CE 0682 !

FC FCC ID: BVYFSG2T

LBA.O.10.911/103 JTSO
replaced by:
ESTO: EASA.21O.1304

FAA: TSO C37d
TSO C38d

DFS-No.: D - 0002/2002

KBA: e1 03 2777

FSG 2T PC

Fixed / Portable / Mobile
VHF/AM Airband Transceiver

5 Watt 118.000...136.9

Operator's M

Before operating the Transceiver, please
read this manual thoroughly!
Please observe the Safety Information!
Keep for further use!

Date of Issue May 2010
Revision 05
Document no.: OM 152.2T-EN Article no.: D10079

Owners Name:
Serial No. 2T PC:

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Manual Revision History

MANUAL OM 152.2T-EN
REVISION 05

This list gives you a RECORD OF REVISIONS of the **« Operator's Manual »** issued to include new hardware, mistakes or errors.

Revision	DESCRIPTION/REASON FOR CHANGE	Date
-	NEW	March 2003
01	New version of document "Declaration of Conformity the German law (FTEG) of radio and telecommunication terminal e	12/05/03
02	FAA TSO numbers added at front page	17/09/03
03	Section 6, Option "Channel only Mode" added	May 2005
04	Extension of EC-Type Approval (Kraftfahrt-Bundesamt)	December 2008
05	Company's name changed into "Dittel Messtechnik G ESTO document, 2-pole DC connector changed into 3-pole DC connector due to ceased production	May 2010

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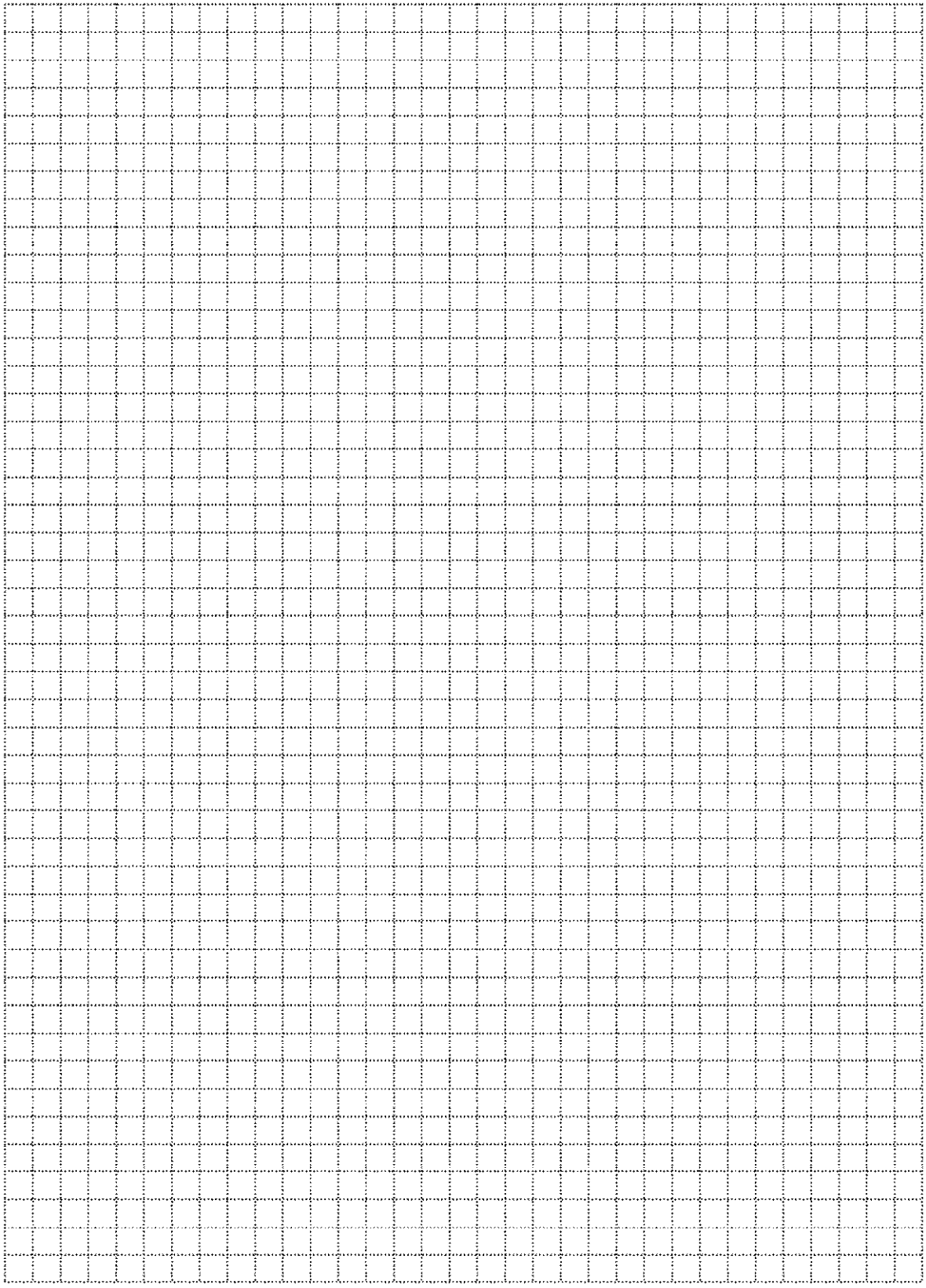
Abbreviations

Ω	Ohm
°C	Degrees Centigrade
°F	Degrees Fahrenheit
A/C	Aircraft
A/N	Article Number (Dittel Messtechnik GmbH)
AGC	Automatic Gain Control
Ah	Ampere hour
AM	Amplitude Modulation
ANT	Antenna
Ass'y	Assembly
AWG	American Wire Gauge
ccw	Counter-clockwise (turn left ↺)
CH	Channel
cw	Clockwise (turn right ↻)
dB	Decibel
dia.	Diameter
EMF	Electromotive Force (voltage of an open circuit)
F/CH	Frequency/Channel
FL	Flight Level
g	Acceleration due to gravity
GHz	Gigahertz (10^9 Hz)
GND	Ground
HI	High Power
Hz	Hertz
ICAO	International Civil Aviation Organization
IF	Intermediate Frequency
kHz	Kilohertz (10^3 Hz)
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LO	Low Power
LOS	Line-Of-Sight
m	Modulation
mA	Milliampere
MD	Mode
MHz	Megahertz (10^6 Hz)
MIC	Microphone
mW	Milliwatt
NM	Nautical miles (1.852 km)
nW	Nanowatt (10^{-9})
PEP	Peak Envelope Power
PLL	Phase-Locked Loop
ppm	Parts per million
PTT	Push-To-Talk
pW	Picowatt (10^{-12})
RF	Radio Frequency
rms	Effective value (root mean square)
RX	Receive
S+N/N	Signal-to-Noise Ratio
SINAD	Ratio: $\frac{\text{Signal} + \text{noise} + \text{distortion}}{\text{noise} + \text{distortion}}$
SPKR	Loudspeaker
SQ	Squelch
STBY	Standby
STO	Store
SWR	Standing-Wave Ratio
THD	Total Harmonic Distortion
TOT	Time out timer
TX	Transmit
VA	Volt-ampere, apparent power
Vac	Volts, alternating current
VCO	Voltage-Controlled Oscillator
Vdc	Volts, direct current
VFO	Variable-frequency oscillator
VHF	Very-High Frequency
VOL	Volume
VSWR	Voltage Standing-Wave Ratio
W	Watt, real power

Notes:



Section 1 For Your Safety

Every radio, when transmitting, radiates energy into the atmosphere that may, under certain conditions, cause the generation of sparks. All users of our portable radios should be aware of the following warning:

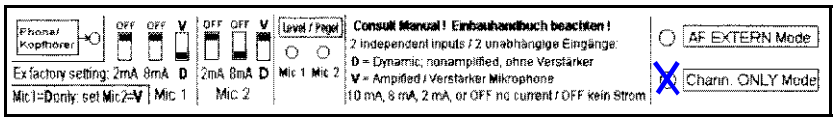
Do not operate this portable radio in an explosive atmosphere (petroleum fuels, solvents, dust, etc.)!

During normal use, the radio will subject you to radio frequency energy substantially below the level where any kind of harm is reported.

There are no user replaceable parts inside the FSG 2T PC! If the radio fails it must be returned to a Dittel Messtechnik GmbH approved repair facility!

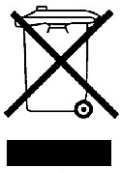
The licensee of a radio station is responsible at all times for the proper operation of the station. Radio operators should use the following guidelines to make this radio a useful tool for safe and efficient communication:

- DO NOT transmit when the antenna is very close to, or touching, exposed parts of the body, especially the face and eyes. Persons with pacemakers should be aware that proper functioning may be affected when in the vicinity of the antenna!
- DO NOT transmit without antenna connected.
- DO NOT operate the radio on an unprotected power supply. Replace a blown fuse only against correct type with specified nominal value. Investigate the cause.
- DO NOT transmit on a busy channel.
- DO NOT press the transmit (PTT) key when not actually desiring to transmit.
- DO NOT transmit with the antenna inside aircraft or vehicle. This may cause malfunction of onboard avionics, trigger the vehicle airbag or interfere onboard instruments! Always operate the portable radio FSG 2T PC with a suitable outdoor / external antenna! Assure appropriate lightning protection / grounding where (elevated) outdoor antennas are used.
- DO NOT operate the radio whilst driving. It should also be noticed that even the use of a hand held microphone while driving could constitute an offence under the Road Traffic Regulations in certain countries.
- DO NOT allow children to play with any radio equipment containing a transmitter.
- DO NOT use a radio FSG 2T for airborne operation which is marked as Chann. ONLY Mode:



Such a radio is allowed only for the use as ground station!

- DO NOT lean over the equipment when opening the cover! If not properly tightened the spring steel band antenna may bounce out!
- Always turn OFF the radio when installing or removing the unit!
- Always turn OFF the radio when starting nearby engines or vehicles!
- The FSG 2T PC should be used exclusively for aviation related communication purposes.
- Unauthorized modifications and changes of the system are forbidden.
- Sufficient speech volume is very important. While the lips are very close and facing the microphone, speak loud and clear. Proper speech level is indicated by the yellow flickering LED on the FSG 2T front panel.
- In vehicles a suitable noise canceling microphone or headset shall be used.
- Prior to any use verify proper FSG 2T PC functions by means of a short radio check. It has however to be taken into account that with a faulty antenna or its cable this communication test may absolutely turn out positive at the airfield or in short distance to the ground station. But at a distance of 2 to 6 miles, a faulty antenna and / or cables will cause communication breakdown!
- Push-to-Talk keys may stick occasionally.
  The transmission signaling RED or flickering YELLOW LED shall be turn to CLEAR or GREEN when releasing the PTT key.
  However, after more than two minutes continuous transmitting (by stuck button or operator caused), the built-in transmit time-out-timer disables the transmitter in order to avoid continuous channel blocking. A continuously flashing display warns the user. Refer to appropriate hints in this manual.


Pb

- The portable airband transceiver FSG 2T PC contains a sealed lead-acid battery (identification "Pb").
- In most countries it is illegal to discard a lead-acid battery except by delivery to a retailer, a distributor, a manufacturer, or a collection, recycling, or smelting facility approved by the department.
- NEVER dispose worn out lead-acid batteries with the household garbage.

1.1 Used Symbols

In this manual the following symbols are used:

DANGER!
describes an immediate threatening danger! Failing to observe the note may cause death or heaviest injuries.

WARNING!
describes a dangerous high voltage. Failing to observe the note may cause death or severe injuries!

CAUTION!
describes a special note for operation. Failing to observe the note may cause damage of the transceiver and / or stored data may be deleted!

IMPORTANT!
describes explanations and other useful hints. Failing to observe the note may cause degraded performance and / or unsatisfying operation!

Section 2 General Description

2.1 About this document

This operator's manual contains operating instructions for the fixed/ portable/ mobile VHF/AM Airband Transceiver FSG 2T PC of Dittel Messtechnik GmbH, 86899 Landsberg, Germany.

2.2 Application & Description of the FSG 2T PC

The portable battery powered VHF/AM Airband Transceiver FSG 2T PC allows independent operation as an airborne or ground radio. Stationary, portable or mobile applications are possible. It consists of a portable case 2T PC (A/N F10388) and a VHF/AM COM Transceiver FSG 2T (A/N F10350), which can be simply inserted and positioned.

This radio is working within the airband frequency range of 118.000 MHz to 136.975 MHz in 25 kHz increments (760 channels). The operating mode is Simplex, i.e. transmitting or receiving only in turns (two way communication).

The built-in rechargeable battery allows an independent operation of up to 130 hours (refer to paragraph 4.14, Battery Operating Times). Continuous operation is possible by the built-in charging unit or, externally, from a vehicle or aircraft DC supply. Microphone and antenna are retractable. External antennas, too, can be advantageously used.

For airborne and ground application two display modes are user selectable:

FREQUENCY MODE: Active Frequency and actual supply voltage are shown at the display. Turning / pushing the **F/CH** knob changes Frequency.

CHANNEL MODE: **Active Channel Number (1 ... 20) and associ** shown at the display. Turning the **F/CH** knob changes preset Channel Number and associated Frequency. Reprogramming without restriction.

Only for ground based operation ('CH ONLY' Mode): Optionally a particular mode can be set where the operation is limited to use only preset channels. To set this mode the radio has to be opened. This may only be performed by an approved repair facility!

The unit features 20 non-volatile channel memories, 2 display modes, Sidetone via headphone, three color status LED, supply voltage indication at the back-lit display, TX time-out timer (2 minutes), a battery supply test, DIN connectors to plug dynamic, non-amplified

microphones and external power supply, and a built-in loudspeaker. The lock-in type carrying handle and a protecting hood completes our FSG 2T PC unit.

