

THE DATA CONNECTOR

MUCH MORE THAN A CONNECTOR...

INTRODUCTION

All of us buy a rig which fits for our possibilities and we always try to take out the maximum efficiency, so we look at the great amount of connectors that they have in the rear panel. This look is always suspicious, since it forces us to turn on a solder. Oh God! If I make a mistake!, Perhaps I could throw away my last investment. Who runs the risk?.

Certainly we have come across the question that makes us feel uneasy, but if there is somebody who takes risks, he is a ham. Since we have decided to install our antenna we are taking risks of confrontations with our neighbors. But in this case, it is necessary to put in the scale the benefit that we are going to obtain and the risk that our gorgeous rig runs.

I have the intention of demonstrating that there are more benefits that we could obtain of this connector, in my opinion wrong called "DATA", than the risk you would take if you turn on the solder.

INSTRUCTION MANUAL INFORMATION

I own three rigs, each of them from different manufacturers (IC-706MKIIG, FT-3000M and TM-255), and each one with a DATA connector. The instruction manuals give us *similar* information, I emphasize the word, because at first glance they could seem the same but if we look at it in depth we can find serious differences.

I am going to detail all the pieces of information that we can obtain of each instruction manual, because the more we know them, the best performance we will get. Figure 1 shows a DATA socket viewed from the rear panel.

Pin 1.- It is an input to our rig. Yaesu calls it PKD, It has 10KOhmios input impedance, you can apply maximum levels of 40mVpp for 1.200bps and 2.0Vpp for 9.600bps. Icom calls it DATE IN, he recommends a level of 0.4Vpp (0.2Vrms), and it considers suitable the levels between 0.2-0.5Vpp (0.1-0.25Vrms). Kenwood calls it PKD, he describes it like a packet data input.

Pin 2.- Ground. All the manuals agree (more or less) in the explanation and function. Yaesu and Icom call it GND and Kenwood calls it DE.

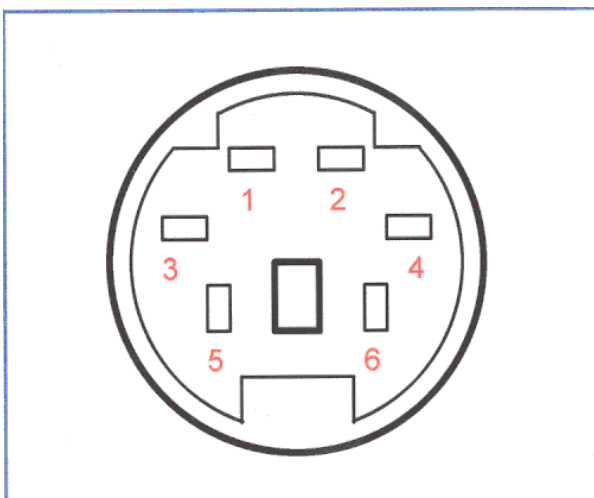
Pin 3.- When this pin is connected to ground, the rig puts on the air, it is the same that when you switch the PTT. Icom calls it PTTP. Yaesu and Kenwood call it PKS and they let us know that when it is connected to ground, the microphone remains disabled.

Pin 4.- 9.600bps data output. All the manuals tell us that if we have the intention of using this pin, we must enable it via the menu of the rig. Yaesu calls it RX9600 and lets us know that it has an output impedance of 10KOhmios and 300mVpp. Icom calls it DATE OUT. Kenwood calls it PR9, and lets us know that it has an output impedance of 10KOhmios and 500mVpp.

Pin 5.- 1.200bps data output. Yaesu calls it RX1200 and tells us that it has an output impedance of 10KOhmios and 300mVpp. Icom calls it AF OUT, and explains that it is the output of 1.200bps data. Kenwood calls it PR1 and lets us know that it has an output impedance of 10KOhmios and 300mVpp.

