



Technical Manual

ASTC BIU Tester

Traffic Cabinet Test Equipment



60Hz BIU Tester

New York City

Technical Manual

p/n: MN078171, Revision 2



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1. REVISIONS

Rev	By	Date	Reason
A	Don Maas	02/02/06	Document Released
1	Ray Deer	02/06/08	Initial release on ECN
2	Jay Oyster	01/06/09	Rebrand, Build manual assembly, fix Rev table

2. GLOSSARY

ABBREVIATION	DESCRIPTION
BIU	Bus Interface Unit
I/O	Input/Output
LED	Light Emitting Diode
ms	milliseconds
NEMA	National Electrical Manufacturing Association
SDLC	Synchronous Data Link Control
VDC/VAC	Volts Direct Current/Volts Alternating Current
UUT	Unit Under Test

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3. INTRODUCTION

The NEMA TS2 Standard for Terminal and Facilities BIU Communication specifies a command and response protocol that has the CU (Controller Unit) setting the Bus Interface Unit (BIU) outputs of TF 1-4 using Command Frames 10, 11, 12 and 13 and reading back the inputs from these BIUs in Response Frames 138, 139, 140 and 141, respectively. The TS2 Standard defines this Command and Response message exchange as occurring 10 times per second (10 Hz).

The New York City project using the U.S. Traffic Corporation (USTC) ASTC controller and BIU has this same scheme of Command and Response Frames (using BIU 12 and 13), but the message exchange rate is increased to 60 times per second (60 Hz).

The standard commercially available automated BIU tester provides evaluation of a UUT (Unit Under Test) in compliance with the NEMA TS2 Standard with regard to input debounce, command frame recognition, address decoding and response frame timing; however, the tester only sends the Command Frames and expects the Response Frames at the normal 10 Hz rate.

To check the U.S. Traffic Corporation BIU for operation at 60 Hz, a special piece of test equipment was developed. This tester uses a standard U.S. Traffic Corporation BIU as a test platform (CPU/Memory/SDLC) but with special firmware to send the Command Frames for BIU 3 and 4 (Command Frames 12 or 13) to the UUT and evaluate the Response Frames (140 or 141) back from the UUT for proper content.

The tester generates its own internal +24 VDC power supply to power both the tester unit and the UUT. The tester requires a standard 120 VAC 60 Hz connection to operate.

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4. GENERAL SPECIFICATIONS

CONTROL:	Function controlled by hardwired address
INDICATORS:	6 Status LEDs (Power, Transmit, Pass/Fail) on tester and Ready to test, Test in Progress and Test Complete on test chassis
INPUTS/OUTPUTS:	Per NEMA TS 2 Type: BIU
CONNECTORS:	One male 64-pin DIN 41612 type B series One 15-pin SDLC
POWER REQUIREMENTS:	+18 - +30 VDC (provided by internal supply)
DIMENSIONS:	2.34" W x 4.50" H x 6.5" D
OPERATING TEMPERATURE:	-30° to 165° F (-34° to 74° C)

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5. INSTALLATION

The BIU's standard NEMA card rack design makes installation and set-up easy. However, the manufacturer recommends that the following step-by-step procedure be used to ensure proper operation.

1. Place the Tester on a flat insulated surface.
2. Plug the BIU Tester module into the corresponding slot on the left side of the Tester.
3. Plug the UUT module into the corresponding slot on the right side of the Tester.
4. Connect the two modules' SDLC ports together using the SDLC Connector Cable.
5. Connect the Tester's power cable to standard 120 VAC supply.

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6. THEORY OF OPERATION

6.1 Loop Back Testing

To verify operation, the BIU Tester loops the 23 output circuits to 23 input circuits on the UUT as shown in Table 1:

Output Circuit	BIU connection	BIU connection	Input Circuit
Out 1	A2	B13	I/O 9
Out 2	B2	A14	I/O 10
Out 3	A3	B14	I/O 11
Out 4	B3	A15	I/O 12
Out 5	A4	B15	I/O 13
Out 6	B4	A16	I/O 14
Out 7	A5	B16	I/O 15
Out 8	B5	A17	I/O 16
Out 9	A6	B17	I/O 17
Out 10	B6	A18	I/O 18
Out 11	A7	B18	I/O 19
Out 12	B7	A19	I/O 20
Out 13	A8	B19	I/O 21
Out 14	B8	A20	I/O 22
Out 15	A9	B20	I/O 23
I/O 1	B9	B21	In 1
I/O 2	A10	A22	In 2
I/O 3	B10	B22	In 3
I/O 4	A11	A23	In 4
I/O 5	B11	B23	In 5
I/O 6	A12	A24	In 6
I/O 7	B12	B24	In 7
I/O 8	A13	A25	In 8

