This electronic collection of documents is provided for the convenience of the user and is Not a Certified Document –

The documents contained herein were originally issued and sealed by the individuals whose names and license numbers appear on each page, on the dates appearing with their signature on that page.
This file or an individual page shall not be considered a certified document.

09/08/99

TIP PROJECT: W-5712L

CONTRACT: DL00254

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

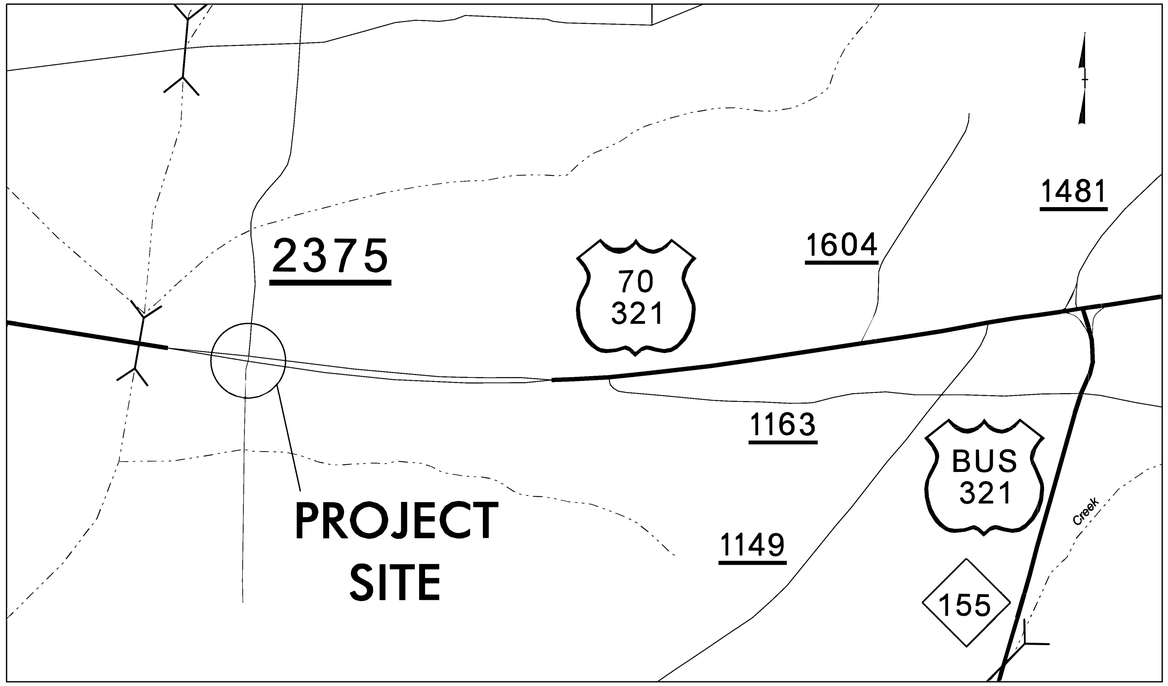
CATAWBA COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	W-5712L	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
44858.1.12	HSIP-070(221)	PE
44858.2.12	HSIP-070(221)	UTIL/RW
44858.3.12	HSIP-070(221)	CONST

LOCATION: *US 70 / US 321 BUS. AT SR 2375 (BUMGARNER INDUSTRIAL DR. / AMERICAN LEGION AVE.)*

TYPE OF WORK: *UPGRADE EXISTING TRAFFIC SIGNAL.*



Prepared In the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2018 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: N\A