Pin 6.- Squelch control output. Yaesu calls it SQC and tells us that it is a logic transistor-transistor output, and it gives +5V (TTL) with open squelch, and 0V(TTL) with closed squelch. Icom calls it SQ and tells us that with open squelch it gives ground. Kenwood calls it SQC and describes it likes an output that gives +5V with open squelch and gives ground with closed squelch. In this rig, by means of an internal switch, we can use this pin to govern the transmission of an amplifier, so it gives ground when the rig is on the air.

This pin 6 is one of the most important differences between the brands. If you use a TNC and you select DCD by audio, you will not notice any difference. But you should be careful if you select DCD by carrier.



*Data socket viewed
from the rear panel*

Figure 1

GET DOWN TO WORK

CONNECTION TO THE PC SOUND CARD

The moment of truth has arrived. The instruction manual of the rigs always includes the DATA connector in the "Packet Operation" chapter. Keeping in mind the previous explanations of each pin, it seems not to be used for another thing.

But if we pay attention to the above pieces of information, we could assure that this connector let us:

- Input and output audio signals to and from our rig.
- Put our rig in transmission.
- The audio output level is constant.
- It gives us information of when our rig detects signals in the receiver.

Under these statements, apart from a TNC as it is indicated in the instruction manuals, this connector is ideal in order to connect our rig to a PC soundcard, because the input and output levels are totally compatible. We have some advantages over the conventional microphone socket:

- We do not need to unplug the microphone to use this connector in order to work with a PC soundcard.

- The wires toward the PC soundcard leave the rig from the rear panel, which it is more convenient.

- It has a constant audio level output, which many microphone sockets do not have.

We can see in the figure 2 how you have to connect the DATA connector to the PC soundcard. There are other more complex ways with insulating transformers and optic-couplers, but with this scheme I did not have any RF problems.

We will be able to work all the digital modes. We can use our PC as an audio recorder to record what you listen or you can use your pre-recorded calls to make CQs in contests or in normal conditions.

