

Eureka / Rebecca Test Unit

6 july 2017

This test unit contains the cockpit instruments of the Rebecca Mk8 unit, and a simulator for the Eureka or BABS beacon on the ground. The video signals TRIG and SIG are simulated, rather than the RF signals. The unit can be used to test the Range, Heading and Tone functions of the Rebecca Mk7 or Mk8. The original junctionbox is not required.

The test unit has a cable with a 28-way connector that can be connected either :

- to the strobe unit of the Rebecca Mk8 set alone, or
- to the complete set

Powering is, in case of connection to the strobe unit, by external supplies for +27V/2A, +300V/50mA and -150V/5mA. In case of the complete unit, only a 27Vdc/6A supply is needed.

The test unit contains the cockpit controls: - the Range / Heading meter and in the gray rectangle the controls for RX and TX channel selection, and the mode switch.



The interrogate pulse generator in the transmitter can not be used, but is simulated here by a simple oscillator.

Also the lobe switching oscillator, normally either a) in the aircraft aerial switching relay for eureka beacons or b) on the ground in a babs runway beacon is simulated in this test box as well.

Both oscillators have a fixed frequency, independent of the 20nm or 200nm scale. The (free running) lobe switching oscillator is adjusted to get 5 pulses in each lobe, more or less synchronized.

The Beacon type (eureka or babs) is switched together with the Rebecca mode switch.

When the code key is pressed, the pulses are 31 μ s wide instead of two 5 μ s pulses, spaced 30 μ s. This disturbs temporarily the range and heading measurement.

Specifications

Power supply 27Vdc

TRIG output pulse Pulse repetition frequency (PRF) 140 Hz (7ms)
positive pulses, 8 μ s wide, 13V peak

SIG output pulse Variable peak level, OFF push button to interrupt signal.
when connected to strobe unit: 0 ... 22V pk, adjustable, 0V between pulses
or connected to the complete unit : 0.... 12V pk, adjustable, 8V between pulses

Pulse width :

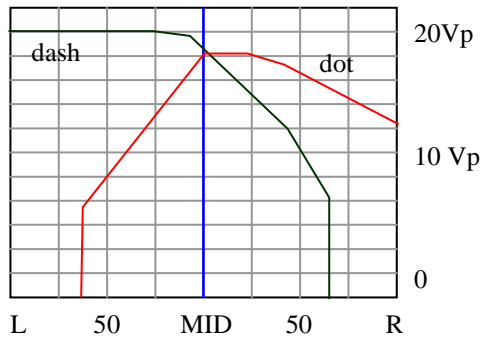
	normal	tone
Eureka	5 μ s	31 μ s
Babs dot	5 μ s	31 μ s
Babs dash	14 μ s	40 μ s

rise time < 1 μ s

decay time 3 μ s

Note: tone pulse is *one* 31 μ s long pulse, not two pulses as in the eureka and babs beacons.

Course dial



Lobe switching frequency 14 Hz (70ms)
Compromise between Eureka (22Hz) and Babs Mk4 (8Hz)
5 PRF pulses low, 5 pulses high
"synchronised" with PRF by careful adjustment

Range dial

The rangeknob dial is non-linear :

dial	20nm	200nm
0	2 μ s	25 μ s
0.5	42	483
1	86	970
1.5	150	1520
2	125	2000
end	327	2470

babs forces 20nm range

20/200nm selection applied both to dials on meter and dial of knob.

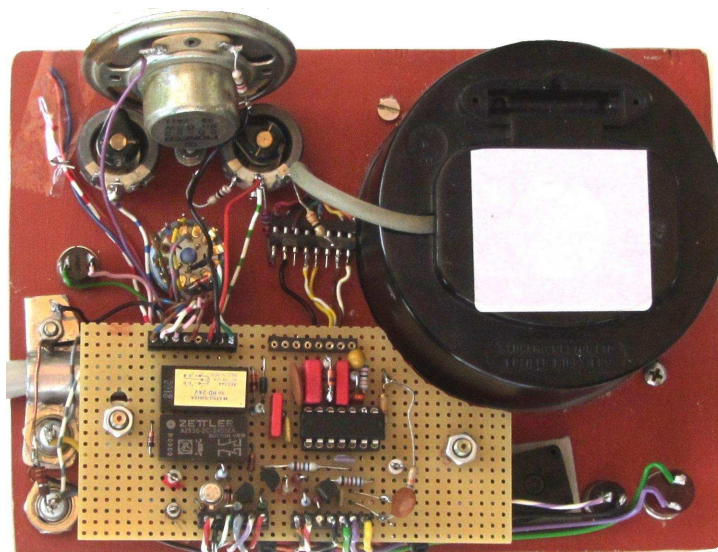
Size

It all fits in a 17 x 12 x 7 cm box.

