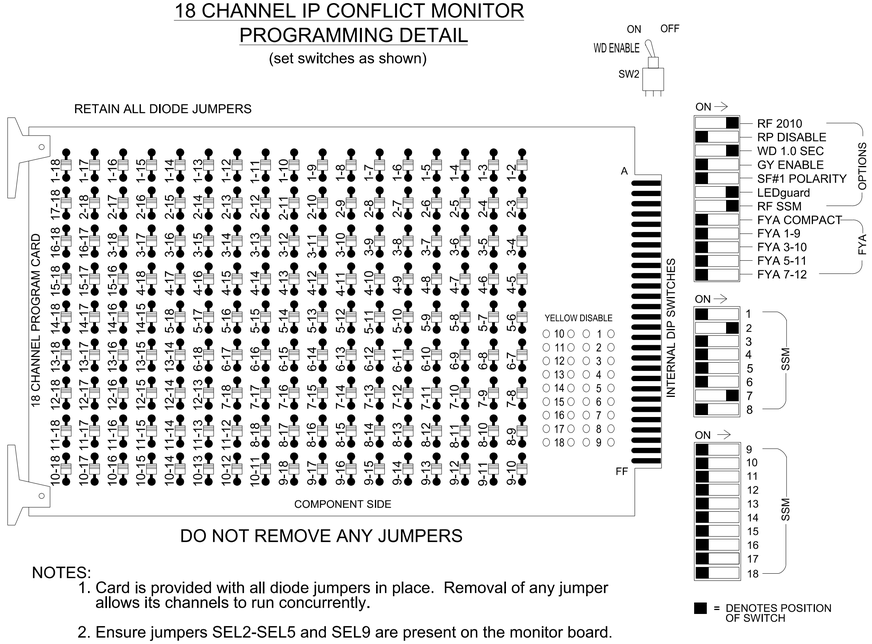
REVISIONS	INIT.	DATE

SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P. GALLOWAY

DocuSigned by:
Jason Galloway 12/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1834TI

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. 14.1

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																
YELLOW		129	129																
GREEN			130																
RED ARROW											122								
YELLOW ARROW											123								
GREEN ARROW		130									124								

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, 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

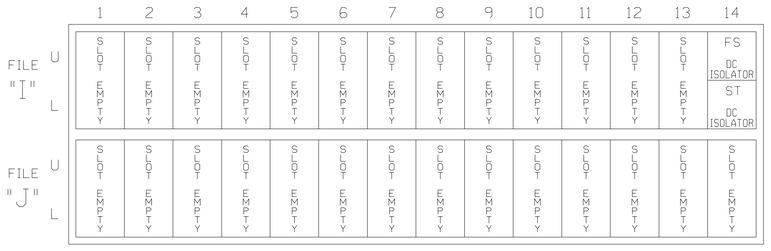
Web Interface
Home >Controller >Sequence

Sequence 1

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

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.

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1834T1
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

Stantec
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ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
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ITS & Signals Management Section
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NC 150 EB
at
Water Oak Drive U-Turn

Division 12 Iredell County Mooresville

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

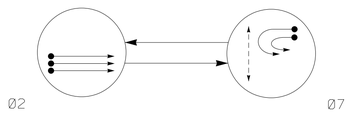
REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. CALLOWAY NORTH CAROLINA PROFESSIONAL SEAL

DocuSigned by: Jason Galloway 5/17/2024
10D1E2B40B4B48E... DATE
SIG. INVENTORY NO. 12-1834T1

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 15.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

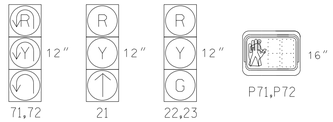
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

SIGNAL FACE	PHASE Ø2	PHASE Ø7	PHASE FLASH
21	↑	R	R
22,23	G	R	R
71,72	(R) ↓	∩	(R) ↓
P71,P72	DW	W	DRK

SIGNAL FACE I.D.

All Heads L.E.D.