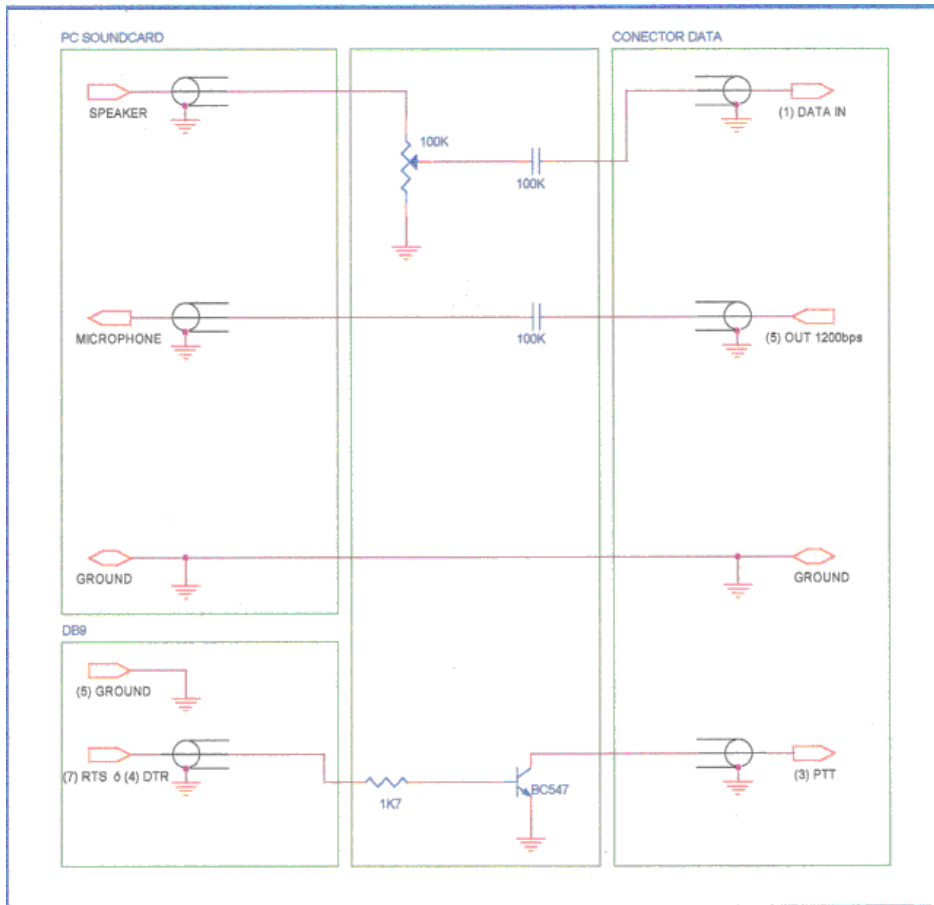


Figure 2

WEATHER SATELLITE RX

There is a very interesting feature of the DATA connector. It has a constant audio level output, so it lets us to change freely the volume control of our rig without changing the audio output level to the PC soundcard.

This feature stands out to decode weather satellites, because it is essential a constant audio level. When we wire the DATA connector to the PC soundcard in order to input audio signal to the PC, we can use the MIC or LINE input, both of them will work fine and we can adjust the input level in very small fixed steps, so in 3 or 4 passes we could adjust the audio input level to get the right color and brightness. We must write down in our notebook where we fix the soundcard potentiometer, so the next time we will see the receiving images rightly at the first attempt.

Before leaving this topic, I must say that I have tried to receive the satellites using the OUT 9.600bps pin, because we can obtain the audio output with a wider band, it is an

essential question in these satellites, but in fact the results that I have obtained are similar. I leave you to test it with your rig.

CROSS BAND REPEATER

I am sure you are scared, What is this guy going to speak about?. Well, I will not comment the legal face, only the technical possibility that DATA connector offers us in this way.

I came across this idea because all the 3 rigs that I have do not have this option, so I can not make them work like a cross band repeater, then I got my brain into gear.

We have taken advantage of 5 of the 6 pins of this connector until now. Well, the pin 6 changes its output level between 0 to 5 Volts each time our rig receives a signal, it is going to help us.

The idea is connect one rig to another rig by means of their DATA connectors, we will do it without using our PC and the couple of rigs will work like a cross band repeater.

The first was to study if the audio level output of the DATA connector could be applied to the audio input of the DATA connector of another rig. As we have all the information, I could get the conclusion that the input audio level needed is a bit less than the output audio level, therefore, the solution was an elemental potentiometer working as a voltage divider.

Now, I only need that the rig n°2 switch to TX when the rig n°1 receives any signal, and vice-versa. Here the pin 6 of the DATA connector comes to stage. This pin changes its level each time the rig receives a signal. If this change of level could switch the PTT of the another rig, everything will work well.

DESCRIPTION AND ADJUSTMENT OF THE CIRCUIT

I propose an electronic circuit in order to make work like a cross band repeater a Yaesu FT-3000M and an Icom IC-706MKIIG. This circuit could be applied to any couple of rigs which have DATA connectors.

You can see how the rigs swap their audio in the figures 3 and 4. In the figure 3 the audio output of Icom (OUT 1200) is applied to the audio input of Yaesu (DATA IN), by means of a potentiometer and a capacitor to separate the rigs. The figure 4 shows the same circuit, but in this case the audio output of Yaesu (OUT 1200) is applied to the audio input of Icom (DATE IN).

