# RTTY/CW  TX TERMINAL for :
# IC756 ( all series ), IC7400, IC746, IC7000
# (PC not required)

### *I0CG  Giuliano Carmignani*

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giulianori@virgilio.it

www.i0cg.com

IC-756, IC-7400, IC746 IC-7000 and Elecraft K3 have a built in RTTY decoder but RTTY transmission is very hard because Keyboard isn't supplied. A USB or PS2 keyboard can be used, preferably a USA Kbd.
This interface can be used to add a standard PC Keyboard to some ICOM TRX.
Also CW transmission can be performed so, for this use can be used as CW keyboard with all commercial or home-made TRX .
Ideal for portable operation because PC isn't required

F1-F10 can be user programmable Key with standardized message
Only one example:

F1 is memorized with : cq cq de i0cg, F2 with: pse K →   (note that "→" is the cursor right Key that perform RX return)

To do a RTTY call :
when I press: F1, F1, F1, F2 consecutively
The TRX transmit the following text:
cq cq cq de i0cg
cq cq cq de i0cg
cq cq cq de i0cg
pse k →


**memory messages transmission can be stopped before message end in this mode**:
**when rtty mode is selected**:
switch CW/RTTY key one second in CW then switch again in RTTY
**when CW mode is selected**:
switch CW/RTTY key one second in RTTY then switch again in CW

The "→" key can be used inside memory message  o directly for the Keyboard to switch TRX in RX mode.
Transmission is performed automatically when any Key has pressed

The F11 is a dedicated memory that allow an automatic counter for contest . Any time I press F11 TRX transmit three numbers automatically incremented  ( Ie: 001, 002, 003 ). I can overwrite this # to modify the first numbers transmitted. This counter can be used in RTTY or CW too.
F12 transmit I0CG logo and SW version used. Can be voluntarily transmitted

The others functions F3- F10 key can be programmed as desiderata with Name QTH and so on.

Programming is very fast because it is necessary only press the ESC + function n Key to save any test (max 64 Chr. For any key ).
Text is memorized on no volatile memory so isn't lost if keyboard is switched off.

CW USE NOTE:
To perform CW mode it is necessary to connect to GND pin 15 of PIC also a 10k pull-up to +5V is necessary
1)If TRX is  in "FULL BREAK-IN,  CW transmission of any KEY pressed is automatic.
2) Side-tone of CW transmission can be listen on the interface  frontal loudspeaker; so, this interface, can be also used for CW RX training.
3) PAGE-UP and PAGE-Down key change the CW  speed and is saved on no volatile memory so isn't lost if keyboard is switched off.
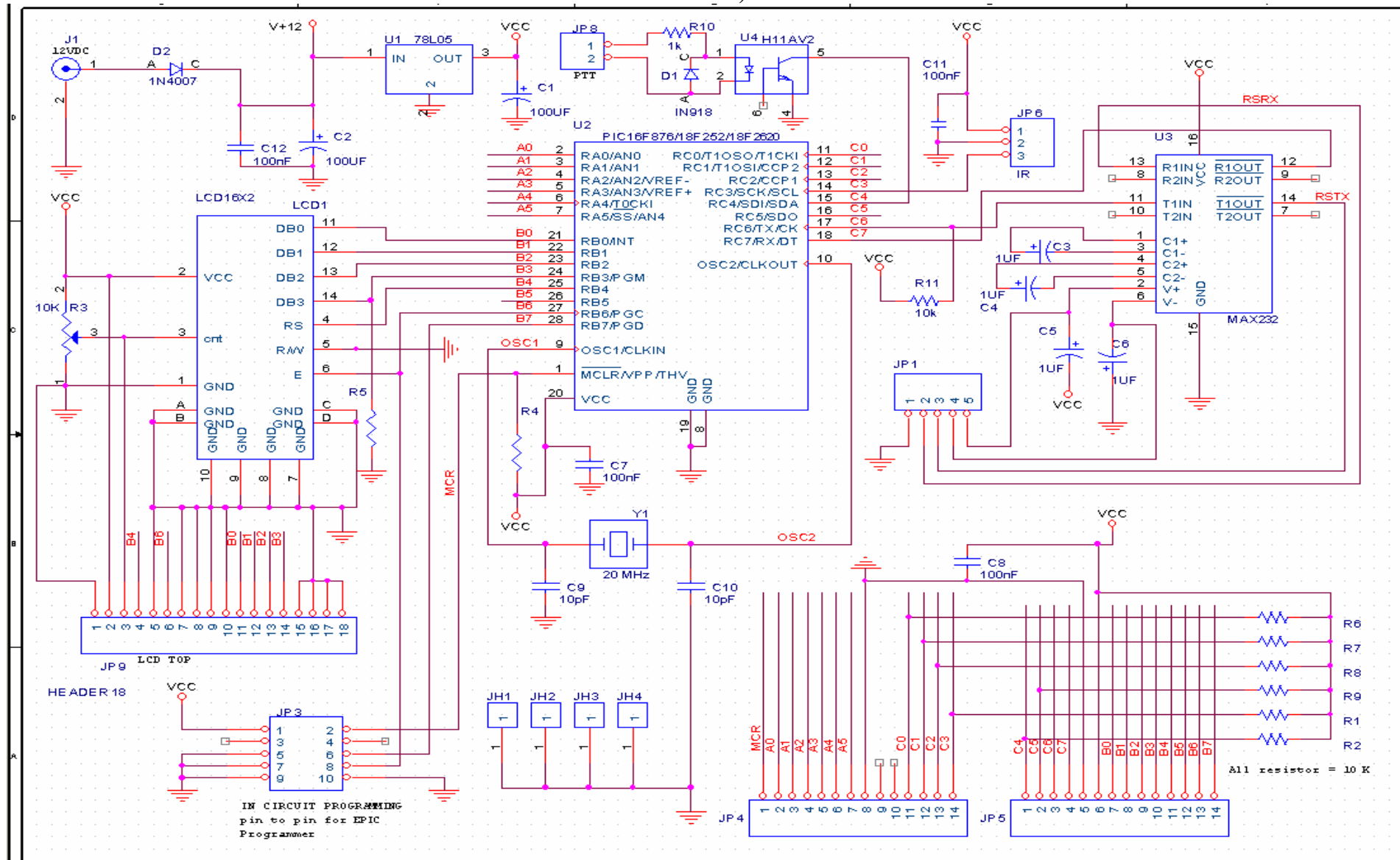
Some special CHR used on CW only:

