



The Bullsheet

The Official News Bulletin of
The Texas DX Society
An ARRL Affiliated Club

The Texas DX Society, Houston TX K5DX@tdxs.net June 2014

There is no TDXS meeting in the month of June. Attendance at the joint TDXS/BVARC/Echo Field Day will be counted as attendance to a meeting. We will meet at the Richmond Fire Training Grounds, 260 Clay Road, Richmond, TX June 28th and 29th.

ARRL Field Day

ARRL Field Day is the most popular on-the-air event held annually in the US and Canada. On the fourth weekend of June, more than 35,000 radio amateurs gather with their clubs, groups or simply with friends to operate from remote locations.



- Objective

To work as many stations as possible on any and all amateur bands (excluding the 60, 30, 17, and 12-meter bands) and to learn to operate in abnormal situations in less than optimal conditions. Field Day is open to all amateurs in the areas covered by the ARRL/RAC Field Organizations and countries within IARU Region 2. DX stations residing in other regions may be contacted for credit, but are not eligible to submit entries.

Editor's Note by Allen N5XZ

DX wise, band conditions haven't been nearly so good this past month, with the flux hovering around 100 much of the time. DX has been a little harder to pull out. Some good ones I worked during the month of May were: 3D2RH, TJ3SN, PY0F/PP1CZ, 9K2HN, HV0A, 7P8JR, 7P8YY, E21YDP, S01WS, 7Q7VW, BH4SYG, 9G5ZZ, XW0YJY, XX9LT, 7QNL [no typo there, believe it or not!], etc. I did notice that 17 meters was hot hot hot for EU DX at night and in the mornings. 15 was so-so and 12/10 were poor. I know we're on the downside of this lousy cycle, but I hope it doesn't drop off like a cliff! Maybe it's time to get that PSK going...I'm looking at the P3 and I see a slew of signals between 065 and 080. **FRESH MEAT!**

TDXS, BVARC and The Houston Echo Society are all

joining forces at the end of June for Field Day. Please try to attend! On top of operating in a nice air conditioned room, we will probably all meet a lot of new friends from other clubs. We will use BVARC's call KK5W and for the GOTA station, we'll use TDXS's call sign K5DX. Please check BVARC's Field Day Bulletin Page at http://www.bvarc.org/index.php?page=field_day for the latest news.

Speaking of Field Day, where are the TDXS CW Operators? I put out a request for CW Ops on the reflector a week or so ago and got only one response from TDXS members. WHERE ARE YOU TDXS CW OPS?

Please check out TDXS member Tom Taormina K5RC's article "High Performance Antenna Systems for the Motivated Ham" in the June issue of QST. On page 66, Tom

details all the things to consider when planning, and constructing your dream antennas, and towers. Tom's 55 years of ham experience and professional expertise in management consulting and quality control engineering highlights all the things to consider when starting such a project. *[I would also recommend subscribing to the Tower Talk Reflector (found on www.contesting.com) and buying "Up The Tower" by Steve Morris K7LXC (found at www.championradio.com) I found both invaluable during the installation of my modest 70 ft Hy-Gain crank-up tower. - Ed]*

One last thing: for those who think FD is not about contesting, look at the first statement above right which was copied directly from the ARRL website.

For now, 73, Allen N5XZ

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The Prez Sez by Bob, W5UQ

BS Prez Sez for June 2014

NOTE: Watch the TDXS Website for announcements about our JULY DINNER MEETING and ARRL FIELD DAY EVENT.

Hi to all,

Well, June is one month that we do not have a formal TDXS meeting. Instead we have the ARRL Field Day activities. Did you know that you could get credit for attending a TDXS meeting by participating in the TDXS Field Day activities? That should mean something. Just remember, when do FD to send your participation in Field Day activities at the TDXS station to our Secretary, Arthur Alvarez, N5KTN.

An email notifying him of your participation will do. Would you please CC me on the email too?

