

**Fig 19.55—Kenwood interface schematic.**  
C6-C9, C11, C12, C17, C18—0.01- $\mu$ F  
ceramic disc.

**C13-C16, C19-C21—0.01  $\mu$ F ceramic disc.  
U1-U4—PS2501-1NEC**

**U5—Harris ICL232 or Maxim MAX232.**

and the tip is the bus connection.

It is worth noting that the ICOM and Ten-Tec radios use identical basic command sets (although the Ten-Tec includes additional commands). Thus, driver software is compatible. The manufacturers are to be commended for working toward standardizing these interfaces somewhat. This allows Ten-Tec radios to be used with all popular software that supports the ICOM CI-V interface. When configuring the software, simply indicate that an ICOM radio (such as the IC-735) is connected.

## TYPE TWO: YAESU INTERFACE

The interface used for Yaesu rigs is identical to the one described for the ICOM/Ten-Tec, except that RxD and TxD are not jumpered together. Refer to

Fig 19.54. This arrangement uses only the RxD and TxD lines; no flow control is used.

The FT-990 and FT-1000/FT-1000D use an emitter follower as the TTL output. If the input impedance of the interface is not low enough to pull the input below threshold with nothing connected, the FT-990/FT-1000 (and perhaps other radios) will not work reliably. This can be corrected by installing a 1.5 k $\Omega$  resistor from the serial out line to ground (R2 on pin 1 of U1A in Fig 19.54.) Later FT-1000D units have a 1.5 k $\Omega$  pulldown resistor incorporated in the radio from the TxD line to ground and may work reliably without R2.

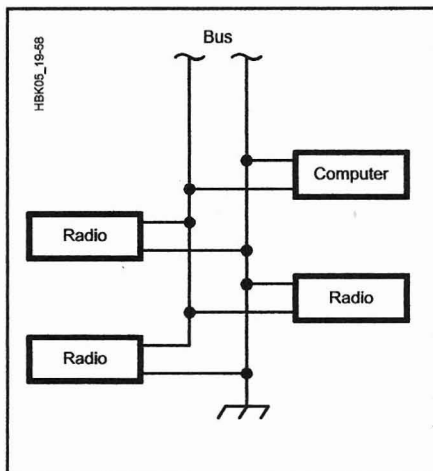
The same computer connector is used, but the radio connector varies with model. Refer to the manual for your particular

rig to determine the connector type and pin arrangement.

### TYPE THREE: KENWOOD

The interface setup used with Kenwood radios is different in two ways from the previous two: Request-to-Send (RTS) and Clear-to-Send (CTS) handshaking is implemented and the polarity is reversed on the data lines. The signals used on the Kenwood system are active-low. This means that 0 V represents a logic one and +5 V represents a logic zero. This characteristic makes it easy to fully isolate the radio and the computer since a signal line only has to be grounded to assert it. Optoisolators can be used to simply switch the line to ground.

The schematic in **Fig 19.55** shows the



**Fig 19.53**—The basic two-wire bus system that ICOM and newer Ten-Tec radios share among several radios and computers. In its simplest form, the bus would include only one radio and one computer.

works with newer ICOM and Ten-Tec rigs. **Fig 19.53** shows the two-wire bus system used in these radios.

This arrangement uses a CSMA/CD (carrier-sense multiple access/collision detect) bus. This refers to a bus that a number of stations share to transmit and receive data. In effect, the bus is a single wire and common ground that interconnect a number of radios and computers.