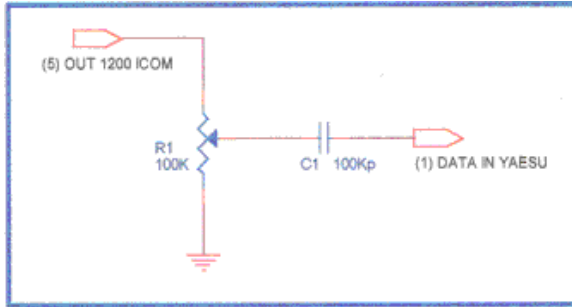


Figure 3

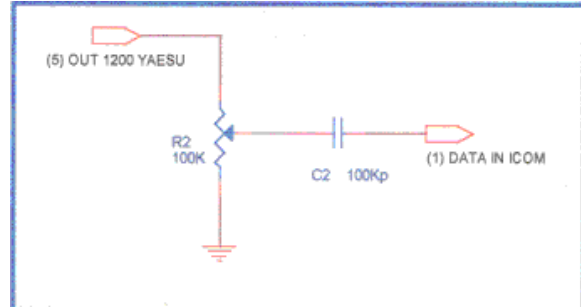


Figure 4

If we come back to the definition of the pin 6 in the instruction manuals, we can see that Yaesu and Kenwood are the same, and this pin gives 5V if the squelch is opened. Figure 5 shows the pin 6 of Yaesu (SQ) exciting a transistor, and applying their collector to the pin 3 of Icom (PTT). So, any signal received by the Yaesu will switch the PTT of the Icom.

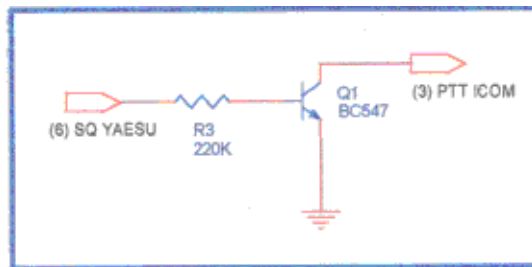


Figure 5

Icom, I ignore why, works in inverse order. In this pin 6 appears ground when the squelch opens. I analyzed several ways of reversing this signal, one of them was by means of a NOR TTL circuit, but these circuits have 4 NOR doors, and I only need one. We could have used a PNP transistor, but at the end I decided to use a simple circuit with a couple of NPN transistors, that in fact it works like an inverse circuit. So I will only use an only type of transistor

Figure 6 shows the complete circuit. Pin 6 of Icom with open squelch gives us ground, that we apply to the base of the Q1, appearing in their collector the voltage supplied for the 7805, that is to say 5V, that it is applied to the base of the Q2, it switches on, appearing ground in their collector, that we applied to the pin 3 of Yaesu (PTT), and "Voila", Yaesu begins to transmit. When the squelch of Icom is closed, the transistors inverse their state, stopping transmitting the Yaesu.

The only adjustment that this circuit needs is the audio level. In my case, the potentiometer worked well in its central point.

