Microair Avionics

T2000SFL TRANSPONDER USER MANUAL

About This Document

Microair Avionics has developed a series of transponders for use with OEM applications, and for commercial sale by Microair Avionics. The manual explains the basic functions and elaborates on the more sophisticated features, such as altitude display and alerts.

Microair reserves the right to amend this manual as required, to reflect any enhancements or upgrades to the T2000SFL transponder series.

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Statement:
The T2000SFL owner accepts all responsibility for obtaining the proper licensing before using the transponder. The coverage you can expect from the T2000SFL is limited to "line of sight". Low altitude or aircraft antenna shielding by the aircraft itself may result in a reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

The T2000SFL should be turned off before starting or shutting down aircraft engine(s).
Mobile phones must not be turned on during the operation of the T2000SFL.


T2000SFL-01 (8)
1-6-9 software

REVISION STATUS

Revision	Date	Change
1.0	11/02/01	Initial Draft
2.2	11/07/01	Voltage Monitoring
2.3	22/08/01	Standby function added
2.4	05/10/01	Hi / Lo alerts added
2.5	12/10/01	Mode and Program Mode menu functions amended
2.6	07/11/01	Deleted SF references
2.7	01/06/02	Assigned Alt & Buffer Alt input amended, Name/Reg relocated to end of Program Mode
2.8	22/11/03	ID and VFR key instructions amended
2.9	08/04/05	Amended for function changes incorporated into software revision 1.6.4
01R3	11/05/06	Amended for 1.6.5 software
01R4	27/05/06	Hardware and software revision references amended Mobile phone to be turned off references
01R5	22/11/06	Display graphics updated
01R6	10/05/07	VFR and ID key descriptions amended
01R7	12/05/08	Warranty Statement Upgrade
01R7-1	19/07/08	Alarm acknowledgement added
01R7-2	25/02/09	Updated Limited Warranty Statement
01R8-0	19/08/09	T2000SFL Rev.8 introduced. Serial Alt data & VSI function added – voltage functions deleted
01R8-1	30/08/10	Firmware 1-6-9 introduced
01R8-2	18-09-12	Default setting for ENC SRC is now SERIAL

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1.0   INTRODUCTION

The Microair T2000SFL Transponder is designed to operate in the environment of a Radar Beacon System. This system interrogates the transponder, which in turn *replies* with an identity code and altitude information. The radar system consists of a network of ground stations, which sweep the horizon like a conventional radar. When the transponder in the aircraft detects the radar sweep (is *illuminated*), the transponder *replies* with a burst transmission giving its identity code and altitude.
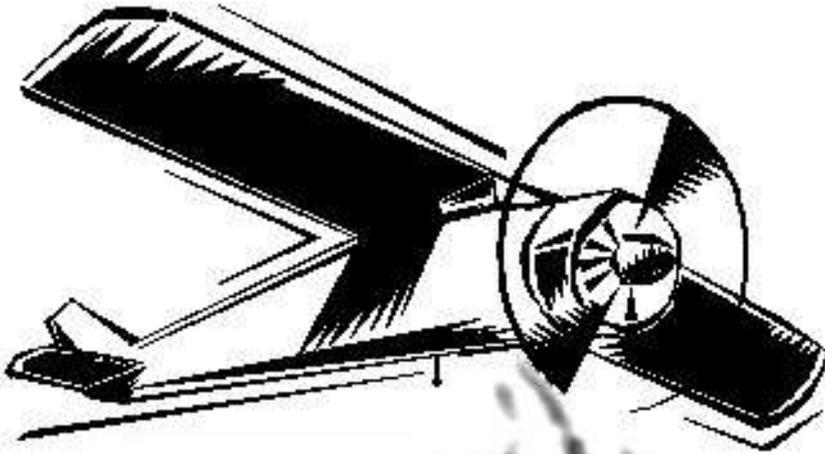
The aircraft's transponder receives the ground station signal asking it to transmit. The transponder "replies" with the code, and if operating in mode C, the encoder altitude.

Ground stations sweep the sky with a signal, which asks the transponder in the aircraft to transmit its code and altitude.

The system presents the *replies* from all transponders in range of the ground stations on a single display screen. This allows ATC to easily locate, identify, and see the altitude of all traffic in their airspace.

A transponder's *reply* is termed a *squawk*. Hence the current code being used by the transponder is termed the *squawk code*. At times of high airspace activity, ATC may wish to uniquely identify an individual aircraft with a request to *squawk ident*. The pilot uses the *ident* control on the transponder to make the transponder's *squawk* on the ATC display flash for a short period. The *ident* control should not be used unless ATC request it.

ATC will issue a code to an aircraft requesting entry into its controlled airspace. This code is normally unique for each aircraft, each time that aircraft passes through the airspace. The code is 4 digits long, and each digit can range from 0-7.

1.1 T2000SFL CONTROLS

All of the T2000SFL's functions and features can be accessed from the controls on the front face.

CONTROL	DESCRIPTION
1	ON Key
2	MODE Key
3	ENTER Key
4	IDENT Key
5	TOGGLE Key
6	CODE SELECT Knob
7	SELECTMODE Knob
8	VFR Key

All of the keys are covered in a soft rubberized plastic, which is backlight with the display. When the key is pressed a small click can be discerned. The selected function will operate on the release of the key.

1.2 TURNING ON

The T2000SFL is turned on by pressing the **ON** key. The **T2000SFL** will go through a start up routine displaying self test messages, including the display of the transponder's *serial number*, a backlight test, and ending with the operational display.
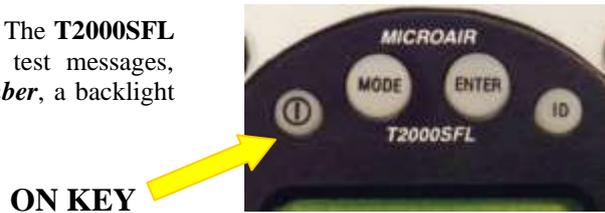
ON KEY

1.3 TURNING OFF

To turn off, press the ON key again, and the unit will immediately turn off.

1.4   DISPLAY LAYOUT

The Microair **T2000SFL** is a 57mm diameter face version to fit the standard 2 ¼ inch instrument hole.

