

APPLICATION NOTE #110

CT2577 / 79

Using the Built in Self Test

Point of Contact:
John Vanchieri
Tel: (516) 752-2484

Self test is useful in determining the basic integrity of a 1553 interface. Determining whether the microprocessor subsystem interconnect is working properly (off-line mode) or the Bus transceivers are correctly interfaced to the 1553 system bus (on-line mode) can be accessed via the Self test feature.

BASICS OF THE CT2577/9 SELF TEST FUNCTION

The self test feature is an **internal (off-line) and external (on-line) loop back test** for additional verification of functionality. This is in addition to the Remote Terminals internal Wraparound circuitry. The difference being that **this test is manual and under subsystem control**.

The subsystem microprocessor **selects either off-line or on-line mode, initializes the self test data** and then **initiates the self test**. After the self test has **completed** the subsystem then **reads back the wrapped data word** and determines if it is correct. The **on-line** self test must be done with the **1553 data bus quiet**.

PERFORMING A SELF TEST

The self test function is **enabled or disabled by writing to specific address locations** (data is don't care). Reset (pulsing NRES) will disable self test.

Addresses shown are for 16 bit operation

<u>Address</u>	<u>Function</u>	(Device status register is Addr 001h)
406h	Enable off-line self test and set device status bit 6	
407h	Enable on-line self test and set device status bit 7	
408h	Disable self test and reset device status bits 6 and 7	

When **8 bit mode** is used (NBIT16=1) upper and lower bytes are selected via **UB** (0=lower byte) and must be asserted along with the address highway. **D0 through D7 contain data**, D8 through D15 are not used.

It is recommended that the user always use word width operations accessing the upper byte then lower byte for all operations.

When self test is enabled the device is set up internally as both BC and RT.

When disabled the device will revert back to its previous state.

BASIC OPERATION

The basic operation is for the **BC portion to transmit the message "receive one data word"** and for the **RT portion to receive this message**.

If the **on-line** self test is selected the message will be **transmitted onto the 1553 bus via the transceivers** and be received by the RT via transceivers. **The RT will not respond with Status.**

If the **off-line** self test is selected the **transceivers will be inhibited** and the **Manchester encoder output is routed to the Manchester decoder input.**

The **Device status (Not the 1553 Status Word)** may be obtained by reading **Address 001h.**

Bit 6 indicates **off-line** self test **enabled.**

Bit 7 indicates **on-line** self test **enabled.**

Bit 7 is the msb of the low byte. High byte is don't care.

DETAILED OPERATION

1. **Enable** self test by **writing** to either **406h (off-line) or 407h (on-line).**
2. **Select desired 1553 data bus** to be tested by **writing to 010h (Primary) OR 018h (Secondary).**
3. **Write** the desired self test **data word**, A55Ah suggested, to the appropriate RAM location.

For a Broadcast RX 1 word message:

Write any SA from 820h (SA1) to BC0h (SA30)

OR

For a Normal receive RX1 word message:

Write any SA from 020h (SA1) to 3C0h (SA30)

4. **Initiate** the BC to RT transfer of one data word by **writing to address 000h** with the **data word** (the **actual 1553 command word**) of, for example, **F821h** for "BCST R SA1 WC1" **OR 0821h** for "RT1 R SA1 WC1".

The following should be noted:

For NON Broadcast commands, the hardwired Remote Terminal address (RTA) must match the RTA field within the Self test Command Word written to address 000h. The RTA must always have correct parity, odd.

The hardwired RTA does not matter if a Broadcast Self test command is used.
The RTA must always have correct parity, odd.

If the LA (Latch RT Address) input is 'high' the hardwired RTA will be 'latched' into the device when reset (NRES) is applied. Any changes in the hardwired RTA will not be seen by the device until such time as reset is applied, the LA input is set low (and returned high if relatching is desired) or a Mode 'Reset Remote Terminal' is received.

5. Immediately write 0000h to the location chosen in step 3 then read the same location immediately to verify the 0000h contents. Upon self test completion (approximately 45 μ s) this location will be overwritten with the self test data.

Writing to address 000h initiates the following automatic sequence:

- a. The Command word (data word written to location 000h) is processed by the BC protocol, transferred to the Manchester encoder and transmitted onto the bus (on-line self test) or to the Manchester decoder (off-line self test).
- b. The self test data word is read from the appropriate RAM location (step 3) is transferred to the encoder and transmitted contiguously following the command word.
- c. The Command word is received by the Manchester decoder, if valid and with correct RT address or broadcast, is stored in the RT protocol command stack and is available via reading address 000h.
- d. The contiguous word (Data word) is written into RAM at the location initially chosen (step 3). At this point the data should be read and compared with the initial self test data written.
- e. Primary Bus Self test is now complete.
- f. Repeat Self test on alternate bus.
- g. Disable Self test.

TYPICAL SEQUENCE OF EVENTS

1. Select desired external RT Address with odd parity.
2. Set LA for desired function.
3. Issue Reset (pulse NRES).
4. Initialize the desired operating mode (W=Write, R=Read, address/data)
W - 400h/XXXX (RT Mode) OR 401h/XXXX (BC Mode)

5. Select Self test mode
W - 406h/XXXX (off-line) OR 407h/XXXX (on-line)
6. Verify Self test mode (Assumes BTL is disabled)
R - 001h/XX40h (off-line) OR 001h/XX80h (on-line)
7. Select Bus to be tested
W - 010h/XXXX (Primary) OR 018h/XXXX (Secondary)
8. Write Self test Data word
W - 020h/A55Ah (Normal) OR 820h/A55A (Broadcast)
9. Write Command word
W - 000h/0821h (RT1 R SA1 WC1) OR 0000h/F821h (BCST R SA1 WC1).
Any Bcst or Receive SA can be substituted
10. Clear Self test Data location. Should be performed immediately following
Command word write (Step 9)
W - 020h/0000h (Normal) OR 820h/0000h (Broadcast)

This location will be overwritten with self test data and must be altered to insure that when finally read the self test data was actually written

11. Verify Cleared self test data location
R - 020h/0000h (Normal) OR 820h/0000h (Broadcast)
12. **Wait 45us** for Self test to complete (after NCMDSTRB)
13. Read self test data
R - 020h/A55Ah (Normal) OR 820h/A55A (Broadcast)
14. Compare to initial self test data
15. Repeat on other bus
16. Disable Self test
W - 408h/XXXX
17. Verify Self test disabled (assumes BTL is disabled)
R - 001h/0000h