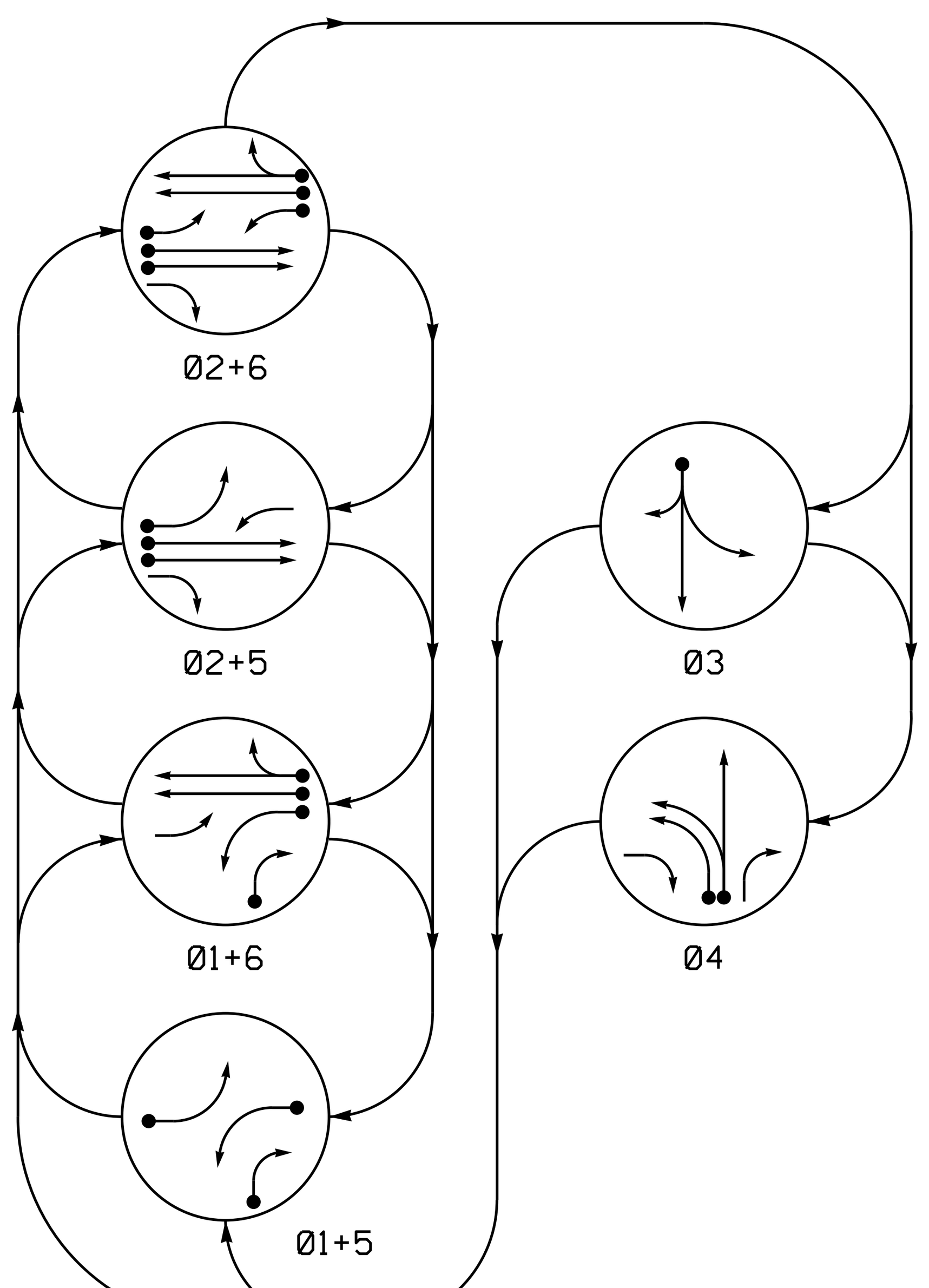
LETTING DATE: NOVEMBER 23, 2021

BYRON ENGLE, PE
PROJECT ENGINEER

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION •

04-OCT-2021 14:43
S:\DDC\District 3\Catawba\W-5712L_US70atSR2375\W-5712L_Rdy_tsh.dgn
$$$$USERNAME$$$$