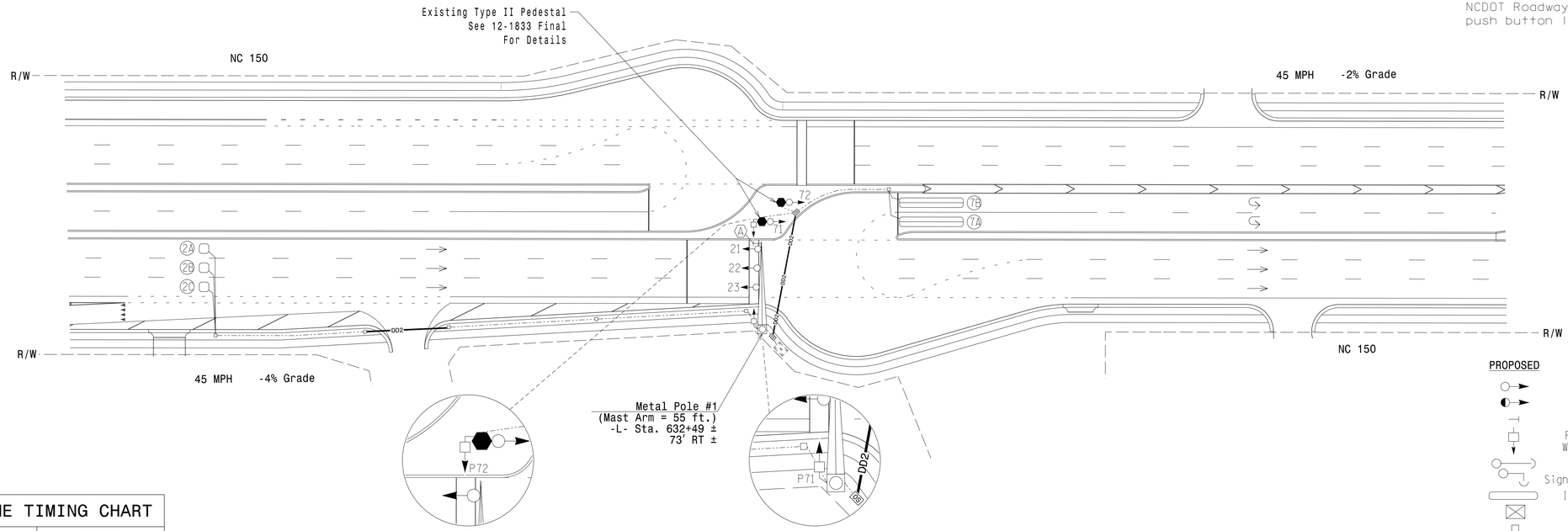
MAXTIME DETECTOR INSTALLATION CHART

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

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. Omit "WALK" and flashing "DON'T WALK" with no pedestrian calls.
5. Program pedestrian heads to countdown the flashing "Don't Walk" time only.
6. Maximum times shown in timing chart are for free-run operation only. Coordinated signal system timing values supersede these values.
7. 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 II Signal Pedestal	⬢
OS	Oversized Junction Box	■
Ⓐ	No Left Turn Sign (R3-2)	Ⓐ

MAXTIME TIMING CHART

FEATURE	PHASE 2	PHASE 7
Walk *	–	4
Ped Clear *	–	10
Min Green	12	7
Passage *	6.0	2.0
Max 1 *	60	30
Yellow Change	4.9	3.0
Red Clear	2.1	4.4
Added Initial *	1.0	–
Maximum Initial *	34	–
Time Before Reduction *	15	–
Time To Reduce *	30	–
Minimum Gap	3.0	–
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 2 lower than what is shown. Min Green for all other phases should not be lower than 4 seconds.