The mounting is by 4 x M4 machine screws, located through the panel and screwed into threaded holes in each corner of the transponder's front face.

Clean only with a dry cloth, and do not allow the display face to become wet.

The mode of operation is set using the SELECT MODE knob located at the lower left, and the standby code (displayed on the lower line of the display) can be edited with the CODE SELECT knob, located at the lower right.

T2000SFL Front Face

1.5   Special Codes

There are several special codes, which are used to identify General Aviation aircraft, and some special situations which aircraft could encounter. ***Misuse of these codes may result in legal charges against the user.***

IMPORTANT NOTE
ALWAYS check the standby code, BEFORE transferring it to the ACTIVE position.

0000	General Purpose code subject to regional agreement
1200	Civil VFR Flights OCTA not participating in Radar Information Service (RIS). General Aviation Code (US and other countries)
2000	Civil IFR Fights OCTA not participating in RIS
3000	Civil Flights in Controlled airspace
7000	VFR General Aviation Code (Europe)
7500	Unlawful Interference Code
7600	Radio Communications Failure
7700	Emergency Code
7777	Military Intercept Code (NEVER USE)

Code 2100 is a test code that can be used by qualified personal to test the transponder to ATC.

The user should check the Civil Aviation Rules/Regulations to determine the VFR General Aviation transponder code for their country.

2.0   DISPLAY FUNCTION

The **T2000SFL** is a dual line display of 8 characters each, with the active code on the top line, and the standby code on the bottom. With the **SELECTMODE** knob set to either the **ON** or **ALT** positions, the active code is displayed on the top line, and the standby code is displayed on the bottom line.

In the top left corner the operational mode character (**X**, **A**, or **C** character) is displayed. At the top right is the Mode A/C annunciator (**R** character) which also flashes with every transponder reply transmitted. If the **ID** key is pressed to activate the ident function, the **R** character is replaced with an **I** character while the ident function is operating.
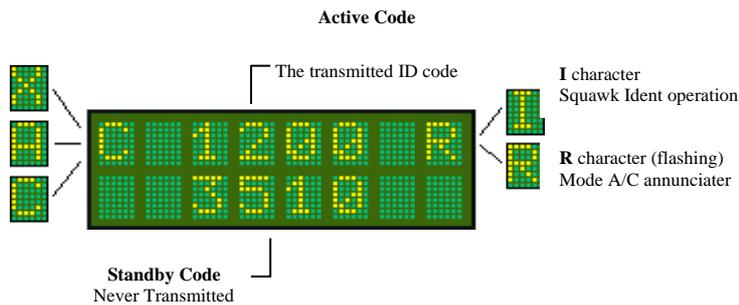

X - STANDBY
Neither code or altitude are sent

A - MODE 3A
Transmit ON – Only ID code sent

C - MODE C
Transmit ON – ID Code and altitude sent

Active Code

The transmitted ID code

I character
Squawk Ident operation

R character (flashing)
Mode A/C annunciater

Standby Code
Never Transmitted

With the **SELECT MODE** knob in the **ALT DISPLAY** position, the active code is displayed on the top line, and the encoder altitude is displayed on the bottom line. If the latitude units are set to feet the altitude is followed by the **F** character. If the altitude units are in metres, the altitude is followed by the M character. If no **QNH** or **BARO** value has been entered (default 1013mB or 29.92HG), the raw encoder output is displayed as "pressure altitude", and the characters **PA** appear at the lower left. If a **QNH / BARO** value has been set, the **Q** character appears at the lower left.
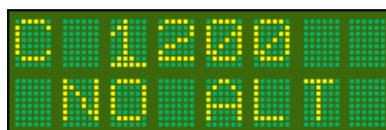

PA Pressure Altitude as sent
from the altitude encoder.

Q Altitude is adjusted for
QNH or barometric pressure
from the mode menu

F Feet
Altitude units are in Feet

Displayed Altitude

Altitude generated by Encoder, and may be
adjusted for barometric pressure (QNH)
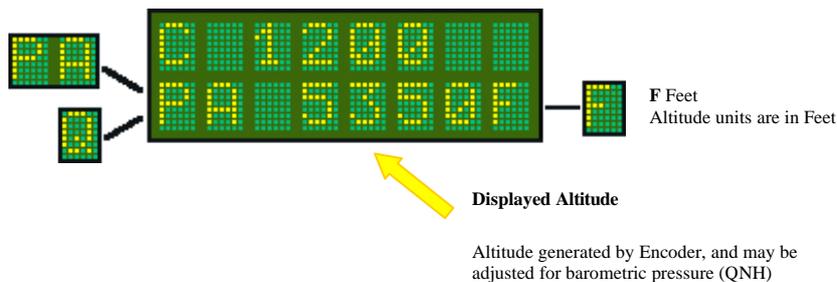
The altitude value is rounded to the nearest 10 foot increment. Be aware that where the altitude data input is received in increments of 100ft the rounding can only be in 100ft steps also.

If the Encoder is not powered or not fitted, the message **NO ALT** will appear on the display.

The **T2000SFL** will transmit the encoder altitude (pressure altitude) only, in accordance with normal mode C operation. The adjusted **QNH / Baro** altitude is *never* transmitted.

3.0   CONTROL FUNCTIONS

This section describes the transponder control keys and their functions. Many of the control keys have more than one function, and some keys access multi-option menus, which can be scrolled.

3.1   SELECT MODE KNOB

The **SELECT MODE** knob allows the user to switch the transponder between the 4 operating modes.

