Flytec AG, Ebenaustrasse 8a, CH-6048 Horw

Electronic flight instruments made in Switzerland

Flytec 4020

Operating Instructions

General remarks

Introduction

Flytec's 4020 is a completely new development. The new instrument is now more compact, lighter and more economical thanks to the use of the very latest technology.

The 4020 is an instrument which you can adjust to suit your requirements. For this reason, all important data can be altered quickly and easily. You're flying in the United States? No problem: Altimeter 1 displays the altitude in feet and Altimeter 2 displays the meters to which you are accustomed! This is just one example of what the 4020 has to offer.

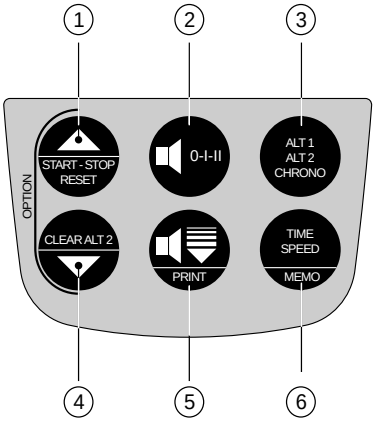
With this new instrument, we have remained loyal to Flytec's operating philosophy - and also improved it with the new option mode. Flytec's new 4020 is an instrument that will give you immense enjoyment.

Your Flytec team

Instrument overview

1. On/Off switch
2. Analog vario bar display
3. Digital vario display
4. INDICATOR display
5. TIME / SPEED / MEMO display
6. Altimeter & stopwatch display
7. Key
8. Speed sensor socket
9. PC and printer interface
10. REC switch

Keyboard



1 START-STOP-RESET
2 VARIO
3 ALT1-ALT2-CHRONO
4 CLEAR ALT 2
5 SINK (PRINT)
6 TIME / SPEED / MEMO

Operating philosophy

The philosophy behind all Flytec instruments is to keep everything as simple as possible. This is why each key has only one function, i.e. a function can be displayed and switched on or off with each key. In order to alter a function, you press and hold down the relevant function key. The setting to be changed will then flash and can be altered by pressing and .

The instrument has three operating modes: normal operating mode, setting mode and configuration mode.

Run mode (normal operating mode)

The instrument is in run mode when used in normal operation. In run mode, the instrument will display your altitude, ascent and the time continuously.

Setting mode (for adjustments)

In setting mode, the most important value can be changed for each display. For example, the altitude can be set by using the setting mode for altimeter 1.

Enter setting mode for a particular display (e.g. for altimeter 1), by pressing the relevant function key (e.g. ALT1 / ALT2 / CHRONO) and holding it down for about 4 seconds. As soon as you are in setting mode, the SET indicator will appear in the INDICATOR display. The value to be changed begins to flash.

In order to return to run mode, press the relevant function key briefly (e.g. ALT1 / ALT2 / CHRONO)

If no change is made in setting mode for 15 seconds, the instrument returns to run mode.

Option mode (configuration mode)

Option mode allows you to configure the instrument to your requirements and preferences. In option mode, you can set the parameters for the relevant display or function at various levels. For example, these can be units or special functions. A precise description of the various settings in option mode is given in the descriptions of the individual functions.

You can enter option mode (in the setting mode of a function) by simultaneously pressing the two keys marked “Option” in yellow (Fig. 1). If the instrument is in option mode, this is confirmed by the OPTION indicator in the INDICATOR display.

In OPTION mode you can change several parameters. By briefly pressing the relevant function key (e.g. ALT1 / ALT2 / CHRONO) you skip from one level to the next. In each level you can change one parameter of the relevant function. The level number will appear each time in the digital vario display.

If no change is made for 15 seconds in option mode, the instrument returns to run mode.

In order to return to run mode manually, press the two option keys simultaneously again (Fig. 1).

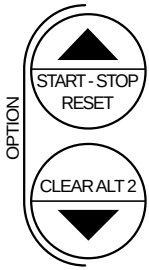


Figure 1

Using FlyChart 4.0 software on a PC, all settings in setting and option modes can be conveniently set and transmitted to the instrument via the PC interface.

