µSmartDigi™

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by
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Painter Engineering, Inc.

μSmartDigi™
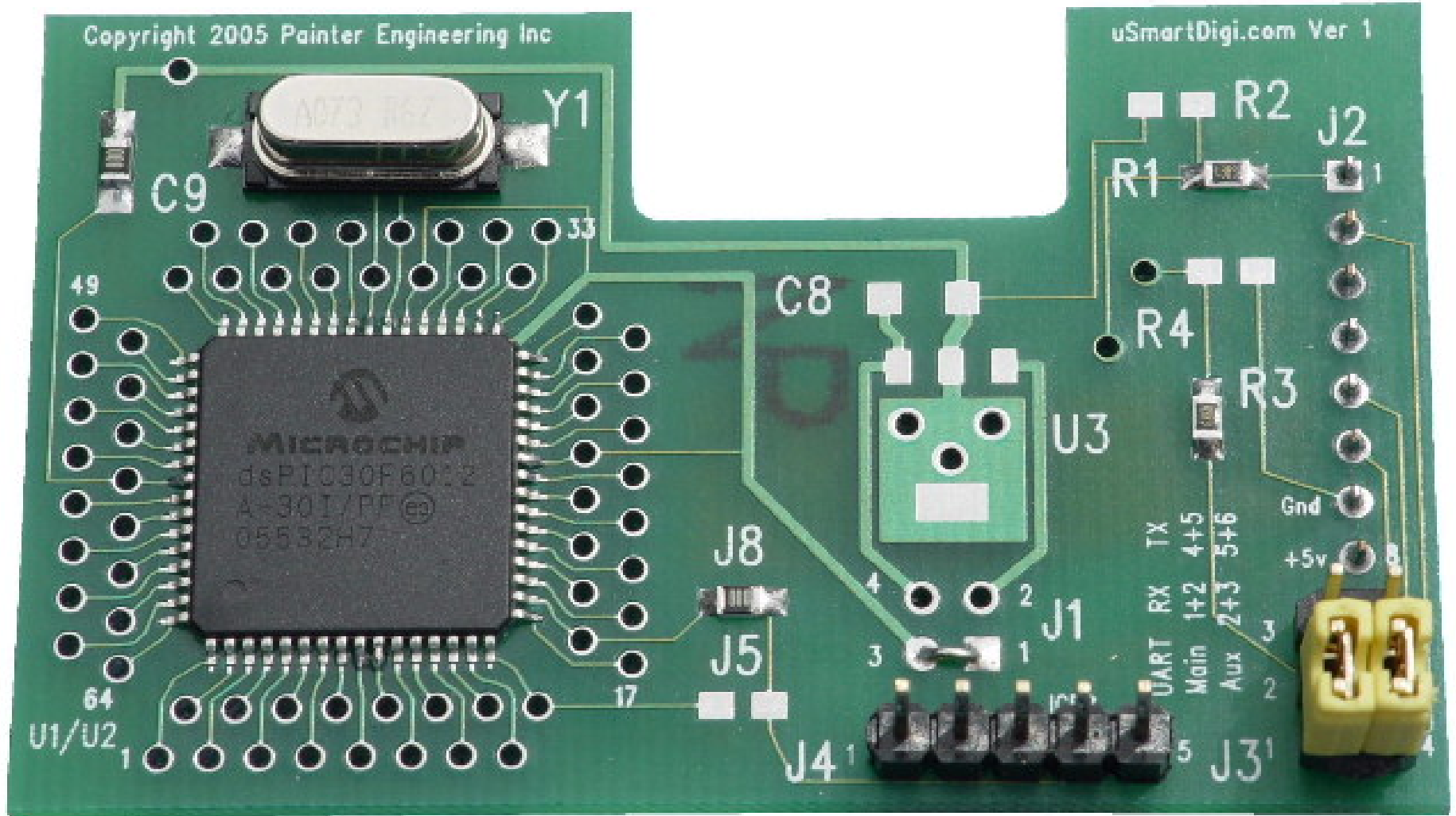
◆ **μSmartDigi™** APRS® Digipeater
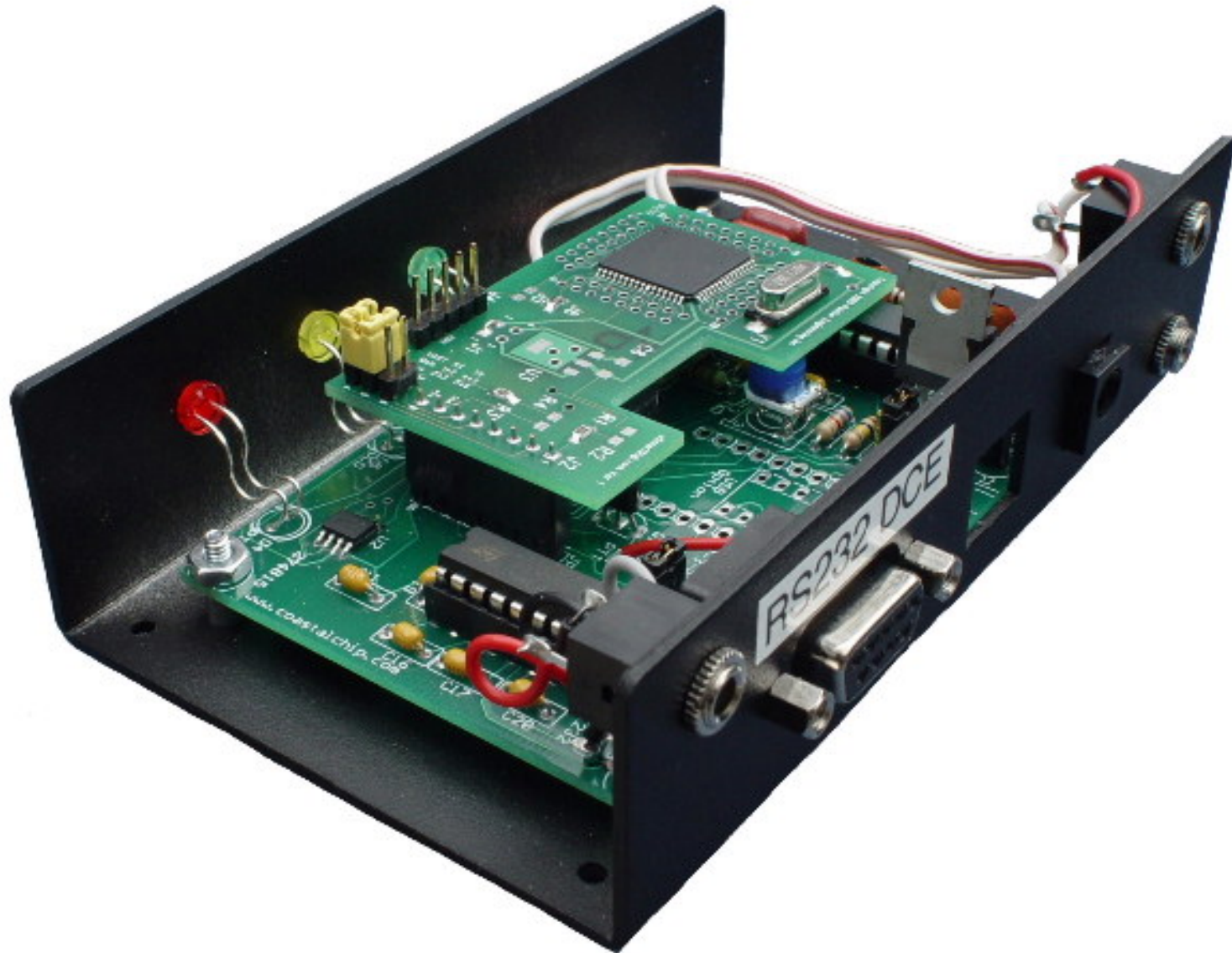
◆ **μSmartDigi™** New Features