**1) push first Caps-lock and then  A : transmitted   AR ,without letter space (message Ends)**
**2)................................then V:   transmitted VE ,without letter space**
**3)................................then S: transmitted SK ,without letter space**
**4)................................then K: transmitted KN ,without letter space**
**5)................................then B: transmitted BK ,without letterspace**
**6)................................then W: transmit AS ,without letter space (wait )**
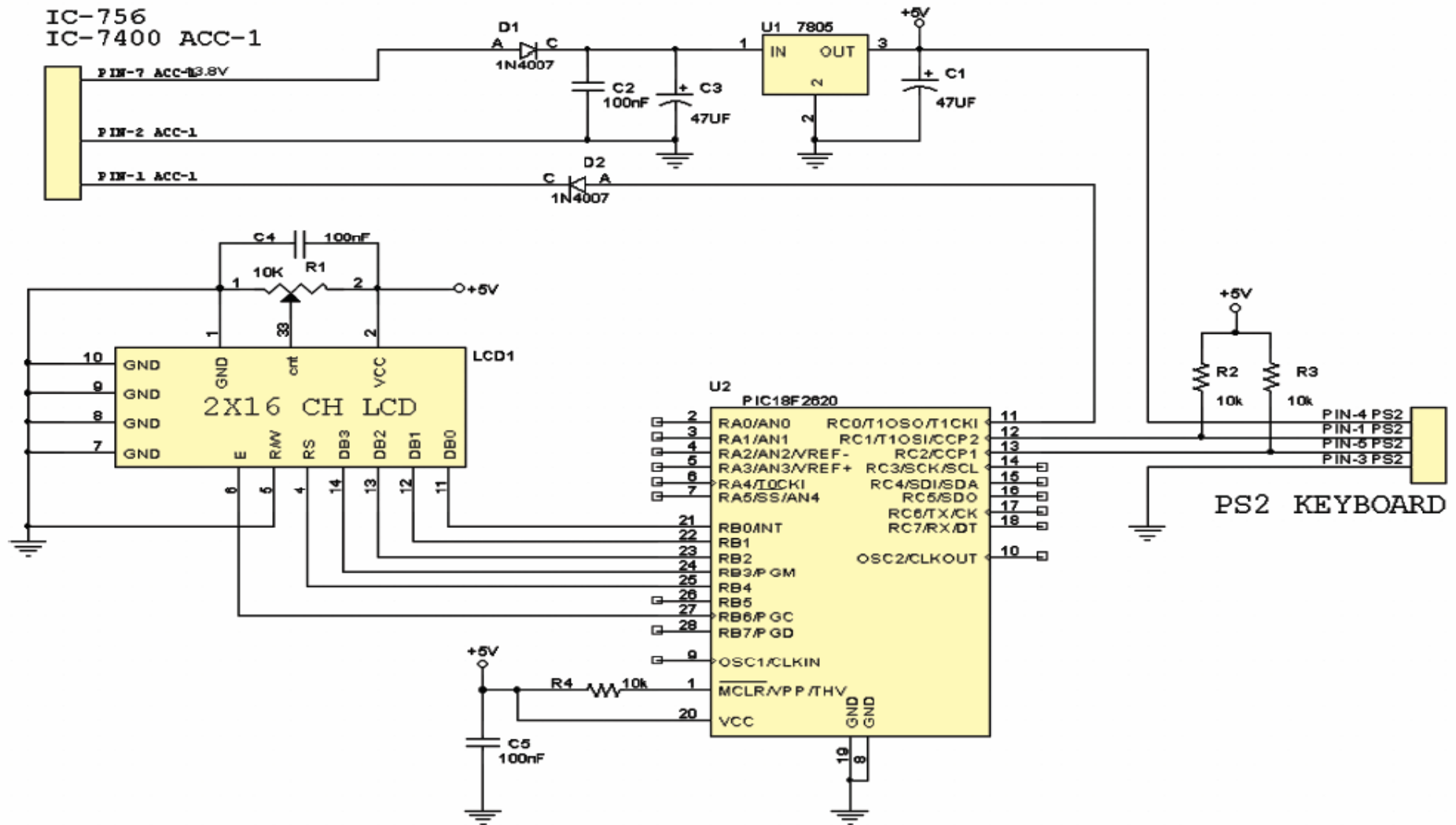
**Some special Chr or punctuation:**