Commissioning

Switch on the instrument with the On/Off switch. On being switched on, the instrument goes through a self-test routine and then enters run mode.

When switched on, the instrument settings correspond to those valid when the instrument was last switched off.

When first switched on, the instrument displays the approximate charging status of the batteries in the vario bar display. If the display shows approximately 50% of the maximum display in the green sector, the batteries are still half full. If the display is in the red sector, the batteries must be changed. If the batteries are low on charge during a flight, PO will light up briefly in the digital vario display and, at the same time, the charging status of the batteries is shown in the bar display.

The battery life of the instrument using alkaline batteries is 160 hours. Rechargeable batteries can also be used. However, operating time is substantially shorter with these (total operating time is approximately 40 - 50 hours).

Alkaline batteries can also be recharged several times using the appropriate charging unit (no fast chargers!).

The altimeter

General remarks

How does an altimeter work?

An altimeter is really a barometer because it does not measure altitude directly but pressure. The altitude is then calculated from the pressure. For the purpose of calculating absolute altitude (according to the international formula for altitude), the pressure at sea-level is assumed as being zero-point pressure.

Why does pressure change with altitude? The air pressure at a point on Earth is produced by the weight of the atmospheric air above it. This is why air pressure decreases with altitude - there is less air above your head! At 500 meters above sea-level, a pressure change of 1 mbar corresponds to a difference in altitude of about 8 meters.

In practice, however, it is not quite that simple as other factors also have an influence on air pressure. Pressure also depends on temperature and, of course, weather. On a stable day, there can be air pressure fluctuations of 1 mbar caused by temperatures and this corresponds to a difference in altitude of ± 10 meters. Depending on the weather, air pressure at sea-level (QNH) can be between 950 mbar and 1050 mbar. In order to eliminate this weather effect, an altimeter needs continual recalibration. This means that the altimeter must be set at a known altitude to display that same altitude.

When the weather changes fast (e.g. cold fronts), air pressure can change in the course of a day by up to 5 mbar. This represents a change in altitude of 40 meters!

Another method of calibrating an altimeter is by entering the current QNH. What is the QNH? In flying circles, a general zero point is needed to enable all aircraft at the same altitude to also have the same altitude on their altimeters. This joint basis is called the QNH. The QNH is the current air pressure in hPa (1 hPa = 1 mbar) calculated at sea-level. It is redetermined several times daily and can be obtained in the flying weather report or from airfields by radio.

Altimeter 1 (ALT 1)

Altimeter 1 displays absolute altitude, i.e. the altitude above sea-level.

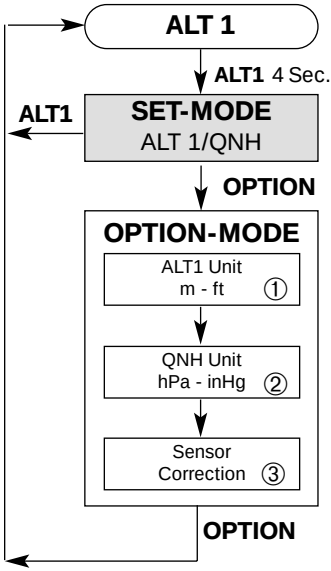
Function key is used to change from the displays for altimeter 1, altimeter 2 and the stopwatch. Pressing and holding down this key will make the instrument go into setting mode.

Attention: While a flight is being recorded (REC activated) the setting mode is blocked for Altitude 1. This altitude can only be readjusted after the REC has been switched off. This is an FAI requirement.

Altimeter 1 setting mode

As mentioned above, the **absolute altitude can be set** in setting mode. The altitude and the QNH flash on 2 lines. Using the setting keys and , you can set the altitude and the QNH simultaneously. If you do not know what altitude you are currently at, you can set the altitude using the QNH but this method is not as precise as direct altitude setting. The QNH has a resolution of 1 mbar which corresponds to an altitude resolution of approximately 8 meters. The altitude, however, can be set directly to an accuracy of 1 meter.