Select Mode Knob

STANDBY	In standby the transponder is powered up, but will not transmit. *On the active display line the letter X appears on the left hand side.*
ON	Will reply to Mode **A** interrogations. Mode **C** blind encoder is normally powered up in this mode, but can be powered down if encoder power option is set **OFF** (refer **E/C POW** in Initialisation and Setup section). *On the active display line the letter A appears on the left hand side.*
ALT	Will reply to Mode **A** and **C** interrogations, with the mode **C** encoder information. In the absence of a valid encoder input, only the **C** framing pulse will be sent. *On the active display line the letter C appears on the left hand side.*
ALT DISPLAY	The standby code is replaced with the encoder altitude. If the pressure has been set via the **QNH / Baro** option of **MODE MENU**, the displayed altitude will be adjusted for barometric air pressure. Altitude will be displayed in units set in **ALTITUDE** option of **MODE MENU**. The **DISPLAY ALT** only displays altitude if a valid encoder input is being received. When climbing above the transition level/layer, the user must reset the transponder at the same time as the aircraft's altimeter to 1013mb or 29.92HG. If altitude is replaced on the bottom line of the display with **VSI** data if selected in the **DSP ALT** option of the **MODE MENU**. *On the active display line the letter C appears on the left hand side.*
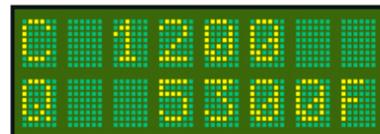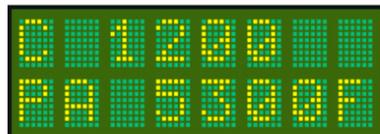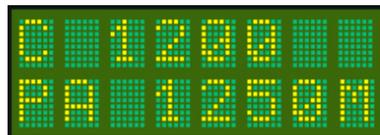
*Encoder altitude for "pressure altitude"
(1013mB or 29.92HG)*

*Adjusted encoder altitude for local
QNH or BARO setting*

3.2   CODE SELECT KNOB

The **CODE SELECT** knob can be rotated clockwise to scroll upwards, and counter-clockwise to scroll downwards. Each digit of the code is adjusted separately. The adjust function starts with the left hand digit, and is moved across to the next digit by pushing the **CODE SELECT** knob inwards. After 10 seconds of inactivity the cursor will revert to the left hand digit.

When operating in the Display Alt mode with altitude displayed, the actual Gillham 4 digit altitude code can be displayed by pressing and holding the code select knob in.
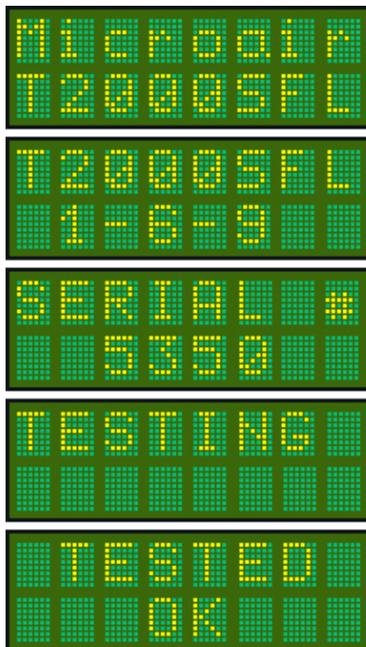

Code Select Knob

3.3   ON KEY

The T2000SFL is turned on by pressing the **ON** key.

The T2000SFL then performs a self test before moving on to the operational screen, in whatever mode the select mode knob is set to.

This test sequence includes the display of the serial number and the firmware version.

On Key

3.4   MODE KEY

The **MODE** key can be used to access two separate menus:

Mode Key

- If the transponder is turned on, by holding down the **MODE** key, and pressing the **ON** key, the **T2000SFL** will start in **PROGRAM MODE**. The **MODE** key must be held down, until the start-up self-test messages have been displayed.

- If the transponder is **ON** and in normal operation, press the **MODE** key to access the **MODE MENU**. The first item of the **MODE MENU** is displayed. Step through the **MODE MENU** by pressing the **MODE** key. After the last menu item the **T2000SFL** returns to the operational display currently in use.

  The **MODE MENU** is designed to allow the operator fast easy access to functions and parameters, which may need to be adjusted in flight.
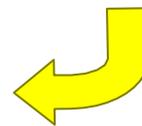
MODE MENU	QNH or BARO
	Assigned
	Buffer
	Dsp Alt
	Backlits
	Alert Tone

USE   MODE   KEY   TO   STEP
THROUGH MENU OPTIONS

OR

USE THE *Toggle* KEY TO RETURN
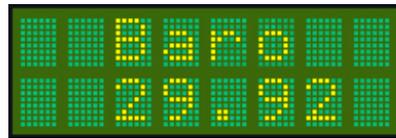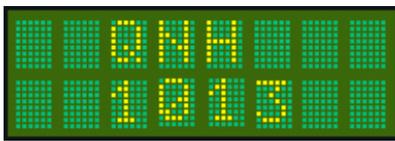TO THE OPERATIONAL DISPLAY

3.4.1   QNH OR BARO (BAROMETRIC PRESSURE)

The altitude encoder outputs a pressure altitude fixed at an *above mean sea level* (**AMSL**) pressure of **1013**mb or **29.92**Hg. The aircraft's altimeter however is normally adjusted for actual surface pressure before take off. This means the encoder altitude may not be the same as the altimeter reading.

The **QNH / Baro** can be entered here to allow the **T2000SFL** to compensate the displayed altitude for surface pressure, and hence read the same as the aircraft's altimeter. The default **QNH** is **1013**mb or **Baro** is **29.92**HG. If the **QNH / Baro** is set to **1013**mb or **29.92**HG, the altitude displayed will default to the unadjusted pressure altitude direct from the encoder. If the **QNH / Baro** is set to a discrete value (normally provided by ATC), the encoder pressure altitude displayed will be adjusted for that **QNH / Baro** value.

The barometric units are set in the **BARO** option of the **PROGRAM MODE**. When **MB** is selected the **QNH** screen is displayed, and when **HG** is selected the **Baro** screen is displayed.

Press **MODE** key (once)	To select **QNH / Baro** option
Rotate **CODE SELECT** knob	Scroll lower line to desired pressure.
Press **ENTER** key	To set default value. The default is **1013**(mb) or **29.92**(HG
Press **toggle** key	Display returns to current operational display

IMPORTANT NOTE
The T2000SFL will only transmit the encoder pressure altitude. The adjusted QNH / Baro altitude is NEVER transmitted, even when it is selected for display.

Example:

ATC provide a pressure of 1018mB, to an aircraft flying at 5000 feet. The difference from pressure altitude (1013mB) is +5mB, which converts to 137 feet.

The T2000SFL will adjust the displayed altitude by +137 feet, and then round the value to the nearest 10Ft increment.