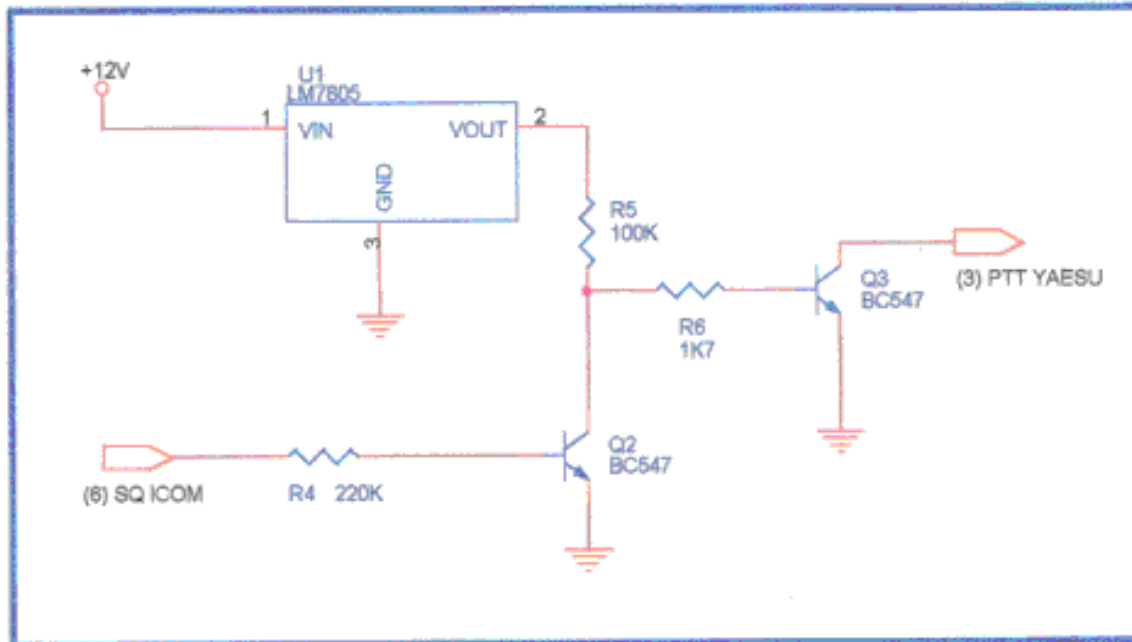


Figure 6

ASSEMBLING THE CIRCUIT

I could have designed the board circuit with multiple programs of design that there are in the market, but the simplicity is an important principle in my shack, and in order to not complicate the things with acids neither photosensitive boards, I decided to use a PCB with strips of copper in bars shape.

You can see the whole of the electric circuit if you join the figures 3, 4, 5 and 6.

Figure 7 shows the part list and the ended circuit, in red the components, in blue the solder layer. You should not forget to cut the strips marked with “//”. The assembly doesn't need any explanations because it is extremely easy.

Photos 8 and 9 show the ended assembly.