Pressing the setting keys and simultaneously will take you from setting mode to option mode.



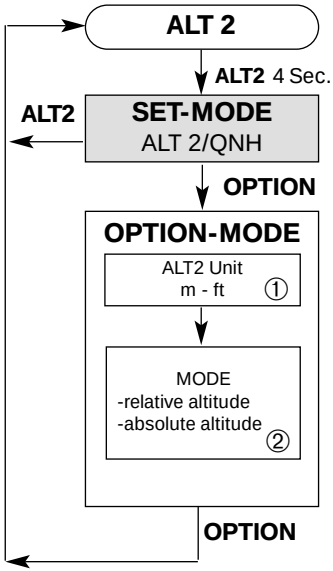
Altimeter 1 option mode

In option mode, you can set the unit for ALT 1 (meters or feet) at the first level and, at the second level, you can set the unit for the QNH (hPa or inHg). The indicator for the relevant unit set flashes in the display.
The pressure sensor can be corrected at the third level (± 50 hPa).
If you find that the QNH value displayed at a known altitude deviates seriously from the QNH value of a weather station in your area, you can correct this deviation by entering the deviation (with a different prefix). I.e. if the QNH displayed by your instrument is 20 hPa too high, enter -20 to correct this deviation.

This deviation is caused by the aging of the pressure sensor and stabilizes after 2 - 3 years.

N. B.: Incorrect manipulation of the correction value of the pressure sensor will result in false altitude readings! Never alter the basic settings of the altimeter unless you have good reason to do so (in your own interest)!

In option mode, the indicators OPTION and ALT 1 appear and the relevant number of the module is shown at the top of the display. The unit to be adjusted will flash.



Altimeter 2 (ALT 2)

Altimeter 2 can either be used as an absolute altimeter or as a relative altimeter.

When used as an absolute altimeter, it functions in precisely the same way as altimeter 1. Altimeter 2 can now, for example, display the altitude in feet and altimeter 1 the altitude in meters.

The relative altimeter displays the current altitude with reference to a point. This reference point can be set at zero in run mode at any time by using the key or set at any altitude in setting mode. The relative altimeter can thus be used to measure the higher altitude of the take-off area. Pressing the key at the take-off area will zero ALT 2 for this purpose.

Altimeter 2 setting mode

The altitude can be set in setting mode in precisely the same way as with altimeter 1.

If altimeter 2 is selected as the absolute altimeter, it is coupled to altimeter 1. Any change in the display for altimeter 1 is reflected by a corresponding change in the display for altimeter 2 and vice-versa.

Altimeter 2 option mode

In option mode, you can select the unit (meters or feet) at the first level as with altimeter 1. The unit selected flashes in the display. You can toggle between units by pressing either the key or the key.

Press key to enter the second level of option mode. At this level, you select **the operating mode of altimeter 2**. If this is set at absolute altimete, the two indicators ALT 1 and ALT 2 will flash in the display. If set at relative altimeter, only the indicator ALT 2 will flash.

You return from option mode to run mode by waiting 15 seconds or again pressing the two keys marked “OPTION” simultaneously.

Vario

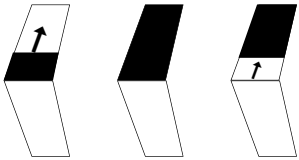
Vario sound levels

Two sound levels can be set or the sound system switched off completely by repeatedly pressing the key. While the key is pressed, a tone will sound at the desired level.

Analog vario bar display

The vario bar display has a range of ± 8 m/s in two scale passes. The scale unit always corresponds to 0.2 m/s. Up to 4 m/s , the bar display fills. If it displays more than 4 m/s (ascent), the ascent is displayed inverted, i.e. the display is full at 4 m/s and empties from below when ascent increases.

