



Radio Direction Finding Multi- Tx Experiment

Maxi Keyer Manual

INDEX

1 IN 5 ID	7	Keyer battery failure	11
2 IN 10	3	Keyer will not start	11
80 40 20 10	7	Licence	5
Adding speech	5	Opto isolator	6
Advanced features	5	Output to key circuit	6
At the start of the event	4	Power socket	8
Basic use on a 2 in 10 event	3	Problems	11
Batteries	3	Produce gaps to avoid doubling	7
Battery life	3	Relay	6
Callsign	7	Relay/Off/Direct	6
Charging	3, 6	Sample procedure	8
Check connection	4	Sample schedule	8
Check the Keyer's operation	4	Setting up a single Maxi, Multi-TX event	8
Check TX connection	4	Silent/Tone	6
Chrg /Trickle/Emrg	6	Slot fill	7
Circuits	6, 10	Start Maxi and all Minis	8
Connection to the transmitter	4	Switches	6
Connections	8	The red manual switch	6
Continuous transmission phase	4	The yellow setup switches	7
Correcting time error	4	Timing problem	11
Cycle/Cont	6	TR	3, 8
Delays	5	Trickle charging	3, 8
Faults	11	Tune/load the Tx	4
Filling wrong slot(s) in continuous mode	11	TX is on all the time	11
Flowchart	9	Using delays	5
ICSP	8	Wrong callsign or ID	11
Initial switch positions	3	Wrong timing mode	11
Introduction	3		

INTRODUCTION

The Keyer is a general purpose and can be used with any solid state TX or even a valve rig with a certain amount of operator support. It is completely self contained using internal rechargeable batteries. Two timing modes are provided, 2 in 10 for normal Colchester events and 1 in 5 for Multi-Tx events.

The unit can be preset for you well in advance of the event. All you have to do is replace your key with it and switch on (top left) at exactly 7:30.

BATTERIES

9 X 500 mAH NiCd

Socket is 2.1 mm

TR is the default switch position, giving a trickle charge of 30 mA for normal charging.

CHRG gives direct access to battery for peak detect charge or 60 mA with simple charger provided.

Fully charged voltage (after settling time) is 11.8V; measure in TR position for extra safety. Immediately after charging the voltage may be well over 12V.

EMRG emergency switch position allows external 12V supply to be used to power unit if battery goes flat on an event, will trickle charge internal batteries at the same time.

Normal charging with the simple charger provided

If you were given the unit in a fully charged condition and have only experimented with it for a couple of hours then probably there is no need to charge it, but if in doubt, a trickle charge for 2-5 hours will do no harm. Plug in the charger with the switch in the TR position. If the LED on the charger does not light then you can move the switch to CHRG to check the connection (the LED should definitely light in this position), then move the switch back to the TR position. The fact that the LED is off does not mean that no charging is taking place only that it is charging slowly because the battery is almost full. The Keyer must be charged separately from the Minis (voltages different) but can use the same charger.

Battery life

The unit will operate for at least 12 hours if the relay is in use. If the direct connection to the TX is used then the battery life would be several days. Note that the batteries self discharge at about 5% per week, so if you have it in your possession for some time, trickle charge it for a couple of hours every month or so.

Note that the trickle charging is always preferable; only use the CHRG position if time is limited. Never charge in this position for more than 5 hours.

BASIC USE ON A '2 IN 10' EVENT

Initial switch positions

Check the following

ON/OFF is OFF (The horizontal motion is so that in the OFF position the switch is given some protection by the red key terminal).

The charging switch EMRG/TR/CHRG is set to TR (trickle – middle safe position)

All others are down. This means all delays are off, the unit is in CYCLE mode, no side tone

and the relay is selected. Normally you won't have to touch the small yellow switches; they will have been set for you, if not see the information on page 7.

Connection to the transmitter

Attach a suitable lead between the red and black terminals on the Keyer and the Tx. The keying voltage is supplied by the TX and must be the right way round for correct operation, however, if it is wrong no damage should occur. The output may be sent direct or via a relay by using the appropriate switch (top right). Details are on page 6, if in doubt use the relay option.

Check connection

Leave the Keyer off

Switch the TX on

It should be possible to key the TX using the red MANual button on the bottom of the Keyer. Fault - if the Tx is permanently keyed you probably have the polarity of the connection wrong, try reversing it.

Tune/load the Tx

Use the red MANual button to set up TX as normal.