2.3 Components of a complete Portable Airband Radio FSG 2T PC

A complete Portable VHF/AM Airband Radio FSG 2T PC consists of:

- A portable case 2T PC, containing a 12 Vdc/7.2 Ah gas-tight lead-acid battery, charger for 115 Vac/230 Vac, 50 - 60 Hz, DC supply indicator, DC supply socket, microphone socket, antenna socket, loudspeaker, Snap-On cover - fits on top or bottom, and a Operator's Manual.
- a VHF/AM COM Transceiver FSG 2T.
- a suitable, vertically polarized VHF airband antenna, frequency range minimum 118 to 137 MHz, 50 Ohm, e.g., spring steel band antenna, A/N F10345, and
- a microphone, e.g., hand-hold dynamic microphone with PTT-switch, A/N F10041.

2.4 System and Type Approval Information

The VHF/AM Airband Transceiver FSG 2T complies with ICAO 25 kHz channel spacing and also meets applicable National and International Type Approval requirements, for any airborne and ground operation:

- JTSO Authorization LBA.O.10.911/103 JTSO (LBA Luftfahrt-Bundesamt), replaced by ETSO Authorization EASA.21O.1304 (2009), is based on EUROCAE ED-23B Airborne requirement (25 kHz ONLY CH spacing).
- FM Immunity requirements according to ICAO ANNEX 10 against FM Broadcast RF Interference.
- Audio filtering required in areas with CLIMAX operation in 25 kHz channel spacing.
- Associated EUROCAE ED-14D / RTCA DO-160D Environmental requirements for Fixed Wing and Helicopter aircraft.
- Associated EUROCAE ED-12B Software requirements based on ED-12B, Level C.
- Type Approval requirements for ground operation, meeting ETSI EN 300 676.
- CE Conformity requirements for ground operation, meeting ETSI EN 301 489-1 and -22.
- DFS (Deutsche Flugsicherung) No. D - 0002/2002 German (ground) Type Approval.
- DIN / ISO 7637-1 Dc supply in 12 Vdc vehicle,

KBA No.: e1 03 2777 (2008).

- FCC Compliance with Part 15 (receiver) and Part 87 (transmitter), FCC ID: BVYFSG2T.
- FAA / TSO Authorization

2.5 Re-calibration Information

IMPORTANT!

- For the first time after three years, FSG 2T equipment for ground applications requires checking and re-calibration of the high precision reference frequency (tolerance better than ±10 ppm).
- For airborne applications, no frequency re-calibration is necessary, since applications in the 25 kHz channel spacing require a frequency accuracy tolerance of less than ± 20 ppm.
- All tolerances include the full operating temperature range of -20°C ... +55°C / -4°F ... +131°F.
- Checking and re-calibration must be performed by the equipment manufacturer or through authorized and approved avionics services!

2.6 Operating License

IMPORTANT!

- Depending on national regulations, VHF/AM ground and / or VHF/AM airborne operation may require an individual national operating license. Such license is usually granted by the responsible National Telecommunications Authority, through suitable application forms.
- Aircraft registration, operator's name, address and operating license payment details, radio type / model, Serial number, ESTO number EASA.21O.1304, and DFS number D-0002/2002, or, when applicable, the FCC ID number BVYFSG2T.

Example:

2.7 Optional Accessories and Spare Parts

A/N	Description
F10345	Spring steel band antenna, swivel type, PL-259 connector
W00043	Magnet mount vehicle rod antenna, incl. 4 m/13 ft cable, and UHF connector PL-259
W00114	Mobile Whip Antenna with shock spring, 118 - 137 MHz, incl. 5 m/ 16.5 ft cable, w/out UHF connector PL-259
F10314	Balloon antenna BFA 1, 118-137 MHz, weatherproof - flexible - high efficiency, including 3 m/10 ft cable and UHF connector PL-259
W00013	Roof mounted weatherproof folded-top fiberglass antenna, UHF-connector, anti static, 1" mount
E57328	UHF antenna connector PL-259 for antenna cable RG-213/U
B01116	Antenna cable RG-213/U, low loss, for roof antenna W00013, please state length (in meters)
F10041	Dyn. hand-held microphone incl. PTT-switch, coiled cord and 5-pole DIN plug
F10042	Dyn. hand-microphone/loudspeaker with PTT-switch, coiled cord and 5-pole DIN plug
F10125	Inline PTT-switch (U-94 A/U), coiled cord, 5-pole DIN plug, to connect headset W00048, clip allows attaching to clothing
W00048	Dynamic headset with PJ-plug, fits inline PTT-switch
F10393	Car Cable, coiled cord, incl. 3-pole DIN plug to supply station from 12 Vdc car battery (fits cigarette lighter socket, minus = ground)
E61933	3-pole twist-lock DIN Connector, to fit into "**12 V DC EXT.**" socket of carrying case 2T PC.
E08834	5-pole twist-lock Connector, to fit into "**MIC**" socket of carrying case 2T PC.
E61181	Valve-regulated lead acid battery, 12 Vdc, rated capacity 7.2 Ah

Section 3 Functional Description

3.1 Introduction

This section includes a functional description of each switch, push button, knob, socket, indicator and display located on the front or rear panel of the FSG 2T PC, together with operating instructions.
After removing the Snap-On cover all controls to operate the transceiver are accessible. The cover can be pushed onto the rear side of the carrying case.

DANGER!

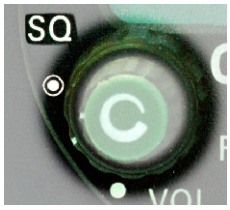
- DO NOT lean over the equipment when opening the cover! If not properly tightened the spring steel band antenna may bounce out!

3.2 Operator's Controls and Indicators

A front and back view of the FSG 2T PC is given on the last page of this manual. Please fold out the back flap when reading the operating instructions. Each position number of a control, knob, switch, etc., corresponds to the number of control, knob, switch, etc., given below.

Control		Description / Function
①	**VOL** 	Rotary switch and control (inner knob) ▷ To turn ON the radio, rotate the **VOL** knob clockwise from the OFF position (dot). When power is activated • the front panel **TX/RX** LED lights up green momentarily, then • all segments of the display are visible for a short time, to verify their operation. • The display shows the firmware version and then • the operating mode, which was used before last turning OFF or Power OFF: The radio is now ready for use. ▷ Rotating the **VOL** knob clockwise (cw) increases - turning counter-clockwise (ccw) decreases the audio volume audible in the built-in loudspeaker or a connected headphone. ▷ To turn OFF the radio rotate the **VOL** knob fully counter-clockwise (ccw) to the OFF position (dot). Blank display.

② **SQ** (SQUELCH)



Rotary control (outer ring)

After turning ON the radio FSG 2T the automatic squelch is active depending on the **SQ** knob position.

Standard Operating Mode:

- ▷ Set the **SQ** knob to the dot ◉ position, the Squelch (mute) threshold is approximately 1 µV. No Receiver noise should be audible during Standby. Only received signals above the **SQ** threshold are audible.
- ▷ Rotating the **SQ** knob fully counter-clockwise (ccw) puts the radio into the **SQ**-OFF mode (overrides the automatic squelch). Basic receiving noise is then audible during Standby. This adjustment gives maximum receiving range. Slightly increased current consumption.
- ▷ Rotating the **SQ** knob clockwise (cw) achieves Receiver muting.
- ▷ To eliminate ignition noise or RF interference adjust the **SQ** knob up to the full clockwise (cw) position. This gradually increases the required RF signal to exceed the **SQ** threshold (max. threshold 5 µV / -93 dBm).

③ **STO** (STORE)

Push button

- ▷ When pressing the **STO** button (within approx. one minute)
- storing of a frequency in one of the memory channels is initiated, or
- storing of a frequency is confirmed (at least 1 sec).

20 frequencies may be programmed in non-volatile memory channels. The channel memory numbers (1 ...20) are user programmable.

If the FSG 2T is set to "**CH ONLY**" Mode **STO** button is without function!

④ **TX/RX** LED

The **TX/RX** 3-color Status LED on the front panel indicates the following:

CLEAR .....indicates a Standby condition or radio is OFF.
STEADY RED .....indicates a Transmit condition without or too low modulation.
FLICKERING YELLOW.....indicates a Transmit condition with proper microphone signal / modulation.
STEADY YELLOW.....indicates a Transmit condition with too much modulation or background noise (microphone sensitivity too high)
STEADY GREEN.....indicates a Receive condition; Squelch is open automatically (or set OFF manually).

⑤ **F/CH** Button

Push button

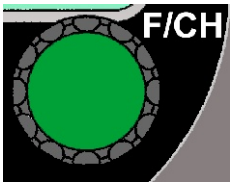
▷ When pressing the **F/CH** button

- while in **DIRECT TUNE MODE** (MHz or kHz is underscored), this will change the radio into **CHANNEL MODE**, or
- while in **CHANNEL MODE** (Channel number is underscored), this will change the radio into **DIRECT TUNE MODE**.

The last used frequency in each mode remains. This allows toggling between two operational frequencies by just pressing the **F/CH** button.

If the FSG 2T is set to "**CHANNEL ONLY**" Mode press **F/CH** button will show the DC supply voltage for 5 seconds (instead of continuous channel number).

⑥ **F/CH** Knob



Rotary control and push button = dual function

▷ Pressing the **F/CH** knob once

- while in **DIRECT TUNE MODE** changes the access from kHz to MHz or vice versa from MHz to kHz. The active access to MHz or kHz is underscored by a cursor.
- While in **CHANNEL** or **MONITOR ONLY** mode pressing the **F/CH** knob is without function.

▷ Rotating the **F/CH** knob

- while in **DIRECT TUNE MODE** will increment or decrement the MHz or kHz portion of the active frequency with rollover at each band edge.
- while in **CHANNEL MODE** changes the channel memory number and associated frequency. All channel numbers (1 to 20) can be used.

If the FSG 2T is set to "**CHANNEL ONLY**" Mode rotating **F/CH** knob changes the channel memory number and associated frequency. All 20 channel numbers are adjustable.

IMPORTANT!

- Only ONE control element may be operated at a time. If more than one element is operated simultaneously, function change is blocked.

⑦ Frequency Display

Frequency Display, the 5-digit Liquid Crystal Display (LCD) can be backlit.

Frequency display complies with ICAO rules.

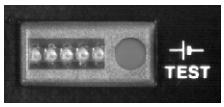
‘ D I R E C T M O D E ’

‘ C H A N N E L M O D E ’ or ‘ C H O N L Y ’

Initial boot at Switch-ON / Power ON

- Displays all segments for 2 seconds
- Clear Display for 0.5 seconds
- Shows Firmware Version for 0.5 seconds
- Goes to last user setting (operating mode and frequency, refer to paragraph 3.3).

⑧ DC Supply Indicator



LED indicator to check the capacity of the built-in battery or external DC supply.

▷ When the red push-button is pressed

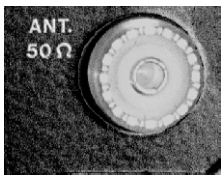
- at least 3 LEDs should light up to indicate sufficient capacity of the battery or DC supply.
- and only two or less LEDs light up either the battery should be recharged or the station should be powered by an external DC source of sufficient capacity (e.g. vehicle battery).
- the display ⑦ and the frontpanel of the transceiver is back-lit.

⑨ Loudspeaker

8 Ohm, 3 Watt, tropics-proof.

To make received signals audible; volume adjustable with **VOL** control ①. It is <u>not</u> switched OFF when using a headset connected to ⑬.

⑩ Antenna Socket



DANGER!

NEVER TRANSMIT inside airplanes, vehicles or buildings without external antenna! Otherwise electronic equipment can be interfered.

CAUTION!

NEVER operate the radio without any antenna!

UHF type antenna socket SO 239, 50 Ohms.

Any 50 Ohms antenna with UHF type cable plug PL-259 and a frequency range of 118 … 137 MHz minimum may be connected to this antenna jack.

- For portable use in the open field we recommend our spring steel band antenna.
- In aircraft or ground vehicles, an external antenna must always be used.
- For long range operation a base station folded top antenna, grounded for lightning protection, is recommended.

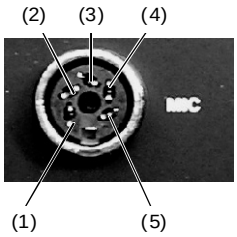
⑪ Antenna Compartment

When using our spring steel band antenna, A/N F10345, this antenna can keep there without disconnecting.

⑫ Microphone Compartment

When using our hand-hold microphone with built-in push-to-talk switch, A/N F10041, this microphone can kept there without disconnecting.

⑬ Microphone Socket



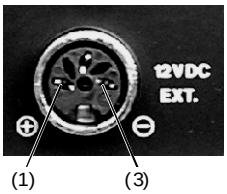
5-pole twist-lock DIN socket to connect microphone, headphone and PTT-switch.

Mating DIN plug: article No. E08834

Any dynamic microphone (200 to 600 Ω), headphone (ca. 300 Ω), push-to-talk key, or dynamic type head-set can be connected to this socket. Wiring refer to "2T PC, Circuit Diagram".

Pin 1	Common Ground (PTT switch/Headphone)
Pin 2	Dynamic microphone
Pin 3	Headphone
Pin 4	Microphone Ground
Pin 5	Push-to-talk key

⑭ NEW SOCKET! External Supply



3-pole twist-lock DIN socket to supply the radio by external 12 Vdc sources.

Mating plug: article No. E61933

The capacity of the built-in battery may not be adequate due to frequent transmitting operations or very long operating times without possibility to recharge. Radio operation can be enabled through an external 12 Vdc power source such as an automobile battery via our Car Cable F10393 which fits into the cigarette lighter socket of most cars (minus on common ground).

Pin 1	Plus 12 Vdc
Pin 3	Minus 12 Vdc (Ground)

⑮ Fixing Screws

Three cross recessed screws, M 3 × 8, to fix the transceiver in the case.