Arthur's email is: kingarthur@msn.com
and my email is:
W5UQ2@att.NET

This year, like last year, TDXS will be joining BVARC's Field Day activities. As you all know, BVARC is Brazos Valley Amateur Radio Club. The weekend will be a bigger event this way and pooling our resources helps a lot. Please contact one of the TDXS hams that will be participating or BVARC hams to get the details. They will have it posted on their website and we will have info on the TDXS website too.

Mike Davidson, N5MT, has graciously accepted the position of TDXS Field Day Chairman. He will be representing our club and working with the BVARC Field Chairman, Roy Storey, W5TKZ. We wish Roy and Mike all the best and give them our support for working so hard to have a good ARRL Field Day 2014.

BVARC Field Day Officers are:

Roy Storey, W5TKZ Field Day Chairman or chief rstorey1940@gmail.com

Nathan Vessey, N5NYV Planning and Opera-

tions Chairman

Stephani Vessey, K5SFV, Administration and Finance Chief

Jerry Muller, KF5EYC, Security/Safety Officer

Also our best wishes for a good turnout and support of all the groups.

The Echo Society will be participating too. However I do not have much info on their involvement at this time. Possibly in the next Bull Sheet we can have some info.

Field Day gives us a chance to work with each other, have fun and further TDXS and its existence. It is also a good time to give our support to the BVARC Field Day event. If you were there last year, then you already have a good idea of the activities that are going on Friday, Saturday and Sunday, June 27th, 28th and 29th

TDXS will use David Topps' RV similar to last year. David has been so gracious as to make it available for so many years. This is my 4th FD in Houston and his RV has been used every field day that I've been here. The stations in the RV will have an RTTY station and another station probably. They will be using the BVARC Club call. The GOTA station will use the TDXS club call of K5DX.

David says he will arrive at the Field Day site around NOON on Friday, June 27th. So JOIN HIM TO SET IT UP. Then several hams will be needed to set the towers and antennas up as well as the rigs inside, to keep it busy around the clock during the contest.

Dave also says the air conditioners are fixed this year and all the rotors and rigs are working now too. If you need to contact him: w5bxx@aol.com. Thanks to all that help. And a GREAT BIG THANKS to Dave for letting TDXS use his RV and rigs again.

Please monitor the TDXS website and BVARC website for further information about the Field Day Event.

We hope you join the Field Day activities this year and have a great time. Remember, all

TDXS members that participate in the Field Day event, please notify Arthur, N5KTN when you do so we will have a record of your attendance.

Don't forget Dallas (Plano) HamCom June 13th and 14th. Then Field Day June 27th, 28th and 29th. And of course, the ARRL Centennial Celebration in Hartford Connecticut on July 17th, 18th and 19th.

Lance, WD5X has been working hard on our July Dinner meeting plans. We hope to SEE YOU at our July Dinner Meeting, so jot down the date and time... see below.

Plans are in the works to combine TDXS and the ECHO Society meetings. At the time this article was being written, we still had not confirmed the joint meeting. So the ECHO Society may not be able to join us.

Regardless, we will still have the Dinner Meeting on July the 14th, a Monday night and at 6:30PM...

The restaurant and time has been set:

**Silver Palace Chinese Restaurant.
4005 Bellaire near Stella Link
6:30 pm Monday July 14, 2014**

We want to have as many as we can attend that TDXS Dinner meeting. Invite someone to come.

"And, the beat goes on" Dah, di dah, di daaaaaahhh.

73,

Bob Hardie W5UQ
TDXS President 2014

DX Report by Cookie K5EWJ

Cookie reports that he has been too busy with Museum Ships Weekend so there won't be a DX Report this month. He'll be back next month with more DX news and CW operating tips and Triplexer/Bandpass filter articles.



Contest Chatter by Joe W5ASP

CONTEST CHATTER

Did anyone notice that May came and went with little more than a whisper of contest activity from TDXSers. For the WPX CW contest the 3830 Report listed only N5XZ (Single Operator, All Band, High Power) and K5GN (Single Operator, All Band, Low Powers). K5TU also made a quick appearance. Hey.. it's good to see Dave back under the TDXS banner.