**1) press Backspace: transmitted error**
**2)  push first Caps-lock and then @: trasmitted @ ( di dah dah di dah di )**
**3)  push first Caps-lock and then / : transmitted ?**

# PIC board schematic ( IOCG PCB code: 080108)

J1 12VDC
V+12
D2 1N4007 A C
U1 78L05 IN OUT
VCC
+ C1 100UF
JP8 1 2 PTT
R10 1k
D1 IN918
U4 H11AV2
C11 100nF
VCC
VCC
RSRX

C12 100nF
+ C2 100UF

U2 PIC16F876/18F252/18F2620
RA0/AN0 2 A0 — RC0/T1OSO/T1CKI 11 C0
RA1/AN1 3 A1 — RC1/T1OSI/CCP2 12 C1
RA2/AN2/VREF- 4 A2 — RC2/CCP1 13 C2
RA3/AN3/VREF+ 5 A3 — RC3/SCK/SCL 14 C3
RA4/TOCKI 6 A4 — RC4/SDI/SDA 15 C4
RA5/SS/AN4 7 A5 — RC5/SDO 16 C5
RB0/INT 21 B0 — RC6/TX/CK 17 C6
RB1 22 B1 — RC7/RX/DT 18 C7
RB2 23 B2
RB3/PGM 24 B3 — OSC2/CLKOUT 10
RB4 25 B4
RB5 26 B5
RB6/PGC 27 B6
RB7/PGD 28 B7
OSC1/CLKIN 9
MCLR/VPP/THV 1
VCC 20
GND 19 GND 8

U3 MAX232
R1IN 13 R1OUT 12
R2IN 8 R2OUT 9
T1IN 11 T1OUT 14 RSTX
T2IN 10 T2OUT 7
C1+ 1 C1- 3 C2+ 4 C2- 5 V+ 2 V- 6
C3 1UF C4 1UF C5 1UF C6 1UF
VCC GND 15

LCD16X2 LCD1
DB0 11
DB1 12
DB2 13
DB3 14
RS 4
R/W 5
E 6
VCC 2
cnt 3
GND 1
GND A GND B GND C GND D

10K R3

R11 10k
R4
R5
C7 100nF

Y1 20 MHz
C9 10pF
C10 10pF
OSC1
OSC2

JP6 1 2 3 IR
JP1 1 2 3 4 5

C8 100nF
VCC

JP9 LCD TOP HEADER 18
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

JP3 IN CIRCUIT PROGRAMMING pin to pin for EPIC Programmer
1 2 3 4 5 6 7 8 9 10

JH1 JH2 JH3 JH4

JP4
MCR A0 A1 A2 A3 A4 A5 C0 C1 C2 C3
1 2 3 4 5 6 7 8 9 10 11 12 13 14

JP5
C4 C5 C6 C7 B0 B1 B2 B3 B4 B5 B6 B7
1 2 3 4 5 6 7 8 9 10 11 12 13 14

R6 R7 R8 R9 R1 R2
All resistor = 10 K

**For RTTY use, many components on the PCB are not necessary : Quartz Y1, U3, U4 etc..**

# Minimum schematic for RTTY: If IOCG PCB isn't used



Attention: In the schematic the D2 diode must be reversed. Also connect a 10 K pul-up to pin 15

**What is available from me:**

1. .exe code can be downloaded freely from my web page [www.i0cg.com](www.i0cg.com) (see also the minimum rtty schematics if you are able to homemade yourself the circuit)

2. e-mail me to obtain a programmed PIC ( PIC18F2620 ) if you aren't able to program this device

3. PCB : code I0CG080108

4. The PIC board assembled and tested with LCD display all connectors to connect the TRX, switches and PS2 or USB keyboard adapter ( BOX and Keyboard are not supplied)