The Q character indicates that the altitude value has been adjusted for local pressure.

3.4.2   ASSIGNED (ALTITUDE)

The user can input an assigned altitude given by ATC. When used with the altitude buffer value, an audio alert and display indicator advises when the aircraft has climbed or descended, from the assigned altitude.
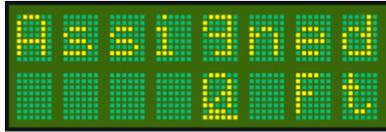
When the **Altitude** option of the mode menu is set to Feet, the **Assigned** altitude is adjusted in feet.
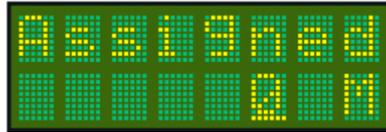
When the **Altitude** option of the mode menu is set to Meters, the **Assigned** altitude is adjusted in Meters.

Press **MODE** key (2 times)	To select **Assigned** option
Press **CODE SELECT** knob	Increment displayed value in units of 500 feet / 100m
Rotate **CODE SELECT** knob	Increment displayed value in units of 100 feet / 10m
Press **ENTER** key	To set default value. The default is **0**.
Press **toggle** key	To save and display returns to current operational display

When entering an altitude…
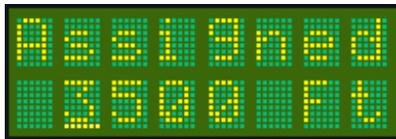
Press the **CODE SELECT** knob to increase the height value in units of 500FT / 100M.
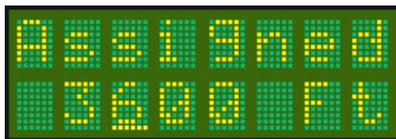
Rotate the **CODE SELECT** knob to increase or decrease the height value in units of 100FT / 10M.

Press the **ENTER** key to return the **ASSIGNED ALTITUDE** to the default value of 0,   **or**
Press the *Toggle* key to save the height value, and return to the operational display.

If **Assigned** is set to **0**, the altitude alert function is disabled. The assigned altitude function is only active when the **SELECTMODE** knob is set to **DISP ALT**.

3.4.3   BUFFER ALT

The user can input a buffer altitude, above and below the assigned altitude, to define a height band in which to fly. When the aircraft exceeds the upper or lower limit, an indicator alert message will be displayed. The alert message advises the pilot of how far, above or below the assigned altitude the aircraft is. If the **Alert Tone** function is **ON**, an audio tone is heard as well.
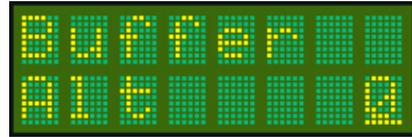
If the **ALTITUDE** option in the **PROGRAM MODE** is set to **FEET** the **Buffer Alt** increments are in feet. If **ALTITUDE** is set to **METRES**, the **Buffer Alt** increments are in meters.

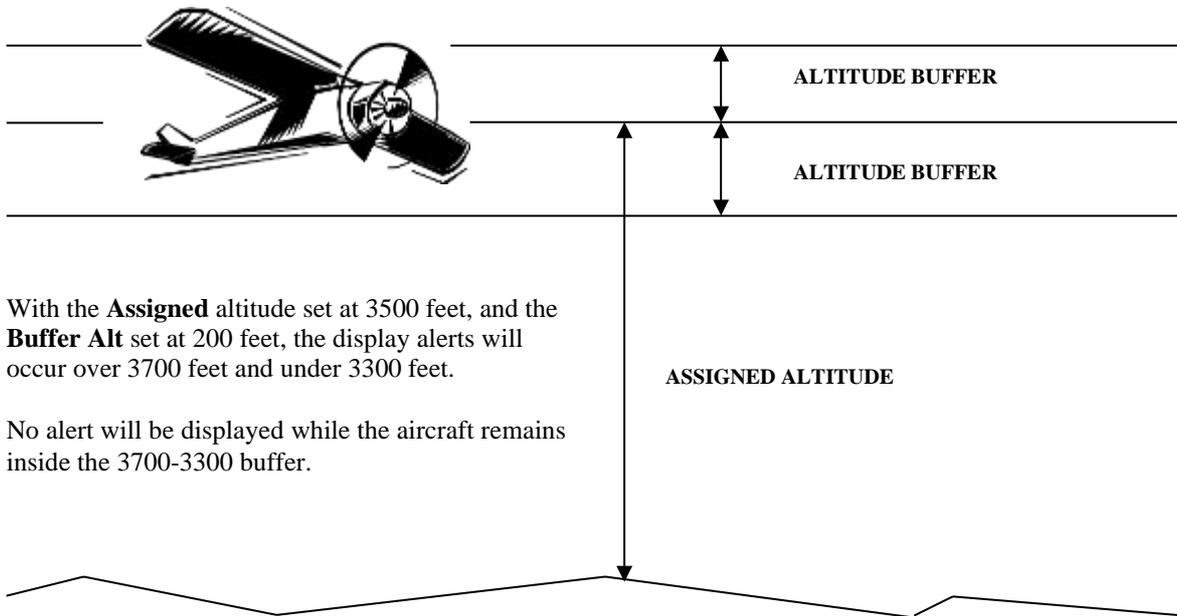|	
Press **MODE** key (3 times)	To select **Buffer Alt** option
Press **CODE SELECT** knob	Increment displayed value in units of 500 feet / 100m
Rotate **CODE SELECT** knob	Increment displayed value in units of 100 feet / 10m
Press **ENTER** key	Display returns to current operational display (No default value)
Press **Toggle** key	Display returns to current operational display

With the **Assigned** altitude set at 3500 feet, and the **Buffer Alt** set at 200 feet, the display alerts will occur over 3700 feet and under 3300 feet.

No alert will be displayed while the aircraft remains inside the 3700-3300 buffer.

If the aircraft climbs or descends outside the altitude buffer limits, a **Hi / Lo** warning is displayed on the lower line.