Check the Keyer's operation

If you don't want to transmit the Morse, move the direct/relay switch to the centre (OFF).

Switch the Keyer on.

The amber LED should come on and the orange activity LED should begin to flash in time with the Morse. If you are using the relay you should hear it clicking.

If you want to hear the Morse you can turn the TONE on. You should hear Test DF DE your call sign for 50 seconds followed by a minute of carrier, it then reverts to Morse for the last 10 secs of the two minutes. After this it falls silent for 8 minutes and then begins the cycle again. To check again just switch the unit off, wait a few seconds then turn it back on.

When you are happy with all tests return all switches to their initial conditions as above.

At the start of the event

Check all switches are back in their initial conditions.

Turn the TX on.

Check the TX connection by blipping the Red MANual button.

Have your finger poised on the Keyer's ON/OFF switch and move it left at exactly 7:30 pm.

Correcting time error

The internal clock is accurate to within a second in several hours so incorrect timing is only likely to occur if the unit is switched on at the wrong time. In this case, turn the unit off, put all switches to initial positions (no delays), and then switch on again at the start of the next transmission period.

Continuous transmission phase

On Colchester evening events continuous transmission is required from 8:50 pm. To achieve this, move the CYCLE/CONT switch to CONT after the 8:40 transmission has finished.

ADVANCED USE OF THE UNIT

Adding speech

If the TX has a modulator you can use the minute of carrier time to add speech. Watch the activity light to help you with the timing. Usually your PTT can be used in parallel with the Keyer so leave it connected in case you are distracted and forget a transmission.

Using delays

Assuming this is the only/or lead Tx, the keyer can be switched on at the start of any ten minute period up to two and a half hours before the event is due to begin. The Tx can be tuned up while the Keyer is on so no need to wait until everything is set up. When the transmitter is roughly in place keep an eye on your watch. As the time approaches a ten minute point, turn your attention to the Keyer. Set the delay switches appropriately (see below or the bottom of the Keyer for a timing table). Then switch the Keyer on exactly on the ten minute point. The Keyer will read the delay settings within the first second of operation; they have no effect after that. If you make a mistake, just turn off and repeat the process with adjusted delays at a later 10 minute point. Once set you can continue working on setting up and tuning the Tx using the MANual button. If you need to return to your car or set up other Txs leave the Tx on under the control of the Keyer then, if you are late getting back, the Keyer can make the first transmission.

Note to comply with the licence an unattended Tx should be on 1960 KHz.

Table DSP (Delay switch positions) Slot 0

Friday Time	80	40	20	10	Delay (Minutes)	Sunday Time
7:30					0	1:30
7:20				10	10	1:20
7:10			20		20	1:10
7:00			20	10	30	1:00
6:50		40			40	12:50
6:40		40		10	50	12:40
6:30		40	20		60	12:30
6:20		40	20	10	70	12:20
6:10	80				80	12:10
6:00	80			10	90	12:00
5:50	80		20		100	11:50
5:40	80		20	10	110	11:40
5:30	80	40			120	11:30
5:20	80	40		10	130	11:20
5:10	80	40	20		140	11:10
5:00	80	40	20	10	150	11:00

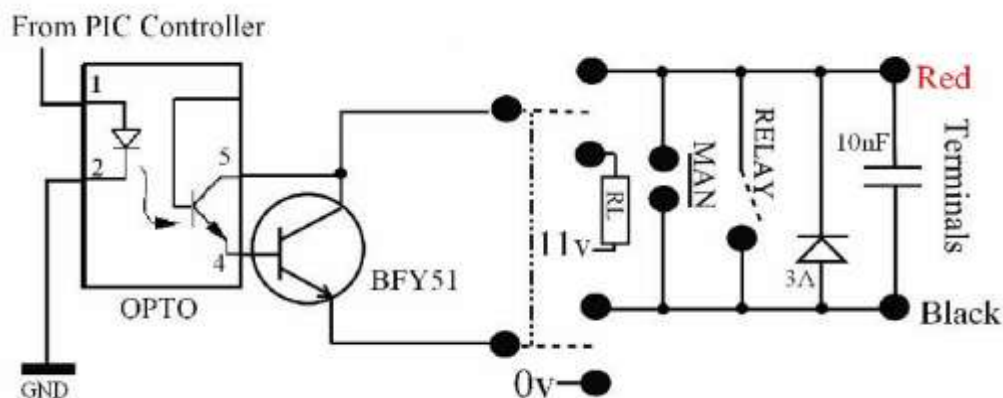
SWITCHES

Relay/Off/Direct

Relay sends the control signal through a relay for 'unknown' Tx's

Off allows Keyer function to be checked without transmitting – monitor via side tone.