Well, it's June again and time for another Field Day! This year's TDXS Field Day plans are discussed elsewhere in this issue (I hope ...). Since Field Day is "not a contest", it may not be an appropriate subject for this column. But its role in the evolution of TDXS is so significant that I'm going to plow ahead with some remarks that might be of interest.

Many of you probably know that TDXS had its origin as a Field Day club. If you look at the list entitled "Member Number" shown on the TDXS website, you will see the calls of the original group who got together for the first TDXS field day. It became an annual affair, and grew as the membership increased to become a significant activity, one noted in the annuals of the ARRL Field Day results. Over the years Contesting and DXing became the stock and trade of the group, but Field Day remained the highlight

of club's annual program.

The record of TDXS Field Day accomplishments is impressive, perhaps even unique. The first TDXS FD was in 1971 when the group operated Class 3A placing first in the 5th Call District and 7th overall. That was just the beginning. TDXS placed 1st in the nation, Class 3A in 1975, 77, 79, 81, 82, 84, and 86. The 1984 score was an All Time Field Day record. Adding additional stations resulted in 4A ('87) and 5A ('88) wins setting all-time records. The 5E effort in 1983 and the amazing 23A-Battery circus in 1989 also were record setting wins. Since this era results have been modest to say the least.

OK ... this is all over-the-hill stuff and not pertinent to today's TDXS. But it does account for the sense of pride exhibited by some of the "old timers" still kicking around, and explains some of the statue still held by TDXS among other major amateur radio clubs. Perhaps we shouldn't knock (past) success.

Field Day is a unique event. Not only is it great fun, but it is a chance for an operator to polish his skills in a very active environment. Depending on your skill level and/or preference, a good option is to hook up with another operator and work together as a

team. Get a second set of headphones and share the station. The more experienced operator can take the lead as the primary with his partner as spotter and log checker. This is a great way to get the hang of operating during Field Day. If you're reasonably new to the game, you'll pick up the techniques fast operating at the side of someone who has "been there, done that", and if you're an "old hand" you'll really get a kick out of "showing the ropes" to your less experienced partner.

Looking beyond Field Day there lies a major event coming up in July. This year the IARU HF World Championship in mid-July will host the World Radio Team Championship (WRTC) event.

Contester or not every active radio amateur should be aware of this activity and make it a point to participate. I'm not going to try to preview WRTC now. I hope that next month's issue of the Bullsheet will give everyone a good look at what's going to happen. And, if we're lucky, we will have another TDXS member, intimately involved with WRTC, to tell us about it.

. Until next time ... "dit dit" ... Joe, W5ASP

Radiant Barriers and Roof Mounted Antennas by Ron Litt, K5HM

Carmichael's Equation is the principal calculation for optimum antenna height over a roof or radiant barrier. The effect of the radiant barrier is decreased by the square of the distance from the roof to the antenna according to Carmichael's Equation. Its complicated due to the fact that the shingle material and plywood underlay have a capacitive coupling effect on the antenna. So it is important to consider the reflective effects of both the ground plane material and the coupling of the plywood and shingle sandwich as well as the radiant barrier.

That's where the Schmidt number becomes a significant factor in Carmichael's equation. The Schmidt number is a function of the material composition and its thickness. It is increased in direct proportion to the material

thickness. So the higher the Schmidt number, the higher the antenna must be to escape the effect of the roof shingle or radiant barrier.

One can look up the Schmidt number for simple materials in any Table of Materials. However, when you have a roof that is made of complex sandwich of radiant barrier and plywood and roof shingle and/or an angled roof surface, you must calculate the integral of the entire roof volume including the thickness of each layer to arrive at the proper reflective value of the roof.