Rear panel:

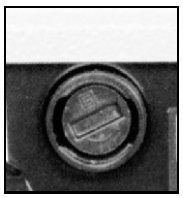
WARNING!
- Risk of electric shock!
- DO NOT OPEN!

⑯ Mains cable compartment

WARNING!
- Changing the plug may only carried out by a trained specialist -electrician-! Please observe national safety regulations!

Contains the mains cable of the built-in battery charger, length of cable: ca. 1.2 m.

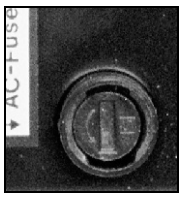
⑰ DC Fuse



WARNING!
- Always turn OFF radio and disconnect mains plug when replacing fuses!

Fuse to protect the transceiver in case of heavy current.
Contains 1 glass cartridge fuse, ∅ 5 × 20 mm,
4.0 Amps, medium time lag.

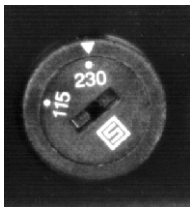
⑱ Mains Fuses



WARNING!
- Always turn OFF radio and disconnect mains plug when replacing fuses!

Fuses to protect the charging unit.
Contains 1 glass cartridge fuse each, ∅ 5 × 20 mm, 0.04 A time-lag.
The fuses fit for both mains voltages, no change required.

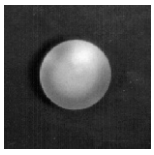
⑲ Mains selector switch



WARNING!
- Always turn OFF radio and disconnect mains plug when changing the mains voltage!

The charging unit is factory set to 230 Vac mains voltage (position ”230”).
When 110 … 115 Vac mains is available, set the mains selector switch by means of a coin or screwdriver to th

⑳ Ejector knob



CAUTION!
- Always turn OFF the radio first when removing from its case!

After removing three cross-recessed screws ⑮ and the matching plate on the front, the transceiver may be dismounted from its case by pressing this ejector knob.

3.3 Frequency Display

5-digit liquid crystal display (LCD), may be back-lit by pressing the "Test" button ⑧.

a) **DIRECT TUNE MODE**, Normal Operation:

Example:
Display shows an active frequency of 129.350 MHz. Turning the **F/CH** knob will either increase or decrease the MHz-portion of the frequency.

Normal on-board Supply 13.8 Vdc (11 ...16 Vdc

b) **CHANNEL MODE**, Normal Operation:

Example:
Display shows Channel no. 3 with its associated active frequency of 126.275 MHz. Turning the **F/CH** knob will either increase or decrease the Channel number.

c) **DIRECT TUNE MODE** (continuously flashing Dc value, Emergency Operation):

Example:
Display shows an active frequency of 134.800 MHz. Turning the **F/CH** knob will either increase or decrease the MHz-portion of the frequency.

Low-voltage: 9.7 Vdc (indicator is flashing!)

d) **CHANNEL MODE**, Emergency Operation:

Steady display for 25 seconds:

Example:
Display shows Channel No. 4 with an active frequency of 118.975 MHz.

Low-voltage: 9.9 Vdc, indicator is flashing!

The flashing low-voltage warning is shown automatically every 25 seconds for 5 seconds when the supply is between 9 Vdc and 11 Vdc.

Flashing supply indicator for 5 seconds:

IMPORTANT!

- During Emergency Operation (low voltage) no storing of frequency is possible!

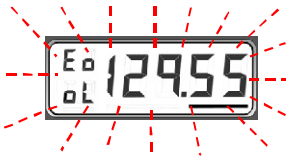
3.4 Error Codes

Display in all Modes!

High Voltage: Continuously slightly too high supply voltage changes value indication into ‘ **H**i’ (above 16.1 Vdc / below 16.5 Vdc).
Above approximately 16.5 Vdc, the radio automatically switches OFF itself, at no display indication.
When supply is reduced to between 16 Vdc and 10.5 Vdc, the FSG 2T comes back into operation.

Temperature Error: The whole LC display flashes. Temperature of the Transmitter Power Amplifier is too high. The keyed transmitter will be disabled.
Switch OFF the radio, wait a few seconds and switch ON again.

Process Error: The whole LC display flashes. A severe process error must have occurred.
Try to revive the radio by switching OFF and ON again.
If the same error occurs contact a DITTEL approved repair facility!



Out-Of-Lock Error: The whole LC display flashes. A severe frequency error must have occurred.
Try to revive the radio by switching OFF and ON again.
If the same error occurs contact a DITTEL approved repair facility!

2 Minutes TOT Time-Out-Timer: After two minutes continuous transmitting the transmitter of the FSG 2T switches OFF itself and the whole LC display flashes as long as the PTT key is pressed.

When the PTT key stuck accidentally it can be received with the adjusted frequency although the display is flashing. After switching the radio OFF and ON again it can be transmitted for another 2 minutes followed by receive mode.

Section 4 Operation

4.1 Introduction

This section contains a description of the basic operation procedure for the portable transceiver FSG 2T PC.

DANGER!

- DO NOT OPERATE THIS RADIO IN AN EXPLOSIVE ATMOSPHERE (PETROLEUM FUELS, SOLVENTS, DUST, ETC.).
- DO NOT lean over the equipment when opening the cover! If not properly tightened the spring steel band antenna may bounce out!

After removing the Snap-On cover all controls to operate the transceiver are accessible. The cover can be pushed onto the rear side of the carrying case.

A front and back view of the FSG 2T PC is given on the last page of this manual. Please fold out the back flap when reading the operation instructions.

4.2 Battery Check

- If applicable, disconnect built-in charger from mains first, before checking the battery supply.
- Press the red test button of the battery indicator ⑧.
- The LED indicators ⑧ will light up.
  - ➔ 5 LEDs ON = battery fully charged, supply OK!
  - ➔ 3 to 4 LEDs ON = battery partially discharged; reduced operation time when powered only from the battery.
  - ➔ 2 or less LEDs ON = battery discharged. The battery should be recharged or the radio should be powered by an external 12 Vdc source of adequate capacity (e.g. automobile battery).

Additionally the transceiver FSG 2T includes a 3 digit display of the actual supply voltage level while in the ‘DIRECT TUNE MODE‘ levels below 11 V the voltage digit value starts automatically flashing for low supply warning!

Reference:	Approximately +20°C / +68°F, battery 7.2 Ah, only radio is supplied.
Duty cycle:	10% Transmit, 20% Receive, 70% STBY
Flashing Dc value only in Transmit:	ca. 4 hrs left
Flashing Dc value also during Receive:	ca. 45 min. left. Recommendation: Reduce utmost transmitting!
Short-time flashing Dc value during Standby (**SQ** ON, clear channel)	ca. 45 min. left in Standby. Cease transmitting!
Continuous flashing Dc value during Standby (**SQ** ON, clear channel)	Radio will soon switch OFF itself! Recharge battery as soon as possible.

Remark: These transitions are fluent. Recovery effect after load reduction may be possible. Low battery temperature reduces operation time.

IMPORTANT!

- The battery must always be recharged immediately after an extensive discharge because this incurs the risk of deterioration and permanent damage - this risk is increased if a discharged battery is stored in that state.

4.3 Charging the Battery

- Charging should be done within the ambient temperature range of +10°C to +40°C.
- First check the line voltage and set it with the voltage selector switch ⑲ on the back, if necessary.
- Take out the mains cord from its compartment ⑯ and connect it to a wall socket.
- The transceiver may be operated while charging.
- Charging lasts up to 30 hours depending on the state of the battery.
- Overcharging the battery is not possible due to automatic controlled charging function. For trickle charging or buffer operation the charger can be left unattended continuously connected to mains. A fully charged battery can be stored for several months.

4.4 Antenna - Antenna jack SO 239

DANGER!

- NEVER TRANSMIT in vehicles, aircraft or inside buildings with the spring steel band antenna! This may cause malfunction of the avionics, trigger the airbag or mix-up electronic equipment! Always operate the radio with a suitable external antenna!
- NEVER OPERATE the radio without any antenna!
- Already a transmit power higher than 1 Watt creates very high electromagnetic field strengths in close proximity to shortened antennas (e.g. rubber helix antennas). This causes a high radiation exposure for persons and may produce sparks under certain circumstances!

As portable radio used in the open the FSG 2T PC is usually operated with the spring steel band antenna (Article-No. F10345).
The spring steel band antenna, connected to the SO 239 antenna jack ⑩, can be replaced by any other 50 Ω antenna with UHF type PL-259 cable plug and a frequency range of 118 … 137 MHz minimum.

When the FSG 2T PC is operated in open, non-metallic or wire mesh balloon baskets we recommend BFA's 'Balloon

To operate the radio in aircraft or ground vehicles a suitable external antenna should always be used.

For long range operation a base station folded top antenna, grounded for lightning protection, is recommended.

- Ensure the plug of your antenna or antenna cable is securely tightened.
- If the spring steel band antenna is used, pull it out of its compartment ⑪ and adjust it in a vertical position by tightening the screwed cap and wing screw.

4.5 Microphone

The hand-held dynamic microphone with push-to-talk switch (Article-No. F10041) which fits into the Portable Case 2T PC can be replaced by any other dynamic microphone (200 to 600 Ohms) with PTT switch or a head-set for dynamic type systems with additional PTT switch (mating 5-pole DIN plug: Article-No. E08834, wiring to station, refer to Circuit Diagram 2T PC).

- Plug microphone; ensure the plug is secured by twist-lock cap.

4.6 Turning ON - Selecting Frequency - Audio Volume

CAUTION!

- The FSG 2T PC should be turned on after engine start-up. This is a simple precaution which helps to protect the solid state circuitry and extends the operating life of your avionics equipment.

IMPORTANT!

- Frequent transmissions as well as large receiving volume reduce the operating time when radio is only powered by the built-in battery!

▷ Turn the radio FSG 2T ON by rotating the **VOL** knob (1) clockwise. For a short time the **TX/RX** LED (4) lights up green and all segments of the display are visible to verify their operation. After indicating the Firmware version, the last used operating mode and frequency are displayed.

No warm-up period is required. However, at temperatures of approx. -20°C / -4°F, the LC display needs approximately one second until it is fully visible when the frequency or operating mode is changed.

▷ To change the operating mode and therefore the display: Press the **F/CH** button (5).

Example:

STANDARD: **DIRECT TUNE MODE**

After switching ON the radio, either the MHz portion or the kHz portion of the displayed frequency is underscored. The underscore indicates accessibility to this portion.

Assume the MHz is underscored: Select the appropriate MHz portion by rotating the **F/CH** knob (6). A clockwise rotation will increment the previous frequency in 1 MHz steps (130, 131, 132 etc.) while a counter-clockwise rotation will decrement the previous frequency in 1 MHz steps (128, 127, 126 etc.) with rollover at each band edge (118.XX → 136.XX or 136.XX → 118.XX).

Press the **F/CH** knob (6) once, the cursor will jump to underscore the kHz portion.

The underscored kHz portion of the frequency indicates accessibility to kHz selection.

Select the appropriate kHz portion by rotating the **F/CH** knob (6). A clockwise rotation will increment the previous frequency in 25 kHz steps (37, 40, 42 etc.) while a counter-clockwise rotation will decrement the previous frequency in 25 kHz steps (32, 30, 27 etc.) with rollover at each MHz and band edge (121.97 → 122.00 or 121.00 → 121.97).

This is the new active frequency!

Example:

CHANNEL MODE or **CH ONLY**:

Important: The appropriate operating frequency must be stored already in a memory channel (refer to § 4.9 Memory Programming).

Select appropriate channel memory number together with the associated frequency by rotating the **F/CH** knob ⑥. A clockwise rotation will increment (4, 5, 6 etc.) while a counter-clockwise rotation will decrement (2, 1, 20 etc.) the previous channel number with rollover at each edge.

This is the new active frequency and its associated channel memory number!

▷ Rotate **VOL** knob clockwise, about half way.

Continue either with

4.7 Receive (Listen) Operation, or

4.8 Transmit (Talk) Operation

4.9 Memory Programming

4.7 Receive (Listen) Operation

- After turning the radio ON the automatic squelch is either ON or OFF depending on **SQ** knob (2) position.
- Squelch ON means that – without received si noise is blocked, the **TX/RX** LED (4) is clear. When normal signals are received, the **TX/RX** LED (4) turns to green, weak signals and interfering pulses are disabled.
- Set the RX volume of the built-in loudspeaker (9) or earphone to a comfortable level by rotating the **VOL** knob (1).
- Weak signals can be received if the squelch circuit is switched OFF by rotating the **SQ** knob (2) fully counter-clockwise. Then typical RX noise is continuously heard during communication breaks.
- Rotating the **SQ** knob (2) more cw clockwise switches the squelch circuit ON again.
- DO NOT press the PTT (Push-To-Talk) key if you want to receive! During RX the **TX/RX** LED (4) must not light RED or flicker YELLOW!

This radio contains an audio-leveling circuit. So if you change the frequency or you receive another station you should get an almost constant audio volume (the received signal must be at least modulated by 30% AM).

IMPORTANT!

- Switching OFF the Squelch only makes sense if long range reception shall take place. Thus the radio is noisy during Standby operation, but no weak signals are suppressed and the full receiving range is available!
- Notice increased current consumption when battery operated!

4.8 Transmit (Talk) Operation

WARNING!
Every radio, when transmitting, radiates energy into the atmosphere, therefore:

- DO NOT operate this portable radio in an explosive atmosphere (petroleum fuels, solvents, dust, etc.)! Risk due to generation of sparks!
- DO NOT transmit with the spring steel band antenna inside aircraft or vehicle. This may cause malfunction of onboard avionics, trigger the vehicle airbag or interfere onboard instruments! Always operate the portable radio FSG 2T PC with a suitable outdoor / external antenna! Assure appropriate lightning protection / grounding where (elevated) outdoor antennas are used.
- Never place the radio such as the antenna gets very close to, or touching, exposed parts of the body, especially the face, shoulder or the eyes. Persons with pacemakers should be aware that proper functioning may be affected when in the vicinity of the antenna!