T2000SFL advises the pilot that the aircraft is 500 feet above the **Assigned** altitude. If the **Alert Tone** function is set on, an audio warning tone is heard.
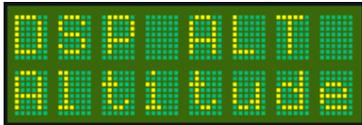

T2000SFL advises the pilot that the aircraft is 500 feet below the **Assigned** altitude. If the **Alert Tone** function is set on, an audio warning tone is heard.

3.4.4   DSP ALT

This **MODE** menu option allows the user to select from the following data sources to display on the bottom line when the **SELECTMODE** knob is in the **DSP ALT** position:

Displays altitude data sourced from the altitude encoder.
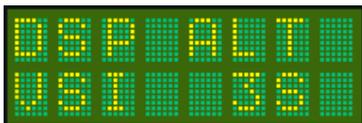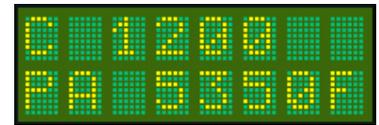
Displays the VSI data derived from the altitude encoder data, with a 3 second average.

Displays the VSI data derived from the altitude encoder data, with a 20 second average.

Press **MODE** key (4 times)	To select **Dsp Alt** option. The current setting is displayed.
Rotate **CODE SELECT** knob	To select from **Altitude / VSI 3S / VSI 20S**
Rotate **ENTER** key	To save Dsp Alt data option
Press **Toggle** key	Display returns to current operational display

The altitude and VSI data units (feet or meters) are determined by the **ALTITUDE** option in the **PROGRAM MODE** menu (refer section 4.1.3).

IMPORTANT NOTE
The VSI function is only available with the Microair EC2002 altitude encoder, set to Microair 1ft format. Any other altitude data resolution is not sufficiently sensitive for good VSI operation. If the serial altitude data is not Microair 1ft format, the VSI function is NOT displayed.

3.4.5   BACKLITS

The T2000SFL display is backlit by a series of LEDS. The level of backlight can be selected from three options:

Backlighting is **OFF**
When the T2000SFL is turned on the backlighting
will default to OFF.
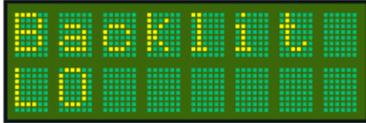
Backlighting is **LO**
When the T2000SFL is turned on the backlighting
will default to the LO or 50% level.
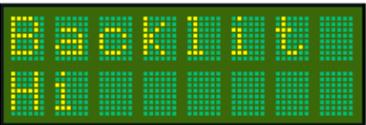
Backlighting is **HI**
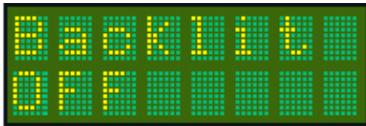When the T2000SFL is turned on the backlighting will
default to the HI or 100% level.

Press **MODE** key (5 times)	To select **Backlits** option. The current setting is displayed.
Rotate **CODE SELECT** knob	To select from **OFF / LO / HI**
Rotate **ENTER** key	To save backlist level
Press **Toggle** key	Display returns to current operational display

The BACKLITS setting is saved to memory. When the transponder is next turned on, the backlighting level will be recalled from memory.

3.4.6   ALERT TONE

The **Alert Tone** function is used by the **T2000SFL**'s altitude alert function. When set **ON**, the **Alert** can be heard through the headphones, when connected to the headphone circuit.

Press **MODE** key (6 times)	To select **Alert Tone** option
Rotate **CODE SELECT** knob	Scroll lower line to select **ON** or **OFF**. The default is **ON**
Press **ENTER** key	No operation. No default value.
Press **Toggle** key	Display returns to current operational display
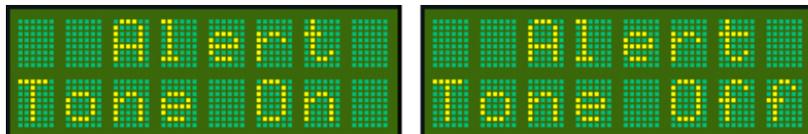
IMPORTANT NOTE
Pressing the MODE key again returns the display to the operational screen.
The user can press the toggle key at any point in the MODE menu to return to the operational screen.

3.5 ENTER KEY

The **ENTER** key is a confirmation key used to confirm information the user has inputted. After pressing the **ENTER** key, the display will typically give the message **SAVED**, for a short period.

The **ENTER** key is also used to quick-set a parameter to a default value.

Enter Key

3.6 TOGGLE KEY

This key acts as a **toggle** switch, exchanging the active and standby codes.

Toggle Key

When the transponder is operating in **DISPLAY ALT** the bottom line displays the encoder altitude instead of the standby code. The standby code is stored in memory. To toggle the active and standby codes in this mode, push the **toggle** key once to display the standby code on the bottom line. The standby code is displayed for 10 seconds. Push the **toggle** key again to exchange the active and standby codes. Once the codes have been exchanged, the display will revert back after 10 seconds, to displaying the altitude on the bottom line.

In all modes of operation, only the active code is transmitted.

The **toggle** key is also used to return to the operational screen from the **MODE** and **PROGRAM MODE** menus.

3.7 VFR – HOT KEY

The **VFR** key will default the standby code immediately to the stored **VFR** code. Typically this code will be **1200** for a General Aviation aircraft. The **VFR** key calls the value set in the **VFR** option of the **PROGRAM MODE** menu.

To transfer the **VFR** code to the active position, press the **toggle** key. If no code is entered, after 10 seconds idle the standby position will revert back to the original **VFR** code.

VFR Key

To make the **VFR** code the *active* code, press the toggle key to bring **VFR** to the top line

Press **VFR** key to bring the stored **VFR** code to the *standby* line. In this case **VFR** = 1200

3.8 ID KEY

The **ID** key (Ident) when pressed, adds additional code information to the transmission for **ATC**. The code will flash on the **ATC** display as a means of uniquely identifying the aircraft's code from any other. The **T2000SFL** has the option of a remote **ID** switch (pin 16).

The external switch should be a momentary-ON type. The switch or ID key only need to be pressed briefly to activate the *Ident* function.