PHASING DIAGRAM



PHASING DIAGRAM DETECTION LEGEND

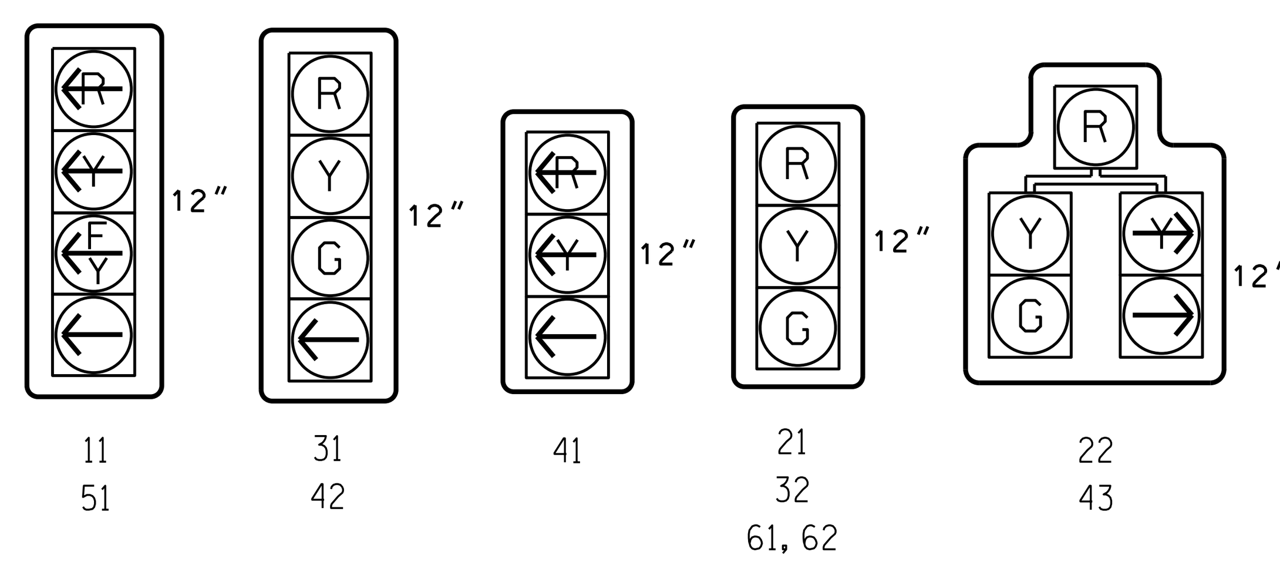
- DETECTED MOVEMENT
- UNDETECTED MOVEMENT (OVERLAP)
- UNSIGNALIZED MOVEMENT
- PEDESTRIAN MOVEMENT

TABLE OF OPERATION

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

SIGNAL FACE I.D.

All Heads L.E.D.