IMPORTANT!

- Please keep radio discipline!
- DO NOT transmit on a busy channel!
- DO NOT transmit on 121.50 MHz as this is the international distress frequency!
- Care for an all-round obstacle free antenna location; the called station should be within "line-of-sight" distance.

If the operating mode shall be changed:

▷ Push the F/CH button ⑤.

If the active frequency shall be changed:

Refer to § 4.6 Turning ON - Selecting Frequency - Audio Volume.

Transmitting is normally performed on a clear channel (no communication audible).

▷ When the DITTEL hand-held microphone, article-no. F10041 is used, take it out of its compartment ⑫.

▷ Press and hold the PTT (Push-To-Talk) key. Talk in a loud, clear voice with the microphone opening 2 to 4 cm (1" - 2") from your lips.

▷ Make each transmission as brief as possible.

▷ As long as the PTT key is pressed the **TX/RX** LED at the front lights red! When modulated properly, the red **TX/RX** LED ④ turns

to flickering YELLOW.

▷ Release the PTT key to end transmission and to clear the channel for reception; the **TX/RX** LED must turn to clear (Standby) or green (Receive / Intercom).

IMPORTANT!

- The radio is equipped with a transmit TOT time out timer. This is used to limit the duration of transmissions to approximately 2 minutes. When the transmitter is keyed continuously longer than 2 minutes the display of the FSG 2T starts flashing and transmission is disabled. Although the display is flashing receiving on the displayed frequency is possible!
- If you have to make calls longer than 2 minutes, momentarily release the PTT key and press again.
- Should the TOT disable the transmitter accidentally (e.g. stuck PTT key) and you have to transmit, turn radio OFF and ON again. This allows another 2 minutes to transmit.

4.9 Memory Programming

IMPORTANT!

- Memory programming is disabled for all FSG 2T radios which are marked Chann ONLY!
- Memory programming is disabled at a supply voltage below 11 Vdc.
- When storing a frequency into a memory the "old" frequency will be overwritten without warning!

Up to 20 non-volatile memories can be user-programmed. They are accessible after calling up the respective **CHANNEL MODE**.

4.9.1 Programming while in the **DIRECT TUNE MODE**:

Example:

▷ Turn the **F/CH** knob ⑥ to change the underscored portion of the frequency to the desired frequency.

▷ Press the same knob once and note that the cursor has jumped to underscore the other portion of the frequency.

▷ Turn the **F/CH** knob ⑥ to select the desired frequency.

▷ Press the **STO** button ③ to initialize storing.

▷ Release the **STO** button. The "dc" display disappears, a flashing "CH" together with the underscored last used channel number is shown. The active frequency is now ready within 1 minute to be stored in any of the 20 memory channels.

▷ Use the **F/CH** knob ⑥ to select the desired memory location.

▷ Press and hold the **STO** button ③ for at least 1 second. The flashing "CH" should change to steady "St" and the underscore disappears indicating that it has been stored into memory successfully.

▷ Release the **STO** button and the radio returns to **DIRECT TUNE MODE**. The stored frequency is now the active frequency.

4.9.2 Programming while in the **CHANNEL MODE:**

IMPORTANT!

- While in the ***CHANNEL MODE*** only pre-programmed Channel Numbers with its corresponding frequencies can be stored in other memory locations!

Example:

▷ Turn the **F/CH** knob ⑥ to change the underscored Channel Number to the desired Channel Number to be stored in another memory location.

▷ Press the **STO** button ③ once to initialize storing.

▷ Release the **STO** button ③. A flashing "CH" is shown. The active Channel Number and its frequency are now ready within 1 minute to be stored in any of the other 19 memory channels.

▷ Turn the **F/CH** knob ⑥ to select the desired memory location.

▷ Press and hold the **STO** button ③ for at least 1 second. The flashing "CH" should change to steady "St" and the underscore disappears indicating that it has been stored into the new memory successfully.

▷ Release the **STO** button and the radio returns to **CHANNEL MODE**. The stored Channel Number is now the active Channel Number with its corresponding frequency.

4.10 Lighting the Frequency Display and Front Panel

▷ Lighting of the frequency display (7) and Front panel is activated by pressing the red test button of the battery indicator (8).

4.11 Turning OFF the radio

▷ Always turn OFF the radio after use by rotating the **VOL** switch (1) to the fully ccw position to prevent discharge of the battery.

▷ Place the microphone in its compartment (12).

▷ Loosen screwed cap and wing screw of the spring steel band antenna and push the upper part into its compartment (11). Bend the remaining portion so, that the Snap-On cover can be placed in position.

DANGER!

- Always tighten the antenna's screwed cap and wing screw before closing the cover; otherwise the spring steel band antenna will bounce out, when the cover is lifted again!

4.12 External Power Supply

The capacity of the built-in battery may not be adequate due to frequent transmitting operations or very long operating times without possibility to recharge. Radio operation can be enabled through an external 12 Vdc power source such as an automobile battery via our Car Cable F10393 which fits into the cigarette lighter socket of most cars (minus on common ground).

4.13 Removing & Installing the Transceiver

IMPORTANT!

- Switch OFF the radio first! This is a simple precaution which helps protect the solid state circuitry and extends the operating life of your avionics equipment.

▷ To dismount the transceiver FSG 2T from the case 2T PC, remove the three cross-recessed screws (15) and lift off the matching plate. Eject the transceiver from the rear connector of the case by pressing ejector knob (20) on the rear. Pull out transceiver.

▷ To install the transceiver, carefully insert it into the case. The plugs mate automatically to the case's wiring. Put on the matching plate and fix it by the three cross-recessed screws (15). Check fixing and function.

4.14 Battery Operating Times

The following duty cycle of Transmit (TX), Receive (RX) and Standby (STBY) results in available operating time (hours). Both the worst and the most favorable operation conditions are considered, e.g. maximum receiver volume combined with maximum speaker load.

Higher current consumption will degrade the nominally available battery capability, as well as lower temperatures. The following tables show significant time differences depending on current consumption due to different duty cycles and temperatures.

Condition: only headset operated

Max. current drain	.05A	1.35A	.26A	.05A	1.35A	.26A	.05A	1.35A	.26A	.05A
Sealed lead-acid Accumulator 12 Volts 7.2 Ah	STBY, w/out RX	5% TX	5% RX	90% STBY	10% TX	20% RX	70% STBY	20% TX	40% RX	40% STBY
Temperature -20°C/-4°F	76 hrs	30 hrs			16 hrs			9 hrs		
Temperature +20°C/+68°F	131 hrs	52 hrs			29 hrs			16 hrs		
Temperature +50°C/+122°F	139 hrs	55 hrs			30 hrs			16 hrs		

Condition: maximum RX audio volume (Loudspeaker

Max. current drain	.05A	1.35A	.8A	.05A	1.35A	.8A	.05A	1.35A	.8A	.05A
Sealed lead-acid Accumulator 12 Volts 7.2 Ah	STBY, w/out RX	5% TX	5% RX	90% STBY	10% TX	20% RX	70% STBY	20% TX	40% RX	40% STBY
Temperature -20°C/-4°F	76 hrs	25 hrs			11 hrs			6 hrs		
Temperature +20°C/+68°F	131 hrs	44 hrs			20 hrs			10.5 hrs		
Temperature +50°C/+122°F	139 hrs	46 hrs			21 hrs			11 hrs		

4.15 Emergency Operation

Without degradation the FSG 2T can be operated on a dc source between 11 Vdc and nearly 9 Volts. This however will NOT reduce the TX output level, RX sensitivity, and audio output power, due to internal supply regulation. Below 11 Volts the dc indicator flashes continuously as a low supply warning.

Since the current drawn from battery will increase with lowered Dc supply voltage, the automatic shut-down will speed-up.

If the supply voltage drops below 9 Vdc the FSG 2T switches OFF itself. This automatic feature avoids battery damage due to deep discharging, even if the radio is left switched ON for months! This is true for all types of 12 Vdc batteries.

If the battery recovers and voltage exceeds approximately 10.3 Vdc, the radio returns to operation with the last used setting.

4.16 Siting

The radio FSG 2T operates in the VHF frequency band, this is a Line-Of-Sight (LOS) frequency; therefore, siting of the radio greatly affects its operating range. The longest range is normally obtained when a direct LOS is maintained between the radios. Use of hilltop, roof or tower locations will increase the LOS range. Location in valleys with intervening hills, behind vehicles or buildings or in dense woods may reduce or prevent communications. If possible, avoid antenna locations near electrical interference sources, such as computers, power and telephone lines, radar, welders and electrical generators.

4.17 Base Operation

To operate the radio as a base station, a weather-proof anti static and lightning protected folded-top antenna is ideally suited. The antenna should be mounted vertically and elevated as high as possible on a roof, horizontally free of obstacles. The antenna mast has to be grounded and anchored, as necessary. For a distance of up to 15 meters the antenna cable may be a RG-58 C/U type, for longer distances always use the cable type RG-213/U (low loss).

In general, the antenna cable should not be longer than necessary.

4.18 Troubleshooting

If the portable transceiver FSG 2T PC does not operate correctly, check the following:

- Is the required frequency visible? Adjust required frequency or channel number!
- Is onboard supply sufficient? Observe onboard supply indicator particularly during transmit, at least 11 Vdc must be shown!
- Weak RX signal? Adjust **SQ** control counter-clockwise!
- Weak TX signal? Check microphone, mic setting, radio, or antenna system! Lights **TX/RX** LED RED while speaking? The voice volume is too low, check MIC setting. Speak loud and clear while the lips are facing the microphone! The **TX/RX** LED must flicker YELLOW!
- Singing during transmit? Adjust sidetone more quietly; keep microphone in other position!
- Rattles when transmitting? Metal propellers between antenna and ground station!
- Tower hears carrier, but no voice? Check **TX/RX** LED (red or yellow?), microphone and contacts on microphone jack!
- Noisy - distorted - garbled? Suppress electrical interference of motor aircraft or vehicle (generator, regulator), check antenna-, microphone- and radio- connector for proper seat!
- Flashing display, transmitter switches off itself? PTT key sticks! Check PTT key and cables. Transmitter was keyed longer than 2 minutes. Release PTT key, normal operating is possible again. In case of emergency turn radio OFF and switch ON again, this permits another two minutes to transmit "blind".

In case of doubt, compare operation of the transceiver with another transceiver on the same location or call another station. If service is necessary please consult your authorized dealer or an approved avionics workshop.

Section 5 Technical Data FSG 2T PC

5.1 General

Type:	FSG 2T PC Portable amplitude modulated (AM) VHF Avionics Transceiver
Frequency range:	118.000 ... 136.975 MHz
Channels:	760 channels, 25 kHz spacing
Frequency selection:	VFO, digital
Frequency display:	5 digit 7-segment LCD display (backlit)
Frequency control:	PLL frequency synthesizer, microprocessor controlled
Memories	20, stored in a non-volatile EPROM
Additional features:	2 operating modes; voice activated Intercom; transmit Sidetone via headphone; onboard supply display; three-color status LED; TX Time-out-Timer; error code.
Connectivity for	External 12 Vdc supply, dynamic, non-amplified microphone, PTT key, headphone, headset, 50 Ohm antenna

5.2 Dimensions, Weight

Dimensions	Width = 86 mm, height = 345 mm, length = 277 mm (incl handle)
Weight	5.7 kg including hand-held microphone and spring steel band antenna

5.3 Power Supply, Fuses

Built-in battery	Gas-tight lead-acid battery, 12 Vdc / approx. 7.2 Ah							
Voltage Range, Radio	Nominal 13.8 Vdc (normal 11.0 ... 1							
Emergency Operation	9 Vdc ... 11 Vdc (flashing display)							
Automatic Turn-OFF	At approx. 8.5 ... 9 Vdc, comes back							
Current Consumption at:	9 Vdc		11 Vdc		13.8 Vdc		16 Vdc	
Squelch ON, no AF volume	80 mA		65 mA		50 mA		40 mA	
Receive, Intercom and / or AF External, Headphone	400 mA		330 mA		260 mA		210 mA	
Receive, max. volume, Loudspeaker (30 %.. 85 %A M)	1400 mA		1150 mA		800 mA		600 mA	
Transmit Mode (carrier /70% AM)	1.8 A	2.2 A	1.45 A	1.7 A	1.1 A	1.35 A	0.9 A	1.2 A
Backlighting	add 60 mA							
Dc supply voltage metering status	≥ 12.7 Vdc ≥ 12.0 Vdc	Battery full Battery ca. ½ capacity						
Emergency operation	< 11.0 Vdc	Battery is nearly flat, display starts flashing between 11 V and 9 Vdc supply						
Fuse, Radio	1 × 4 Amp, semi-time lag							
Nominal Voltage, built-in charger	115 VAC / 230 VAC, 50 ... 60 Hz							
Power consumption, built-in charger	9 VA / 39 mA							
Fuses, built-in charger	2 × 0.04 Amp, slo-blo							