Direct - connection to the electronics via an opto isolator and a 'floating' BFY51. Since all power is derived from the TX the voltage will only pull down to 0.8V. The Red terminal goes to the collector and the black to the emitter. **Off** allows you to disconnect from the TX without stopping the timer. The ganged switch may be seen at the centre of this diagram. A copy is on the end of the Keyer, the full circuit may be seen on page 10.



Note that Red terminal must be connected to the most positive wire coming from the transmitter key input. If you get this wrong the Tx will be on permanently because of the protection diode. This is true even if the relay is used.

SILENT/TONE

The unit includes a tone generator if you want to hear what it is sending - useful when checking setup before Tx goes live.

CYCLE/CONT

The position of this switch is read at the end of the normal transmit period in each cycle. CYCLE for normal pauses between transmissions..

CONT removes pauses to help competitors near the end of the competition.

In 2 in 10 mode Tx will simply repeat the 2 minute pattern without any pauses.

In 1 in 5 mode it is used in conjunction with the 80, 40, 20 and 10 switches to fill silent periods. See running a 1 in 5 Multi Tx event.

The Red MANUAL switch can be used as a key to aid Tx tuning. It may be operated with or without the electronic keyer being on. The button could be used as emergency Morse key. This switch can be seen in the diagram above.

The **CHRG /TRICKLE/EMRG** switch selects power input from socket. **TR** (centre is the **normal position** for charging and use). If the internal battery failed EMRG allows the unit to be powered from an external 8 to 15V supply. CHRG position connects directly to the battery to allow the use of special fast peak detect charger. Since this is a direct connection to the battery be very careful in this position (CHRG) as nicads supply very destructive amounts of current if shorted. If in doubt keep it in the centre TR position at all times.

80 40 20 10 (Dual Purpose Group)

i) Delays (main function)

These are read and values stored as the unit is switched on. Values are added to produce the total initial delay time in minutes. So for an hour delay push the 40 and 20 switches up. All delay switches up gives a 2 ½ hour delay before Morse cycle starts.

ii) Gap Fill (secondary function in 1 in 5 mode only)

Once the unit has started, these switches may be moved from their initial delay values to new positions. These second positions determine where gaps will be left if the CYCLE/CONT switch is moved to CONT. This allows the Maxi to fill all slots not being used by Mini TXs to help competitors near the end of the event, see table below:

TABLE SF (Slot Fill)

The Maxi Tx is always on in		first	minute	(slot 0)
If	10	is on	then gap during	second
	20			third
	40			fourth
	80			fifth
				(slot 1)
				(slot 2)
				(slot 3)
				(slot 4)

Example – if the Maxi is used for slot 0 and you have a mini operating in slot 2; as the end of the event approaches, move the 20 switch up and the CYCLE/CONT switch up to CONT. The Keyer should then operate in all slots except slot 2 so that the Mini can still be heard.

Note that the CYCLE/CONT switch is only checked once in the 5 minute cycle at the end of SLOT 0 (see the flowchart on page 9). To get the new pattern with extra transmissions from 8:50 pm move the switch up after 8:46 pm. Another example is given on the next page.

THE YELLOW SETUP SWITCHES

	FUNCTION	LEFT	RIGHT
0	CALLSIGN	G4ICP, G4TEB, G0NOX, G4JAC	M0BGE, G4HKC, G4KQE, G0DXB
1	CALLSIGN	G4ICP, G4HKC, G0DXB, G4JAC	M0BGE, G4TEB, G4KQE, G0NOX
2	CALLSIGN	G4ICP, G4HKC, G4TEB, G4KQE	M0BGE, G0NOX, G0DXB, G4JAC
3	1 IN 5 ID	B	Q
4	TIMING	I IN 5	2 IN 10

Notes

These switches are read at start up. If one needs to be changed the power must be cycled. They are delicate, so please use care. If any is pushed off its track the unit will default to the left hand value.

The unit only sends a single letter ID when the 1 in 5 mode is selected.

Connections

Key Terminals - see page 4 for procedures and page 6 for circuit; polarity is important. Red terminal must connect to positive side of key lead (the voltage will come from the Tx).