E.g.:



1.6 m/s 4 m/s 5 m/s

The sensitivity of the bar display corresponds to the basic attenuation of the vario (‡ setting mode of the vario). It therefore always displays current ascent.

Digital vario display (Integrator)

The digital vario displays the attenuated climb rate for the last X seconds in second rate. The time X, via which ascent is attenuated (integration time), can be changed at the first level of option mode. These values appear flashing in the digital vario display.

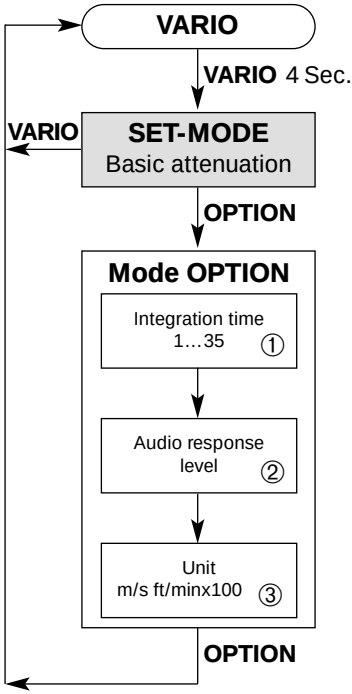
You can enter the vario's setting mode by pressing the key for a long time (approximately 4 seconds).

Vario setting mode

The basic attenuation of the vario can be altered in setting mode. The basic attenuation of the vario is effective on all vario functions; it can be set to 0.5 sec, 1 sec or 1.5 sec.

N.B.: The fastest vario is not always the best vario. In very rough and severe conditions, it is advisable to attenuate the vario more. Turbulences are then filtered out by the attenuation and not displayed.

You can enter option mode by simultaneously pressing the two option keys.



Vario option mode

The integration time of the digital vario can be altered at the first level of option mode. The values are in 5-second steps between 5 and 35 seconds and appear flashing in the digital vario display. At setting 1, the digital vario is displayed without averaging and then runs parallel to the bar display. The values can be altered with the and the keys.

The audio response point can be adjusted at the second level. The audio response point can be adjusted from +2 cm/s to +40 cm/s. The current response point appears in the bar display and represents one tenth of the value displayed. E.g.: a display of 2 m/s corresponds to an audio response point of 20 cm/s.

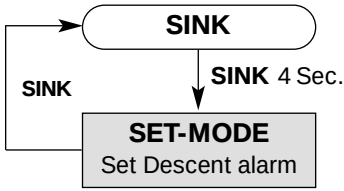
The digital vario unit can be selected at the third level: m/s or feet/min x 100. The current setting flashes in the digital vario display. You can switch between the two units with the key.

Descent tone/Descent alarm

The descent tone is a continuous tone dependent on descent which sounds as soon as descent is greater than the response point. The descent tone can be set or switched off with the key. When the descent tone is active, the SINK indicator is displayed. When the descent tone is first switched on, a mark appears in the bar display indicating the response point set.

Descent alarm setting mode

The response point of the descent alarm is set in the bar display using the keys. The response point can be set over the entire range of the display and also remains stored in memory after the instrument has been switched off.



Speedometer

General remarks

A speed sensor (speedometer) can be purchased as an accessory. The speed sensors in the 3000 series can also be used with instruments in the 4000 series.

The accuracy of a vane wheel sensor is highly dependent on its point of attachment.

Additionally, the individual probes have an accuracy of approximately + 2.5% (industrial standard) resulting from manufacturing operations and it is possible for two probes not to display exactly the same speed. These deviations can be largely corrected by the instrument. (± option mode of the speedometer).

Display

If a vane wheel sensor is connected to your instrument, speed (in kph, mph or knots) relative to the air can be shown in the lower display by pressing the  key.

When a stall alarm is switched on, a warning tone sounds when speed falls below a certain absolute speed. No stall alarm will sound at speeds that are below 10 kph. If the threshold is set at 10 kph (or 5 mph), the stall alarm is switched off.

The current time can be shown every 30 sec in the SPEED display (▸ option mode of the speedometer).