This value, "r" is key in calculating the Schmidt number. When there is a layer of plywood between the shingles and the radiant barrier, the three materials are all factors, which are significantly more important than the

capacitive effect of just the shingles or the radiant barrier by itself with the ground plane itself. Any value of "r" that is less than 10^{-3} doesn't really matter anyway.

Ignoring this interaction can result in poor antenna performance as noted in Carmichael's paper, "The Effect of Antenna Height on Roof Mounted Antennas" published in Proceedings of the IEEE, April 1966. Carmichael's work was later confirmed by experiments conducted a year later by noted amateur, Larson E. Rapp, WIOU in his paper published by QST in April 1967. Rapp was of course, famous for his experimental work advancing ham radio in many areas, especially propagation.

Ron, K5HM

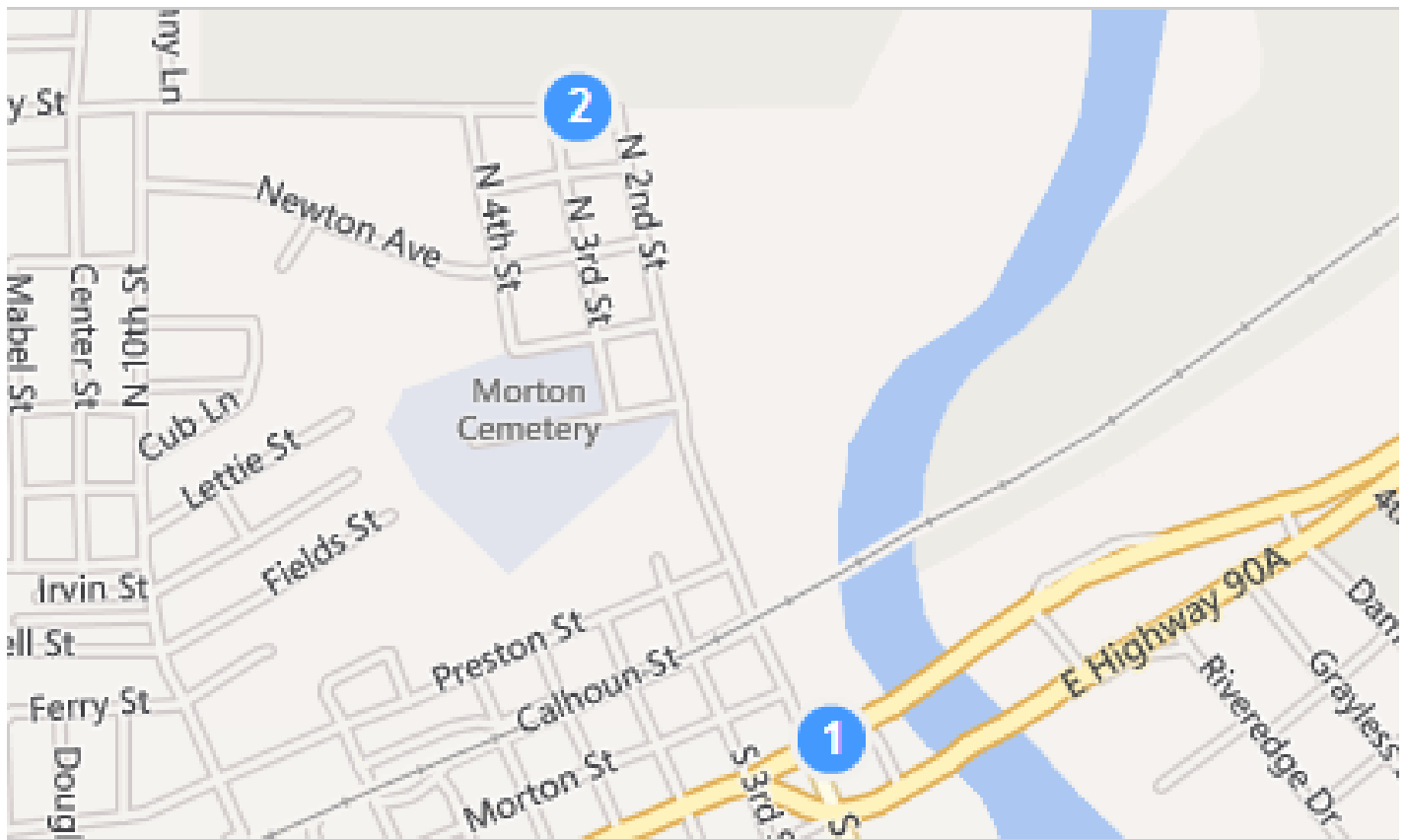


Joint TDXS/BVARC/Echo Field Day Location

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fireacademyonline.com

260 Clay St, Richmond, TX, US, 77469 - (281) 489-9221



Why Learn CW?

Why learn CW?

Learning morse code is regrettably no longer required for radio amateurs to gain access to the High Frequency radio spectrum, at least in most of Europe. As morse's detractors are quick to point out, in wealthy countries it is also no longer used by professional radio operators, although in parts of Eastern Europe and the developing world, it remains extensively used. However, for the average radio amateur interested in working DX and in contests, CW remains an essential skill - not least as an antidote to extreme boredom during the solar minimum. While CW is an effective DX mode for all shapes and sizes of station, for the 'typical' European station with a barefoot transceiver and the sort of constrained urban location permitting only wire antennas or verticals, CW is an order of magnitude more effective than even RF clipped SSB. For stations even more constrained in power - for example UK Foundation Licensees limited to 10 Watts output, the difference is even more stark. In a solar minimum it is, bluntly, the difference between working shed loads of DX on 30 and 40 metres and struggling even to make inter-European contacts in the Dante-esque piece of spectrum that is 40 metres after dark.

I found a wonderful list of reasons why CW is special while browsing the internet recently. I'm not sure who the author is, but here it is:

