LOOP DELAY SERVICE MANUAL

Short function description

Functional Test procedures

The first test is a software sequence to confirm propper fuctioning.
The next chapter then explains what the steps do and how to search further if a problem ocurs.
Once an error has been detected, the second software package is offered to search the problem in detail.

Some tests end in an endless loop if they fail. The machine has to be powercycled to continue testing.

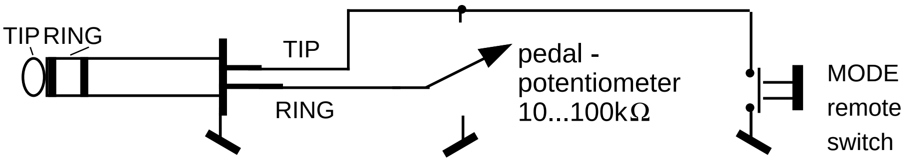
Tools needed:

1. *Testplug*

Nothing more than a 1/4” phone plug with alll short cirquited (tip – ring – ground).

2. *Testpotplug*

A potentiometer and a small key can easily be soldered to a stereo 1/4” phone plug. If the apropriate Pedal is available, the better.



3. *The MIDI cable*

A short cable with two 180° 5pole DIN plugs. At least pins 3/5 have to be wired.

4. *The Jack cable*

A short audio cable with two 1/4” plugs.

5. *The amplifier*

A Casset recorder with external input is suficiant.

6. *Measurement instruments in case of trouble*

In case of trouble, a 30MHz Scope is required.
A Sine Wave Generator is integrated in the test software. However, in some cases it might be helpfull to have an exeternal at hand.

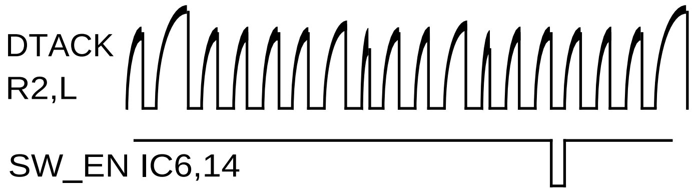
Function verifyingtest procedure

#	What you do	What happens	What you see
	insert 2*256k SIMMs in sockets near the border of PCB		
	flip all DIP-switches to position ON		
	insert MIDI-cable in MIDI-IN and MIDI-OUT jack		
	Power on	start Tester 1	Display shows 1 in the last digit
1.0	press MODE	test LEDs	all LEDs become green, yellow, red
1.1		test DISPLAY	count 0.0.0.0.0. to 9.9.9.9.9.
1.2	toggle once all DIP-switches (set OFF and ON again)	test all DIP-switches	LEDs become green while DIP-switch is OFF RecLED = DIP 1 OverdLED = DIP 2 MultLED = DIP 3 InsLED = DIP 4 BreakLED = DIP 5
1.3	insert testplug in all footswitch jacks	test footswitches	the corresponding LEDs become red while plug is inserted
1.4	insert testplug in BeatSync jack and take it out again	test beatsync (input)	Mode1 LED (lower) flashes once red If not, continue to 1.6
1.5	insert testplug in BrotherSync jack	test brothersync (brother-record signal)	if the switch is ok, the following two tests are executed, else all stays dark.
1.6		test beatsync (output)	if test fails all LEDs turn red and the machine has to be restarted. Display shows kind of error.
1.7		test memory banks	Mode LEDs show: green=ok; red=failed lower LED must turn green! Mode1LED = Bank1 Mode2LED = Bank2
2.0	press RECORD key (testplug still in brothersync)	test brothersync (sample-sync)	RECORD...UNDO LEDs turn red/yellow and ” — ” apears in display
2.1	remove testplug	test MIDI	RecordLED shows result of testing MIDI. Record green = ok Record yellow = connected? Record red = failed (if the test fails the machine has to be restarted)