New Installation - Final Design

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

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 EB
at
Water Oak Drive U-turn

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

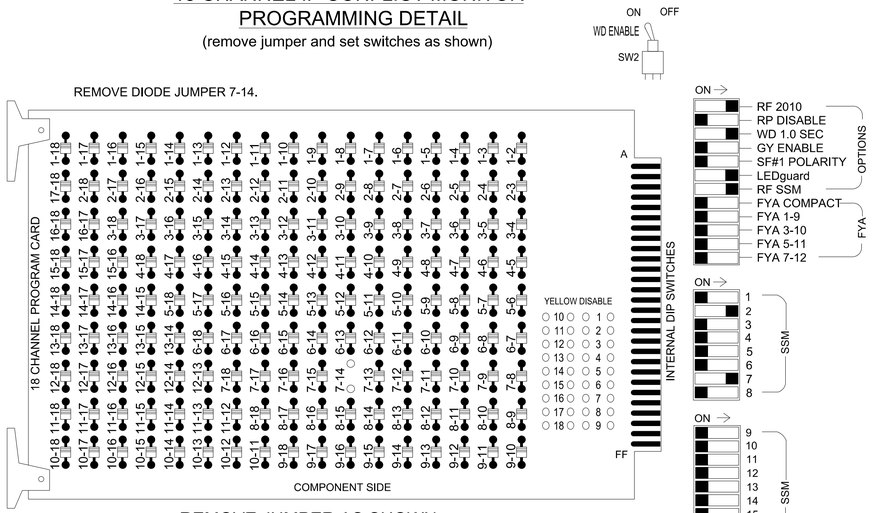
SEAL
NORTH CAROLINA
PROFESSIONAL
SEAL 029904
ENGINEER
JASON P GALLOWAY

DocuSigned by:
Jason Galloway 9/17/2024
10D1E2B40B4B46E...
DATE

SIG. INVENTORY NO. 12-1834

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.

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 2B	Ø2 2C / NOT USED	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	NOT USED / Ø7 PED DC ISOLATOR	SLOT EMPTY	FS DC ISOLATOR / ST DC ISOLATOR
FILE "J" L	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	Ø7 7A / NOT USED	Ø7 7B / NOT USED	SLOT EMPTY	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
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	
PED PUSH BUTTONS												
P71,P72	TB8-5,6	I12L	69	35	4	PED 7						

NOTE:
INSTALL DC ISOLATOR
IN INPUT FILE SLOT I12.

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 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, S6, S10
Phases Used.....2, 7, 7PED
Overlap "1".....NOT USED
Overlap "2".....NOT USED
Overlap "3".....NOT USED
Overlap "4".....NOT USED

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 15.1

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	7 PED	5	6	6 PED	7	8	8 PED	OL1	OL2	SPARE	OL3	OL4	SPARE
SIGNAL HEAD NO.	NU	21	22,23	NU	NU	NU	P71, P72	NU	NU	NU	71,72	NU	NU	NU	NU	NU	NU	NU	NU
RED		128	128																
YELLOW		129	129																
GREEN			130																
RED ARROW											122								
YELLOW ARROW											123								
GREEN ARROW		130									124								
✋							104												
🚶							106												

NU = Not Used

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.

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 PHASE 7 PED 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

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: 12-1834
DESIGNED: MAY 2024
SEALED: 5/17/2024
REVISED: N/A

Final Design
Electrical Detail

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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License No. F-0672

ELECTRICAL AND PROGRAMMING DETAILS FOR:

Prepared for the Offices of:
Traffic Engineering Branch
Traffic Signal Systems & Signals Management Section
Transportation Mobility and Safety Division
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

750 N. Greenfield Pkwy, Garner, NC 27529

NC 150 EB at Water Oak Drive U-Turn

Division 12 | Iredell County | Mooresville

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

REVISIONS	INIT.	DATE

SEAL 029904 ENGINEER JASON P. GALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Gallaway 5/17/2024
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SIG. INVENTORY NO. 12-1834