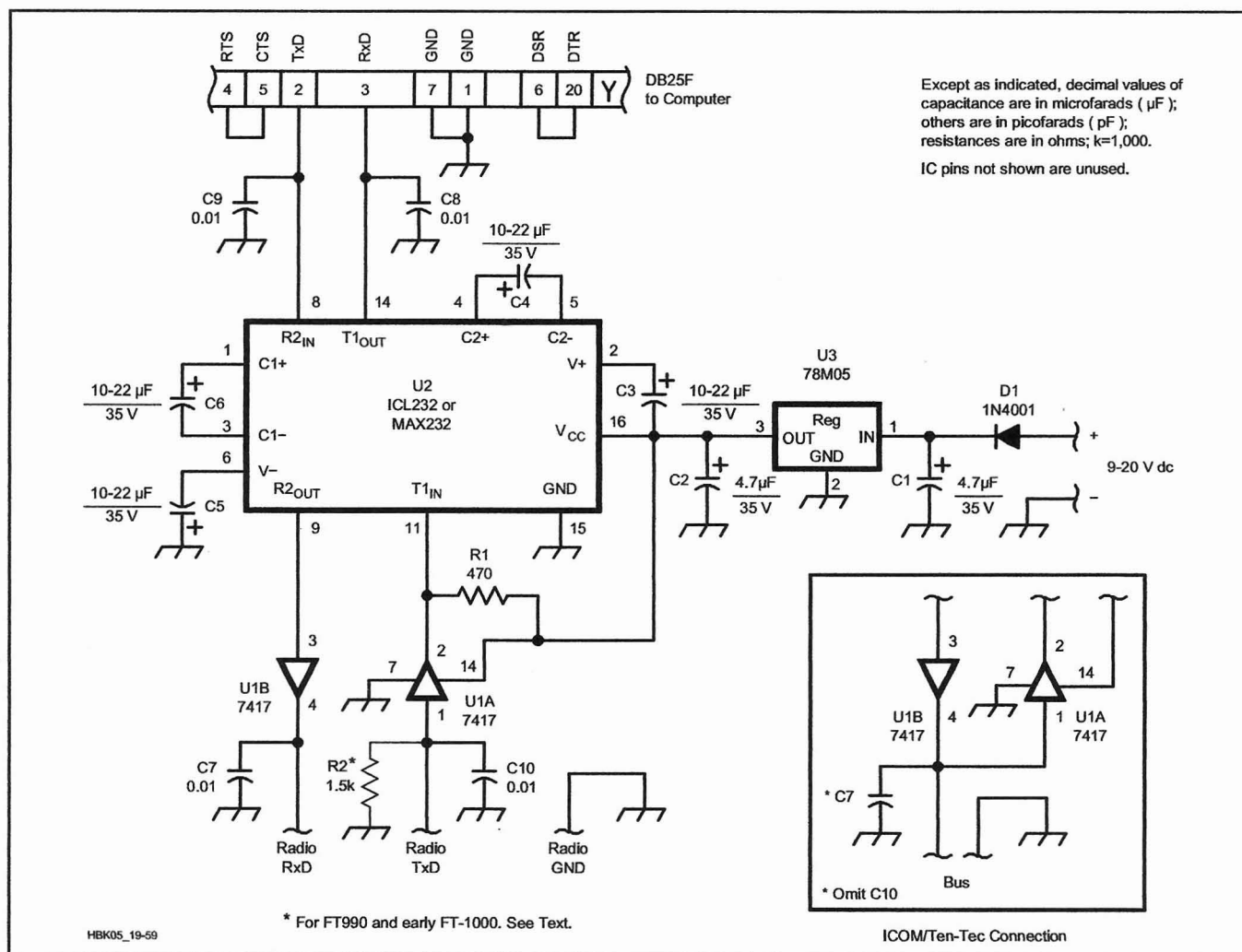
The single wire is used for transmitting and receiving data. Each device has its own unique digital address. Information is transferred on the bus in the form of packets that include the data and the address of the intended receiving device.

The schematic for the ICOM/Ten-Tec interface is shown in **Fig 19.54**. It is also the Yaesu interface. The only difference is that the transmit data (Tx/D) and receive data (Rx/D) are jumpered together for the ICOM/Ten-Tec version.

The signal lines are active-high TTL. This means that a logical one is represented by a binary one (+5 V). To shift this to RS-232-D it must be converted to -12 V while a binary zero (0 V) must be converted to +12 V. In the other direction, the opposites are needed: -12 V to +5 V and +12 V to 0 V.

U1 is used as a buffer to meet the interface specifications of the radio's circuitry and provide some isolation. U2 is a 5-V-powered RS-232-D transceiver chip that translates between TTL and RS-232-D levels. This chip uses charge pumps to obtain  $\pm 10$  V from a single +5-V supply. This device is used in all three interfaces.

A DB25 female (DB25F) is typically used at the computer end. Refer to the discussion of RS-232-D earlier in the chapter for 9-pin connector information. The interface connects to the radio via a 1/8-inch phone plug. The sleeve is ground



**Fig 19.54**—ICOM/Ten-Tec/Yaesu interface schematic. The insert shows the ICOM/Ten-Tec bus connection, which simply involves tying two pins together and eliminating a bypass capacitor.

C7-C10—0.01- $\mu\text{F}$  ceramic disc.

U1—7417 hex buffer/driver.

U2—Harris ICL232 or Maxim MAX232.