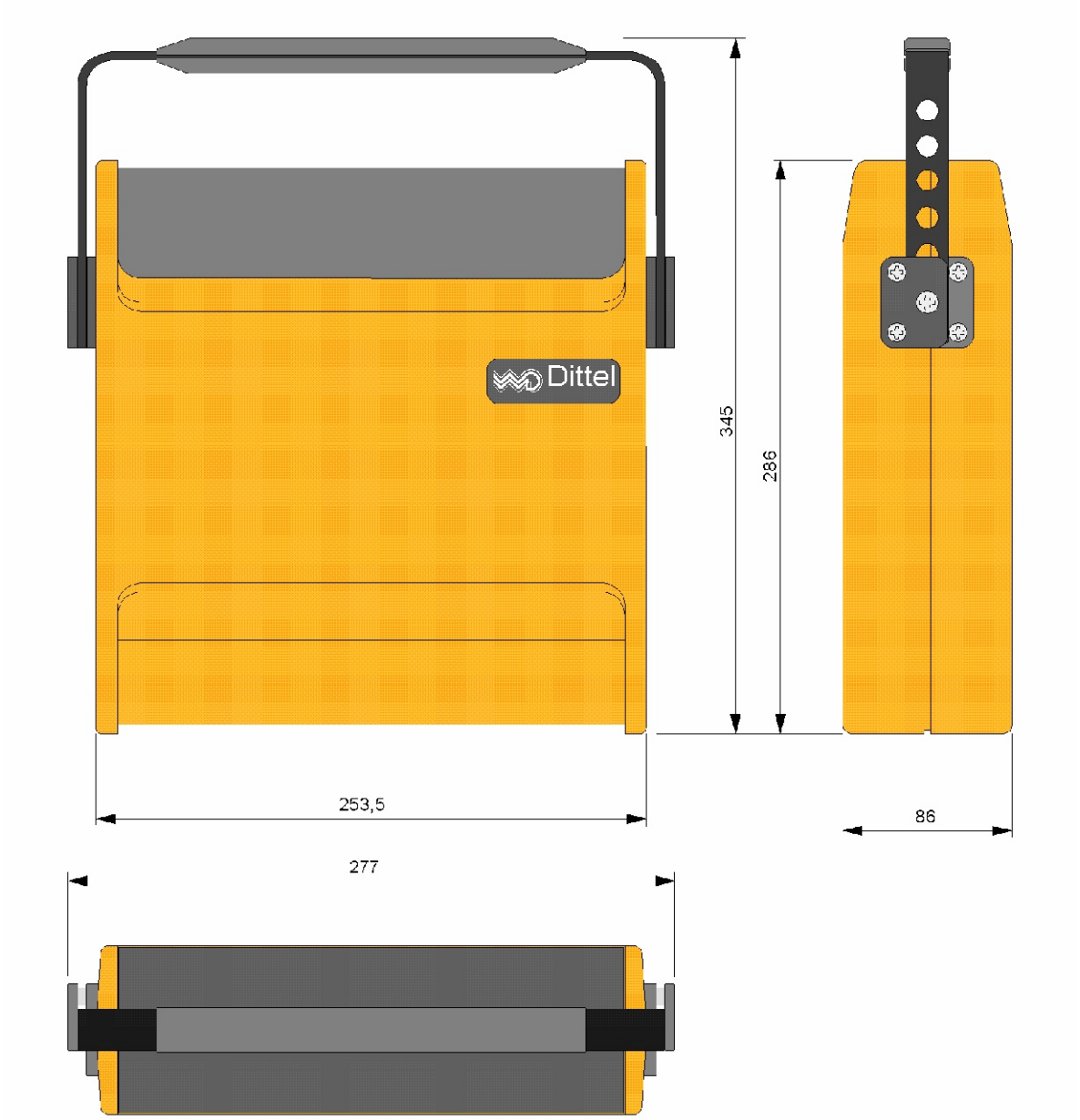
5.4 Detailed Receiver Specification

Receiver Type	Single Superhet
IF Frequency	IF 21.4 MHz, high injection
Sensitivity (m = 30% / 1,000 Hz)	≤ 1 µV (≤ -107 dBm / 50 Ω) for 6 dB S+N/N
Selectivity (AGC method)	≤ 6 dB at ± 8 kHz ≥ 60 dB at ± 17 kHz ≥ 70 dB at ± 25 kHz
Squelch Type, manual override	Automatic (FM noise /Carrier override), adjustable on front panel
AGC (m = 30% / 1 kHz)	≤ 6 dB, 1 µV (-107 dBm) to 1 V (+13 dBm / 50 Ω)
AGC Delay (RX), m = 30%/1 kHz	≤ 0.2 sec, 5 mV (-33 dBm) to 5 µV (-93 dBm / 50 Ω)
AGC Recovery after TX	≤ 0.1 sec at 5 µV (-93 dBm / 50 Ω), after TX end
Transfer time RX to TX	≤ 50 msec
Modulation distortion	≤ 10 % 350 ... 3,400 Hz (m = 85 %)
Audio Frequency Response / AF Fidelity	≤ 6 dB (+2 dB / -4 dB), 350 ... 3,400 Hz, ≥ -20 dB at 4 kHz, 25 kHz Ch spacing (Climax Offset Operation)
Nominal AF Output (Speaker)	≥ 4 Watt into 4 Ω (at 9 Vdc ...16.1 Vdc supply)
Nominal AF Output (Phone)	≥ 50 mW into 300 Ω (at 9 Vdc ...16.1 Vdc supply)
AF Noise Level, normal operation (under environmental conditions)	≥ 35 dB (≥ 25 dB), m = 30% / 1,000 Hz at 100 µV to 5 mV / -67 dBm to -33 dBm / 50 Ω
AF External Input (OPTION)	ca. 1 Volt into 600 Ω for rated AF output
Receiver Immunity Spurious Response for ≤ 6 dB S+N/N (m = 30% / 1 kHz)	≥ 5 mV (-33 dBm / 50 Ω) 108 - 156 MHz (any 25 kHz Test Channel ≤ ± 8 kHz), except assigned channel and adjacent channels 50 kHz – 1,215 MHz, except 108 - 156 MHz
Cross Modulation	Max. AF output level ≥ 10 dB below nominal AF output level: Wanted signal 10 µV (-87 dBm) to 250 µV (-59 dBm / 50 Ω), unmodulated at assigned RX channel, plus additional Unwanted signal 5 mV (-33 dBm), m = 30% / 1000 Hz, frequency 100 - 156 MHz (assigned channel ± 2 RX channels)
Intermodulation (FM Immunity)	≤ 6 dB AF Quieting (-5 dBm / 50 Ω, 87.5 - 107.9 MHz), 2 signals
RF Intermodulation within the VHF Frequency Band	≥ 70 dB, for 6 dB AF Quieting (unmodulated test signals) Any VHF / AM Ch +1/+2 Ch, -1/-2 Ch, +1/+2 MHz, -1/-2 MHz
Desensitization	≥ 6 dB S+N/N, at wanted signal 10 µV (-87 dBm), at RX frequency, m = 30% / 1,000 Hz, in the presence of: Unwanted signal A 5 mV (-33 dBm / 50 Ω), unmodulated, any frequency 108 ... 156 MHz, except used CH and ± 1 RX CH, or Unwanted signal B 100 mV (-7 dBm / 50 Ω); minimum 5 mV (-87 dBm), unmodulated, frequency 50 kHz – 1,87.5 MHz ... 156 MHz, or Unwanted signal C 125 mV (-5 dBm), unmodulated, frequency 87.5 ... 156 MHz
Receiver Spurious Emission	≤ 141 µV / 400 pW / -64 dBm (50 kHz ... 8 GHz)
Channel Selection Time	≤ 0.4 sec, AF level within 3 dB, max. 20 Memory Channels

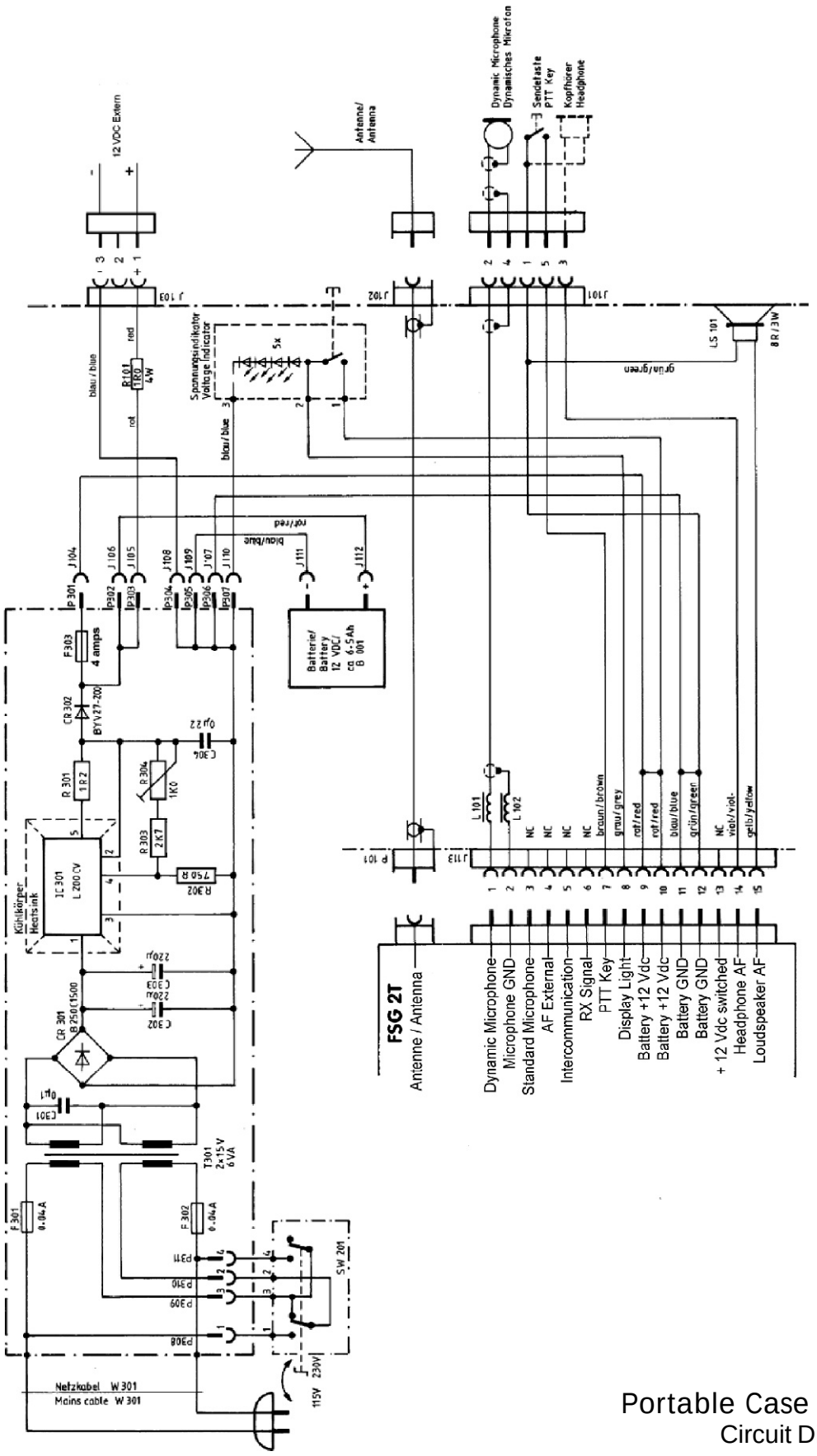
Receiver Muting, Squelch (CLIMAX RX Operation)	Simultaneous input of: Wanted Signal A: 5 µV (-93 dBm) +8 kHz (m = 30% / 1,000 Hz), Squelch is open. Unwanted Signal B: More than 12 µV (-85 dBm), m = 30% / 1000 Hz. While this channel frequency is varied slowly from -8 kHz to +4 kHz, Squelch must remain open.

5.5 Detailed Transmitter Specification

TX RF Output Power (also during emergency operation)	approximately 5 Watts / 50 Ω (carrier), 18 Watts PEP, at 9 Vdc ... 16.1 Vdc, -0.5 dB ... +1,5 dB
TX Duty Cycle	1 : 4 (1 minute TX / 4 minutes RX)
Frequency Tolerance	≤ 10 ppm (-20°C ... + 55°C / -4°F ... + 131°F) ≤ 5 ppm (0°C ... + 40°C / +32°F ... + 104°F)
Modulation	Amplitude modulation, AM (7K00A3EJN)
Depth of Modulation	85% ± 2%, approx. 60-70% AM <u>average</u> with Voice modulation
Modulation Distortion	≤ 10%, m = 70% / 1,000 Hz ≤ 15%, m = 70% / 350 ... 3,400 Hz
Modulation Audio Frequency Response	≤ 6 dB (+2 dB / -4 dB), 350 ... 3,400 Hz
Modulation AF Input for m = 70% Located at the rear panel DIL switches and potentiometers allow proper customized microphone type selection and proper modulation adjustment for each MIC input	Standard factory setting: Mike 1: Dynamic Microphone: ≤ 1 ... 10 mV symmetrical, sensitivity adjustable. Mike 2: Amplified / Carbon Microphone: ≤ 80 ... 500 mV unsymmetrical, sensitivity adjustable. <u>Note</u>: One, or two <u>identical</u>, dynamic <u>or</u> Standard Carbon microphone(s) may be used on each mike input. For Standard Carbon Microphone(s) the supply current can be set to 2 mA, 8 mA, 10 mA, or none.
Transmit Audio Sidetone	≥ 50 mW into 300 Ω (at 9 Vdc ... 16.1 Vdc supply) average phone volume is adjustable on equipment's rear side
Carrier Noise Level	≥ 35 dB (m = 70% / 1000 Hz)
Emission of RF Energy (≤ 1 GHz)	≤ 0.25 µW (-36 dBm) / 71 dBµV / 3.54 mV / 50 Ω ≤ 25 nW (-46 dBm) / 61 dBµV / 1.12 mV / 50 Ω, from 47 ... 68, 87.5 ... 108, 162 ... 244, 328 ... 336, 470 ... 862 MHz
Emission of RF Energy (≥ 1 GHz)	≪ 1 µW / ≪ -30 dBm / ≪ 77 dBµV / ≪ 7 mV / 50 Ω
Transmitter Spectrum Mask	≥ 70 dB attenuation at 1,250 Hz modulation / m = 60%, + 10 dB
Channel Selection Time	≤ 0.1 sec
Unwanted Frequency Modulation	≤ 1.0 kHz at m = 70% / 1000 Hz
TX Intermodulation	≥ 45 dB
TX Time-Out-Timer (TOT)	After 2 minutes in continuous transmit Mode the transmitter is disabled. The LC display flashes as time-out warning. RX now possible.
Antenna Mismatching	VSWR ≤ 3 : 1, normal operation At VSWR 3 : 1 the requirements for modulation distortion, spurious and harmonics output as well as frequency stability are met. In addition, the RF output is ≥ 40 % / ≥ 2 Watt into 50 Ω At VSWR ≤ 5 : 1 Transmitter is still functional.