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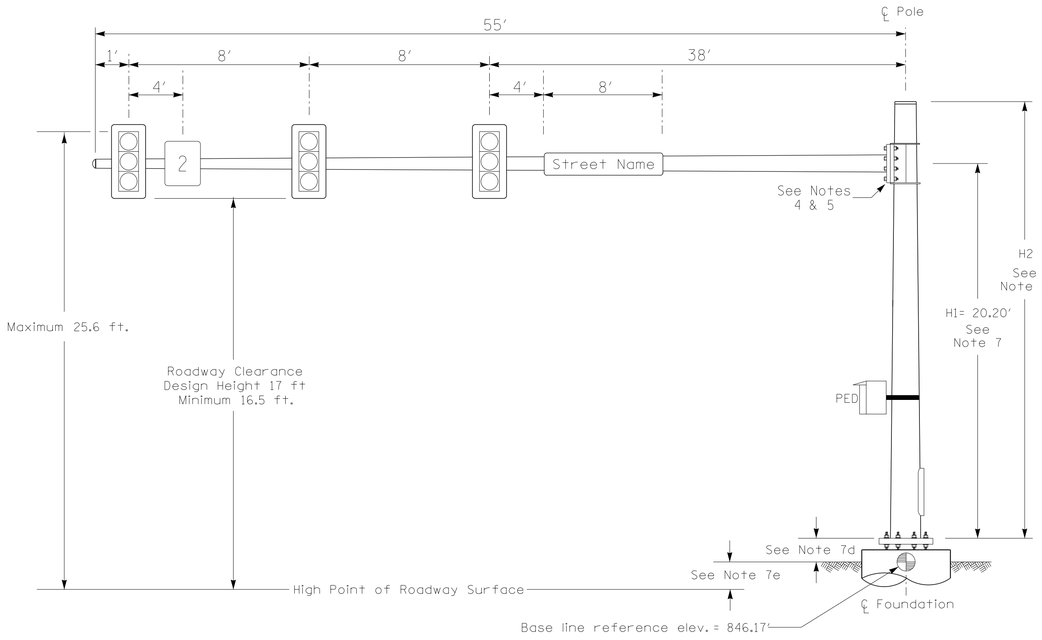
I:\Projects\Designs\Design\Electrical Details\Final Design\MAXTIME\R-2307B_sm_ele_12-1834.dgn
User:jgalloway

Design Loading for METAL POLE NO. 1



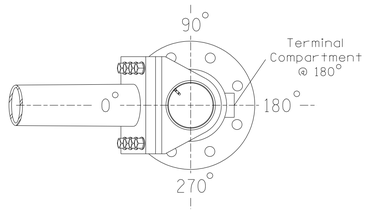
Elevation View

SPECIAL NOTE

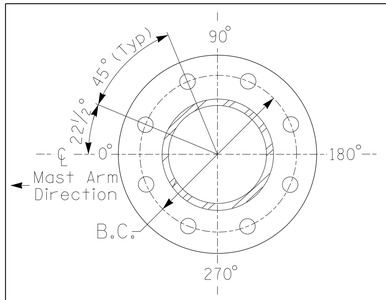
The contractor is responsible for verifying that the mast arm attachment height (H1) will provide the "Design Height" clearance from the roadway before submitting final shop drawings for approval. Verify elevation data below which was obtained by field measurement or from available project survey data.

Elevation Data for Mast Arm Attachment (H1)

Elevation Differences for:	Pole 1	
Baseline reference point at ⊕ Foundation @ ground level	846.17 ft.	
Elevation difference at High point of roadway surface	+1.19 ft.	
Elevation difference at Edge of travelway or face of curb	+/-0.0 ft.	

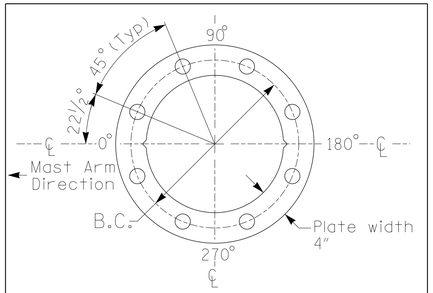


POLE RADIAL ORIENTATION



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. 15.2

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
NCDEPARTMENT OF TRANSPORTATION
Signal Design Section

750 N.Greenfield Pkwy.,Garner,NC 27529

NC 150 EB
at
Water Oak Drive U-turn

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
DATE

SIG. INVENTORY NO. 12-1834

5/16/2024
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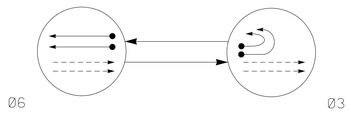
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 16.0

PHASING DIAGRAM



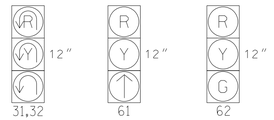
PHASING DIAGRAM DETECTION LEGEND

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

TABLE OF OPERATION			
SIGNAL FACE	PHASE Ø6	PHASE Ø3	PHASE FLASH
31,32	R		R
61		R	R
62	G	R	R

SIGNAL FACE I.D.