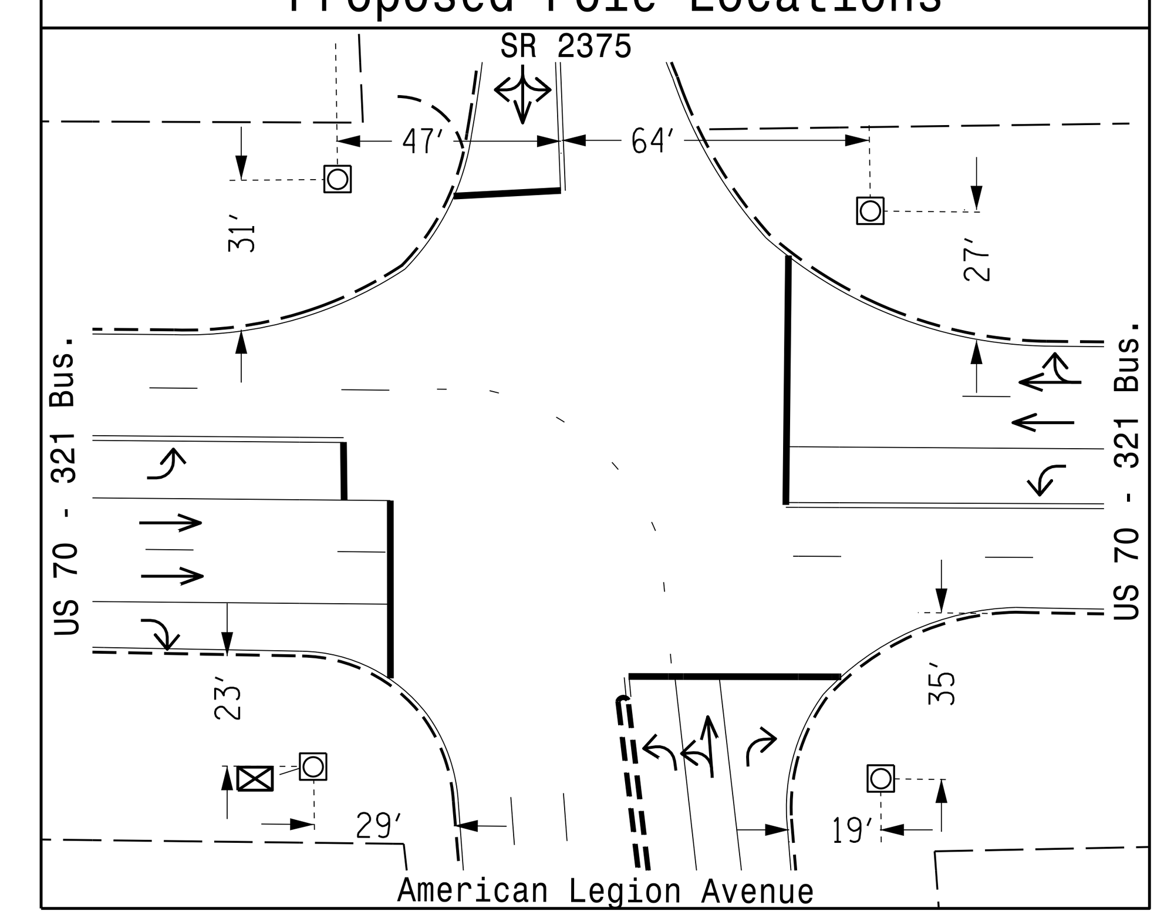


(See note 5)

SE-PAC 2070 LOOP & DETECTOR UNIT INSTALLATION CHART

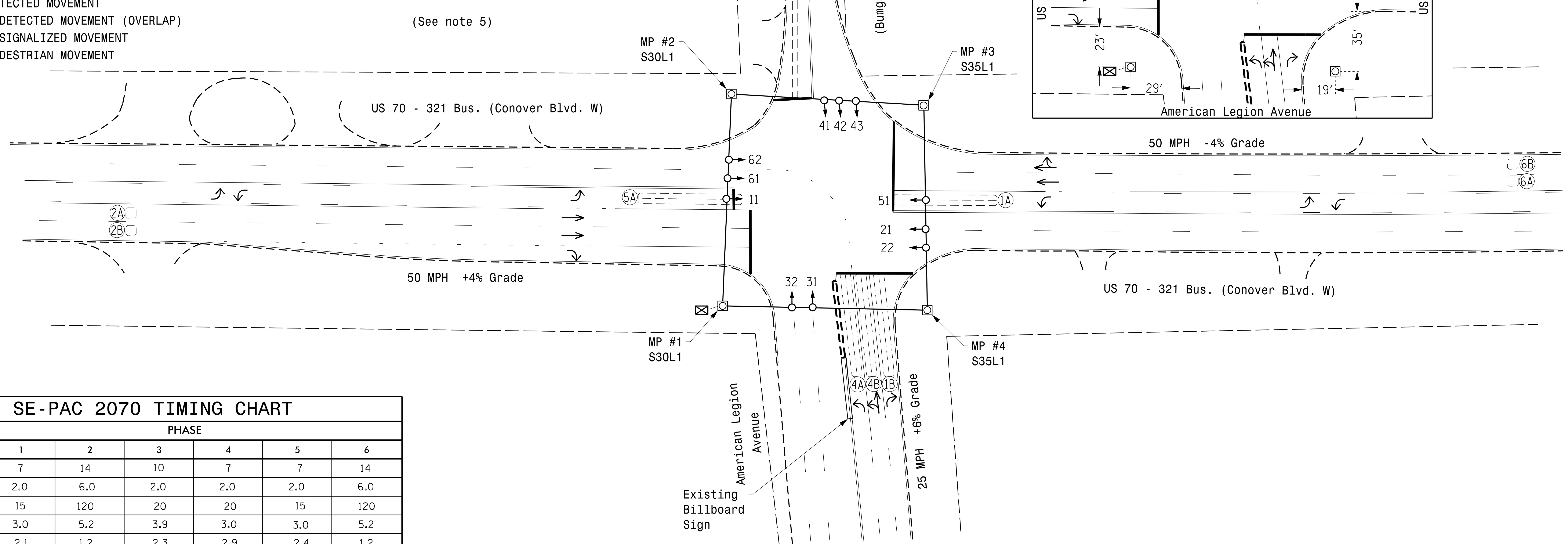
INDUCTIVE LOOPS: LOOP NO.	SIZE (ft)	TURNS	DIST. FROM STOPBAR (ft)	NEW	EXISTING	DETECTOR PROGRAMMING: ASSIGNED PHASE	TIMING: DELAY	TIMING: EXTEND (STRETCH)	OPERATION MODE 0: VEHICLE	1: PEDESTRIAN	2: 1 CALL	3: STOP A	4: STOP B	5: PROT/PER LEFT	6: PROT/PER THROUGH	7: AND	SWITCH	SYSTEM LOOPS	STATUS: NEW	STATUS: EXISTING
1A	6X60	2-4-2	0	-	X	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
						6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
1B	6X60	2-4-2	0	-	X	1	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2A	6X6	4	355	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
2B	6X6	4	355	-	X	2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
3A	6X60	2-4-2	0	-	X	3	10 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
4A	6X60	2-4-2	0	-	X	4	3 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
4B	6X60	2-4-2	0	-	X	4	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
5A	6X60	2-4-2	+5	-	X	5	15 SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
						2	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6A	6X6	4	355	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-
6B	6X6	4	355	-	X	6	- SEC.	- SEC.	X	-	-	-	-	-	-	-	-	-	X	-