Portable VHF/AM Transceiver
FSG 2T PC
Dimensions



Portable Case 2T PC
Circuit Diagram

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Section 6 Option "Channel ONLY Mode"

IMPORTANT!

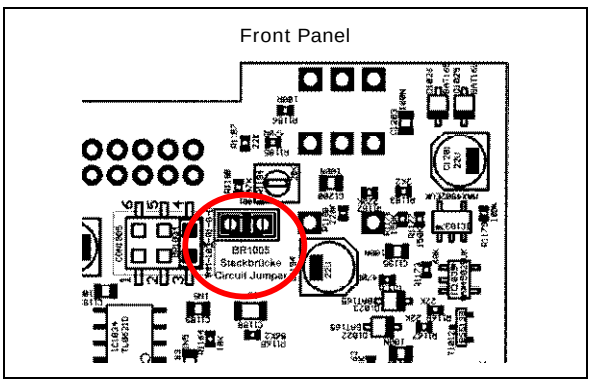
- ***The option "Channel ONLY Mode" may onl***
  an approved Avionics workshop!

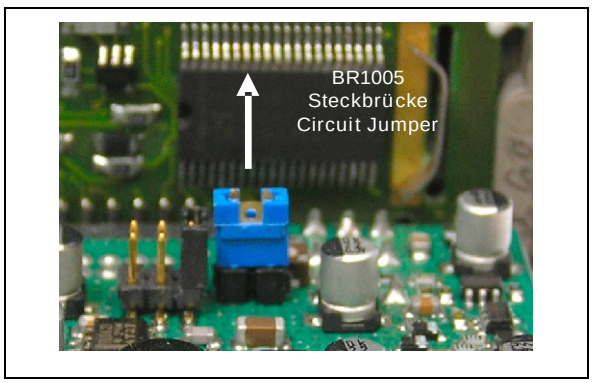
For ground based operation only a special mode can be set on request of the customer. Then the operation is limited to the use of preset channels only; user-selection of frequencies and programming frequencies in a memory are disabled.

6.1 Activating the option „Channel only

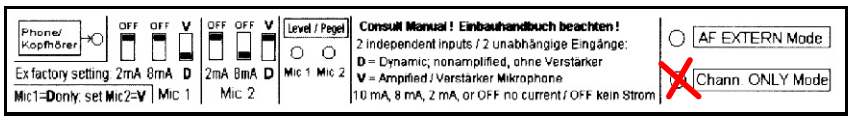
The option Channel only Mode is activated by removing a circuit jumper at the TX/RX board. To set this mode the radio FSG 2T has to be removed from the 2T PC case and to be opened.

- ▷ To dismount the transceiver FSG 2T from the case 2T PC remove the three cross-recessed screws (15) and lift off the matching plate. Eject the transceiver from the rear connector of the case by pressing the ejector knob (20) on the rear. Carefully pull out the transceiver.
- ▷ Connect the radio via a test wiring harness (see Fig. 3-1 of FSG 2T Installation & Operation Manual) to a test bench setup and supply the radio with 13.8 VDC. Turn on the radio with the **VOL** switch on the front panel.
- ▷ While in the **DIRECT TUNE MODE** program up to 20 channels with the frequencies requested by the custome
  Programming while in the **DIRECT TUNE MODE**" of this manual.
- ▷ Remove the Top Cover of the FSG 2T (see 8.3.1, Maintenance/Overhaul Manual), and while the radio is still powered, pull off the blue circuit jumper BR1005 which is located on the TX/RX board near the front panel.





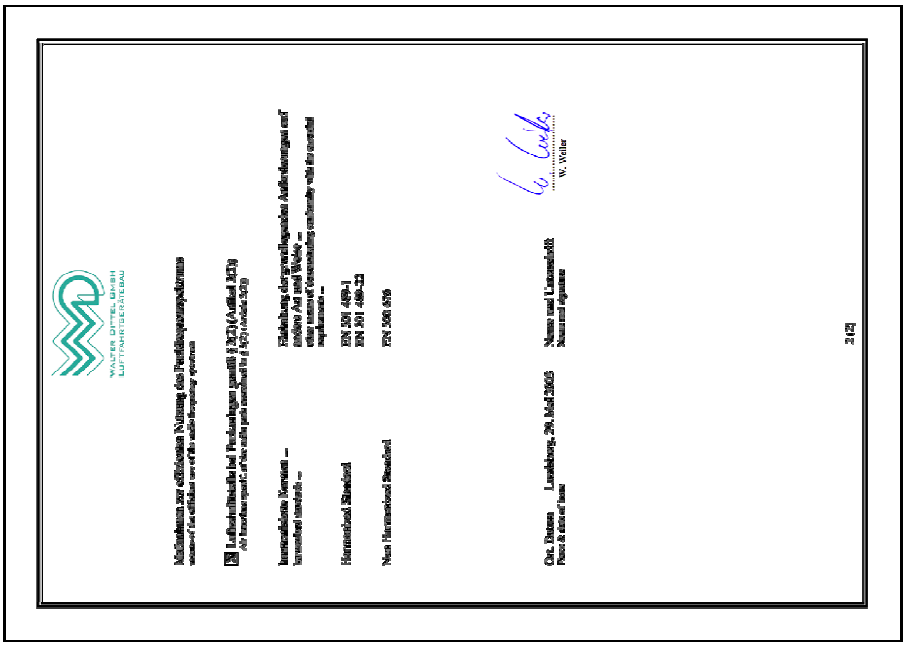
- Switch off the radio and disconnect the test wiring harness.
- Assemble the radio and fix the Top Cover by appropriate screws. Ensure the two screening profiles are in position between Top Cover and Chassis.
- On the Information Label mark permanently the option Chann. ONLY Mode!

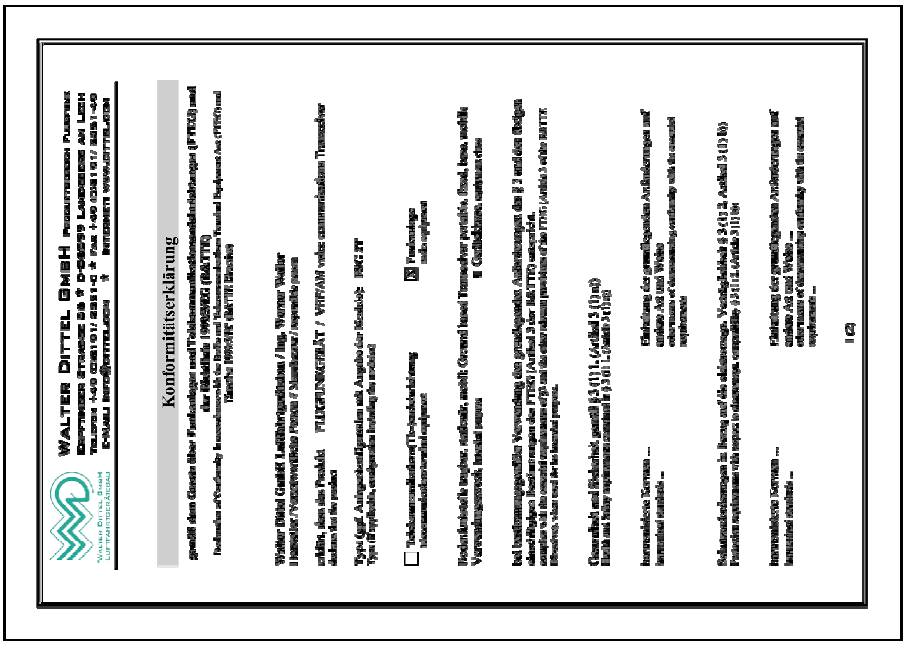


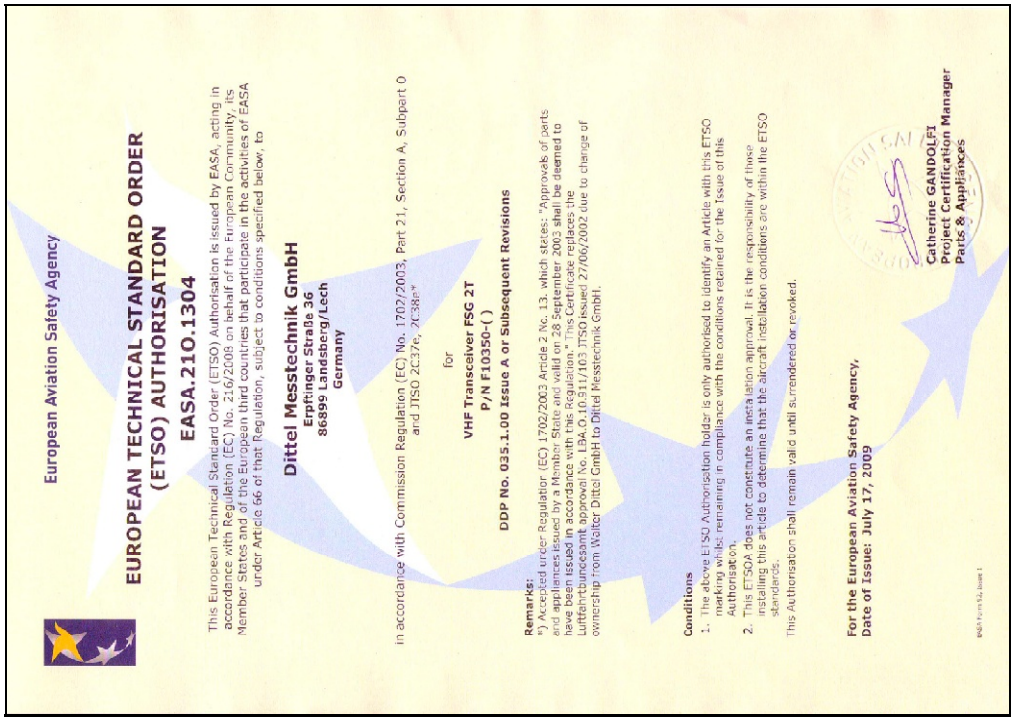
Such a marked radio is allowed only for ground based operation!

- To install the transceiver FSG 2T, carefully insert it into the case 2T PC. The plugs mate automatically to the case matching plate and fix it by three cross-recessed screws ⑮. Check fixing and function!

Appendix Certificates







European Aviation Safety Agency

EUROPEAN TECHNICAL STANDARD ORDER
(ETSO) AUTHORISATION
EASA.210.1304

This European Technical Standard Order (ETSO) Authorisation is issued by EASA, acting in accordance with Regulation (EC) No. 216/2008 on behalf of the European Community, its Member States and of the European third countries that participate in the activities of EASA under Article 66 of that Regulation, subject to conditions specified below, to

Dittel Messtechnik GmbH
Erpftinger Straße 36
86899 Landsberg/Lech
Germany

in accordance with Commission Regulation (EC) No. 1702/2003, Part 21, Section A, Subpart O and JTSO 2C37e, 2C38e*

for

VHF Transceiver FSG 2T
P/N F10350-( )
DDP No. 035.1.00 Issue A or Subsequent Revisions

Remarks:
*) Accepted under Regulation (EC) 1702/2003 Article 2 No. 13, which states: "Approvals of parts and appliances issued by a Member State and valid on 28 September 2003 shall be deemed to have been issued in accordance with this Regulation." This Certificate replaces the Luftfahrtbundesamt approval No. 1.BA.O.10.511/103. JTSO issued 27/06/2002 due to change of ownership from Walter Dittel GmbH to Dittel Messtechnik GmbH.

Conditions
1. The above ETSO Authorisation holder is only authorised to identify an Article with this ETSO marking while remaining in compliance with the conditions retained for the Issue of this Authorisation.
2. This ETSOA does not constitute an installation approval. It is the responsibility of those installing this article to determine that the aircraft installation conditions are within the ETSO standards.

This Authorisation shall remain valid until surrendered or revoked.

For the European Aviation Safety Agency,
Date of Issue: July 17, 2009

Catherine GANDOLFI
Project Certification Manager
Parts & Appliances

CETECOM ICT Services GmbH

CETECOM

CERTIFICATE OF CONFORMITY

Registration-No.: ES 29840-CC Number of annexes: ---

Certificate Holder: Walter DITTEL GmbH
Luftfahrtgerätebau
Erpftinger Str. 36
D-86899 Landsberg

Product Designation: FSG 2T

Product Description: VHF/AM Air Band Transceiver for ground based applications

Product Manufacturer: Walter DITTEL GmbH
Luftfahrtgerätebau
Erpftinger Str. 36
D-86899 Landsberg

Specifications and test reports:

Specification	Test report no. & date	Name of test laboratory	Notes
EN 301 489-1, Aug. 2000 EN 301 489-22, Dec. 2000	2-2603-01-02/01 dated 30.11.2001	CETECOM ICT	conform
EN 300 676, May 2000	2-2603-A-01 dated 03.09.2001	CETECOM ICT	conform

Statement: This equipment fulfils the requirements or parts thereof in the above mentioned specifications.

By decree Vfg 282/2000, issued in the Official Journal 6/2000 of the Regulierungsbehörde für Telekommunikation und Post, CETECOM ICT Services is authorized to act as Notified Body in accordance with the R&TTE Directive 1999/5/EC of 09. March 1999

Saarbrücken, 18.03.02
Place, Date of Issue

Signed by Ernst Hassinger
Notified Body

CETECOM ICT Services GmbH, Untertürkheimer Straße 6-10, D-66117 Saarbrücken, Germany

CETECOM ICT Services GmbH

EC Identification number 0682

authorized by the German Government

with decree Vfg 28/2000 , issued in the Official Journal 6/2000
of the Regulierungsbehörde für Telekommunikation und Post,
to act as Notified Body in accordance with the R&TTE Directive 1999/5/EC of 09. March 1999.

