Test Procedure for the NCV7748GEVB Evaluation Board

1) Place the DEMO MODE switch OFF (left).
2) Populate all jumpers except the “LOOP” jumper next to the OUTPUT CONTROL push-button.
3) Plug the 12V (1.0A) wall adapter (Triad P/N: WSU120-1000) into the input on the right side of the NCV7748 board.
    a. Confirm the Display reads “NCV7748 Automotive LIN LowSide Relay Driver ON Semiconductor”.
4) Switch the DEMO MODE ON (right).
    a. Confirm the relays switch individually from OUT 1 to OUT 8 continuously. This will be observed by the LEDs adjacent to the OUTx labels.
5) Switch the DEMO MODE OFF (left).
    a. Confirm the sequence will continue until it reaches OUT 8 and stops.
    b. Confirm after a few seconds (maximum 10 seconds) OUT 8 will also turn off.
6) Set DIP switches Bit1-Bit7 (***odd bits only***) for OUT 1 – OUT 4 and OUT 5 – OUT 8 to a one where up is a one.
   Set switches Bit0- Bit6 (***even bits only***) for OUT 1 – OUT 4 and OUT 5 – OUT 8 to a zero where down is a zero.
    a. Push the OUTPUT CONTROL button.
    b. Confirm OUT 1 –OUT 8 LEDs illuminate and then go out after a few seconds (maximium 10 seconds).
    c. Confirm the display reads “Output Control”
        i. Data 1 = 10101010
        ii. Data 2 = 10101010
        iii. Data 3 = 00000000
7) Connect the “LOOP” jumper.
    a. Confirm the LEDs stay on indefinitely.
8) Remove the TxD jumper.
    a. Confirm all LEDs go off after a few seconds (maximum 10 seconds).
9) Connect the TxD jumper.
    a. Confirm all LEDs go on.
10) Remove LOAD 1 – LOAD 8 jumpers individually and replace.
    a. Confirm the LEDs go on and off
11) Press and hold the GET STATUS button.
    a. Confirm the display reads “GET STATUS”
        i. Data 1 = 00000000
        ii. Data 2 = 10101010
        iii. Data 3 = 10101010
12) Remove the LOOP jumper. Wait for OUT 1 – OUT 8 LEDs to turn off.
    a. Press the GET STATUS button.
    b. Confirm the display reads “Sleep Mode”.
        i. Data 1 = 11111111
        ii. Data 2 = 11111111
        iii. Data 3 = 11111111

13) Connect the LOOP jumper.
    a. Confirm OUT 1 – OUT8 LEDs turn on.
    b. Remove the RxD jumper. Remove the LOOP jumper. Wait for OUT 1 – OUT 8 LEDs to turn off.
    c. Press the GET STATUS button.
    d. Confirm the display doesn't change. It should still read "Output Control".
        i. Data 1 = 10101010
        ii. Data 2 = 10101010
        iii. Data 3 = 00000000
14) Connect the "LOOP" and "RxD" jumpers.
    a. Confirm OUT 1 –OUT 8 LEDs are on.
    b. Press ***AND HOLD*** the GET STATUS button.
    c. Press OCD8. Confirm OUT 8 LED goes out.
        i. Confirm Data 1 = 00001000
        ii. Confirm Data 2 = 10101010 (no change)
        iii. Confirm Data 3 = 11101010
            1. Continue to press each OCD button individually.
                a. Confirm each LED goes out with the press of a button.
                b. Confirm the display after all OCD buttons are pressed that all LEDs are off.
                    i. Confirm Data 1 = 00001000
                    ii. Confirm Data 2 = 11111111
                    iii. Confirm Data 3 = 11111111
15) Release the GET STATUS button.
    a. Repower the device.
    b. Set DIP switches Bit1-Bit7 (***odd bits only***) for OUT 1 – OUT 4 and OUT 5 – OUT 8 to zero.
    c. Set DIP switches Bit0- Bit6 (***even bits only***) for OUT 1 – OUT 4 and OUT 5 – OUT 8 to one. Note the DIP switches are now opposite polarity from the previous tests.
    d. Press ***AND HOLD*** the GET STATUS button.
        i. Confirm Data 1 = 00000000
        ii. Confirm Data 2 = 01010101
        iii. Confirm Data 3 = 01010101
    e. While still holding the GET STATUS button.
        i. Remove the jumper for LOAD 4.
            1. Confirm Data 1 = 00000000
            2. Confirm Data 2 = 00010101
            3. Confirm Data 3 = 01010101
        ii. Remove the jumper for LOAD 8.
            1. Confirm Data 1 = 00000000
            2. Confirm Data 2 = 00010101
            3. Confirm Data 3 = 00010101