2.2	remove MIDI cable		
3.0	turn all potentiometers down (left) connect amplifier or KO to MIXOUT		
3.1	press OVERDUB key	processor generates 1kHz sinoidal signal	OVERDUB LED turns green
3.2	turn MIX potentiometer from DIR to LOOP (left to right)		signal slowly increases look for distortion by listening to overtones or looking at KO
3.3	Connect amplifier or KO to DIR OUT bridge IN to MIXOUT with the jack cable		
3.4	slowly turn up INPUT LEVEL from left to right just until the INPUT LED turns red (about center position)	test analog cirquit, level LEDs, Limiter	The signal is increasing INPUT LED first turns green, then yellow, then red. The FEEDBACK LED turns green and yellow, but not red.
3.5	turn FEEDBACK from minimum (left) to maximum (right)	test FEEDBACK potentiometer	Display shows result: L = minimum (low) 0 = middle H = maximum (high) Must reach L and H.
3.6	insert testpotplug in feedback jack		
3.7	turn potentiometer on testpotplug from minimum (left) to maximum (right)	test feedback input	Display shows result: L = minimum (low) 0 = middle H = maximum (high) Must reach L and H.
3.8	press MULTIPLY	VCA OUT check	MULTIPLY LED turns yellow Signal disappears FEEDBACK and INPUT LED dark.
3.9	press MULTIPLY	VCA IN check	Signal comes back again INPUT LED red, FEEDBACK LED dark.
3.10	press MULTIPLY		FEEDBACK LED turns yelow
3.11	press OVERDUBB again	20Hz sinoidal	MULTIPLY LED turns off INPUT LED flickers red-yellow FEEDBACK LED turns yellow
3.12	press OVERDUBB again	2kHz sinoidal	INPUT LED turns red
3.13	press OVERDUBB again	10kHz sinoidal	INPUT LED turns yellow
3.14	press OVERDUBB again	15kHz sinoidal	INPUT LED turns green
3.15	press OVERDUBB again	16kHz sinoidal	no change
3.16	press OVERDUBB again	18kHz sinoidal	FEEDBACK LED turns green
3.17	press OVERDUBB again	20kHz sinoidal	FEEDBACK LED turns off MODE LED turns green to show end of sequence
4.0	press INSERT key		INSERT LED turns green

4.1	connected the amplifier or KO to MIXOUT and turn amplifier up until hum is audible	trim DA unlinearity	An about 50Hz signal apears at very low level turn trimmer RV1 until noise is minimal
5.0	press BREAK key (amplifier connected)	trim VCA offset	BREAK LED turns green turn trimmer RV2 until noise is minimal

Explanations of possible errors

1.0	The initial software loop on purpose does not do anything depending on a peripheral exept SW_EN. So the awakening of the processor only can be noted, when the first key is pressed. If this first key has no effect, there are a lot of possible errors. So check the following signals: • +5V supply • DTACK R2,left If DTACK is always high, it means that the processor does not run: If RESET (IC0,20) is low, the power-up cirquit (IC7/40; R0; C0) is bad. Check clock on IC0,15 else it hanged itself and little can be measured. Try to find short cirquits around IC0...9 If there is a signal on DTACK different from the picture, you may find the error by checking all data and adress lines for reasonably changing signals or short cirquits.  If DTACK is correct, check the hardware of the switches as noted under 1.1. or try other test functions.
1.0	IC 64/65/66; RP6x; Front PCB
1.1	IC 61/62/63; Front PCB
1.2	IC 42; RP43
1.3	C33..39; RP42;
1.4	Simple test of only SYNC input. Continue to 1.6, where the Sync output is tested, too and the result of test more detailed
1.5	R32/33; IC21/43
1.6	Display shows error: L = pulse short 0 = no pulse H = pulse long — = eternal pulse IC44/20, R34..37; T30; IC40/42
1.7	Remember: Usually one set of SIMM sockets is empty. Change SIMMs/IC2...5/9...12. To test further, go to step 8.
2.0	If procedure goes on directly to MIDI test, check SASYNC, IC20...22; R21

2.1	If the LEDs stay red/yellow, BROTHER SYNC or the ADC cycle is not ok: If IC20 pin12 stays low, there is no AD_EN signal If IC20 pin13 stays low, there is no Sample clock (IC22,3): check IC50/55 or no Conversion clock (IC20,13): check IC22a/24 If the MIDI test is negative, check IC50...53; R51...56
3.2	If no signal is heard, follow the signal with the KO on its way: IC35,7 — IC76,1 — IC70,14 — IC78,7 If the signal disappears after IC78,7, the power mute cirquit might be bad: T41/42; R66...69; D43/44. Note, that IC74,6 should be at +5V If the signal does not increase linearly: On early series it happens that a pin of the potentiometer creates a short cirquit with a track on the component side of the PCB
3.4	If no signal is heard, but the LEDs react correctly, the direct output is bad. IC78,1; T40 If the the INPUT LED stays dark, and the signal is heard, the problem is probably at level detection: IC77; R93...106. If the the INPUT LED stays dark, and no signal is heard, follow the signal with the KO on its way: R40 — IC71,1 — IC71,7 If only the FEEDBACK LED does not react correctly, follow the signal with the KO on its way: IC70,1 — IC76,7 — IC36,1 Note, that IC74,2 should be at +5V If the signal arrives at the ADC (IC28), check DC bias at IC28,21/23; IC36 to be 2,5V and the ADC digital connection: IC28,9: regular rectangle wave of 41kHz, probably present, if the BROTHER SYNC test was successfull. IC28,10: regular rectangle wave of 2,6MHz, probably present, if the BROTHER SYNC test was successfull. IC28,11: Serial output with the sequence:16bit pedal data — break — 16bit sound data — break. If the FEEDBACK LED turns red, the limiter is bad. Control signal at IC70,1. It should be constant and undistorted while the INPUT LED is in red.. Only distorts at 20dB abouve red level. (=10 times overload)
3.5	Follow control signal 0V...5V at: IC75,13 — IC28,1
3.7	Follow control signal 0V...5V at: R20 — R30; — IC28,1
3.8	If signal does not disappear, the Output VCA cannot be switched off. IC75,4/5/9; IC 74,6 must be near 0V a dirty effect: If the Pedal value at IC75,3 exeeds 5,5V, the Output does not close properly!
3.9	If signal does not disappear, the Input VCA cannot be switched off. IC75,2/10/15; IC 74 2 must be near 0V
3.11 t0 3.17	Asimple way to check the over all frequency response. Can be done better with mesuring instruments acording to step 9.