- It is a unique, intimate, concise and effective communications skill still employed throughout the world.
- It is the most efficient mode in terms of power required for long distance communication, least susceptible to interference, and conserving of the radio frequency spectrum.
- It involves no accent or pronunciation problems, therefore providing a wide-

ly understood international language.

- It employs simpler, more reliable and easily maintained equipment than any other communications mode.
- It is an equalizer, negating age, speech impediments and dialectical differences; it provides for ready acceptance of youngsters in an adult environment.
- It is the **only** radio communications mode that is understood readily by both man and machine.

Although it has been argued that PSK is more effective overall, and undoubtedly is in many circumstances, in casual operation morse operators are generally friendlier and more community-focused. How many PSK31 contacts have you had recently where you did much more than press the first three function keys on your computer? On 40 metres during the day, and 80 at night, ragchewing is the norm rather than exception on CW.

For many non-English speaking amateurs, moreover, it is much easier to learn how to handle a basic CW QSO than it is to learn how to pronounce English correctly!

I know what you're saying now - *Gerry, I couldn't possibly learn The Scary Morse Code (TM). It's too difficult!* Fair enough - it does take time and effort to learn morse - but then again doesn't anything worthwhile in life! You will not switch your rig on at the end of two weeks learning CW and feel happy making QSOs. However, most people greatly **over**-estimate the amount of effort required to learn morse.

To give you an example - when I was studying for my radio exams, I started memorising the alphabet in June in a very casual way. In early November, I had my first 'under-supervision' QSO at about 5 words a minute, and it was one of the most terrifying experiences of my life! However, the operator at the other end knew exactly how I felt and was patient with me (thanks to IK2GGP!!!). From then on, I was addicted. I made a significant number of CW QSOs

in the ARRL 10 Metres DX Contest in December. By early March, I made over 800 QSOs in the ARRL DX CW contest and was running pile-ups with my club station's special prefix (the only GN6 prefix in the world!!!) And I was working more DX, and having more fun, than I'd ever had on SSB.