If time permits...

◆ **μSmartDigi™** D-Gate D-STAR Gateway

μSmartDigi™ Basics

- 1.5in x 2.5in PCB Expansion Board for Coastal ChipWorks TNC-X
- CPU is Microchip's dsPIC 30F/33FJ DSP Microcontroller Family
- 30+ MIPS
- Powered at 8-16 VDC, 60-200 mA
- Programmed in native C

μSmartDigi™ Common Features

- ◆ Operates without dedicated PC/Laptop
- ◆ Firmware is Field Flashable without special hardware
- ◆ Configuration and Rules stored in EEPROM
- ◆ Interactive Command Monitor for Configuration changes and Message Logging

μSmartDigi™ Common Features

◆ PC/Laptop Utility

- Processes Configuration and Rules from ASCII text files

- Performs extensive input error checking

- Communicates with μSmartDigi™ over RS-232 or TNC-X Optional USB Module

- Downloads Configuration and Rules into EEPROM over RS-232

μSmartDigi™ Common Features

- ◆ PC/Laptop Utility cont.
  - ▪ Flashes Firmware distributed in Intel Hex format (standard for Microchip)
- ◆ Use PC/Laptop Terminal Emulator, etc. to Monitor Logged Messages, directly enter Configuration Parameters (but not Rules)

μSmartDigi™

APRS Digi Features, Use & Configuration

µSmartDigi™ Digi Features

◆ Configured with fixed Lat-Lon or use real-time updates from attached GPS

◆ Supports a combo of GPS and Log Monitoring on single serial port

◆ Log output is UI-View style

```
DROP: Path Rules: Bad Digi: -0 and H=0
KD6FVP-2>APS224,N6EX-1,WIDE1 <UI Len=45>:
>152343z[224]*We know most of your faults!!!

DROP: Path Rules: Digi1 RELAY
N6XQY-12>GPSLJ,RELAY,WIDE2-2 <UI Len=71>:
$GPRMC,013641.06,A,3348.1607,N,11807.4631,W,34.0,090.5,231105,13.,E*73
```

μSmartDigi™ Digi Features

◆ Ver 2.8 Packet-Checking Algorithm- uses short-circuit logic

1. OTA Run-Stop Mode check
2. Check for My Beacon
3. Do Path Edits (deletes, substitutions)
4. Verify Digipeater Path
5. Perform Call Rate Limiting
6. Perform Duplicate Check
7. Decode Position Information
8. Process against User-defined Rules

μSmartDigi™ Digi Features

◆ Over-The–Air (OTA) Run-Stop Mode

- Uses APRS Directed Station Query
- start: ?**** and stop: ?****
- Configuration: `controlcall CALL-SSID`
- Command prompt or Config File
- Command `run` toggles mode
- Not secure from eavesdropping

μSmartDigi™ Digi Features

◆ Digi Path Editing

- Delete and Substitution

- Indexes are 0 for wild, 1-8 for specific

- Match_String can have certain wild *...

  - ◆ *   to match any digi
  - ◆ xxx*   wild char match xxx anything
  - ◆ xxx-n   to match the digi xxx AND ssid n

μSmartDigi™ Digi Features

◆ **Digi Path Editing (cont.)**

- deletepath Match_Index Match_String Del_Index
  - `del * ab0vo-11 * # remove UITrace call to shorten path`
  - `del * RELAY *    # remove RELAY from the path`
- substitutepath Match_Index Match_String Sub_Index Digi_List
  - `sub * WIDE1-1 * WIDE2-2 # replace entire path with`
    WIDE2-2 if WIDE1-1 appears anywhere
  - `sub * wide * wide1-1,wide2-2 # replace entire path if`
    wide

- rmeditpath number

- New Rule: drop|pass digi Match_Index Match_String

µSmartDigi™ Digi Features

◆ Verify Digipeater Path

- Checks for Generic Path (dst field)

- Checks for exhaustion

- Optionally scans for RELAY

- Ignores TRACE

- Applies hop-count limits (Max, Total)
eg. WIDE1-1,WIDE4-4

µSmartDigi™ Digi Features

◆ Call-Rate Limiting Check

- Specify a period in seconds
- Limits 1 packet per call within period
- Not SSID specific

μSmartDigi™ Digi Features

◆ Perform Duplicate Check

- Fields src, src ssid, dst, info

- Uses Fast CCITT CRC16 1021 Normal Table-based algorithm

- User-defined time window (default 28 seconds)

μSmartDigi™ Digi Features

- **Decode Position Information**
  - Raw NMEA Messages
    - GGA
    - RMC
  - MIC-E
  - Base-91 Compression

µSmartDigi™ Digi Features

◆ Beaconing

- Specify default digi Path
- Specify interval in seconds
- Specify comment string
- Specify Icon and Overlay (ver 2.5+)

μSmartDigi™ Digi Features

◆ Position Information Currently Supported

- $ (GGA and RMC only)
- !=
- /@
- `\

µSmartDigi™ Digi Features

- ◆ Process against User-defined Rules
  - ■ Implicit and Explicit Rules
  - ■ Short-circuit logic
  - ■ Specify PASS or DROP
  - ■ Match src or dst fields with optional wild character (*)
  - ■ Geoposition based on *compass* direction, *circle*, *sector* (pie segment) or *rectangle*

μSmartDigi™ Digi Features

◆ Process User-defined Rules (cont.)