Correction

If a probe always displays too much or too little, this deviation can be corrected at the third level of option mode.

Speedometer setting mode

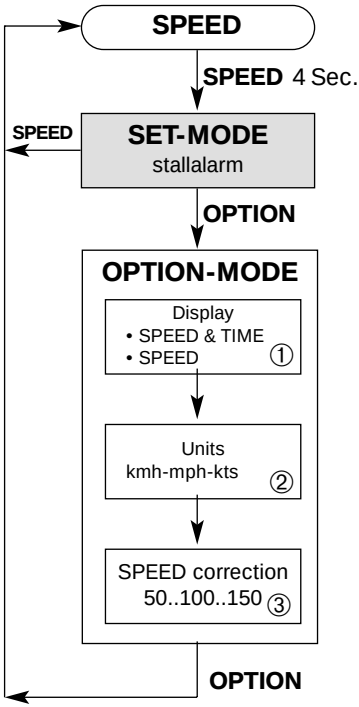
The response threshold of the stall alarm can be altered. If the threshold is set at 10 kph (or 5 mph), the stall alarm is switched off.

Option mode of the speedometer

At the first level, you have a choice of whether the **time should be displayed** automatically every 30 seconds when the speed display is switched on.

At the second level, the desired **unit of the speed display** is set. You can choose between kilometers per hour (kph), miles per hour (mph) and knots (kts) by using the key and the key.

At the third level, you can also make adjustments to the correction of the speedometer. The correction value is given in percent using the key and the key. If the speed display is uncorrected, the display will show 100 (%). If the display still shows a 4% excessively high value (e.g. 50 kph instead of 48 kph), the display is corrected by setting 96 (%). This means that the display will now always show 96% of the original speed.



Time measurement and temperature display

Clock time (real-time clock)

In the lower display, the key is used to toggle between speed, time and MEMO display. The time, the date and the year can be set in setting mode.

Stopwatch (CHRONO)

The stopwatch is displayed in the upper display. It can be started and stopped with the key. If the stopwatch has been started, the indicator CHRONO will flash. Press key to toggle between ALT 1, ALT 2 and CHRONO in the upper display. Press key again to stop and start the stopwatch again. In order to reset a halted stopwatch, press the key for 4 seconds. If the stopwatch has been halted, the CHRONO indicator remains displayed until the stopwatch has been reset.

Flying time

The flying time clock is automatically started after the instrument has been switched on and runs in the background independently of the stopwatch. The flying time is saved when the instrument is switched off. The flying time saved in memory is kept in the flight log. During flight, the flying time can be invoked in the MEMO display (⧫ Logbook).

Temperature display

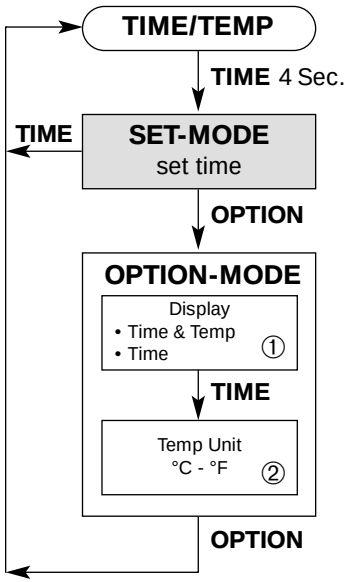
The temperature display is an additional function of the time display. The temperature display can be switched on or off. If the temperature display is switched on, the temperature is briefly shown every 30 seconds in the time display (the time interval can be set using the PC setup). The temperature display is switched on or off in option mode.

Please note: The temperature display reacts to changes in temperature with a slight delay as the temperature sensor is inside the instrument.

Time measurement and temperature display setting mode

The key and the key are used in setting mode to set the time. The hours and minutes are set first and confirmed with the key. The date can now be entered in precisely the same way. This input is again confirmed with the key. The year is also entered and confirmed in the same way.