Table 1. Loop-Back Wiring Paths

Table 1 shows the complete wiring path of each of the loop back circuits. As an example, Output Circuit 1 on the UUT appears on its BIU card rack connector pin A2. The tester routes the signal from A2 to the BIU card rack connector B13 on the UUT and into the BIU circuitry as I/O Circuit 9. All of the loop back wiring is found on the backside of the UUT's BIU connector.

The tester works by setting one of the outputs active (logic zero) and pausing approximately 17 ms. After the pause, the tester sends the same output pattern again and pauses an additional 17 ms. After the second Command Frame is sent and the Response Frame from the BIU containing the active inputs is received, the firmware on the tester validates the frame to verify that only the expected input is active. This process repeats for all the Outputs and when complete, the tester firmware repeats the test again using logic one for all the circuits. All 23 circuits are tested for both logic 1 and logic 0 states continuously for about 15 seconds.

6.2 BIU 3 and BIU 4 Selector Switch

To accommodate the testing of both BIU 3 (Command Frame 12 and Response Frame 140) and BIU 4 (Command Frame 13 and Response Frame 141), a switch is provided to change the address of the UUT and the tester itself. The switch must be set to either BIU 3 or BIU 4 prior to starting the test.

6.3 Start Switch

The Start switch starts the testing. Once activated, the test cannot be stopped. Pressing the switch after the test starts has no effect. The start switch is connected to the tester on Input #1.

6.4 Reset Switch

The Reset switch restarts the testing. The tester will run back through the initialization routine by setting and clearing the three LEDs on the tester unit and the three LEDs on the chassis. After the LED scan, the tester chassis 'Ready to Test' LED will light. The start switch is connected to the tester on Input #2.

6.5 Power Switch

The Power switch controls the power AC power into the internal power supply.

6.6 Testing a BIU

NOTE: Prior to testing a BIU for 60 Hz operation, the BIU **MUST** be tested on the ATSI automated tester to verify that all inputs and outputs are functional and that the SDLC port and associated circuitry is performing correctly.

After successful verification on the standard ATSI BIU tester at 10 Hz, the UUT can be tested on the 60Hz tester.

- The UUT BIU is inserted into the tester in the right side card cage. After seating into the card cage connector, the SDLC cable needs to be securely attached to the UUT's SDLC 15-pin 'D' connector.
- Turn on the power tester.
- The Tester program starts and activates the 'Power', 'Transmit', and finally the 'Pass/Fail LEDs for one-half (0.5) second each. After this scan of the LEDs, the chassis LEDs 'Ready to Test', 'Test in Progress' and 'Test Complete' LEDs are scanned is lit the tester 'Power' and the 'Ready to Test' LEDs are lit continuously.

- Press the START pushbutton to begin the test.
- Note that the Tester's Transmit LED and the 'Test in Progress' LED glow (the READY TO TEST LED will now be off) to indicate the test is running.

6.7 Test Disposition

The Pass/Fail LED and the 'Test Complete' LEDs are used to display the disposition of the test. If the UUT responds correctly to all commands, the LED will show **PASS** by flashing the Pass/Fail LED twice per second and activating the 'Test Complete' LED. If the UUT fails to correctly respond to any command, the tester will show **FAIL** by turning on the Pass/Fail LED continuously and the 'Test Complete' LED. The test disposition is latched so power must be shut off and switched back on or the 'Reset' switch activated to execute another test.

Figure 1 shows the complete tester.