Ident Key
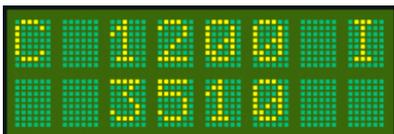
I character replaces the **R**, while the **IDENT** function is in operation
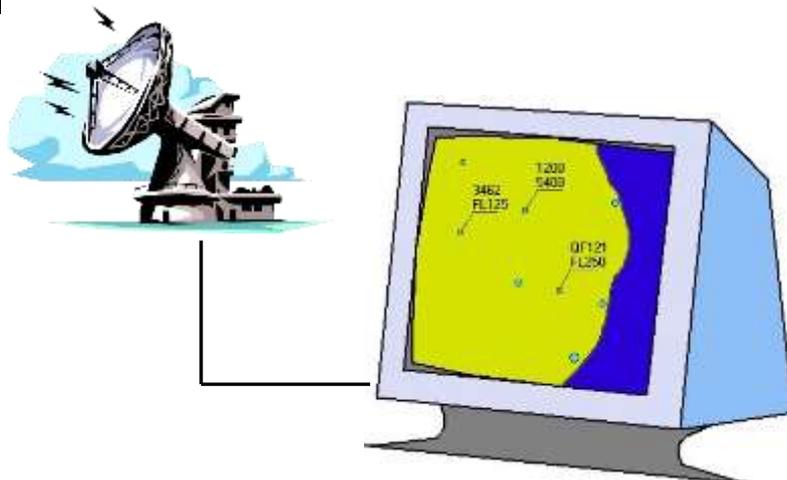
4.0　INITIALISATION AND SETUP

The **T2000SFL** will operate as a conventional transponder when first installed and powered up. You will be able to turn the transponder **ON/OFF**, adjust the standby code, and transfer the standby and active codes.

The **T2000SFL** has many other features, which can be programmed. Microair recommends that the full setup procedure be carried out prior to first flight. This section provides detailed procedures on the various parameters and functions that can be setup from the front panel.

The following procedures provide step by step instructions to program the transponder options.

PROGRAM MODE	VFR CODE
	ENC SRCE
	ALTITUDE
	BARO
	REM STBY
	EXIT PROGRAM

4.1　PROGRAM MODE

To start the **T2000SFL** in **PROGRAM MODE**, hold down the **MODE** key, and then press the **ON** key. Keep the **MODE** key held down until the start up self test messsages have been displayed.

Each item can be adjusted to the desired value or option by scrolling the **CODE ADJUST** knob. The selected value or option can be saved by pressing the **ENTER** key. **PROGRAM MODE** then moves to the next menu item.

4.1.1   VFR CODE

This item sets the default **VFR** code which can be hot key accessed from the **V** (VFR) key. For most countries the default general aviation code is **1200**. We recommend that this code be used.
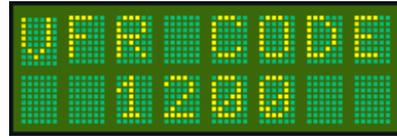
Press **MODE** key	Until **VFR CODE** message appears
Rotate **CODE SELECT** knob	Scroll to adjust first digit of voltage
Press **CODE SELECT** knob	Moves the digit to the right
Press **ENTER** key	The message **SAVED** appears briefly on the display
	The display moves to **BARO** menu item

The default VFR code can vary depending on the type of aircraft (eg GA, glider, balloon) and where in the world the aircraft is operating (US VFR code = 1200, Europe GA VFR code = 7000).

0000	General Purpose code subject to regional agreement
1200	Civil VFR Flights OCTA not participating in Radar Information Service (RIS). General Aviation Code (US and other countries)
2000	Civil IFR Fights OCTA not participating in RIS
3000	Civil Flights in Controlled airspace
7000	VFR General Aviation Code (Europe)
7500	Unlawful Interference Code
7600	Radio Communications Failure
7700	Emergency Code
7777	Military Intercept Code (NEVER USE)

IMPORTANT NOTE
Microair does NOT recommend that the emergency codes 7500, 7600, or 7700 be used as the VFR default code. These codes should only be used in specific circumstances.

4.1.2   ENC SRCE

The T2000SFL can accept altitude data from the 10 line Gillham input or the RS232 serial input. The user can select from Gillham or serial as the encoder source.

Press **MODE** key	Until **ENC SRCE** message appears
Rotate **CODE SELECT** knob	Set **ENC SRCE** Gillham/Serial. The default is **SERIAL**.
Press **ENTER** key	The message **SAVED** appears briefly on the display
	The display moves to **Altitude** menu item

Where serial is selected the T2000SFL will self detect at start up the data speed, data format, and altitude resolution from the following commonly used altitude data protocols:

Format	Baud Rate	Message Formatting	Example Message (5200 feet above MSL)
Garmin AT	1200bps	#AL, space, +/- sign, five altitude digits, T+25, checksum, carriage return	#AL +05200T+25D8[CR]
Magellan	1200bps	$MGL, +/- sign, five altitude digits, T+25, checksum, carriage return	$MGL+05200T+250C[CR]
Northstar, Garmin	4800bps	ALT, space, five altitude digits, carriage return	ALT 05200[CR]
Trimble, Garmin	9600bps	ALT, space, five altitude digits, carriage return	ALT 05200[CR]
Microair	9600bps	STX, a=, - (if negative), five altitude digits, ETX, checksum	[STX]a=05200[ETX]9A

Where the ENC SRCE is set to GILLHAM, the T2000SFL will convert and output the altitude data as SERIAL data at a rate of once a second in the Garmin AT format in 100ft increments.

Serial
Altitude Data

Gillham
Altitude Data

4.1.3   ALTITUDE (UNITS)

The altitude data can be displayed as feet, flight level, or meters. Once the **Altitude** units are set, all altitude data is displayed in these units.

The options are: **F   = FEET**   e.g. **15000F**
                      M   = METERS   e.g. **5000 M**

Press **MODE** key (4 times)	To select **Altitude** option
Rotate **CODE SELECT** knob	Scroll to select desired units. Options are Feet or Meters.
Press **ENTER** key	No operation. (No default value)
Press **Toggle** key	The display moves to **BARO** menu item

In both examples below the **PA** characters displayed at the lower left indicate "*pressure altitude*", where the **QNH / BARO** value has been left at the default value (1013mB or 29.92HG) in the **MODE** menu.