ANNEX A – Arduino Programming

There are two programs and two microprocessor devices needed to construct this eval board.
One acts as a LIN Generator and the other acts as a LIN Decoder.

LIN Generator Details

```
// LIN command generator for NCV7748 stand-alone demo board.
// Copyright 2016, ON Semiconductor and P. Ingles

// This sketch outputs dip-switch programmable LIN commands
// on arduino pins 1 and 13. Pin 13 is for writing individual bits,
// and pin 1 is for inserting control and checksum bytes into the
// data stream. The two outputs are combined using two open collector
// buffers (7407). Each command is sent to the DUT by pressing the
// "Send" button after the desired dip-switch settings are entered.
// There is also a separate "Get Status" button to read back LIN
// data from the DUT.
```

LIN Decoder Details

```
// LIN command decoder for NCV7748 stand-alone demo board.
// Copyright 2016, ON Semiconductor and P. Ingles

// This sketch monitors the LIN bus on Arduino pin 7, then decodes Error and Status data from the NCV7748.
// When a BREAK FIELD followed by a BREAK DELIMITER is detected (13 LOWS, 1 HIGH), the Arduino samples
// and stores BYTE 0, BYTE 1, BYTE 2, BYTE 3.  This data is then used to control an on-board LCD module
// to display system operation.

// Additional feature added 4/25/16: Demo mode LIN generator to repetitively sequence the NCV7748 outputs.
// Outputs on pin 13, toggle switch on pin 8 switches to demo mode.
```

Instructions for programming of Arduino device

1) Make sure the ATMEGA328P-PU comes pre-loaded with the Arduino bootloader. Info is available on the Arduino web site if you choose to load the Arduino bootloader yourself (www.arduino.cc).
2) Download and install the Arduino Software (IDE) on your computer. It is available for Windows, Mac OS X, and Linux 32 bit, Linux 64 bit, and Linux ARM. https://www.arduino.cc/en/Main/Software
   In most cases, just click on "Windows Installer".
3) Plug the Arduino UNO into the USB port of your computer with the ATMEL device in the socket.
4) Start the Arduino programming environment.
5) Open the "INO" file. FILE→OPEN
6) Verify correct board is selected.
   Board→Arduino/Genuino UNO
7) Verify communications between the PC and the Arduino UNO.
   TOOLS→PORT→"Serial Ports" In my case the serial port is COM5. Make sure there is a check in the box.
8) Upload the program to the Arduino board. SKETCH→UPLOAD
9) The Arduino device is now programmed.
10) Unplug the connector to the USB.
11) Remove Arduino device from its socket.
12) Done.

There are two devices which need programming.
Make sure the Generator device and the Decoder device go into the correct sockets on the NCV7748 eval board.

It's important to note the pin numbers associated with the ATMEGA328P do not coincide with the header numbers of the Arduino board.
Reference the diagram to the right.

ARDUINO HEADER		ATMEGA328P		ARDUINO HEADER	
	RESET	1	28	A5	(SCL)
(RXD)	0	2	27	A4	(SDA)
(TXD)	1	3	26	A3	
	2	4	25	A2	
	3	5	24	A1	
	4	6	23	A0	
	VCC	7	22	AGND	
	GND	8	21	AREF	
	XTAL1	9	20	AVCC	
	XTAL2	10	19	13	(SCLK, LED)
	5	11	18	12	(SO)
	6	12	17	11	(SI)
	7	13	16	10	(CSB)
	8	14	15	9	