CERTIFICATE
EXPERT OPINION

Registration-No.: E8129840-EO

Certificate Holder: **Walter DITTEL GmbH**
Luftfahrtgerätebau
Erpftinger Str. 36

D-86899 Landsberg

Product Designation: **FSG 2T**

Product Description: **VHF/AM Transceiver for aeronautical mobile service**

Product Manufacturer: **Walter DITTEL GmbH**
Luftfahrtgerätebau
Erpftinger Str. 36

D-86899 Landsberg

Essential requirements	Specifications / Standards	Submitted documents	Result
EMC (FTEG, § 3, (1), 2.)	EN 301 489-1, Aug. 2000 EN 301 489-22, Dec. 2000	Test Report	conform
Radio spectrum (FTEG, § 3, (2))	EN 300 676, May 2000	Test Report	conform

Marking: **The product shall be signed with CE, our notified body number and the Class II identifier (Alert sign) as shown right hand.**

CE 0682 !

The scope of this evaluation relates to the submitted documents only.
The certificate is only valid in conjunction with the following number of annexes

Number of annexes: 1

Saarbrücken, 18.03.02
Place, Date of Issue

Signed by Ernst Hussinger
Notified Body

CETECOM ICT Services GmbH, Untermarkstrimer Straße 6-10, D-66117 Saarbrücken, Germany
http://www.cetecom.de

Annex 1 of the Certificate „EXPERT OPINION"
Registration no.: E8129840 -EO Date: 18.03.02
Page 1 of 1

Product Characteristics:

Mobile, portable or fixed VHF/AM air band transceiver (analog voice communication) for ground based applications

Frequency Characteristics	:	118.000 – 136.975 MHz
RF-Output Power (conducted)	:	5 W
ITU-Designation	:	7K00A3E
Number of Channels	:	760
Channel Spacing	:	25 kHz
Antenna-Access	:	RF-connector (load 50 Ω)

Conformity Details:

Evaluated testreports	
Requirement	**Standard, test report number, date & laboratory**
EMC	**EN 301 489-1, Aug. 2000** **EN 301 489-22, Dec. 2000** **Test Report 2-2603-01-02/01 issued 20.11.2001 by CETECOM ICT**
Radio spectrum	**EN 300 676, May 2000** **Test Report 2-2603-A/01 issued 03.09.2001 by CETECOM ICT**

Miscellaneous:

- TCF according to the application dated 06.03.2002

*****

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

GRANT OF EQUIPMENT AUTHORIZATION
Certification

Walter Dittel GmbH
Erpftinger Strabe 36, Postfach 260
8910 Landsberg/Lech 1 Germany

Date of Grant: 11/26/02
Application Dated: 9/6/02

Attention: Fritz Moessinger

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: **BVYFSG2T**
Name of Grantee: **Walter Dittel GmbH**

Equipment Class : Licensed Non-Broadcast Station Transmitter
Notes: VHF/AM COM Transceiver FSG 2T

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
AG	87	118.-136.975	5	5 PPM	7K00A3E

AG: Acceptable for airborne mobile use under Part 22 with receiver designed to automatically revert to the signaling channel frequency upon completion of a call.

EA047527

FCC ID: BVYFSG2T
Grantee: Walter Dittel GmbH

In correspondence concerning this grant, please refer to the FCC IDENTIFIER and the date of grant.

Page 1 of 1
FCC 731A

RegTP
Regulierungsbehörde für Telekommunikation und Post

RegTP • Postfach 10 04 43 • 66004 Saarbrücken

Walter Dittel GmbH
Erpftinger Straße 36

D-86899 Landsberg/Lech

Ihr Zeichen, Ihre Nachricht vom	Mein Zeichen, meine Nachricht vom	☎ (06 81)	Saarbrücken
Ing. Werner Weiler 24.08.02	70556-01	93 30-574 oder 93 30-0	01.08.02

Mitteilung über das Inverkehrbringen von Funkanlagen nach §10 (4) des Gesetzes über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG)

Sehr geehrte Damen und Herren,

Ihre Mitteilung ist am 26.08.02 bei uns eingegangen und wurde wie folgt registriert:

Vorgangsnummer	Typenbezeichnung	Inverkehrbringer
70556-01	FSG 2T	Walter Dittel GmbH Erpftinger Straße 36 D-86899 Landsberg/Lech

Zum Betrieb der Funkanlagen ist vom Betreiber die Einzelzuteilung von Frequenzen bei der zuständigen Außenstelle der Regulierungsbehörde für Telekommunikation und Post zu beantragen.

Geben Sie bitte bei weiteren Mitteilungen zu dieser Typenbezeichnung immer die oben genannte Vorgangsnummer an.

Mit freundlichen Grüßen

Im Auftrag

Dietmar Ost

Behördensitz
Bonn
Tulpenfeld 4
53113 Bonn
☎ (02 28) 14-0

Telefax Bonn
(02 28) 14-88 72
E-Mail:
poststelle@regtp.de
Internet
http://www.regtp.de

X.400
S=poststelle
P=regtp
A=bund400
C=de

Kontoverbindungen
Bundeskasse Trier
LZB Trier
(BLZ 585 000 00)
Konto-Nr. 585 010 05

Dienstgebäude
Saarbrücken
Talstraße 34-42
66119 Saarbrücken
Telefax Saarbrücken
(06 81) 93 30-7 00

DFS Deutsche Flugsicherung

Urkunde

Eine(s) **Bodenfunkstelle des beweglichen Flugfunkdienstes**

Typ **FSG 2T**

Frequenzbereich **118,00 – 136,975 MHz**

der Firma **Walter Dittel GmbH**
Erpfinger Straße 36
86899 Landsberg

bestehend aus **Sender/Empfänger mit Stromversorgung aus dem Gleichspannungsnetz oder Batterien**

für die Betriebsart **A 3 E**

ist auf Einhaltung der Anforderungen an Anlagen und Geräte für Zwecke der Flugsicherung gemäß § 4 der Flugsicherungs-Anlagen und Geräte-Musterzulassungs-Verordnung (FSMusterzulV) geprüft worden.

Die Anlage oder das Gerät entspricht damit den Festlegungen des Bundesministeriums für Verkehr, Bau- und Wohnungswesen hinsichtlich Art, Umfang und Beschaffenheit von flugsicherungstechnischen Einrichtungen gemäß § 32 Abs. 4 des Luftverkehrsgesetzes sowie den Richtlinien und Empfehlungen der Internationalen Zivilluftfahrt-Organisation (ICAO).

Es wird daher mit den umseitig aufgeführten Auflagen als Muster in der Bundesrepublik Deutschland zugelassen.

Der Gerätetyp hat die Zulassungsnummer **D - 0002/2002** erhalten.

DFS Deutsche Flugsicherung GmbH
Langen, den 29.10.2002

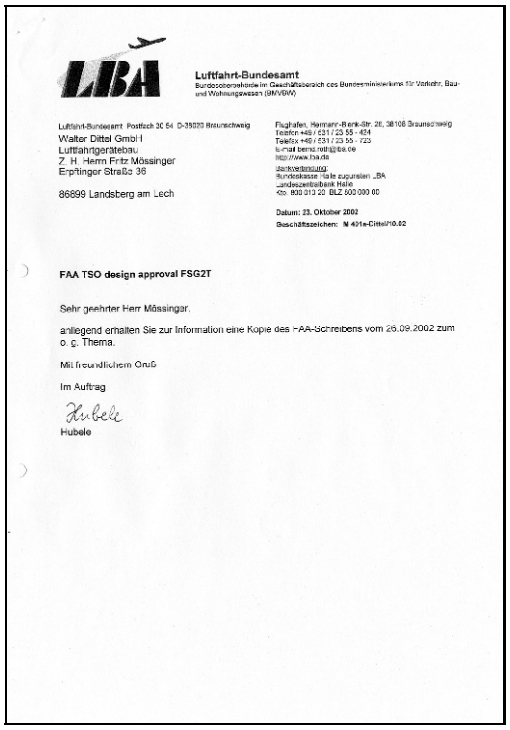
i.A. W. Steinau
Referent Musterzulassung

i.A. H. Mehringer
Leiter Übertragungstechnik

Urkunde

Wichtige Auflagen

1. Jede Anlage oder jedes Gerät des Typs **FSG 2T**, das mit der Zulassungsnummer **D - 0002/2002** versehen ist, muss in seinen mechanischen und elektrischen Charakteristika sowie in der Softwarekonfiguration mit dem vom Flugsicherungsunternehmen geprüften Muster übereinstimmen.
2. Das Betreiben von Geräten des Typs **FSG 2T** als Bodenfunkstelle ist nur zulässig, wenn dieses Gerät entweder fest installiert oder in einem Tragegestell untergebracht ist.
3. Jede Änderung oder Ergänzung des Aufbaues oder der Schaltung der Anlage/des Gerätes sowie der Softwarekonfiguration gegenüber dem Muster macht eine Nachprüfung durch das Flugsicherungsunternehmen erforderlich.
4. Das Flugsicherungsunternehmen kann die Einhaltung der Anforderungen gemäß § 4 Flugsicherungs-Anlagen und Geräte- Musterzulassungsverordnung durch Produktkontrollen überprüfen (§ 8 FSMusterzulV).
5. Diese Urkunde allein berechtigt nicht zum Betrieb einer Anlage oder eines Gerätes. Das Einrichten, Errichten und Betreiben einer Funkstelle unter Verwendung dieser Anlage oder des Gerätes, auch wenn es sich um eine Vorführung handelt, ist vom Vorhandensein einer Frequenzzuteilung der Regulierungsbehörde für Telekommunikation und Post abhängig.
6. Diese Zulassung befreit nicht von der Verpflichtung zur Abnahme flugsicherungstechnischer Einrichtungen durch das Flugsicherungsunternehmen gemäß § 27c Luftverkehrsgesetz.
7. Aus dieser Zulassung können keine Ansprüche auf Zulassung gegenüber anderen Zertifizierungsstellen abgeleitet werden.
8. Aus der Ausstellung dieser Urkunde können keine Forderungen patentrechtlicher Art hergeleitet werden. Sie befreit in keinem Fall von der Beachtung fremder Schutzrechte und stellt keinen Rechtsschutz, ähnlich dem im Patentgesetz vorgesehenen, dar.



Luftfahrt-Bundesamt
Bundesoberbehörde im Geschäftsbereich des Bundesministeriums für Verkehr, Bau- und Wohnungswesen (BMVBW)

Luftfahrt-Bundesamt Postfach 30 54 D-38020 Braunschweig
Walter Dittel GmbH
Luftfahrtgerätebau
Z. H. Herrn Fritz Mössinger
Erpfinger Straße 36

86899 Landsberg am Lech

Flughafen, Hermann-Blenk-Str. 26, 38108 Braunschweig
Telefon +49 / 531 / 23 55 - 404
Telefax +49 / 531 / 23 55 - 723
e-mail bernd.roth@lba.de
http://www.lba.de

Bankverbindung
Bundeskasse Halle zugunsten „BA
„Landeszentralbank Halle
<to. 800 013 20 BLZ 800 000 00

Datum: 23. Oktober 2002
Geschäftszeichen: M 401e-Dittel/10.02

FAA TSO design approval FSG2T

Sehr geehrter Herr Mössinger,

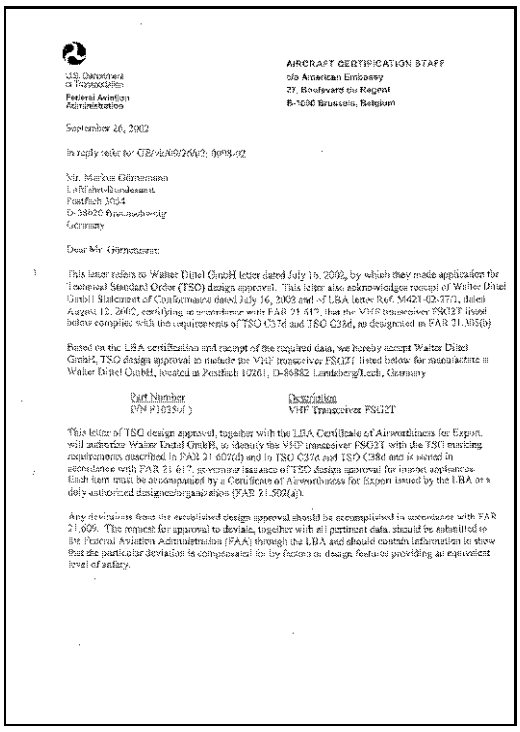
anliegend erhalten Sie zur Information eine Kopie des FAA-Schreibens vom 26.09.2002 zum o. g. Thema.