- digi Match_Index Match_String
- Lat, Lon and Angles are specified in several flexible formats
  - ◆ Colon: [s]DDD:MM:SS[.F*]
    -38:33:29.222 45:18:
  - ◆ Dotted: [s]DDD.MM.[F*]
    -103.00.   -38.33.379
  - ◆ DMC (Degrees Minutes seConds):
    N 39d 23.7m, 33.9c, W104d40m8.4c, -42.5d

µSmartDigi™ Digi Features

◆ Process User-defined Rules (cont.)

- Rules are edited in a .txt file

- No special editor

- Files are portable

- PC/Laptop Utility reads, error checks, complies into compressed internal format and downloads into EEPROM

μSmartDigi™ Digi Features

◆ Example Rules

```
implicit    pass
drop src ab0vo
pass dst APU25N
pass circle 2.5    n 39d 31m,     W 104.669d     // hole
drop cir    50.5   n 39d 31m,     w 104.669d     // donut
drop compass W     39:31:00, w 104.669d  # drops West
drop rect   40d 0m .5c, -104d 30m,39d, -103d    /* box
drop sect   32d, 60d, 5    // drops all packets 5 miles or
                           // greater from the repeater
                           // from 32deg from N to 60deg
drop digi * ab0vo         // drop if ab0vo in path
```

µSmartDigi™ Digi Features

◆ Configuration Parameters

  ■ Parameters are edited in a .txt file or interactively into the µSmartDigi™

  ■ No special editor

  ■ Files are portable

  ■ PC/Laptop Utility reads, error checks and complies into compressed internal format and downloads into EEPROM

μSmartDigi™ Digi Features

◆ ## Configuration Parameters (subset)

```
call        CALL
ssid        SSID
position    Lat Lon
havegps     y | n
digipath    <comma-separated path>
host        [baud]
tnc         [baud]
gps         [baud]
beacon      seconds
relaydrop   y | n
widemax     N
widetotal   N
dupewin     seconds
```

µSmartDigi™

Digi Use & Configuration Demo

- Config File
- Rules File
- Downloading
- Flashing Firmware
- Monitor Commands
- Serialtest Command
- GPS attachment

