

## D-STAR, An Introduction

### Summary

Icom America, Inc. is the first manufacturer to produce equipment that supports the D-STAR digital voice and data standard for amateur radio. Digital techniques are new to Amateur Radio, so this course has been created by Icom for amateurs to educate themselves about the nature of this new technology and the D-STAR system, specifically.

By completing this course, the student will understand the following D-STAR concepts, many applicable to any digital wireless data system:

- How D-STAR exchanges data over the air
- How D-STAR radios and repeaters work
- How the D-STAR repeaters are linked together into a worldwide system
- How to use the D-STAR system
- How to configure D-STAR radios, repeaters and gateways

### How This Course is Organized

The course consists of 11 units. Except for the Final Review and Final Examination, each unit begins with a summary, presents detailed material, follows with a glossary and review, and concludes with a five-question, multiple-choice exam. After passing the exam for each unit, the student is permitted to proceed to the next unit. Once the student has passed the final exam, ICOM is notified and a certificate is provided. Here is a list of the units:

1. Introduction (this unit)
2. D-STAR Characteristics
3. D-STAR Protocol Basics
4. D-STAR Network Operation
5. D-STAR Radios
6. D-STAR Use - Local
7. D-STAR Use - Gateway
8. The D-STAR Repeater
9. The D-STAR Repeater Gateway
10. D-STAR Review
11. D-STAR Final Exam

The text portion of each unit is available for downloading as a PDF file from [here](#). No additional texts or references are required for the course, although you may want to download the operating manual for a D-STAR radio as a source of examples. There are several Web sites that have additional information you may find useful:

**ICOM America D-STAR Web site:** <http://www.icomamerica.com/amateur/d-star/>

**Texas Interconnect Team (D-STAR Development Group):** <http://www.k5tit.org/>

### D-STAR Introduction and Overview

## What is D-STAR?

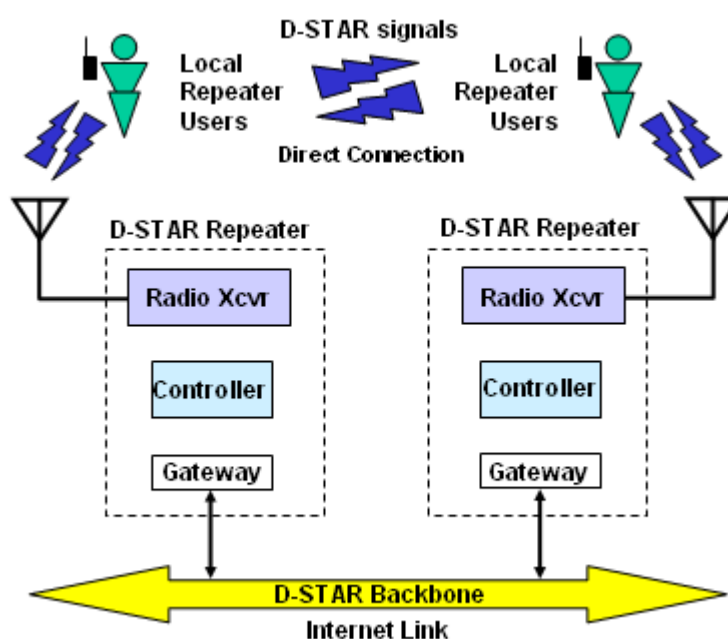
D-STAR is a communications standard--that is, it describes the methods of operation and necessary technical details for radio equipment to be constructed and operate successfully. D-STAR is not a brand name or limited to use by one manufacturer.

Released in 2001, D-STAR's developed was funded by the Japanese Ministry of Posts and Telecommunications to investigate digital technologies for amateur radio. The research committee included representatives of the Japanese amateur radio manufacturers, including Icom, and other observers.

Although D-STAR is a standard published by JARL, it is available to be implemented by anyone. D-STAR is an **open system**, meaning that any equipment complying with the published standard can use the system.

## What D-STAR Controls

As shown in Figure 1-1, D-STAR applies to two parts of a communications system. The first is the **air link** (represented by the blue lightning bolt), meaning the actual radio transmissions between radios. (An example of another amateur air link standard is packet radio that uses the AX.25 standard.) The second is the **backbone** (represented by the yellow arrow) by which D-STAR repeater **gateways** communicate using the Internet or direct radio links. D-STAR radios can also talk directly to each other without any intermediate equipment.



**Figure 1-1**

The D-STAR standard also controls the conversion of voice to and from digital signals (called **digitization**) in radios and repeaters. All voice signals in the D-STAR system must use the same type of encoding so that voices are reproduced properly. Digitization is performed by a device called a **codec**, short for coding-decoding.

For digital data, D-STAR radios present an RS-232 or USB interface for low-speed data and an Ethernet connection for high-speed data. This allows widely available software to use the D-STAR system without special software or electrical interface equipment. The digital data is transmitted in the D-STAR system without modification.

Most D-STAR repeaters will consist of one or more radio transceivers that handle the air link part of the system. An internal controller will manage the transceivers, just like analog FM repeaters. What's different is that the D-STAR radio transceivers handle a stream of digitized voice and digital data instead of the usual analog FM signals. The methods a D-STAR radio or repeater uses to handle those voices or data internally is up to the equipment designer.

D-STAR also specifies how a repeater communicates to other D-STAR systems through gateways that are connected to the repeater controller. Whether the gateways communicate via the Internet or a radio link is up to builders of the repeater system.

### **D-STAR's Status and Future**

D-STAR repeaters are currently installed in a number of locations in Japan, North America, and Western Europe. For a directory of the growing number of D-STAR repeaters, check the Icom America D-STAR Web site. All of the repeaters are linked using the D-STAR system backbone.

Icom also produces several D-STAR radios, including:

IC-V8	2-meter handheld transceiver
IC-U8	70-cm handheld transceiver
IC-91	2-meter/70-cm handheld transceiver
IC-2200H	70-cm mobile transceiver
ID-800	70-cm mobile transceiver
ID-1	1.2 GHz mobile transceiver

Because D-STAR's digital system is so flexible, a number of new applications are being developed. Here are a few examples:

#### **Emergency Communications**

A large amount of communications in support of disaster and emergency response organizations concerns status and resources. This type of information can easily be handled in digital form, quickly and accurately. D-STAR supports keyboard-to-keyboard communications (not email) and Web page entry, making it a powerful tool for amateur emergency responders.

#### **Information and services - the D-STAR Kiosk**

There's no rule that says a D-STAR user must be a person! Digital data can just as well be received by a computer. If the computer stores information of interest to hams, such as event calendars or store locations, it can be retrieved over the D-STAR system. Weather and traffic reports could be made available, as well.

#### **Location Reporting Systems - D-PRS®**

The RS-232 data ports of D-STAR handheld radios are compatible with the GPS receiver NMEA data interface. GPS location data can be forwarded to a D-PRS server where gateway software connects you to the APRS® reporting system [URL for APRS].

#### **IRLP and Echolink Gateway Connections**

Since IRLP and Echolink already forward digitized voices of hams, D-STAR's digital voices can be linked to those popular repeater-sharing applications.

**D-STAR Development**

As additional D-STAR equipment is produced and more D-STAR repeater systems installed, the opportunities to build useful new systems increases. If you are interested in these new systems, we suggest that you join the D-STAR developers groups on the Web via the Icom America D-STAR Web site.

***Click the "Review" button to review the topics covered in this lesson. When you are ready, click "Next" to continue...***