Proposed Pole Locations



6 Phase
Fully Actuated
City of Hickory Signal System

1. Refer to "Roadway Standard Drawings NCDOT" dated January 2018 and "Standard Specifications for Roads and Structures" dated January 2018.
2. Do not program signal for late night flashing operation unless otherwise directed by the Engineer.
3. Phase 1 and/or phase 5 may be lagged.
4. The order of phase 3 and phase 4 may be reversed.
5. Install retro-reflective backplates on all signal heads.
6. Set all detector units to presence mode.
7. Locate new cabinet so as not to obstruct sight distance of vehicles turning right on red.
8. In the event of loop replacement, refer to the current ITS and Signals Design Manual and submit a Plan of Record to the Signal Design Section.
9. Pavement markings are existing.



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	
	Metal Strain Pole	
	Inductive Loop Detector	
	Controller & Cabinet	
	Junction Box	
	2-in Underground Conduit	
N/A	Right of Way	
	Directional Arrow	

SE-PAC 2070 TIMING CHART

FEATURE	PHASE 1	2	3	4	5	6
Min Green *	7	14	10	7	7	14
Passage Gap *	2.0	6.0	2.0	2.0	2.0	6.0
Maximum Green *	15	120	20	20	15	120
Yellow Change	3.0	5.2	3.9	3.0	3.0	5.2
Red Clear	2.1	1.2	2.3	2.9	2.4	1.2
Walk *	-	-	-	-	-	-
Pedestrian Clear	-	-	-	-	-	-
Added Initial *	-	1.8	-	-	-	1.8
Maximum Initial *	-	40	-	-	-	40
Time Before Reduction *	-	15	-	-	-	15
Time To Reduce *	-	30	-	-	-	30
Minimum Gap	-	3.4	-	-	-	3.4
Recall Mode	-	MIN RECALL	-	-	-	MIN RECALL
Vehicle Call Memory	NON-LOCK	LOCK	NON-LOCK	NON-LOCK	NON-LOCK	LOCK
Dual Entry	-	-	-	-	-	-
Simultaneous Gap	ON	ON	ON	ON	ON	ON

* 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

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

US 70 BUS. - US 321 (Conover Blvd W) at SR 2375 (Bumgarner Industrial Dr) / American Legion Ave.