Mit freundlichem Gruß

Im Auftrag

Hubele

Hubele



U.S. Department of Transportation
Federal Aviation Administration

AIRCRAFT CERTIFICATION STAFF
c/o American Embassy
27, Boulevard du Regent
B-1000 Brussels, Belgium

September 26, 2002

In reply refer to: CE/ACO/26/2: 0098/02

Mr. Markus Gömmann
LuFahrt-Bundesamt
Postfach 3054
D-38026 Braunschweig
Germany

Dear Mr. Gömmann:

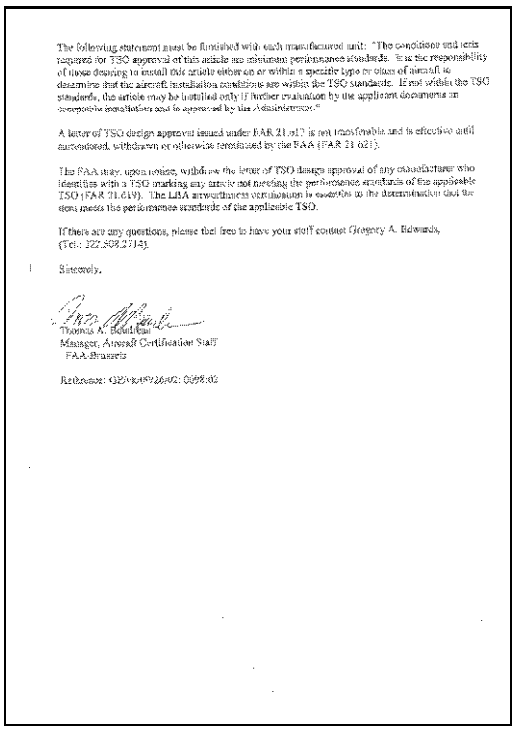
This letter refers to Walter Dittel GmbH letter dated July 15, 2002, by which they made application for Technical Standard Order (TSO) design approval. This letter also acknowledges receipt of Walter Dittel GmbH Statement of Conformance dated July 16, 2002 and of LBA letter Ref. M421-02-3771, dated August 12, 2002, certifying in accordance with FAR 21.617, that the VHF transceiver FSG2T listed below complies with the requirements of TSO C37d and TSO C38d, as designated in FAR 21.303(b)

Based on the LBA certification and receipt of the required data, we hereby accept Walter Dittel GmbH, TSO design approval to include the VHF transceiver FSG2T listed below for manufacture in Walter Dittel GmbH, located at Postfach 10261, D-86882 Landsberg/Lech, Germany

Part Number	Description
(PN P1039-0)	VHF Transceiver FSG2T

This letter of TSO design approval, together with the LBA Certificate of Airworthiness for Export, will authorize Walter Dittel GmbH, to identify the VHF transceiver FSG2T with the TSO marking requirements described in FAR 21.607(d) and to TSO C37d and TSO C38d and is issued in accordance with FAR 21.617, as normal issuance of TSO design approval for import applications. Each item must be accompanied by a Certificate of Airworthiness for Export issued by the LBA or a duly authorized designee/organization (FAR 21.502(a)).

Any deviations from the established design approval should be accomplished in accordance with FAR 21.609. The request for approval to deviate, together with all pertinent data, should be submitted to the Federal Aviation Administration (FAA) through the LBA and should contain information to show that the particular deviation is compensated for by factors or design features providing an equivalent level of safety.



The following statement must be furnished with each manufactured unit: "The condition and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. If not within the TSO standards, the article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administration."

A letter of TSO design approval issued under FAR 21.617 is not transferable and is effective until surrendered, withdrawn or otherwise terminated by the FAA (FAR 21.621).

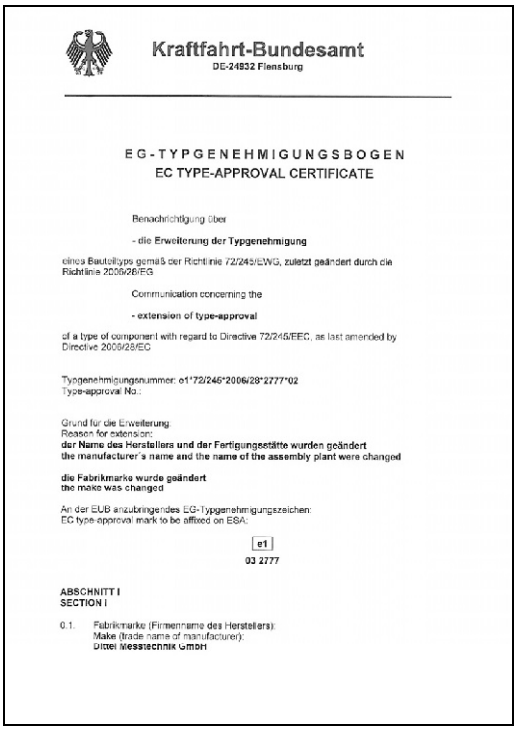
The FAA may, upon notice, withdraw the letter of TSO design approval of any manufacturer who identifies with a TSO marking any article not meeting the performance standards of the applicable TSO (FAR 21.619). The LBA airworthiness certification is essential to the determination that the item meets the performance standards of the applicable TSO.

If there are any questions, please feel free to have your staff contact Gregory A. Edwards, (Tel.: 322.508.2713).

Sincerely,

Thomas A. Boudreau
Manager, Aircraft Certification Staff
FAA-Brussels

Reference: CE/ACO/26/2: 0098/02



Kraftfahrt-Bundesamt
DE-24932 Flensburg

EG-TYPGENEHMIGUNGSBOGEN
EC TYPE-APPROVAL CERTIFICATE

Benachrichtigung über

- die **Erweiterung der Typgenehmigung**

eines Bauteiltyps gemäß der Richtlinie 72/245/EWG, zuletzt geändert durch die Richtlinie 2009/26/EG

Communication concerning the

- **extension of type-approval**

of a type of component with regard to Directive 72/245/EEC, as last amended by Directive 2009/26/EC

Typgenehmigungsnummer: e1*72/245*2009/26*2777*02
Type-approval No.:

Grund für die Erweiterung:
Reason for extension:
der Name des Herstellers und der Fertigungsstätte wurden geändert
the manufacturer's name and the name of the assembly plant were changed

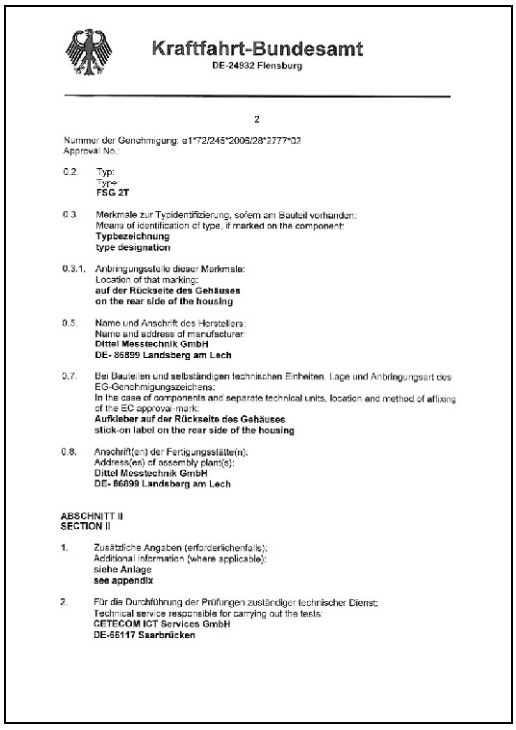
die Fabrikmarke wurde geändert
the make was changed

An der EUB anzubringendes EG-Typgenehmigungszeichen:
EC type-approval mark to be affixed on ESA:

e1
03 2777

ABSCHNITT I
SECTION I

0.1. Fabrikmarke (Firmenname des Herstellers):
Make (trade name of manufacturer):
Dittel Messtechnik GmbH



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Nummer der Genehmigung: e1*72/245*2009/26*2777*02
Approval No.:

0.2. Typ:
Type:
FSG 2T

0.3. Merkmale zur Typidentifizierung, sofern am Bauteil vorhanden:
Means of identification of type, if marked on the component:
Typbezeichnung
type designation

0.3.1. Anbringungsstelle dieser Merkmale:
Location of that marking:
auf der Rückseite des Gehäuses
on the rear side of the housing

0.5. Name und Anschrift des Herstellers:
Name and address of manufacturer:
Dittel Messtechnik GmbH
DE- 86899 Landsberg am Lech

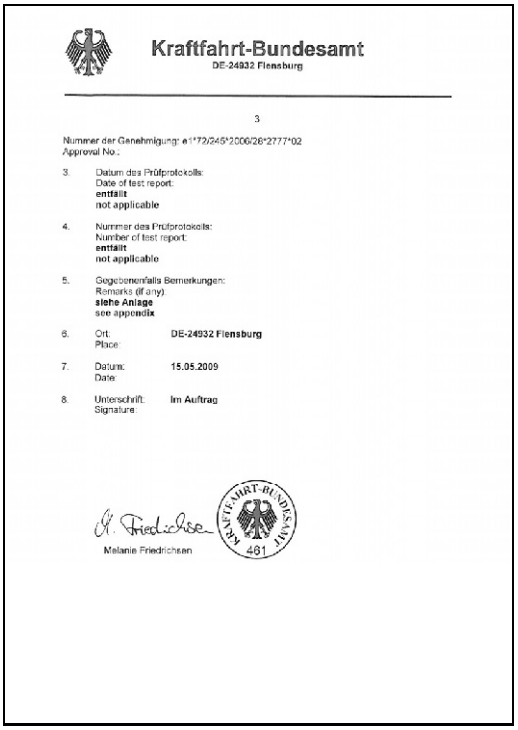
0.7. Bei Bauteilen und selbständigen technischen Einheiten, Lage und Anbringungsart des EG-Genehmigungszeichens:
In the case of components and separate technical units, location and method of affixing of the EC approval mark:
Aufkleber auf der Rückseite des Gehäuses
stick-on label on the rear side of the housing

0.8. Anschrift(en) der Fertigungsstätte(n):
Address(es) of assembly plant(s):
Dittel Messtechnik GmbH
DE- 86899 Landsberg am Lech

ABSCHNITT II
SECTION II

1. Zusätzliche Angaben (erforderlichenfalls):
Additional information (where applicable):
siehe Anlage
see appendix

2. Für die Durchführung der Prüfungen zuständiger technischer Dienst:
Technical service responsible for carrying out the tests:
CETECOM ICT Services GmbH
DE-66117 Saarbrücken



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Nummer der Genehmigung: e1*72/245*2009/26*2777*02
Approval No.:

3. Datum des Prüfprotokolls:
Date of test report:
entfällt
not applicable

4. Nummer des Prüfprotokolls:
Number of test report:
entfällt
not applicable

5. Gegebenenfalls Bemerkungen:
Remarks (if any):
siehe Anlage
see appendix

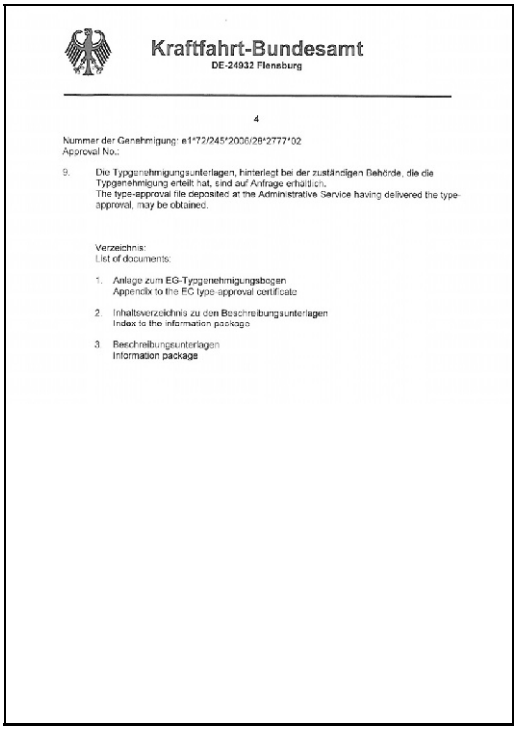
6. Ort: **DE-24932 Flensburg**
Place:

7. Datum: **15.05.2009**
Date:

8. Unterschrift: **Im Auftrag**
Signature:

Melanie Friedrichsen

KRAFTFAHRT-BUNDESAMT 461



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Nummer der Genehmigung: e1*72/245*2009/26*2777*02
Approval No.:

9. Die Typgenehmigungsunterlagen, hinterlegt bei der zuständigen Behörde, die die Typgenehmigung erteilt hat, sind auf Anfrage erhältlich.
The type-approval file deposited at the Administrative Service having delivered the type-approval, may be obtained.

Verzeichnis:
List of documents:

1. Anlage zum EG-Typgenehmigungsbogen
Appendix to the EC type-approval certificate

2. Inhaltsverzeichnis zu den Beschreibungsunterlagen
Index to the information package

3. Beschreibungsunterlagen
Information package

Copyright – Service Information

Service Information

Should any unusual problem arise or further information be desired, please contact your nearest DITTEL representative or the Dittel Messtechnik GmbH, Avionics Department, Erpftinger Strasse 36, 86899 Landsberg, Germany.
The information in this Operator's Manual does not profess to include all the details of design, production, or variation of the equipment, or to cover all the possible contingencies which may arise during operation or maintenance. We welcome your comments concerning this Manual. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the Operator's Manual article number, paragraph or figure number, and the page number.

Send your comments to Publications Department
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Erpftinger Strasse 36
86899 Landsberg am Lech
Germany
or by e-mail to: info@dittel.com

Subject to technical changes

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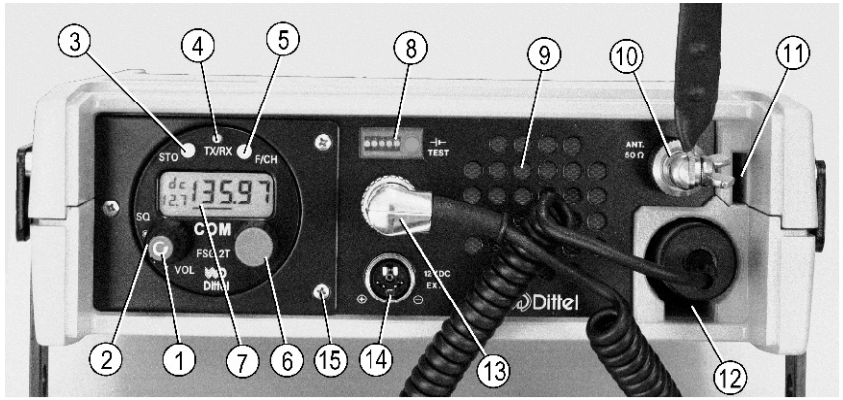

New DC socket!