In the past, morse used to be taught to ensure people passed the 12 wpm exam to get access to HF. This was rather a pity - morse should be taught to help people use it on the air. As most of you reading this will already have access to HF without morse, that's exactly how you should use it. Instead of these bloody awful computer programmes which send random letters and help no-one, **use** morse on the air. Before you're ready to actually stick out a CQ call, find places where you can copy CW repeatedly. Beacons are a good place to start, as are those funny little beeps on your local repeater. You will hear the same things over and over again. Find stations calling CW - they will repeat their call signs over and over again! Find slower stations on the bands and copy what you can - don't worry if you don't copy 100%. They will repeat their names and locations at least once.

...you might see a pattern here!

There's nothing like listening to CW to wet your appetite to use it. The first time you hear that LU station on 20 metres long after the band has closed when all you can hear on SSB are scratchy sounds, you'll know what I mean!

Find an experienced morse operator who would be happy to help you - most of us are delighted to help people learn morse, and you can always give me an e-mail to arrange a sked if you want. Once you're copying rubber stamp QSOs on the bands, find a sympathetic amateur and go on and get your first CW QSO in the log. After a few of those you'll be calling CQ, working the DX and having a ball.

_Why Learn CW? - Page 2

Finally, I find there are a number of questions which come up repeatedly when people enquire about learning CW. I'll try my best to answer them here.

How long does it take to learn the Scary Morse Code Code (TM)?

Well, after 14 years, I'm still learning morse! But if you want to know how long it takes to know it well enough to use on the bands - if you practice intensely maybe twice a week, with a few revision sessions and listen to CW actually being used on the bands for fun, I reckon somewhere between 3 and 6 months, maybe 9 at the outside, to be able to have a 'rubber stamp' QSO on the bands. Remember, you can have fun learning CW on the bands - in listening around you will unearth lots of DX and other interesting stuff (Russian naval stations, North Korean spy stations and all those strange beacons on 7.038).

If, after about 3 months, you aren't making progress at all, there are two possibilities.

Firstly, your learning method might not suit you - try abandoning the little computer programme which sends you random letters! More seriously, seek advice from experienced morse operators, and if someone is helping you, see if they know someone with a different style of teaching and using morse, who might be more attuned to how you learn. We do all learn differently.

Secondly, you might simply lack confidence - this is common! If you are copying basic QSOs but don't feel your morse is up to scratch - you are almost certainly wrong!!! Get your ass on the bands and have a QSO or two - it's a bit like jumping into the sea - once you get in the water is lovely.

But I still make a lot of mistakes?

So??? I still make a lot of mistakes too. Don't worry - morse ops understand what it's like at the beginning. We've all been there. And we all still make mistakes. Don't worry. Have a wee whisky and stick

out that CQ call!

How fast to I need to be to get on the bands?

5 words per minute is fine to start with. If the other guy is too fast for you, simply ask him to "QRS QRS PSE NEW CW OP HR" and 95% of operators will slow down to your speed. The other 5% are lids anyway. You don't need to worry about them.

Particularly if you have a former VHF only callsign - say a G7 or G8 in England, an ED in Spain or a DB or DG in Germany, most operators will expect you to be new to CW, and the same applies to Novice Prefixes like the M3 prefixes in England. If you have a former VHF only prefix and operate CW, you will also be very popular with prefix chasers.

Believe it or not, once you are on the air your speed will improve dramatically and without any special effort. If you are making QSOs at 5 wpm, most people find their

Does CW make that much difference to what you can work?

Yes. Do you want to compare my logbook on 40 metres (100 Watts, Dipole) with yours? Remember, we're in a solar minimum so 40 and 30 are the bands to be on! 30 is CW/Digital only and 40 SSB is hell.

Any final words of wisdom?

Yes, the great high one of morse says chill out, relax, get listening and don't fear the first QSO. Once you make it, the path to serious ham radio fun is wide open!

Oh, yes, and if you want a slow morse sked or would like me to send practice stuff on the air, e-mail me

at me@gerrylynch.co.uk

. And good luck. See you on the bands.