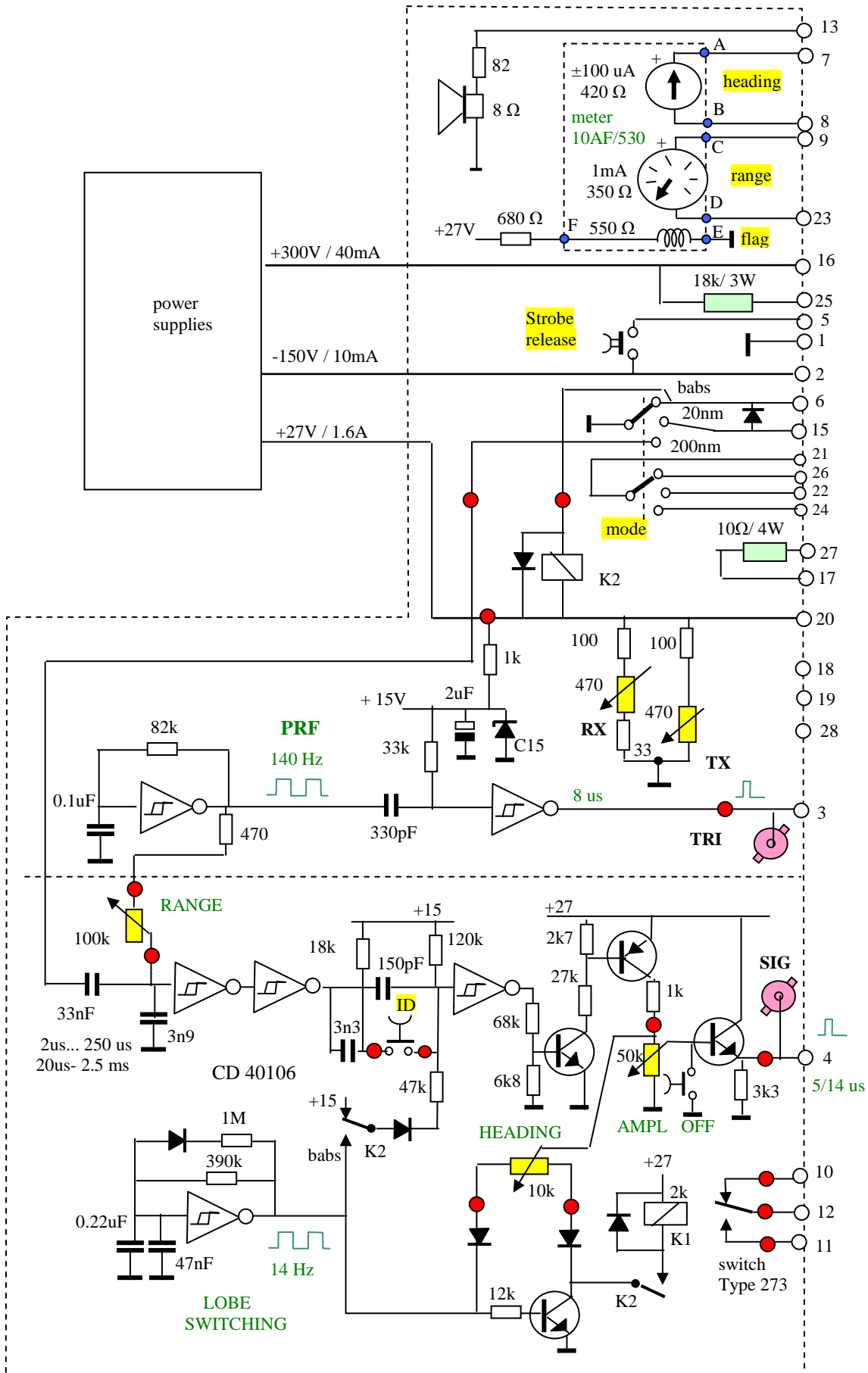
Rebecca Mk8 Test unit plug

to	complete set or	just to the strobe unit.	cable wire color
1	gnd	gnd	black, shield
2	-150 V	-150 V	grey/brown, -150V in
3	Tx pulse	Tx pulse `TRIG`	green
4	20 nm range	Rx signal `SIG`	grey/white
5	Strobe release	Strobe release (to -150V)	pink
6	BABS mode	BABS mode (Relay B)	brown/blue
7	Course meter	Course meter	white
8	Course meter	Course meter	brown
9	Range meter	Range meter	yellow
10	Antenna switch L	Antenna switch left position	white/pink
11	Antenna switch R	Antenna switch right position	brown/pink
12	Antenna switch return	Antenna switch return	brown/red
13	ID tone output	ID tone output	purple
14	OFF flag	Full AGC voltage	blue
15	Rx signal	20 nm range (Relay A)	grey
16	+ 300V	+300 V	+300 V in
17	AGC link to 18	heaters internal (12.6V)	10Ω to 27
18	AGC link to 17	AGC (-1 ... -4V)	blue *)
19	Rx tuning	heaters internal (25V)	white/green *)
20	Tx tuning	+28 V heaters & relays	white/blue 28V in
21	Min.Range	Min. Range input	grey/pink
22	Zero Range (20nm)	Zero Range (20nm)	red/blue
23	Range meter return	Range meter return	yellow/white
24	Zero Range (200nm)	Zero Range (200nm)	brown/green
25	n/c	+85V	18k to 16
26	Zero Range (BABS)	Zero Range(BABS)	yellow/brown
27	+28V dynamotor, tuning	heaters internal (19V)	10Ω to 17
28	+28V heaters , relays	Front panel -yellow coax plug	red/white *)

*) not used, red not used