7.0	The whole sound path is open to mesure sound quality with all kinds of audio measurement instruments. Remember that this tool produces digital noise different from the real program. To check software noise, go to the main program (DIP SW 1 off and restart) and press RECORD and immediately afterwards OVERDUB — a setting that does the same with a small delay with realistic software.
9.0	Opens the VCAs and echoes the ADC output to the DAC. So the whole sound path is open and measurments like fequency response are easy.
10.0 11.0	A short soft loop that writes and reads memory continuously, while data and adress is incremented each time. Facilitates measuring of memory timing and data and adress lines.
12.0	The sophisticated MemCheck fills the whole memory with data and checks them for following errors: • other value read than written • mirroring of memory-parts • refresh-errors (memory-cells not refreshed) To accomplish this, the every long-value in memory (e.g. addresses $800000, $800004, $800008 ...) is filled with it's own address. The first memory-cell not containing it's own address is shown on the display. Because the display has only 5 digits, but an address has 8 digits the value is shown in two pieces: • upper part (nibbles 4-7) • [press any key] • lower part (nibbles 0-4) • [press any key] The same method is used to show the erroneous value in that address. Use the table below to understand how hexadecimal digits are displayed on our display.

The display uses the following (pseudo-)hex digits:

Displayed digit	Value
0	$0
1	$1
…	…
8	$8
9	$9
-	$A
E	$B
H	$C
L	$D
P	$E
blank	$F

Test signal generation

#	*What you do*	*What happens*	*What you see*
	switch DIP SW 2 OFF		
	Power on	start Tester 2	Display shows 2 in the last digit
7.0	press RECORD	MIDI send	Hex55 is sent contiuously to MIDI OUT
8.0	OVERDUB key	for future use	
9.0	press MULTIPLY	AD-DA pipe	facilitates measurements of analog cirquit
10.0	press INSERT	Memery test Bank 1	facilitates search of problem in case of memory error in Bank1
11.0	press BREAK	Memery test Bank 2	facilitates search of problem in case of memory error in Bank2
12.0	press UNDO	sophicticated Memory check	Tests all memory cells and stops as soon as error found

Exlanation of test signals

Some basics about the construction

The purpose of the VCA

Synchronization

Software solutions

Reset

Refresh

Blocks

Connection of a Feedback (volume-)pedal

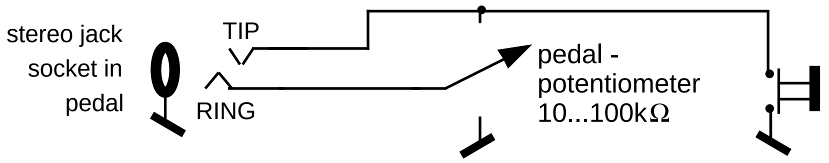
There is a 6.3mm plug on the back called FEEDBACK. It is a very flexible and thus not so easy to understand connector. It accepts a switch or a controller or both at the same time.
Its primary purpose is to connect a ordinary volume pedal to control the Feedback value or Volume.
Since it is essential to regulate the feedback from exactly 0 to exactly one, adjustment is necessary in most cases.

The Pedal electronic

5VDC is fed through the 2k2Ω resistor R26 to the tip of the plug. If it is pulled to ground, the switch is considered pressed.
The ring of the plug receives a tension which controls the Feedback or Volume VCA, depending on the LOOP mode. Both control ranges are 0...5V. The ring tension is amplified through the IC70C. Its gain is controlled by the plugged resistor R28 with the standard value 100kΩ. Since there is a voltage drop on R26 and most pedals do not open all the way up, gain is always greater than 1 and has to be adjusted according to the Potentiometer value which determines the voltage drop on R26 and the opening factor of the pedal.
Using a 10kΩ potentiometer which opens fully, no change of the standard R28 should be necessary.

The adjustment of R28

1. Connect the pedal potentiometer as described in the manual and in the following picture.



2. Open the pedal fully (down).

3. Record a short loop.
4. If the loop is fading, replace R28 by a smaller value, until it is not fading anymore.
5. When it is not fading anymore, reduce carefully the pedal. A small reduction should produce a slight fading of the loop. Otherwise R28 is too small.

The professional way: Open the pedal fully and adjust R28 so that the output of IC70C (pin8) is 5.0...5.1 VDC.

Part list

Schematic drawing