Division 12 | Catawba County | Conover

PLAN DATE: September 2019	REVIEWED BY: RN Zinser, PE
PREPARED BY: EM Minshew	REVIEWED BY:

SCALE 0 40 — 1"=40'

REVISIONS	INIT.	DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 043914 ENGINEER RICHARD N. ZINSER

DocuSigned by: R. N. Zinser
E1388973472248E
11/7/2019
DATE

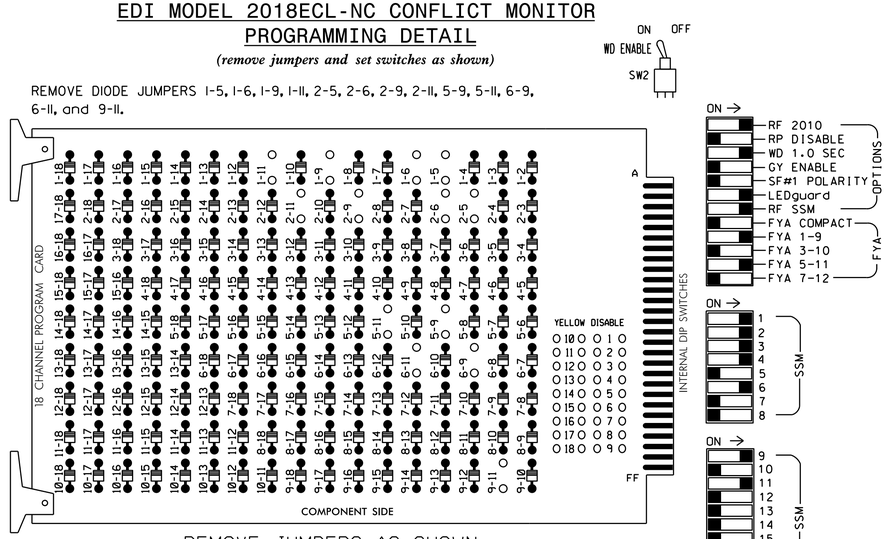
SIG. INVENTORY NO. 12-1421

PROJECT REFERENCE NO.	SHEET NO.
W-5712L	Sig. 1.1

EDI MODEL 2018ECL-NC CONFLICT MONITOR PROGRAMMING DETAIL

(remove jumpers and set switches as shown)

REMOVE DIODE JUMPERS I-5, I-6, I-9, I-11, 2-5, 2-6, 2-9, 2-11, 5-9, 5-11, 6-9, 6-11, and 9-11.



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 Red Enable is active at all times during normal operation.
4. Connect serial cable from conflict monitor to comm. port 1 of 2070 controller. Ensure conflict monitor communicates with 2070.

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 Plans.
2. Program controller to start up in phases 2 and 6 green.
3. Enable simultaneous gap-out feature, on controller unit, for all phases.
4. Program phases 2 and 6, on controller unit, for volume density operation.
5. The cabinet and controller are part of the City of Hickory Signal System.

EQUIPMENT INFORMATION

CONTROLLER.....2070
CABINET.....332 W/ AUX
SOFTWARE.....SE-PAC2070
CABINET MOUNT.....BASE
OUTPUT FILE POSITIONS...18 WITH AUX FILE
LOAD SWITCHES USED.....S1,S2,S4,S5,S7,S8,AUX S1,AUX S4
PHASES USED.....1,2,3,4,5,6
OVERLAP A.....*
OVERLAP B.....NOT USED
OVERLAP C.....*
OVERLAP D.....NOT USED

* SEE SHEET 2 FOR OVERLAP PROGRAMMING

SIGNAL HEAD HOOK-UP CHART

LOAD SWITCH NO.	S1		S2	S3	S4		S5				S6	S7	S8	S9	S10	S11	S12	AUX S1	AUX S2	AUX S3	AUX S4	AUX S5	AUX S6
CMU CHANNEL NO.	1		2	13	3		4				14	5	6	15	7	8	16	9	10	17	11	12	18
PHASE	1		2	2 PED	3		4				4 PED	5	6	6 PED	7	8	8 PED	OLA	OLB	SPARE	OLC	OLD	SPARE
SIGNAL HEAD NO.	11★	43	21,22	NU	31	32	22	41	42	43	NU	51★	61,62	NU	NU	NU	NU	11★	NU	NU	51★	NU	NU
RED		*	128		116	116			101	101			134										
YELLOW			129		117	117			102	102		*	135										
GREEN			130		118	118			103	103			136										
RED ARROW								101										A121			A114		
YELLOW ARROW		126					102	102										A122			A115		
FLASHING YELLOW ARROW																		A123			A116		
GREEN ARROW	127	127			118		103	103	103			133											