I like if, anybody use this interface, let me know

**Future implementations:**

1)Any valid user suggestions
2)SD memory stick to transport Contest log on PC
3)CW demodulation ( at 17 Sep. 08 RTTY demodulation has ready)
4) little ASCII terminal replacing PC ( note that power requested is around 100 mw @ 12Vdc so it is ideal for portable operation).
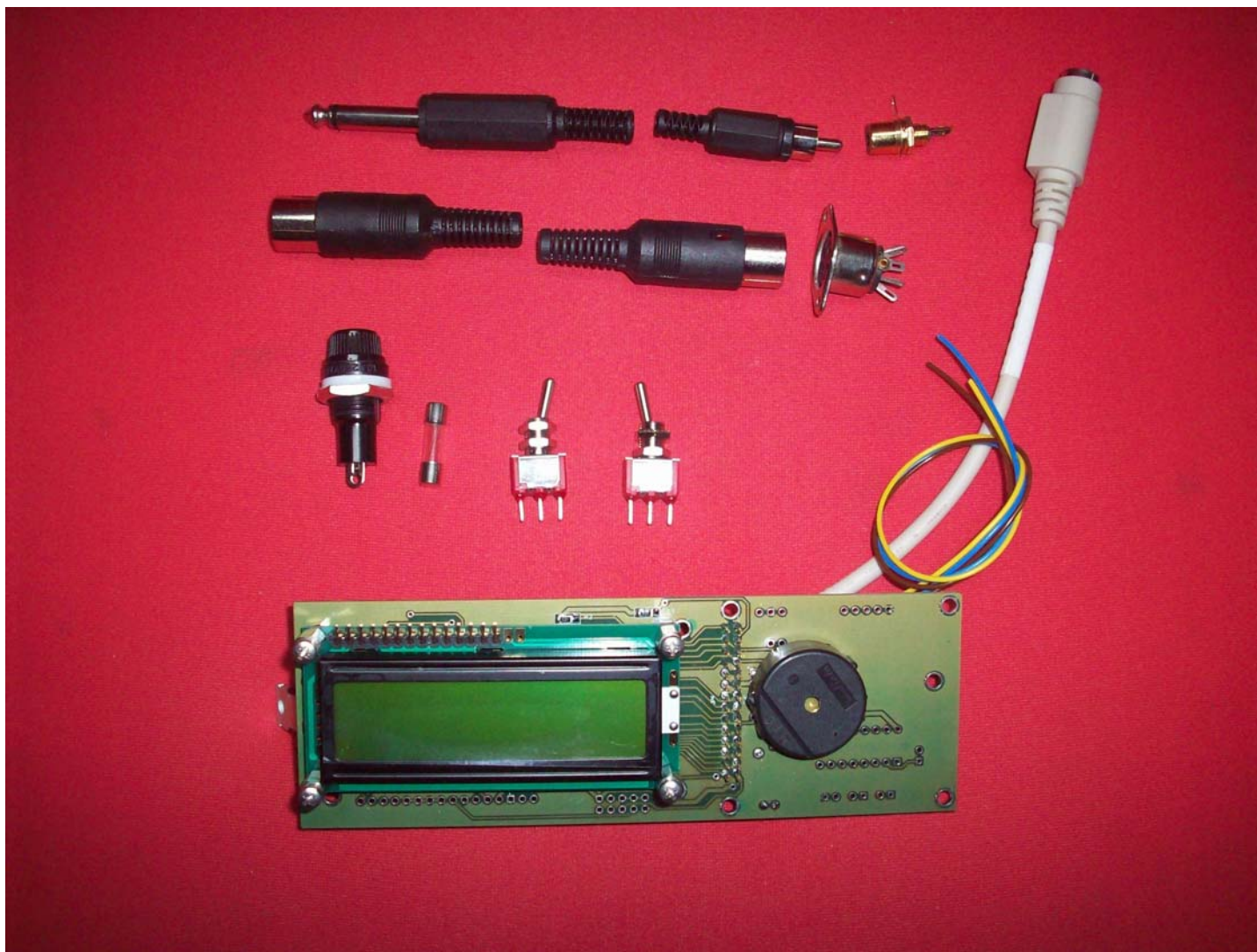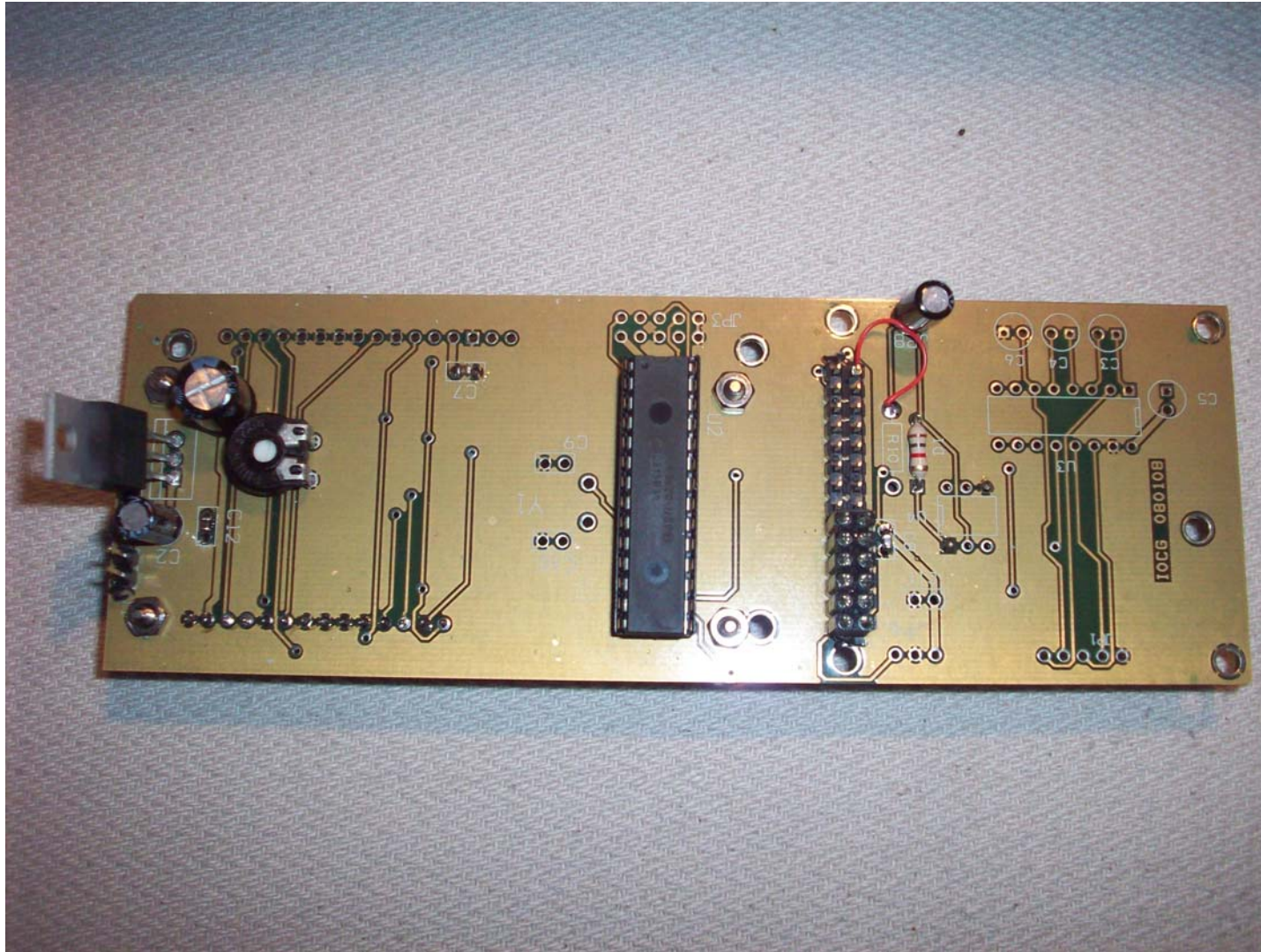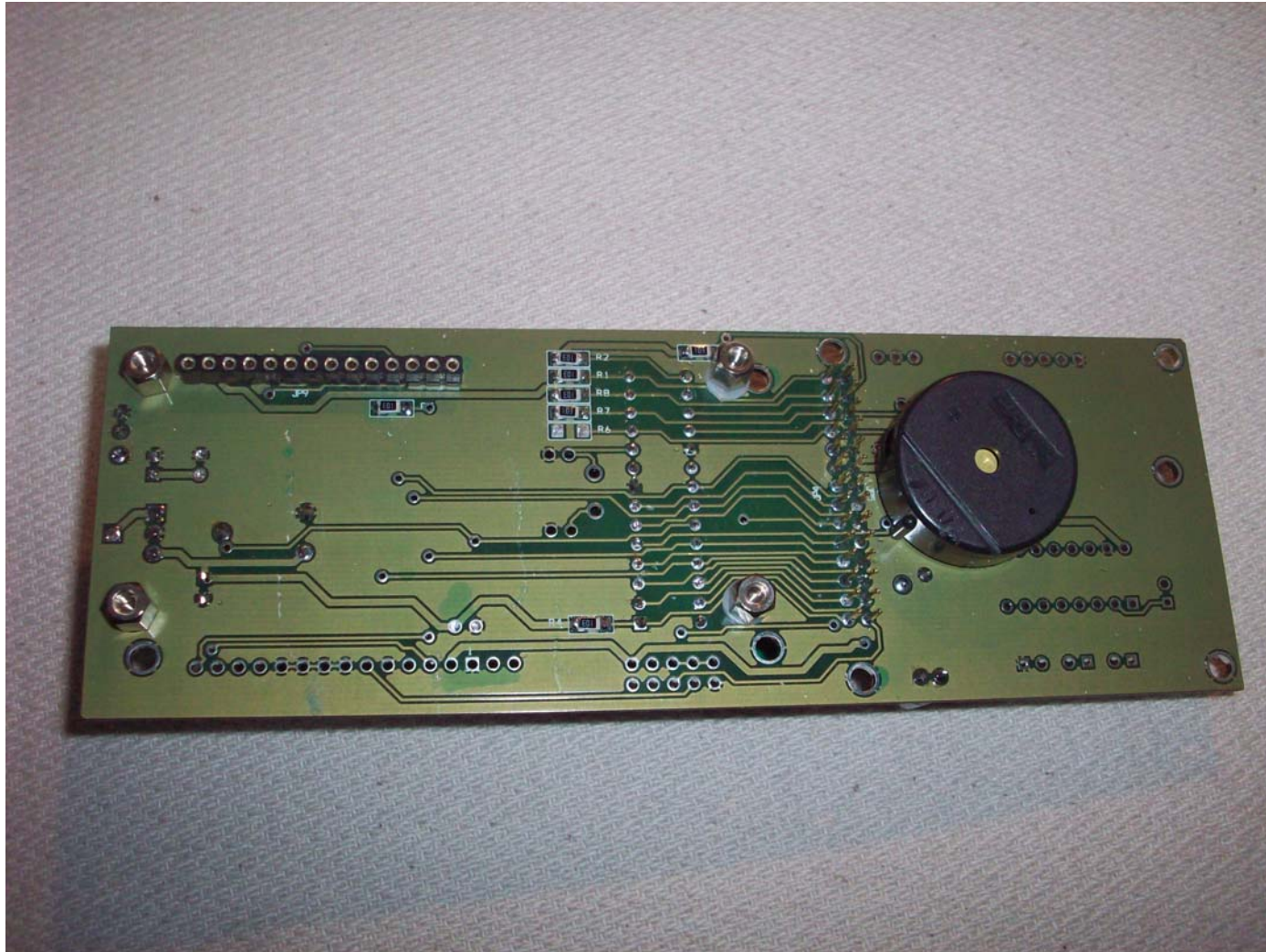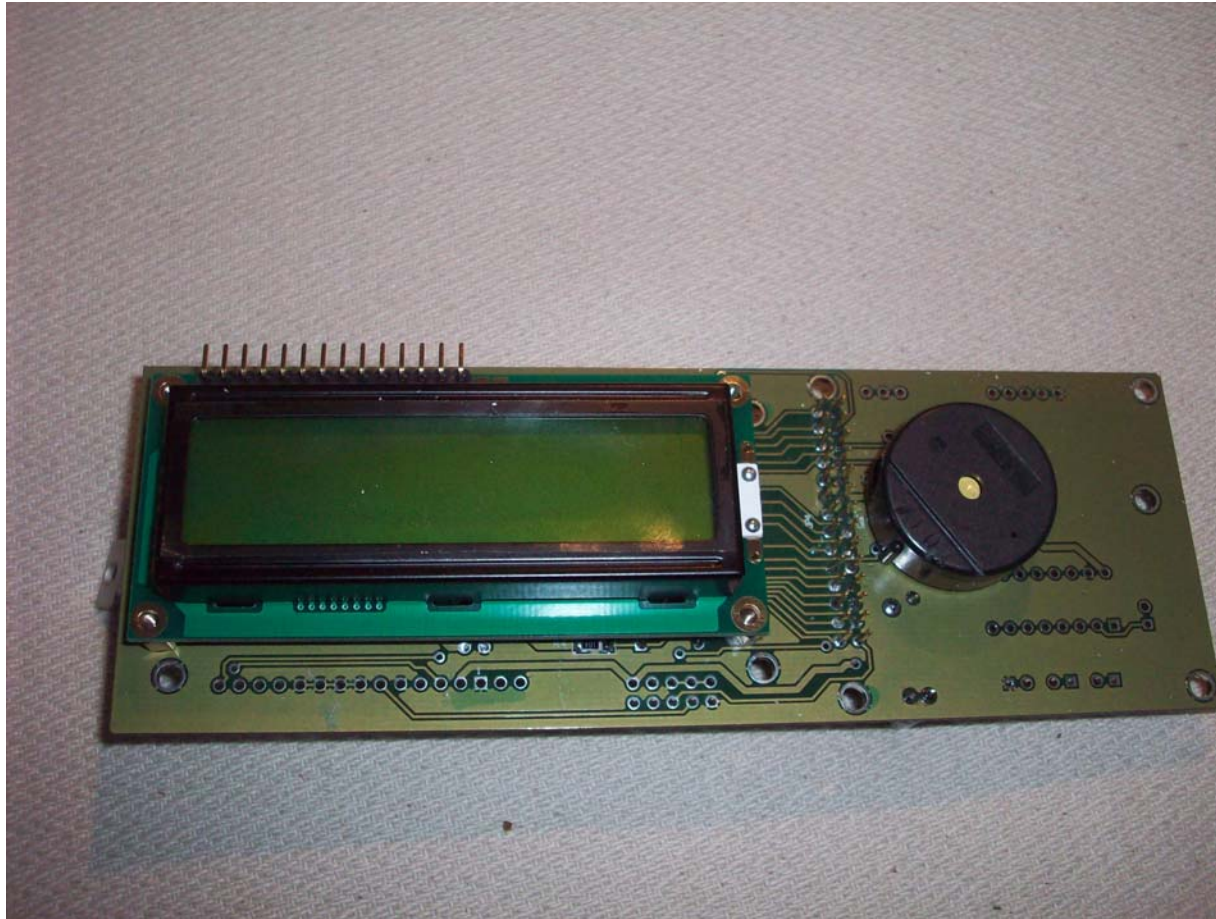
**FIG 1** Full Kit with all components