µSmartDigi™ Summary

◆ Q&A

◆ Web Sites

http://usmartdigi.com

http://www.tnc-x.com

http://www.aprs-is.net/dprscalc.htm

http://www.icomamerica.com/en/products/amateur/dstar/id1/default.aspx

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μSmartDigi™

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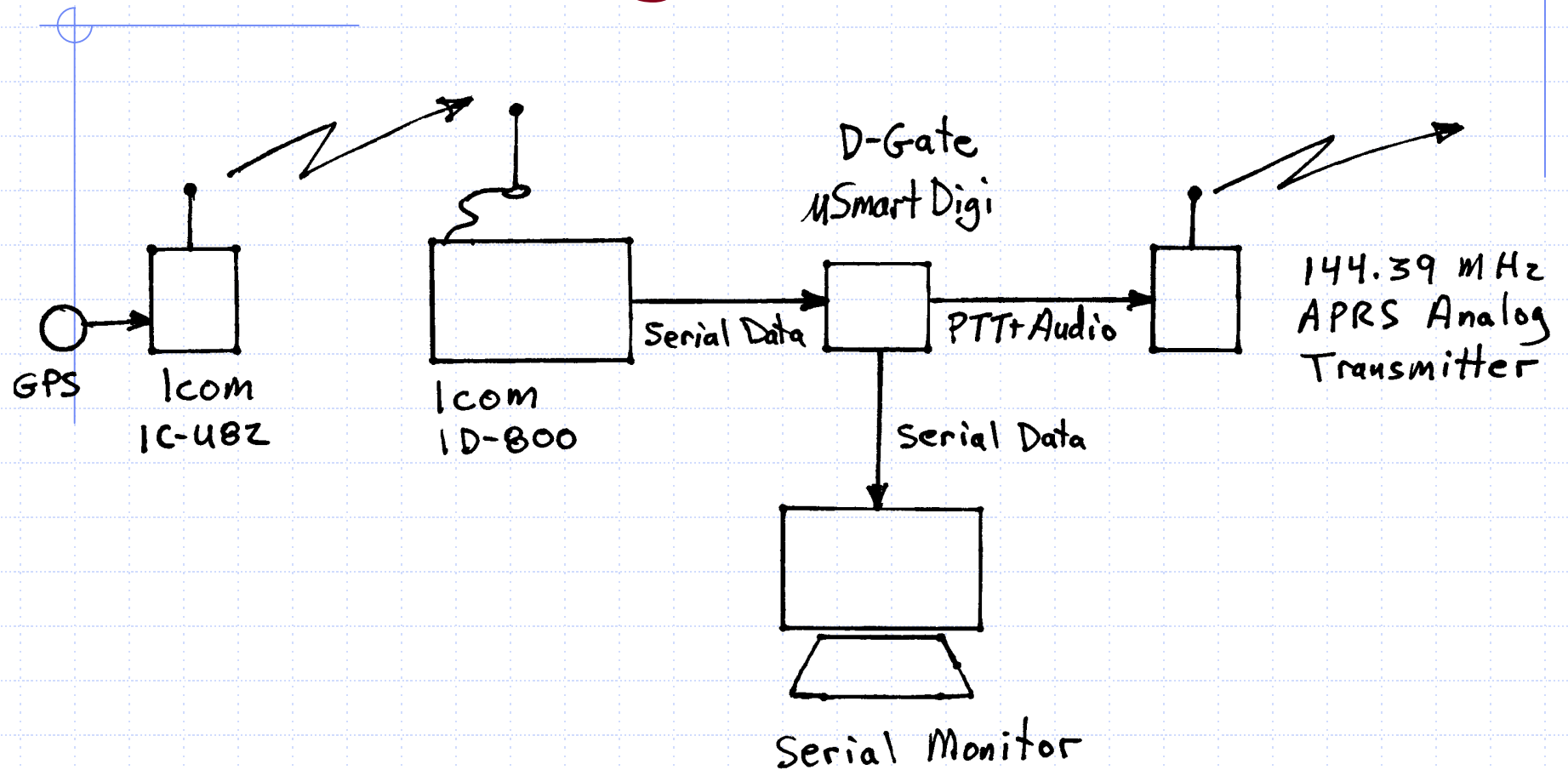
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μSmartDigi™

D-Gate Features, Use & Configuration

μSmartDigi™ D-Gate Features

GPS → Icom IC-U82 ⇒⇒⇒

Icom ID-800 —Serial Data→ D-Gate μSmart Digi —PTT+Audio→ 144.39 MHz APRS Analog Transmitter ⇒⇒⇒

D-Gate μSmart Digi —Serial Data→ Serial Monitor

μSmartDigi™ D-Gate Features

◆ Gates D-STAR Digital Messages to APRS® RF Network

◆ Requires specific D-STAR D-PRS Message Format

◆ Message Format Calculator at http://www.aprs-is.net/dprscalc.htm courtesy of Pete Loveall, AE5PL

μSmartDigi™ D-Gate Features

- ◆ Eliminates duplicates based on Call Sign within 10-second window

- ◆ Eliminates duplicate messages within a configurable 28-second window (classic dupe checking)

- ◆ Filters messages according to set of User-defined Rules

µSmartDigi™ D-Gate Features

- ◆ Converts D-STAR NMEA GPS data to Base-91 compressed Position Reports
- ◆ Converts Symbol and Text Data

```
D-STAR:
$GPRMC,013318,V,2756.4589,N,08227.2434,W,0.0,0.0,010306
    ,4.5,W,S*1B
AB0VO  9,BD  D-GATE TEST*71


DROP: Line 8, Rule 1:
AB0VO-9>APRS,WIDE1*,WIDE2-2 <UI Len=34>:
!/@Bb%9\S]#! @BD  D-GATE TEST
```

µSmartDigi™ D-Gate Features

◆ Supports D-STAR GPS and GPS-A modes for Icom's IC-2820 (ver 2.2)

```
$$CRCCE3E,AE5PL-T>API282,DSTAR*:!3302.39N/09644.66W>/
$$CRC986F,WD5ERDHT>API282,DSTAR*:!3302.39N/09644.66W>/
```

µSmartDigi™ D-Gate

D-Gate Use & Configuration Live Demo

- ◆ Config File
- ◆ Rules File
- ◆ Downloading
- ◆ Flashing Firmware
- ◆ Monitor Commands

μSmartDigi™ Summary

- ◆ Q&A
- ◆ Web Sites

http://usmartdigi.com

http://www.tnc-x.com

http://www.aprs-is.net/dprscalc.htm

http://www.icomamerica.com/en/products/amateur/dstar/id1/default.aspx

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