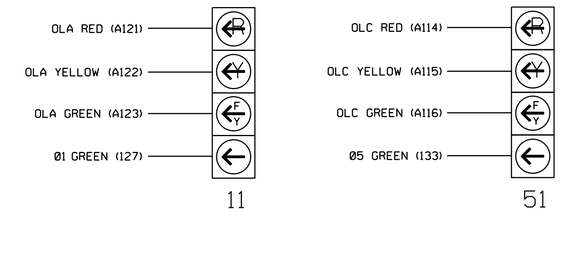
NU = Not Used

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

★ See pictorial of head wiring in detail below.

FYA SIGNAL WIRING DETAIL

(wire signal heads as shown)

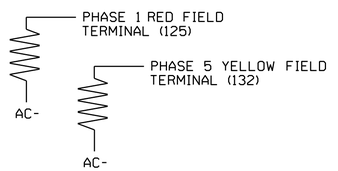


NOTE: See sheet 2 for Protected & Permitted Phases programming.

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)



INPUT FILE POSITION LAYOUT

(front view)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
FILE "I"	U	Ø1 1A	Ø1 1B	Ø2 2A	WIRED ⊗ INPUT	Ø3 3A	Ø4 4A	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	FS DC ISOLATOR
	L	NOT USED	NOT USED	Ø2 2B		NOT USED	Ø4 4B								ST DC ISOLATOR
FILE "J"	U	Ø5 5A	Ø6 6A	SLOT EMPTY	WIRED ⊗ INPUT	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY	SLOT EMPTY
	L	NOT USED	Ø6 6B												

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

FS = FLASH SENSE
ST = STOP TIME

⊗ Wired Input - Do not populate slot with detector card

INPUT FILE CONNECTION & PROGRAMMING CHART

LOOP NO.	LOOP TERMINAL	INPUT FILE POS.	PIN NO.	DETECTOR NO.	NEMA PHASE	DELAY TIME	EXTEND (STRETCH) TIME
1A[1]	TB2-1,2	I1U	56	1	1	15	
	-	J4U	48	25	6		
1B	TB2-5,6	I2U	39	3	1	15	
2A	TB2-9,10	I3U	63	5	2		
2B	TB2-11,12	I3L	76	6	2		
3A	TB4-5,6	I5U	58	9	3	10	
4A	TB4-9,10	I6U	41	11	4	3	
4B	TB4-11,12	I6L	45	12	4		
5A[2]	TB3-1,2	J1U	55	19	5	15	
	-	I4U	47	7	2		
6A	TB3-5,6	J2U	40	21	6		
6B	TB3-7,8	J2L	44	22	6		

[1] Add jumper from I1-W to J4-W, on rear of input file.

[2] Add jumper from J1-W to I4-W, on rear of input file.

INPUT FILE POSITION LEGEND: J2L
FILE J
SLOT 2
LOWER

THIS ELECTRICAL DETAIL IS FOR THE SIGNAL DESIGN: 12-1421
DESIGNED: September 2019
SEALED: 11/7/2019
REVISED:

Electrical Detail - Sheet 1 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 70 Bus. - US 321 (Conover Blvd)
at
SR 2375 (Bumgarner Industrial Dr) / American Legion Ave.

Division 12 | Catawba County | Conover

PLAN DATE: September 2019 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

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

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 031001 ENGINEER D. TODD JOYCE

DocuSigned by: D. Todd Joyce 11/8/2019
49CCADEFB0D4410... DATE

SIG. INVENTORY NO. 12-1421

04-NOV-2019 07:44
S:\ITS&SIGNALS\Signals\Workgroups\Sig Mgmt\Strickland\12142l_sample_xxx.dgn
cestrickland