All Heads L.E.D.



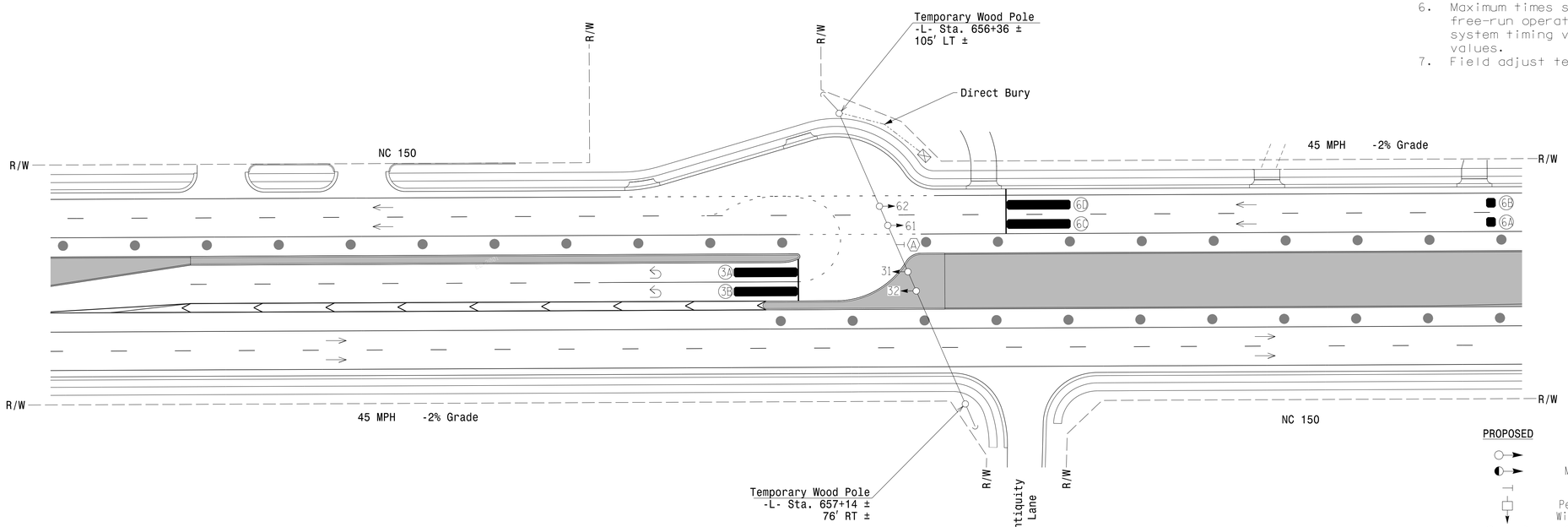
MAXTIME DETECTOR INSTALLATION CHART												
DETECTOR					PROGRAMMING							
LOOP	SIZE (FT)	DISTANCE FROM STOPBAR (FT)	TURNS	NEW LOOP	CALL PHASE	DELAY TIME	EXTEND TIME	EXTEND	ADDED INITIAL	CALL	DELAY DURING GREEN	NEW CARD
3A	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
3B	6X40	0	✳	✳	3	-	-	X	-	X	-	✳
6A	6X6	300	✳	✳	6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

✳ 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 unlesss 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	4.7
Red Clear	4.1	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 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
A	No Left Turn Sign (R3-2)	A

New Installation
Temporary Design 1 - TMP Phase III

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
www.stantec.com
License No. F-0672