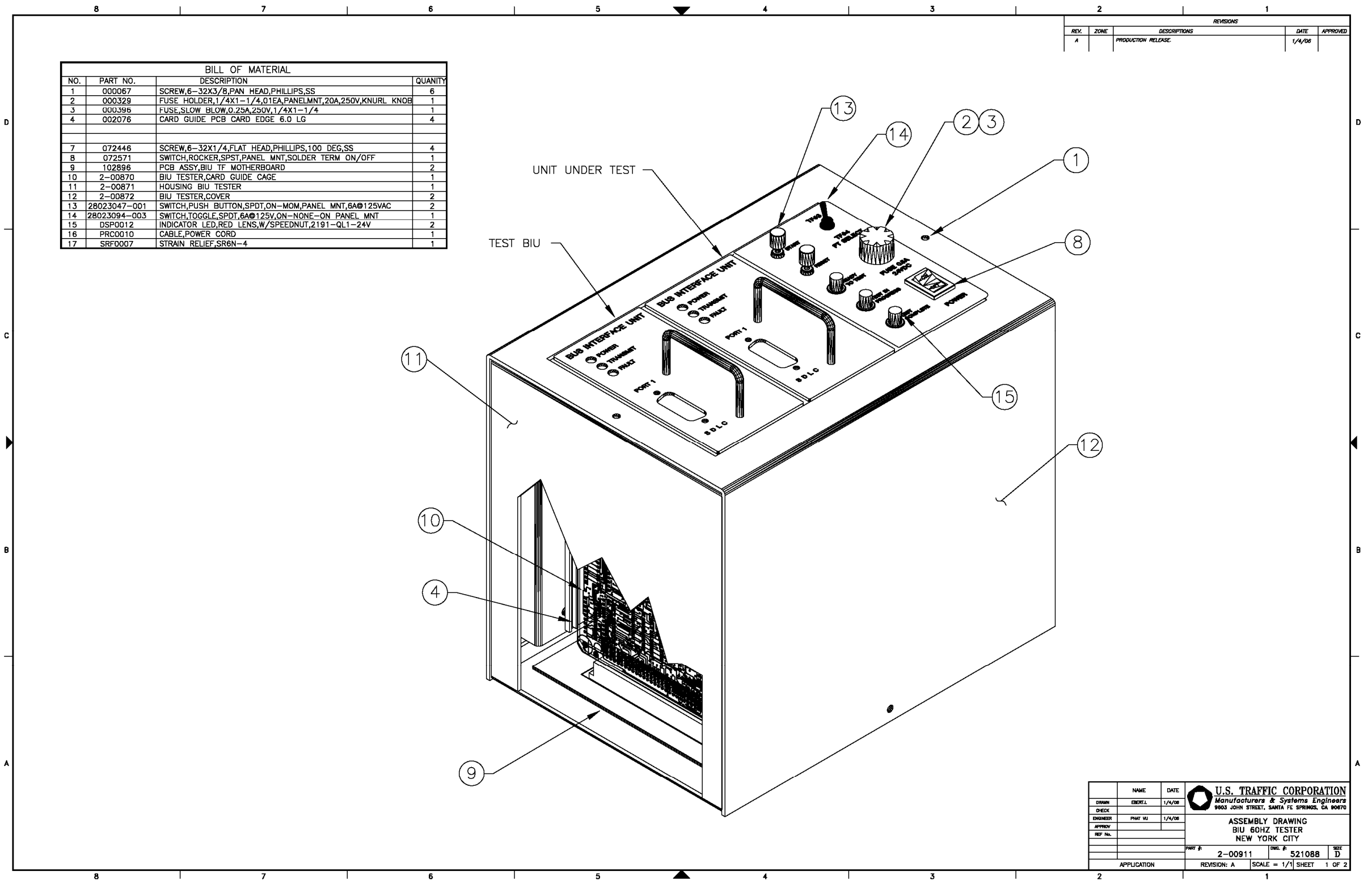


Figure 1. Tester Layout

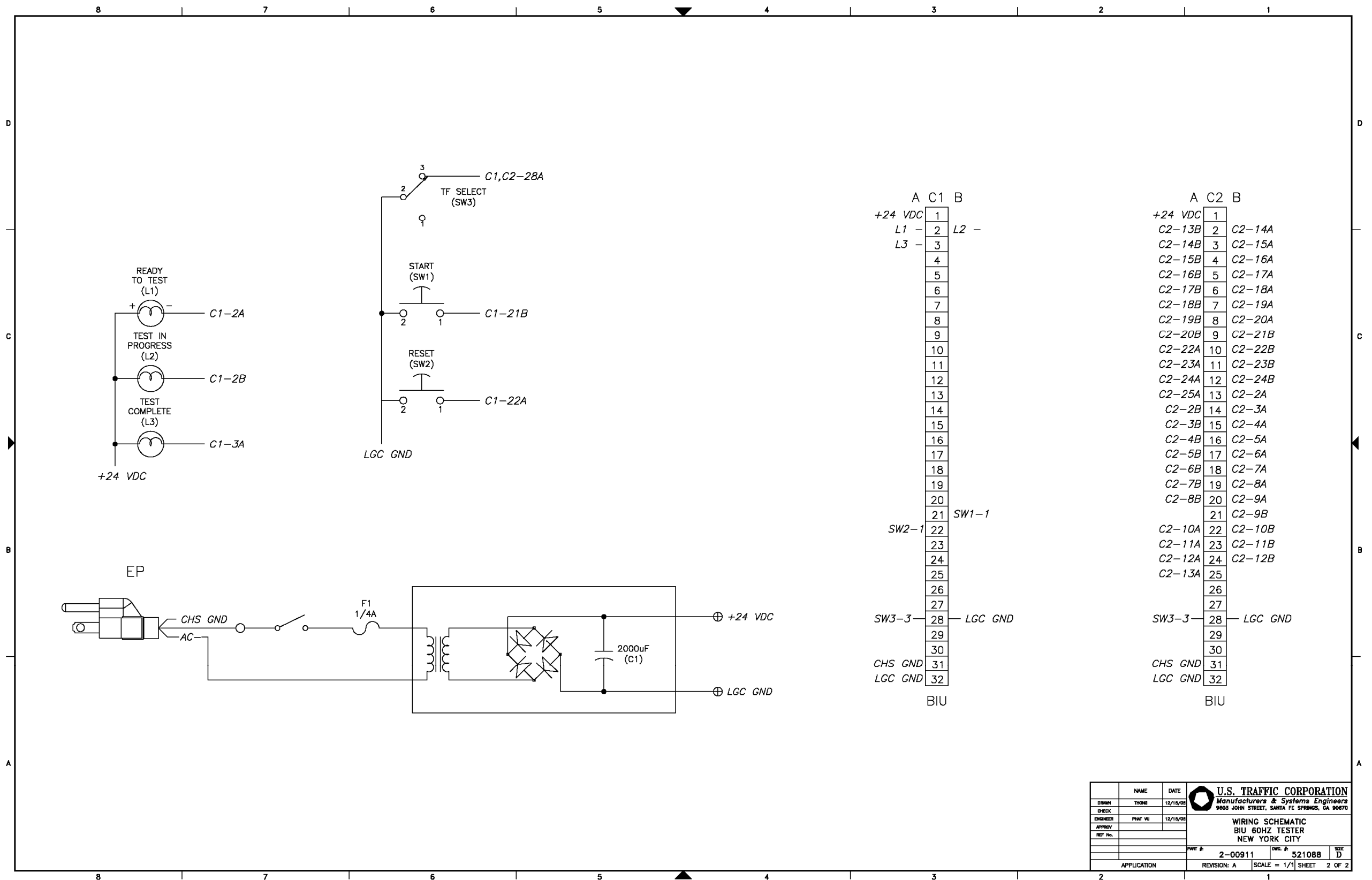
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7. DRAWINGS

7.1 Assembly Drawing



7.2 Schematic Drawing



NAME	DATE	U.S. TRAFFIC CORPORATION Manufacturers & Systems Engineers 8603 JOHN STREET, SANTA FE SPRING, CA 90670
DESIGN	THOMAS	
CHECK		
ENGINEER	PWAT MJ	12/15/02
APPROV		
REF No.		
APPLICATION		WIRING SCHEMATIC BIU 60HZ TESTER NEW YORK CITY
	PWAT #:	2-00911
	DWG #:	521088
	REV:	A
	SCALE:	1/1
	SHEET:	2 OF 2



Peek Traffic Corporation

2906 Corporate Way
Palmetto, FL 34221

ph: (941) 845-1200

in U.S.: (800) 245-7660

fx: (941) 365-0837

web: www.peaktraffic.com