       5300 FEET. Units in feet are indicated by the **F** character at the right hand end of the lower display line. All altitude data will be displayed in feet.

       1250 METERS. Units in meters are indicated by the **M** character at the right hand end of the lower display line. All altitude data will be displayed in meters.

4.1.4   BARO

This item sets the barometric pressure units used by the **T2000SFL**. The user can select from **MB** = millibars, or **HG** = inches Mercury. We recommend that the user selects the same units as those used in the sub-scale of the aircraft's altimeter.

Press **MODE** key	Until **BARO** message appears
Rotate **CODE SELECT** knob	Set **BARO** = MB/HG The default is **MB**
Press **ENTER** key	The message **SAVED** appears briefly on the display
	The display moves to **Rem Stby** menu item

       IMPORTANT NOTE
Where the altitude units have been set to meters, the BARO setting is fixed to milli-bars (MB) only.

4.1.5   REM STBY

For aircraft using the remote standby line (pin 15), the operation of the switch can be changed by the **T2000SFL** software. The remote switch holds the **T2000SFL** in standby (**S**) regardless of what position the **SELECTMODE** knob is in.

If the remote switch releases the **T2000SFL** from standby by closing, the operation is **NORM** (normal).

If the remote switch releases the **T2000SFL** from standby by opening, the operation is **REV** (reverse).

Press **MODE** key	Until **Rem Stby** message appears
Rotate **CODE SELECT** knob	Set **Rem Stby = Norm/Rev** The default is **Norm**
Press **ENTER** key	The message **SAVED** appears briefly on the display
	The display moves to **EXIT PROGRAM** menu item

IMPORTANT NOTE
If a remote switch is fitted, and it becomes faulty, the operation of the switch can be changed with this feature. If the T2000SFL will not change from standby, go to PROGRAM MODE and change the Rem Stdby. This may release the T2000SFL.

4.1.6   EXIT PROGRAM

This is the end of the **PROGRAM MODE** menu. The user can exit by pressing the **MODE** key. The T2000SFL will restart in the operational mode.

The user can exit the **PROGRAM MODE** menu at any time, from any menu item, by pressing the **toggle** key.

To re-enter the **PROGRAM MODE** menu the **T2000SFL** must be turned off, and re-started using the **ON** and **MODE** keys (refer **PROGRAM MODE** section).

5.0　FREQUENTLY ASKED QUESTIONS:

The following questions are common to most users and may help you understand the operation of the T2000SFL, some of these are explained in the user manual but may have been missed by the reader:

Q.　　When I am asked to *Squawk Ident* (**ID**) the **I** indicator stays on for a long time. Why ???
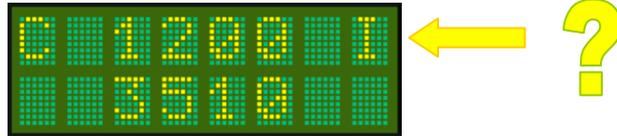
A　The **I** or ident character, is used to denote that the transponder reply now includes the ident information,　to make the return flash on the ATC display. The ident will stay on for 18 seconds before returning to normal operation.

Q　When I first turn the transponder on, I get the message NO ALT. The altitude does not appear for some　time, is this normal ?
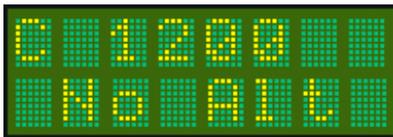
A Yes. Some encoders have a warm up period of up to 10 minutes, and　the encoder　will　not output any altitude data for this period. This is also true for serial data encoders. The warm up period will vary for different models of encoder, and the temperature on the day.

The warm up period means just that – the encoder is heating up its pressure transducer. In many cases this device is only accurate at temperatures above 18C (65F). The encoder will therefore not output until the temperature of the pressure transducer is above this value.

Q　　　I have turned the SELECTMODE knob to ALT to select mode C, but when I am taxiing an X (standby) appears instead of C. What is going on ?

A.　　The unit has probably had the ***external standby switch*** wired to an air-switch. When the aircraft lands,　and slows down, the airflow over the switch is unable to hold back the spring operation of the air-switch. The **T2000SFL** will switch from the operating mode from the **SELECTMODE** knob, to standby and the **X** appears on the display. When the aircraft takes off again, the airflow increases, and operates the external standby switch and the **T2000SFL** reverts back to the **SELECTMODE** setting.

The external standby can be wired as a stick mounted switch. Be aware of this switch when flying, as the **T2000SFL** will operate outside standby, until the switch is operated.

Check the **Rem Stdby** function in the **PROGRAM MODE** menu to ensure the switch is operating the correct way.

Q I have noticed that sometimes when I switch on the Avionics Master, the **T2000SFL** turns on by itself, without pressing the **ON** key. Why ?

A The **T2000SFL**'s **ON** key is software controlled. The **T2000SFL** will remember if it was on or off at the time the avionics master was lasted switched off. When the power is turned on again, the **T2000SFL** will revert to its last operational condition, and turn on. The T2000SFL can be turned ON/OFF via the avionics master or the **ON** key, either method is OK.

Q   Whilst flying outside normal radar coverage I have noticed that the reply symbol still flashes from time   to time – what causes this ?
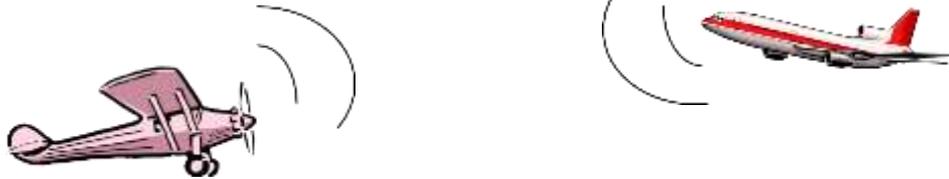
A Other aircraft fitted with **TCAS** systems can still interrogate transponder equipped aircraft like yours. This then lets them know where you are, and your contact information is displayed on their TCAS screens. The **TCAS** aircraft could be 100+ miles away and at altitudes +30,000ft!

Q I have tried to power up my **T2000SFL** on the bench from a dc power supply, but it won't start up properly. What is going on ?