**Back side (components side)**

**Front side without LCD display ( SMD resistors are preinstalled)**
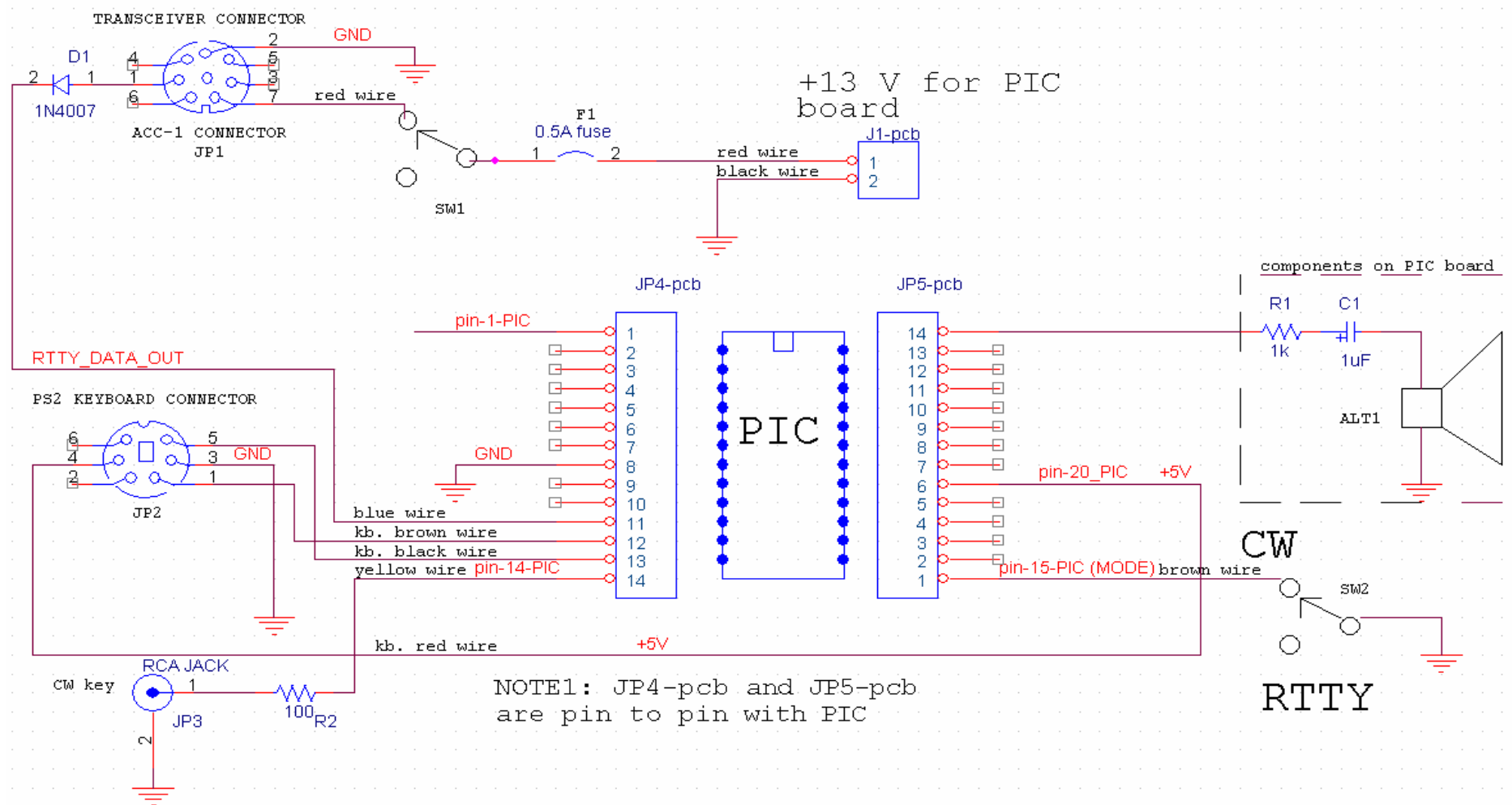
**Front side with LCD display**

**RTTY interface inside a prototype box in use with my IC-756proIII**

# Box wiring with PIC controller
## (PCB code I0CG080108)

TRANSCEIVER CONNECTOR

GND

D1
1N4007

ACC-1 CONNECTOR
JP1

red wire

+13 V for PIC board

F1
0.5A fuse

SW1

red wire
black wire

J1-pcb
1
2

RTTY_DATA_OUT

JP4-pcb

pin-1-PIC

GND

PS2 KEYBOARD CONNECTOR

JP2

GND

blue wire
kb. brown wire
kb. black wire
yellow wire  pin-14-PIC

kb. red wire      +5V

CW key

RCA JACK

JP3

100 R2

components on PIC board

R1      C1

1k       1uF

ALT1

JP5-pcb

PIC

pin-20_PIC       +5V

pin-15-PIC (MODE) brown wire

CW

SW2

RTTY

NOTE1: JP4-pcb and JP5-pcb
are pin to pin with PIC

To perform automatic TX  add a wire from JP1-3 to JP5-3 ( PIC pin 17)

## Bill of materials wired components inside Box

| Reference | components | Use |
|---|---|---|
| Jp1 | Connector 7 pin female | TRX connector for FSK and power supply |
| Jp2 | PS2 adapter connector | Keyboard |
| Jp3 | RCA Jack | CW key |
| Sw1 | Power supply switch | |
| Sw2 | Mode switch | Switch RTTY to CW mode |
| F1 | Fuse | 0.5 A |

# Connector for PS2 keyboard
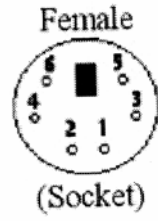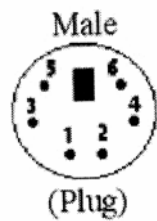


6-pin Mini-DIN (PS/2):
1 - Data
2 - Not Implemented
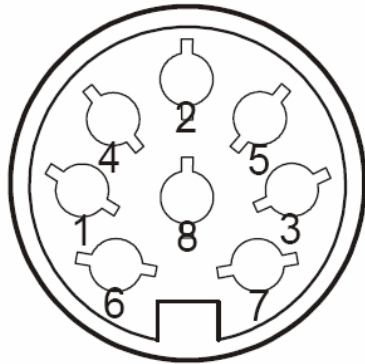3 - Ground
4 - Vcc (+5V)
5 - Clock
6 - Not Implemented