ICSP - Used for programming and connecting extension units. Incorrect use will damage the unit.

2.1 mm Power Socket - Used for trickle charging (30 mA) the batteries (9 x 500 mA); checking battery voltage (11.8v after settling); emergency power supply and direct access to battery for fast charging. See switch descriptions for more detail.

SETTING UP A SINGLE MAXI, MULTI-TX EVENT

Sample schedule (SO means switched off)

7:30 to 9:25	Maxi B Slot 0	1963 KHz (or other available on Tx)
7:31 until SO	Mini I Slot 1	1960 KHz
7:32 until SO	Mini J Slot 2	1960 KHz
7:33 until SO	Mini K Slot 3	1960 KHz
Slot fill 8:54 to 9:30	Maxi B Slot 4	1963 KHz (Fill in at end of event)
Continuous to SO	Micro Z	1843 KHz

Note – slots 1,2,3 are chosen for Minis so that the Maxi is on in the first and last slots of the whole event.

Sample Procedure

If you have not used the Keyer before read about simple use on a basic 2 in 10 event first, many of the procedures are the same.

Setup yellow switches for your call sign, simple ID = B and 1 in 5 timing mode (See previous page)

Set up Maxi aerial.

Set up Micro Z, within 200 m of Maxi or any Mini, and switch it on. Check it can be heard.

Start Maxi and all Minis (this could be done back at the car) - Check time, use [Table DSP](#) (Page 5) to establish required delay. Suppose it is 5:43 PM, next available switch on time is 5:50 pm. The Table DSP says the 80 and 20 delays should be on. Set all Minis and the Maxi Keyer to have this same delay. At 5:50 switch on Maxi B, at 5:51 switch on Mini I, at 5:52 switch on Mini J and at 5:53 switch on Mini K.

Now set up each Mini using the carrier button for aerial tuning (obviously do not turn the unit off or you will have to reset the delays).

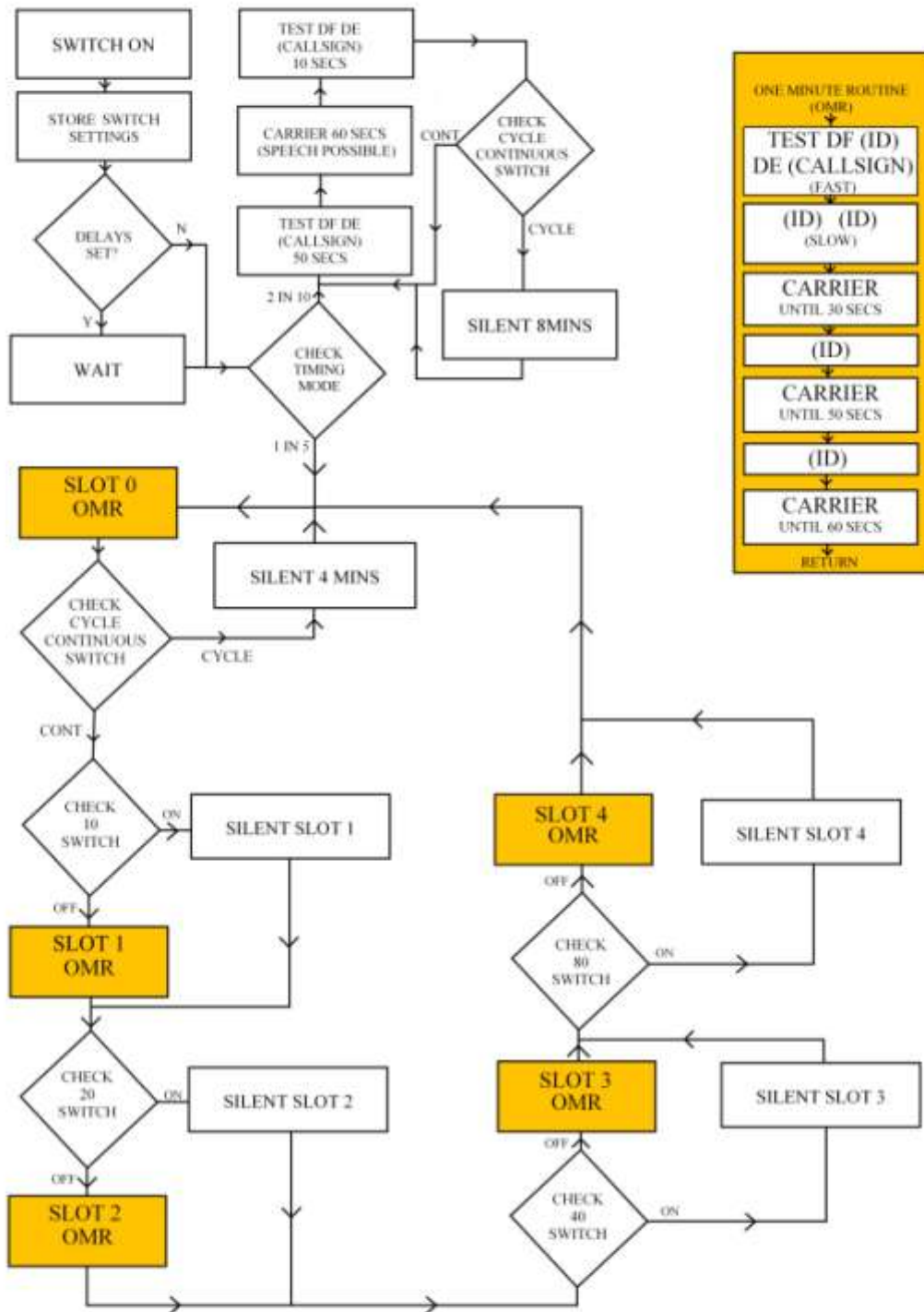
Set up the Tx using the MANual button on the Keyer. As with the Minis keep the Keyer power on to maintain the clock. When ready move the DIRECT/OFF/RELAY switch to the appropriate position so that the Keyer has control of the TX. Turn your receiver on so that you can monitor the first cycle of transmissions then sit back and relax!