Attention: As soon as the barograph display is activated with the REC switch and a flight has already been saved, the real time clock and the date can no longer be changed. They can only be manipulated again once the memory has been cleared (Barograph setting mode).



Time measurement and temperature display option mode

The temperature display can be switched on or off at the first level of option mode. If it is switched on, the TEMP indicator will flash as well as a TIME indicator. When the temperature display is switched off, only the TIME indicator is on.

The unit of the temperature display (° Celsius or ° Fahrenheit) can be selected at the second level using the key and the key.

Logbook

General remarks

The maximum values of the current flight and those of the previous 19 flights are saved in memory and can be invoked in the MEMO display and printed out on a printer. You can access the MEMO display by repeatedly pressing the key until the MEMO indicator appears.

The maximum values saved are:

- Maximum absolute altitude — ALT 1
- Maximum relative altitude — ALT 2
- Maximum ascent and descent — VARIO bar display
- Flying time — CHRONO
- Date — Lower display

The key and the key are used to display the flight required; flight 0 is the current flight, the peak values of which are continuously updated. Flight 19 is the least recent flight and is deleted whenever a new flight is saved to memory.

The maximum values of a flight are saved to memory automatically when the instrument is switched off. (Condition: the instrument has been switched on for at least 3 minutes and a difference in altitude of at least 50 metres has been attained.)

Printout

The logbook can be printed out straight from the instrument via a printer cable onto a printer. Either a serial or a parallel cable must be used dependent on the printer. The printout is started by pressing and holding down the key in the MEMO display, make sure that the MEMO shows flight 0.

Sample printout:

DATE	TIME	ALTI1	ALTI2	VARIOMETER		REC	Barogram	Sample
Nr.dd.mm.yy	hh:mm	MAX	MAX	MAX	MIN	TIME		TIME
1. 03.01.95	11:23	2032	204	1.2	-14.6	00:33	ALT TEMP	15
2. 05.01.95	13:45	1892	349	2.5	-12.3	01:26	ALT SPEED	15
3. 12.02.95	12:03	1580	89	0.8	-9.8	00:23	NO	-
4. 03.01.95	11:23	2032	204	1.2	-2.0	01:09	ALT	15
Nr.dd.mm.yy	hh:mm	[m]	[m]	[m/s]	[m/s]	hh:mm		[sec]

Barograph

Recording

Recording is done with the REC switched on. The saving rate is adjustable (1, 5 or 15 sec), as well as the magnitudes to be saved. Switching off the REC switch stops the barograph recording process and saves the flight in memory. If the REC switch is not switched off, the current recording is saved when the instrument is switched off.

IMPORTANT: If the REC switch is not activated, there will be no barograph recording; consequently, only the flying time and the peak values will be saved when the instrument is switched off.

Time marker

While a flight is being recorded you can set time markers in the barogram durging the flight. For example, the turning-point can be recorded in the barogram. These markers are plotted in the printout and displayed in the FlyChart software. While a flight is being recorded you can set time markers by pressing the key (the indicator must be on ALT1 or CHRONO) until a number appears briefly in the upper display. This is the number of the markers that have been set.

Printout

You access the MEMO display by repeatedly pressing the key until the MEMO indicator appears. The key and the are then used to display the flight required. The print out is started by pressing and holding the key in the Memo display.

Transmission to a PC

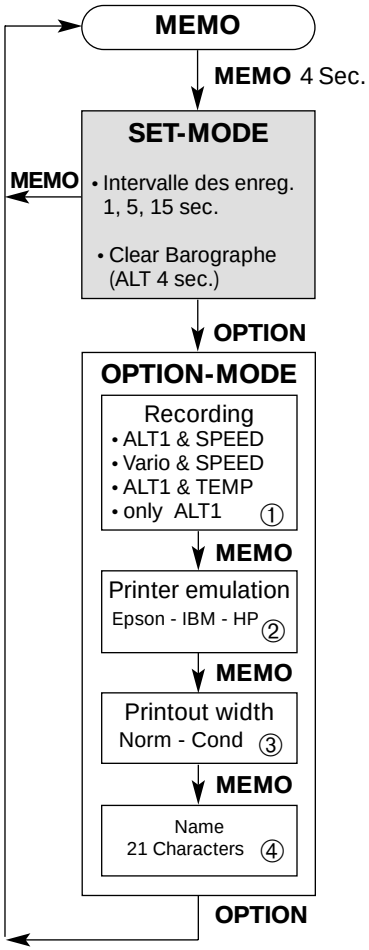
The **flights** recorded can be transmitted to a PC. You will require a PC with Windows 3.X or Windows® 95, a PC cable and Flytec's software.