1=connect to PIC pin 12
3=connect to GND
4=connect to +5V
5=connect to PIC pin 13

## Connection for USB keyboard



1= connect to +5V
2=connect to PIC pin 12
3=connect to PIC pin 13
4= connect to GND

**ACC-1 CONNECTOR for ICOM transceiver IC-756, IC-7400, IC746**



**frontal view**

**PIN 1 = FSK**
**PIN 2= GND**
**PIN 7= 13.8 V**
**PIN 3 =PTT (Optional, to automatic TX switch)**

# ACC Connector of IC-7000

**ACC SOCKET**

| ACC | PIN # | NAME | DESCRIPTION | SPECIFICATIONS | | COLOR |
|---|---|---|---|---|---|---|
| | 1 | 8 V | Regulated 8 V output. | Output voltage :8 V ±0.3 V Output current :Less than 10 mA | | brown |
| | 2 | GND | Connects to ground. | ———— | | red |
| | 3 | HSEND | Input/output pin (HF/50 MHz). Goes to ground when transmitting. When grounded, transmits (connected to 8V line thru 2.2 kΩ resistance/144 MHz operation) | Ground level :−0.5 V to 0.8 V Input current :Less than 20 mA (HF/50 MHz bands) | | orange |
| | 4 | BDT | Data line for the optional AT-180. | ———— | | yellow |
| | 5 | BAND | Band voltage output. (Varies with amateur band) | Output voltage :0 to 8 0 V | | green |
| | 6 | ALC | ALC voltage input. | Control voltage :−4 to 0 V Input impedance : More than 10 kΩ | | blue |
| | 7 | VSEND | Input/output pin (144/430 MHz) Goes to ground when transmitting When grounded, transmits (connected to 8V line thru 2.2 kΩ resistance/HF•50 MHz operation). | Ground level :−0.5 V to 0.8 V Input current :Less than 20 mA (144 MHz band) | | purple |
| | 8 | 13.8 V | 13.8 V output when power is ON. | Output current :Max. 1 A | | gray |
| | 9 | TKEY | Key line for the AT-180 | ———— | | white |
| | 10 | FSKK | RTTY keying input. Connected in parallel to the [RTTY] jack. | Ground level :−0.5 to 0.8 V Input current :Less than 10 mA | | black |
| | 11 | MOD | Modulator input. | Input impedance :10 kΩ Input level Approx 100 mV rms | | pink |
| | 12 | AF | AF detector output. Fixed, regardless of [AF] position. | Output impedance :4 7 kΩ Output level 100 to 350 mV rms | | light blue |
| | 13 | SQLS | Squelch output. Goes to ground when squelch opens. | SQL open Less than 0.3 V/5 mA SQL closed More than 6.0 V/100 µA | | light green |

Rear panel view

⑬
⑨ ⑩ ⑪ ⑫
⑤ ⑥ ⑦ ⑧
① ② ③ ④

# Cable for connections with IC-756 or IC-7400 / IC-746

**Materials:**
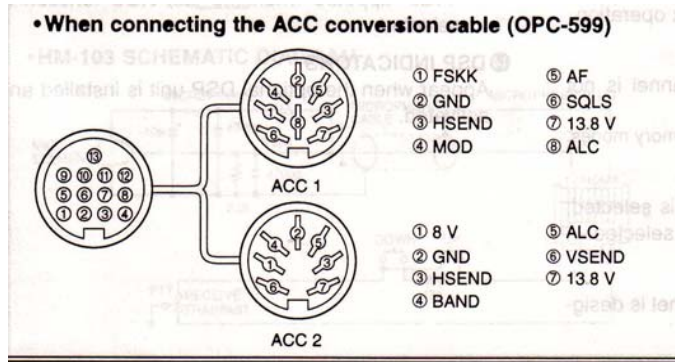**# 2 connctors 7 pin or  8 Pin for AUX-1 ( only three pins used)**
**0.5 m cable with four wire**

| Interface side | Transceiver side | signal |
|---|---|---|
| 1 | 1 | FSK |
| 2 | 2 | GND |
| 7 | 7 | 13.8V |
| 3 | 3 | PTT (Optional, to automatic TX switch) |

# Cable for connections with IC-7000

**If  conversion cable type OPC-599 is used, cable is the same as IC-756 or IC-7400 / IC-746.**



OP5-599 CONVERSION CABLE

# Cable with  13 pins ACC connector supplied with IC-7000

**Materials:**
**# connector 7 pins**
**#1 connector 13 pins supplied with IC-7000**
**0.5 m cable with four  wire**

| Interface side | Transceiver side (13 pin connector) | Wire color | signal |
|:---:|:---:|---|---|
| 1 | 10 | black | FSK |
| 2 | 2 | red | GND |
| 7 | 8 | gray | 13.8V |
| 3 | 3 | | PTT |

# Cable for CW for IC-756, IC-7400, IC-746, IC-7000

**Materials:**
**#1 RCA male connector**
**#1 Jack mono 6 mm**
**0.5 m shield cable**

**cable connected pin to pin**

**Some photo of my prototype:**