[Thanks to the folks at www.sotabeams.co.uk for this informative article—Ed]



speed improves just by being on the air and having fun until they hit another plateau around the 18-25 wpm mark. Really. I'm not making this up.

Another odd thing is that contesting is good for your speed once you get started. I wouldn't make my first ever contact in a contest, but after a few weeks dive in and make some QSOs. Contest exchanges are predictable and stations will be repeating their callsigns a lot. You'll also work some choice DX.

Should I use a paddle or a straight key?

Start with a straight key. Using a paddle is a skill in its own right, and while you'll probably want to learn it sometime - especially if you do a lot of ragchewing or a lot of contesting, it's best to leave it until you're comfortable with the mode.



The “No-Code Penalty” - How Much Does CW Weigh?

Newcomers to the hobby often get a bit fed up when the older hands keep recommending CW. “...it’s more efficient” “....it gets through when SSB fails”, we’ve heard it all before. I want to look at it from a different angle; how much does it weigh? That might sound like a crazy question but bear with me.

First let’s look at CW from a communications perspective. An approximate way to compare CW to SSB is by comparing the bandwidths of the respective modes. This is a simplification but it will suffice for this analysis. The bandwidth of an SSB signal is about 2.7 kHz – so your transmitter power is spread across this bandwidth. Let’s assume that the bandwidth of a CW signal is 100 Hz – your transmitter power is much more concentrated! The ratio of these bandwidths is 27:1. All things being equal this equates to a 14 dB advantage for CW. Thus a 5 Watt CW signal will have the same power density as a 135 Watt SSB signal. What does this weigh?

Let’s start with our CW sta-

tion and we will use an FT-817 to generate our 5 Watt signal. The manufacturers spec says that an FT-817 weighs 1.17 kg including batteries. If we take out the batteries we save 300 g giving a mass of 870 g, that’s 174 g/Watt.

There are no 135 Watt radios that I’m aware of so let’s just look at an FT-857 as it’s very similar in most respects to the FT-817. That radio weighs in at 2.1kg and runs 100 Watts so that’s 21 g/Watt. scaling our FT857 up to 135 Watts gives a mass of 2.85 kg. So as a start our “No Code penalty” is just under 1 kg of extra weight.

That’s just the start though. Let’s look at the batteries we will need. The FT-817 specification indicated 2 Amps on transmit at 5 Watts output. So for an hour of transmitting we will need a 2 Ah battery. The FT-857 draws 22 Amps on transmit at 100 Watts. Scaling to 135 Watts gives about 30 Amps, so an hour of transmitting would require a 30 Ah battery. If we look at Lithium Iron Phosphate batteries, I found a

2.4 Ah 12 Volt battery weighing in at 360 g. The best 30 Ah 12 V LiFePO4 weighs in at 3.7 kg.

So now we can work out our station weight.

FT817 + 2.4 Ah LiFePO4 battery = 1.53 kg

FT857 (scaled to 135 Watts) + 30 Ah LiFePO4 battery = 6.55 kg.

So with this simple analysis we can see that the “No Code penalty” is over 5 kg (11 lbs.).

CW is a skill that weighs nothing but if you are carrying your station it could save you a lot of sweat and toil!

[Thanks to the folks at www.sotabeams.co.uk for this lighthearted article—Ed]

SOTAbears mission statement

We aim to encourage, support and facilitate all radio amateurs to take their hobby to new places. We will achieve this through specialist advice, training and products.