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 WB
at U-turn
across from Antiquity Lane

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

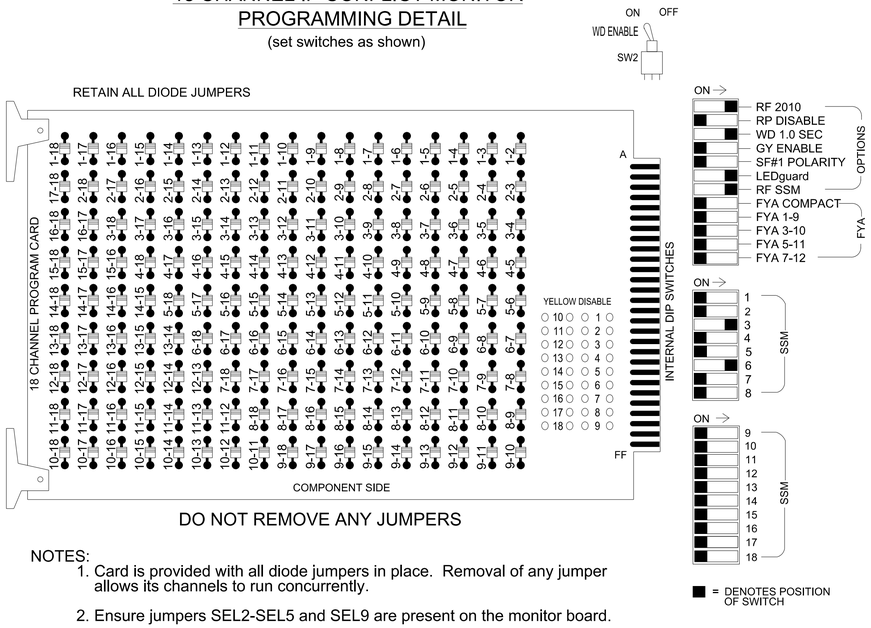
SCALE 0 40 1"=40'

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 029904 ENGINEER JASON R GALLOWAY

DocuSigned by: Jason Galloway 10/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1851T1 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.

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 Phase Not On 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.

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 16.1

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	134										
YELLOW								135	135										
GREEN									136										
RED ARROW				116															
YELLOW ARROW				117															
GREEN ARROW				118				136											

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.....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

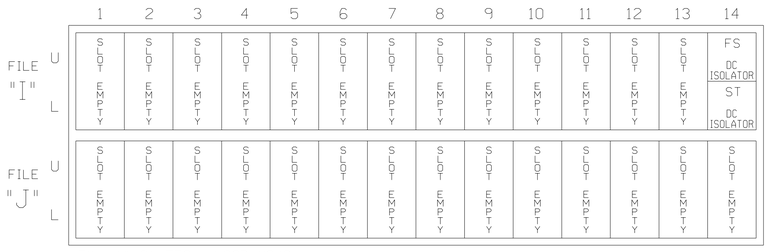
Web Interface
Home >Controller >Sequence

Sequence 1

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

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: 12-1851T1
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

Stantec
Stantec Consulting Services Inc.
801 Jones Franklin Road-Suite 300
Raleigh, NC 27606
Tel. (919) 851-6866
Fax. (919) 851-7024
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 U-turn
across from Antiquity Lane

Division 12 | Iredell County | Mooresville

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

REVISIONS	INIT.	DATE

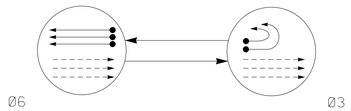
SEAL 029904 ENGINEER JASON P. CALLOWAY NORTH CAROLINA PROFESSIONAL

DocuSigned by: Jason Galloway 5/17/2024
10D1E2B40B4B48E... DATE
SIG. INVENTORY NO. 12-1851T1

5:03:11 PM
\\Mooresville\Designs\Design\Electrical Details\Temporary Design\MAXTIME\R-2307B_sm_ele_12-1851t1.dgn
User:jgalloway

PROJECT REFERENCE NO.	SHEET NO.
R-2307B	Sig. 17.0

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

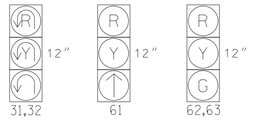
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

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

SIGNAL FACE I.D.