Transmission is started from the PC Software FlyChart. It is required that the instrument is in the run mode on the MEMO display (fligth 0). The entire flight memory is then transmitted to the PC where the flights can be saved and printed out.

Barograph setting mode

In setting mode, all flights in the logbook can be deleted and the recording interval of the barograph can be set.
In setting mode, the recording interval saved is displayed first. Using the key or the key, change in the MEMO display between the recording intervals 1, 5, 15 sec and CI. Briefly press MEMO to save the interval displayed and thus leave setting mode.

If CI appears in the MEMO display, all the flights can be deleted by pressing the key for 4 seconds. As soon as the memory has been deleted, all the segments of the display will flash briefly and the instrument starts up again.



Barograph option mode

The magnitudes which the barograph is to record are set at the first level of option mode.

Use the key or the key to toggle between the different possibilities. The magnitudes to be recorded flash in the display:

• ALT 1 and SPEED	Altitude and speed
• m/s ft/min x 100 and SPEED	Ascent and speed
• ALT 1 and TEMP	Altitude and temperature
• ALT 1	Altitude only

The printer emulation must be given at the second level of option mode:

EP	➧	Epson FX-80
Ibm	➧	IBM Proprinter
HP	➧	HP Deskjet

These two emulations are offered by the majority of standard dot impact printers.

The width of the printout (either condensed mode or normal mode) can be selected at the third level:

--I I-- ➧ condensed mode (double width)

-I I- ➧ normal mode

At the fourth level, you can enter your **name**; the name entered appears on the logbook printout. The individual letters of the name must be entered individually as ASCII code (⧫ ASCII table in the appendix). The letter displayed is confirmed with the key and the next displayed. The name may be 21 characters long. The number of the character appears in the digital vario display and the ASCII code for the character is shown in the MEMO display. Press the key to enter the next character. Press the key to return to the third level of option mode.

Press both option keys to return to run mode.

APPENDIX

Scope of supply

The following items are included:

- FLYTEC 4020 instrument
- Leg clip
- Protective sleeve
- Manual

The following are available as accessories:

- Various attachment fixtures
- Various speed sensors
- PC software and PC cable
- Printer cable (serial or parallel)

Procedure for Official FAI Observers

1. The observer must familiarize himself with the instrument for a period of at least 1 hour

2. At the take-off site, the observer must note the pilot's name and the type and serial number of instrument to be used. He must verify that the case is intact and undamaged. He must inspect both Flytec seals on the back of the unit and ensure that they are in place and undamaged.

3. The observer must switch the instrument on and check that the time, the date and the take-off altitude have been set correctly. If any of these values are incorrect, the observer must set them to the correct value (⧫ setting mode altimeter 1.) The time has to be corrected in the time mesurement display setting mode**.**

   ATTENTION: The real time clock and the date can no longer be altered once the barograph recording has been activated with the REC switch. These two functions can only be reset when the memory has been cleared (⧫ setting mode of the barograph).

4. The observer must switch the barograph on (REC).

5. The observer must continuously observe the pilot until take-off and verify that the pilot takes off with the instrument. The observer must note the exact time of take-off using an independent timepiece.

6. After landing, the pilot must set the REC switch and then the instrument to Off.

7. Printout: The observer must verify that the instrument displays the correct time and date and note any discrepancies with respect to local time. The observer must verify that the instrument is intact. He must also inspect both seals and ensure that they are undamaged. He must ensure that the instrument is connected directly to the printer by a single cable. The observer must also verify that nothing else is connected to the printer, e.g. an additional cable or instrument. Connection of the printer to the electrical mains is, however, permissible. The observer must verify that the printer paper is blank.