PROJECT REFERENCE NO.	SHEET NO.
W-5712L	Sig. 1.2

FLASHING YELLOW ARROW PROTECTED/PERMISSIVE SEQUENCE FOR OVERLAPS A & C

(program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

```
SE-PAC UNIT DATA              PRESS # DESIRED

 1-STARTUP & MISC          6-ALT SEQUENCES
 2-REMOTE FLASH            7-PORT 1 DATA
 3-OVERLAP STANDARD        8-I/O MISC
 4-OVERLAP SPECIAL         9-SIG DRV OUT
 5-RING STRUCTURE

                                F-PRIOR MENU
```

DO NOT enter any OVL PHASES! →

```
SE-PAC OVERLAP - A                    (0-NO/1-YES)

  OVL PHASES:   000000000 0000000
     PHS/CHN:   123456789 0123456789 01234
  OVL CHN(S):   000000000 000100000 00000


A-UP B-DN D-DspChn   E-EDIT  F-PRIOR MENU
```

PRESS "B" TWICE

DO NOT enter any OVL PHASES! →

```
SE-PAC OVERLAP - C                    (0-NO/1-YES)

  OVL PHASES:   000000000 0000000
     PHS/CHN:   123456789 0123456789 01234
  OVL CHN(S):   000000000 000001000 00000


A-UP B-DN D-DspChn   E-EDIT  F-PRIOR MENU
```

OVERLAP PROGRAMMING COMPLETE

PRESS 'F' TO RETURN TO UNIT DATA

PROTECTED AND PERMISSIVE PHASES FOR FLASHING YELLOW ARROW

(program controller as shown below)

FROM MAIN MENU PRESS 4 (UNIT DATA)

```
SE-PAC UNIT DATA              PRESS # DESIRED

 1-STARTUP & MISC          6-ALT SEQUENCES
 2-REMOTE FLASH            7-PORT 1 DATA
 3-OVERLAP STANDARD        8-I/O MISC
 4-OVERLAP SPECIAL         9-SIG DRV OUT
 5-RING STRUCTURE

                                F-PRIOR MENU
```

```
SE-PAC OVLP.A...B...C...D...E...F...G...H.
   TR GRN   0   0   0   0   0   0   0   0
   YEL/10  40  40  40  40  40  40  40  40
   RED/10  20  20  20  20  20  20  20  20
   -G/Y     1   0   5   0   0   0   0   0   ← PROTECTED PHASES
   +GRN     2   0   6   0   0   0   0   0   ← PERMISSIVE PHASES
(-) #-PH G/Y KILLS OVLP= (+) #-PH G STRT
A-UP B-DN C-LT D-RT E-ENTER F-PRIOR MENU
```

NOTE: THIS PROGRAMMING IS REQUIRED FOR SIGNAL HEADS 11 AND 51 SO THAT THE SOLID GREEN ARROWS TURN ON EXCLUSIVELY DURING PROTECTED GREEN PHASES 1 AND 5. AND THE FLASHING YELLOW ARROWS TURN ON EXCLUSIVELY DURING PERMITTED GREEN PHASES 2 & 6.

PPLT DEFINITION PROGRAMMING COMPLETE

PRESS 'F' TO RETURN TO UNIT DATA

THIS ELECTRICAL DETAIL IS FOR
THE SIGNAL DESIGN: 12-1421
DESIGNED: September 2019
SEALED: 11/7/2019
REVISED:

Electrical Detail - Sheet 2 of 2

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

ELECTRICAL AND PROGRAMMING DETAILS FOR:

US 70 Bus. - US 321 (Conover Blvd)
at
SR 2375 (Bumgarner Industrial Dr) / American Legion Ave.

Division 12 | Catawba County | Conover

PLAN DATE: September 2019 | REVIEWED BY: T. Joyce

PREPARED BY: C. Strickland | REVIEWED BY:

REVISIONS	INIT.	DATE

Prepared in the Offices of:
Transportation Mobility and Safety Division
NC DEPARTMENT OF TRANSPORTATION
Traffic Engineering & Signal Management Section
750 N.Greenfield Pkwy,Garner,NC 27529

SEAL
NORTH CAROLINA PROFESSIONAL SEAL 031001 ENGINEER D. TODD JOYCE

DocuSigned by: D. Todd Joyce 11/8/2019
A90CADFDBD4241D... DATE

SIG. INVENTORY NO. 12-1421

08-NOV-2019 07:47
w-5712l_sht_01a_xxx.dgn
cstrickland