All Heads L.E.D.



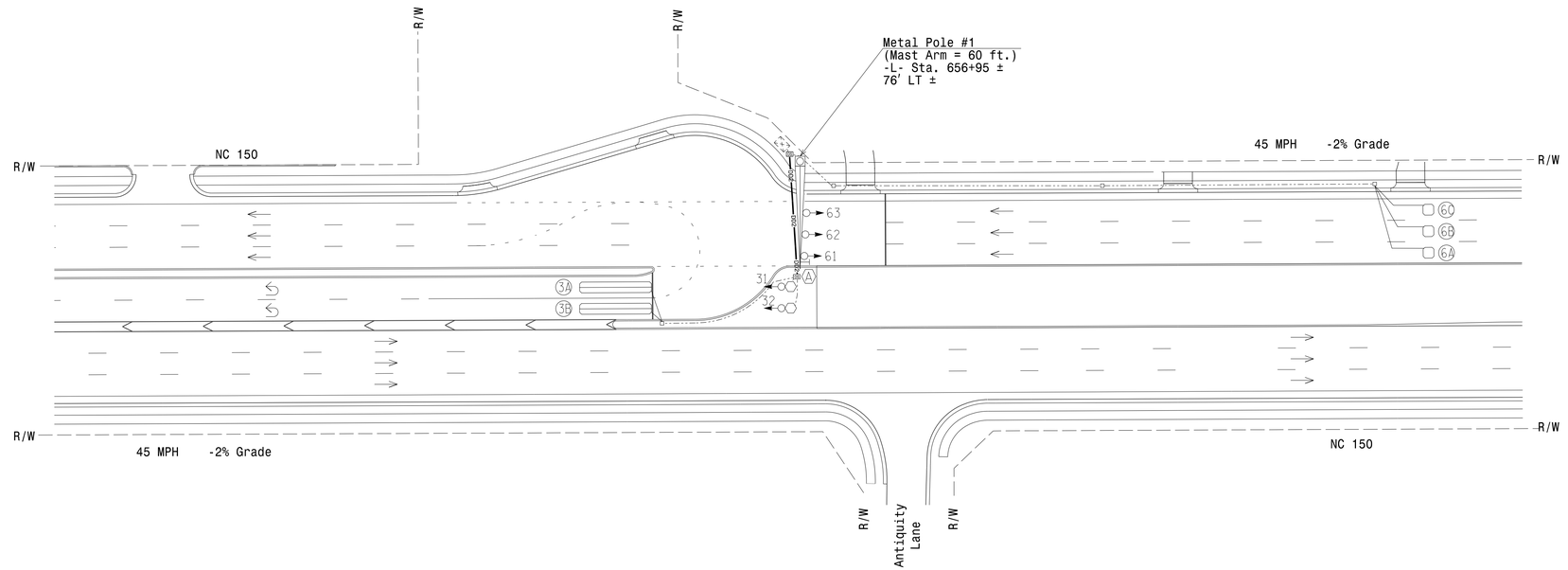
MAXTIME DETECTOR INSTALLATION CHART

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	300	4	X	6	-	-	X	X	X	-	X
6B	6X6	300	4	X	6	-	-	X	X	X	-	X
6C	6X6	300	4	X	6	-	-	X	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.



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 II Signal Pedestal	
OS	Oversized Junction Box	
A	No Left Turn Sign (R3-2)	A

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	4.7
Red Clear	4.8	2.0
Added Initial *	–	1.0
Maximum Initial *	–	34
Time Before Reduction *	–	15
Time To Reduce *	–	30
Minimum Gap	–	3.0
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.

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
PROFESSIONAL
SEAL
029904
ENGINEER
JASON P GALLOWAY

DocuSigned by:
Jason Galloway 10/17/2024
10D1E2B40B4B46E...
SIG. INVENTORY NO. 12-1851