A The **T2000SFL** has a number of large capacitors fitted, and at the moment of turn on they will try to charge up. When this happens, an "*in rush*" of current occurs. If the power supply cannot cope with this "*in rush*" the supply voltage will dip to the point where the **T2000SFL** will detect a power failure, and reboot. The answer is to connect a battery across the power supply to cushion the "*in rush*" and allow the **T2000SFL** to get past this point.

Prolonged operation with the **T2000SFL** in reboot may result in a **NO COMM** error on the display. If this message appears, the communications between the microprocessor has been disturbed, and may require factory service.

Q   Are there any problems with altitude encoders to be aware of ?

A   The **T2000SFL** is designed to work with **ANY** TSO-C88a approved encoder. The **T2000SFL** has the provision to supply the aircraft power to the encoder. There a several things to watch for here:

Firstly the voltage received by the **T2000SFL** will be the voltage out to the encoder. Be careful with 28V aircraft that you select an encoder which is rated to 28V!

Secondly it is very important to wire a connecting ground wire between the encoder and the **T2000SFL**, even if you are **NOT** taking the power from the **T2000SFL**. This will ensure that the data line signals are at best performance.

Thirdly **NEVER** allow the output voltage from the **T2000SFL** to the encoder to be shorted. This will always result in internal damage to the **T2000SFL**, and is **NOT** covered by the warranty! Do **NOT** do this.

Q   Do I need to get my Transponder calibrated ?

A   Yes. In most countries, transponder installations, regardless of the type of aircraft it is installed in, must be calibrated at the time of installation, and every two years thereafter. The calibration will include the aircraft's altitude encoder, and primary altimeter. The test must be carried out with the equipment installed in the aircraft, by a qualified avionics service centre.

There are some installation tips to make the calibration test easier to carry out.

The calibration test will check the aircraft's primary altimeter, static system, and altitude encoder together. It is a good idea to ensure the static line comes first to the altimeter and then the encoder. Install an in-line joiner on the feed to the rest of the instrument panel. This makes isolating the unwanted instruments (eg VSI) from the pressure test easy. It also makes a convenient connection pint for the technician's pressure test set.

When installing the encoder, ensure that it can be accessed to adjust the calibration controls. These are typically trim pots or push keys located under holes in the case. Otherwise mount the encoder with a quick release and sufficient harness length so it can be swung out from under the panel.

Q   Is there anything inside the T2000SFL transponder I can adjust to get better performance ?

A No. Do not open the T2000SFL, or attempt to adjust any internal components. Service should only be carried out by Microair Avionics or a certified avionics service centre which holds the T2000SFL Service Manual. Refer to the Microair Avionics website for details of a service centre near you, or for instruction on how to return your transponder to Microair Avionics.

Q Occasionally the message NO COMM will appear on the display, particularly when I turn the transponder on. What does this message mean?

A   No COMM is a loss of communications between microprocessors inside the transponder. This can occur if the one of the microprocessors begins a task before the other is ready to respond. This can happen if the transponder is turned on with the select mode knob in the ON, ALT or ALT DISPLAY positions. It is possible that the transponder may be interrogated and asked to respond before the start up sequence is complete, and hence cause a conflict. Recycle the transponder's power to clear the error message. If the error message recurs often, send the transponder to a Microair service centre for adjustment.

Q   I often pass through class E airspace, but I do not want to stray into the class C airspace above. Can I use the altitude alert function to warn me if I go above a certain level?

A   Yes. You can use the altitude alert function in the following way to give you a too HI alert at a given altitude. An example of airspace low limit might be 4500 feet.

To remain clear of this airspace you must remain below 4500 feet.
Go to the mode menu, and select altitude. Set the altitude to 100 feet.
Move on to the Buffer value and set this to 4400 feet (4500- 100).
The HI alert message and tone will now occur at 4500 feet, to warn
you of the airspace.

6.0   LIMITED WARRANTY

The warranty period for any Microair Avionics manufactured article is
dependent on Condition of the article at time of sale and the Purchase Date.

For **New Articles** the warranty period commences from Date of Purchase and
is valid for 1 year or the minimum period defined by applicable consumer law,
whichever is the longer.
In the absence of original Proof of Purchase the warranty will be valid for 1
year from Date of Factory Shipment as determined by Microair Avionics.

For **Factory Reconditioned Articles** offered for sale, the warranty period commences from Date of Purchase
and is valid for 12 months.

For **Factory Exchanged Articles** the warranty period commences from the Date of Purchase of the original
article and is valid for the remainder of the original warranty period.

For **Repaired Articles** the warranty period commences from the date of Factory Shipment and is valid for 6
months for the original defect only.

Microair Avionics will, at its sole discretion, repair or replace any components, which fail in normal use. Such
repairs or replacement will be made at no charge to the customer for parts or labour. The customer shall be
responsible for any transportation costs for return of this product to Microair Pty Ltd or an approved Microair
Service Centre.

This warranty does not cover failures due to abuse, misuse, accident, unauthorised alteration, or repairs carried
out by parties other than Microair Avionics or an approved Microair Avionics Service Centre. This warranty
does not cover failures where the product has not been installed or operated, in accordance with the provisions
of the User and Installation manual(s).

It shall be at Microair Avionics sole discretion to decide if a defect is a result of material or workmanship failure.

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OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY LIABILITY
ARISING UNDER WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR
PURPOSE, STATUARY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL
RIGHTS, WHICH MAY VARY FROM STATE TO STATE, AND COUNTRY TO COUNTRY.**

**IN NO EVENT SHALL MICROAIR AVIONICS PTY LTD BE LIABLE FOR ANY INCIDENTAL,
SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM
THE USE, MISUSE OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE
PRODUCT.**

Microair Avionics may at it discretion, refer product returns for repair or service, to a service facility closest to
you. Microair Avionics reserves the right to repair or replace the product or software or offer a full refund of the
purchase price at its sole discretion.

To obtain warranty service, please email or call the Microair Avionics Repair line in Australia.

Domestic or International Return instructions are available on our website. Please follow these instructions
carefully.

Phone: ++ 61 7 4160 8200

Email: support@microair.aero
Website: www.microair..aero

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