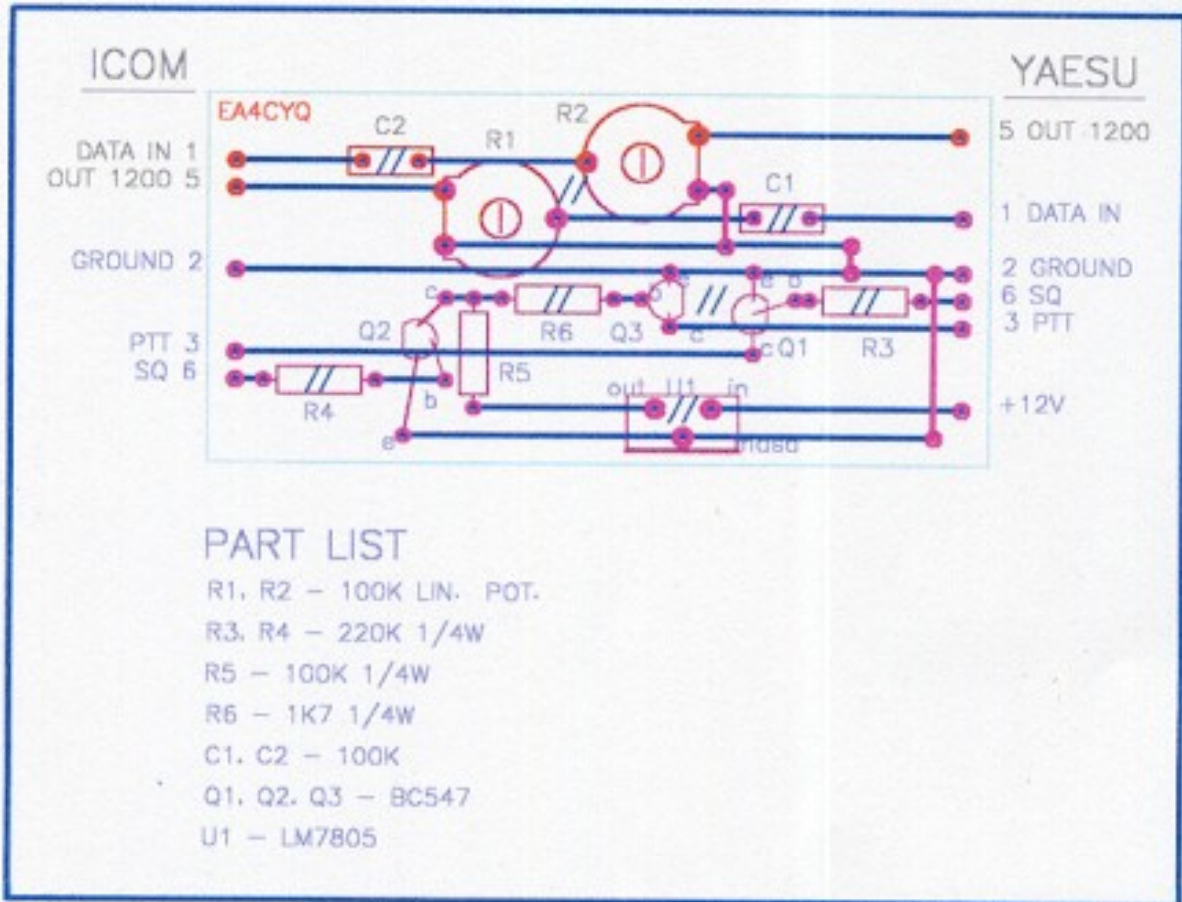


Figure 7

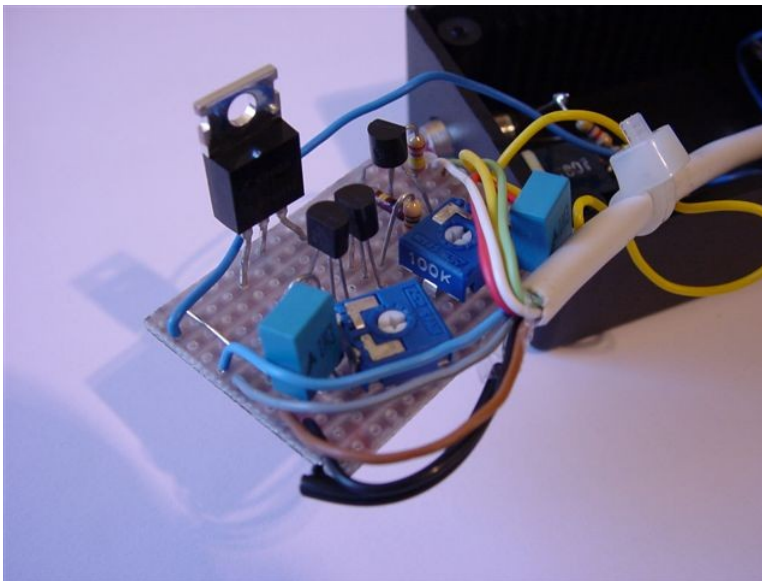


Photo 8.- PCB assembled



Photo 9.- The outcome

CONCLUSIONS

All the tests carried out in digital modes worked in an amazing way. This morning I have worked in PSK31 DS4AEN, our friend Champ from Korea, with my simple dipole antenna. After that I recorded several CQs by means of the PC soundcard and my usual mike, when I tested it people did not notice any difference between my present modulation and the recorded one.

When I began to work with the cross band repeater, the hams of my area did not notice if I was working from my shack or I was walking with my HT.

But I only had another thing to test. I selected by menu in my FT-3000M the full-duplex mode, receiving in UHF and transmitting in VHF, and the IC-706MKIIG in 40 meters band. In my dual band HT in VHF I was receiving the 40 meters band, and when I pushed the PTT of the HT in UHF I was transmitting in 40 meters band like I was sat in my shack, the modulation was 5/5. It was an amazing experience.

I hope you are not bored stiff when you are reading these last paragraphs. My intention was to encourage you to fire up your solder and take out the maximum efficiency of your station, with confidence and for only a few Euros.

If any doubt remains and I could solve it, you can keep in touch with me by ea4cyq@amsat.org.

I would like to express my gratitude to the whole community of hams of the “Vegas Altas del Guadiana” for their advice, and especially to my friend Pedro (EB4DKA).

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