Rebecca Mk8 testunit, when connected only to the strobe unit



Testing the complete Rebecca Mk8 unit with the testbox.

preparations

Transmitting in the 200 - 235 MHz band is prohibited, so the transmitter must be disabled.

This is done by disconnecting the +300V supply to the transmitter, as well as the trig output because an external oscillator must be used to make the interrogation impulses.

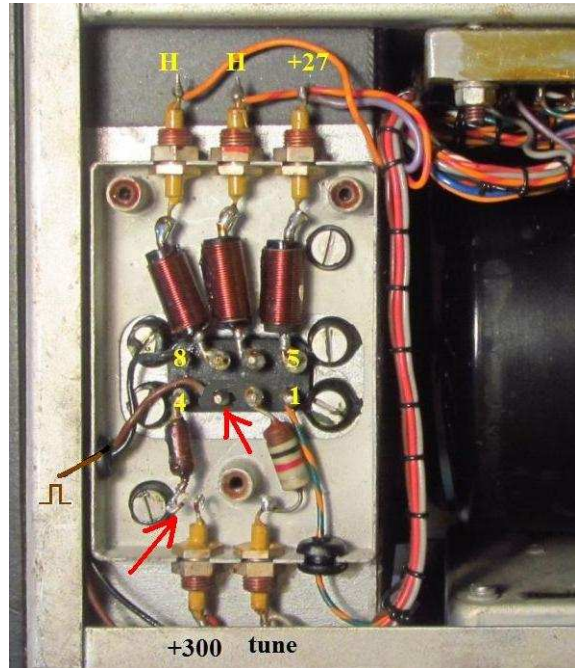
Open the filterbox that connects to the transmitter module, and disconnect

- the brown wire to pin 3
 - and the small inductor to pin 4.
- see the red arrows in the picture.

The transmitter itself should stay in place, otherwise the filament circuit is disturbed.

The 27V should be connected to pin 28 (SB) half a minute before 28V enters pin 27. I used a 26V/5A power supply for the SB on pin 28, and a second power supply, 24V/ 4A for the dynamotor at pin 27.

The tuning motors are reconnected to pin 28 so I can hear the tuning motors before the noise from the dynamotor starts.



Future improvements:

The response signal from the testunit can be modulated on a 220 MHz carrier, and applied to the coax connector on the rear of the TR unit. This allows testing of the receiver, signal-noise ratio and sensitivity data and AGC curves.

Dual pulse, 30 us apart instead of the long tone pulse will not disturb babble mode during code.

Rebecca Mk8 testunit, connected to the TR8193 main connector