8. The observer starts the printout of the flight record and verifies that the Instrument number printed out is identical with the number noted at take-off. The observer must also verify that the time of take-off and the date in the printout agree with his records. The observer must be present during the entire printout procedure. When the printout is finished, the observer must remove the entire printout from the printer and add the date and his own signature.

The observer must ensure that FAI regulations are adhered to.

Water damage

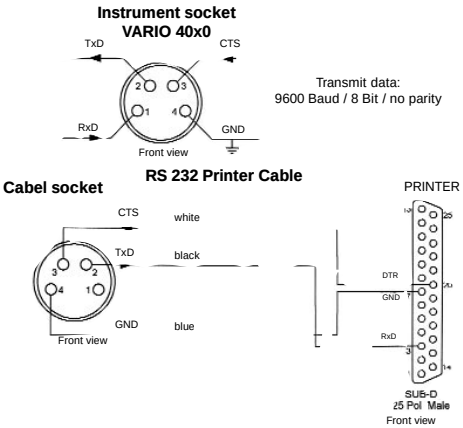
If the instrument is damaged by water, remove the batteries at once. In the case of salt water, rinse the instrument thoroughly with handwarm fresh water. Then leave the instrument to dry out and send it as soon as possible to your FLYTEC dealer or to FLYTEC itself for checking.

Warning: Never try to dry it out in a microwave oven!

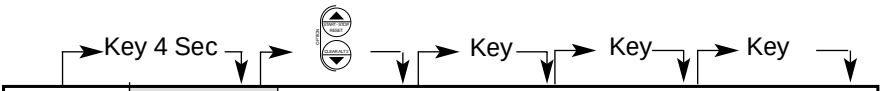
ASCII-table

32		52	4	72	H	92	\	112	p
33	!	53	5	73	I	93	]	113	q
34	“	54	6	74	J	94	^	114	r
35	#	55	7	75	K	95	_	115	s
36	$	56	8	76	L	96	`	116	t
37	%	57	9	77	M	97	a	117	u
38	&	58	:	78	N	98	b	118	v
39	‘	59	;	79	O	99	c	119	w
40	(	60	<	80	P	100	d	120	x
41	)	61	=	81	Q	101	e	121	y
42	*	62	>	82	R	102	f	122	z
43	+	63	?	83	S	103	g		
44	`	64	@	84	T	104	h		
45	`	65	A	85	U	105	i		
46	.	66	B	86	V	106	j		
47	/	67	C	87	W	107	k		
48	0	68	D	88	X	108	l		
49	1	69	E	89	Y	109	m		
50	2	70	F	90	Z	110	n		
51	3	71	G	91	[	111	o		

PC and printer interface



Funktion overview



RUN Key	SET	OPTION Level 1	Level 2	Level 3	Level 4
ALT 1	Altitude-adjustement ALT1	Units ALT1 (m/ft)	Units QNH	Sensor correction	
ALT 2	Altitude-adjustement ALT2	Units ALT2 (m/ft)	Absolut- or relative altimeter		
CHRONO	reset				
SPEED	Stallwarner *	Time display	Units SPEED	SPEED correction	
TIME	time, date, year	Temperature display	Unities TEMP		
MEMO	Clear MEMO (ALT 4 Sec.)	Recording magnitudes	Printer-Mode	Printout width	Pilot name
VARIO	Basic attenuation *	Integrationtime	Audio response level	Units VARIO	
SINK	Set Descentalarm MEMO (PRINT)				

While a flight is being recorded only the settings marked * can be changed. ALT 2 can be set to zero by pressing the key.
While a flight is being recorded you can set time marker by pressing the key, (the indicator must be on ALT1 or CHRONO.
While a flight is being recorded the OPTION-Mode is completetly blocked.