TDXS Recognition for donation to WRTC

TDXS donated \$200 to the WRTC in the name of "West Gulf Division Team Village" along with CTDXCC, LSDXA, OKDX and OKDXA. We were hoping to see our logo on the WRTC website, but it wasn't to be. We did however get on this cool sign which will be on the wall of one of the tents. So that's something, eh? However, nobody from Texas made it on a team. How did that happen? Looks like TDXS members NR5M, K5GN and K5WA all had good shots at it, though. *[Me? I was #88 out of 954. I guess that says sumthin! - Ed]*

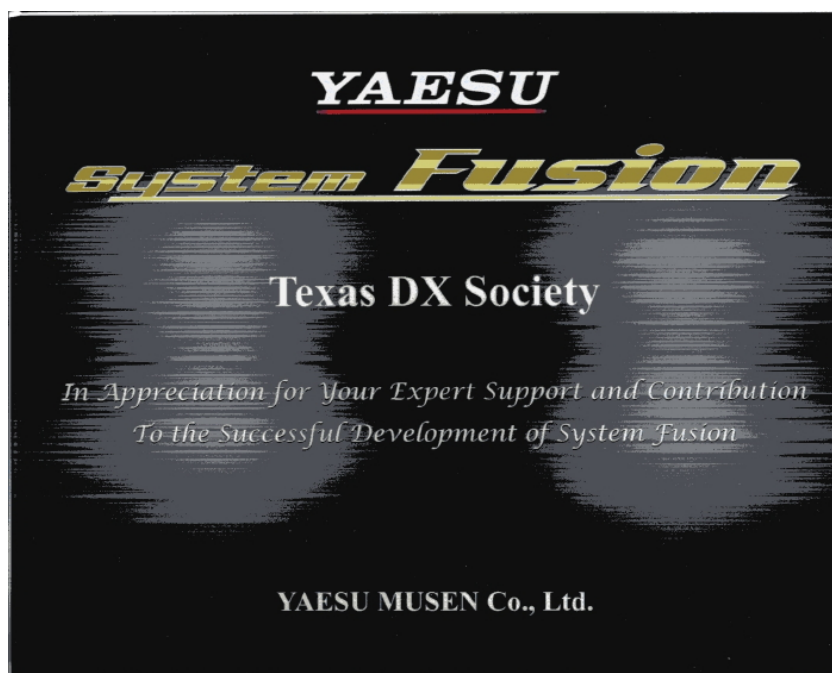


World Radiosport Team Championship 2014 July 8-14, 2014

The World Radiosport Team Championship (WRTC) is a competition between two-person teams of amateur radio operators testing their skills to make contacts with other Amateur Radio operators around the world over a 24 hour period. Unlike most on-the-air competitions, all stations are required to use identical antennas from the same geographic region, eliminating all variables except operating ability. WRTC2014 will include 59 competing teams from 29 qualifying regions around the world. This will be the largest and most competitive WRTC ever! See www.wrtc2014.org. (Note: the actual competition will be held Saturday 12 July 2014 1200 UTC to Sunday 13 July 2014 1200 UTC.)

Yaesu Appreciation Plaque

At the Dayton Hamvention, TDXS member Dennis Motschenbacher K7BV, Executive VP of Sales for Yaesu presented TDXS with an appreciation plaque for our testing and evaluation of the new Yaesu DR-1 System Fusion repeater.



Texas DX Society Board members

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CQ WAZ Card Checker	Bob Walworth, N5ET	rwalworth at charter.net

How to reach US

On the World Wide Web <http://www.tdxs.net> email address: k5dx@tdxs.net

On 2 Meters: 147.96/36 MHz (100 Hz) On 70cm: 447.00/442.00 MHz (103.5 Hz)

DX Cluster—On Packet: Connect to **K5DX** on 145.71 MHz or telnet via IP address 75.148.198.113

TDXS says "HAPPY BIRTHDAY" to these members with birthdays in June

Alex Stalinsky - WA5UHT

Joe Brassfield - N5AQT

Cal White - WF5W

Al Loeckle - K5FK

Madison Jones - W5MJ

Larry Vehorn - W9AJ

Dave Topp - W5BXX

Paul Frantz - W5PF

Mike Anderson - N5MV

Grady Ferguson - W5FU

Kirby van Horn - K7EC

Bill Stein - WB5SJS

Don Busick - K5AAD

William Goins – K5WMG

Steve Smothers - W9DX