Slot fill phase (8:50 on in sample schedule above) After 8:46 and before 8:50 put switches 40,20,10 up, this will maintain silence for the Minis in slots 1,2 and 3. Move CONT/CYCLE to CONT. With 80 left down Slot 4 (in addition to Slot 0) will be filled. See Table SF on previous page for more detail.

Any problems check the faults list on page 11.

FLOWCHART

Note the MANual red button can be used to key the Tx at any time.



PROBLEMS AND FAULTS

Timing problem

If you need to correct the time that the Maxi Keyer or a Mini is running at:

Turn the relevant unit off.

Turn off any delays

Switch on again at the start of the next required transmission period either by using your watch or by monitoring the other TXs to avoid doubling.

Once started reset any slot fills if required (1 in 5 only)

Keyer won't start

Check that there are no delays set. Switch off, wait for correct slot time and switch on again.

If an emergency use the red MANual button to send Morse.

TX is on all the time

Check the polarity of the connection between the TX and the Keyer.

Check for shorts on this lead.

Keyer battery failure

This is only likely to occur if you have accidentally left the Keyer switched on for many hours. If it does happen the Keyer can be powered by another 12V battery (a separate battery from the Tx is preferable but even this could be used in an emergency – if it is, keep a check on timing which could drift as a result of RF getting in to the clock). Connect the power lead provided to the emergency battery and move the CHR/GR/TR/EMRG switch to EMRG.

Wrong timing mode

Check yellow switch 4's position. The unit defaults to 1 in 5, so if the error is that the Keyer is producing 1 in 5 timing when it should be 2 in 10, turn off. Gently move the bottom yellow switch left and right using a pointed object. (The yellow switches are very delicate and can easily be pushed off the end of their track, so care is needed.) Turn Keyer on again at beginning of the next time period. If the switch is broken the unit will default to 1 in 5 timing.

Wrong callsign or ID

As for paragraph above, check yellow switch settings (page 7).

Filling wrong slot(s) in continuous mode

Check the 80, 40, 20, 10 settings. See Table SF on page 7.

Points of confusion could be:

- i) Slots 0-4 correspond to minutes 1-5 because they are named from their start not their end.
e.g. in the 8:50 cycle slot 0 runs from 8:50:00 – 8:50:59 (first minute of five)
slot 2 runs from 8:52:00 to 8:52:59 (third minute of five)
- ii) 10 controls slot 1 fill (second minute), 20 slot 2 BUT 40 controls slot 3 and 80 slot 4.

DO NOT switch the Keyer off to correct slot fills just move any incorrect switches to the correct position. The next 5 minute cycle should be OK.

If you can't get things right move the CYCLE/CONT switch back to CYCLE (down) so that only SLOT 0 is filled during the next sequence.