

April 2016



Newsletter of the County of Orange Radio Amateur Civil Emergency Service

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Captain's Corner

by RACES Captain Ken Bourne, W6HK, Chief Radio Officer

Roofing Filters

During the last few years, manufacturers of amateur radio HF transceivers have been stressing the importance of effective roofing filters, especially for eliminating or reducing interference from strong signals that are fairly close in frequency. If you are in the market for a new HF transceiver, or if you have a Technician Class license and are planning to upgrade to General or Extra and are wondering which roofing filters are needed in your new radio when you join the excitement on HF, this article is intended to provide you with some useful information.

Several OCRACES and City RACES members are active on the Saturday morning ACS net on 7250 kHz at 10:00 AM. We have noticed interference ("splatter") on that frequency from strong stations just 5 kHz away, or even closer. Will newer transceivers with sharp roofing filters eliminate that interference? Often yes, if the interference is caused by the receiver's "front end" being too broad. No, if the interfering station's transmitted signal is too broad, or if the station is much closer than 2 kHz or simply overloading your receiver (such as at Field Day). Even overloading can be reduced with sharp roofing filters, careful selection of front-end active devices, RF gain controls, attenuators, etc.

A roofing filter is the first IF filter in a receiver. The first IF (intermediate frequency) is a result of mixing the fundamental received frequency with the local-oscillator frequency. The local oscillator may be higher or lower than the fundamental frequency (depending on the design philosophy), and the IF is the difference between the fundamental and the local-oscillator

frequencies. The roofing filter is normally placed immediately after (or very close to) the mixer in the first IF stage. It's called "roofing" because it protects (or "shelters") following stages from the "rain" of out-of-passband signals.

"Down conversion" receivers are designed with IFs in the HF region, often between 4 and 10 MHz. "Up conversion" receiver IFs are typically between 40 and 75 MHz. Each type has its advantages and disadvantages. The Elecraft K3 transceiver in the Orange County EOC RACES Room has a "down conversion" receiver. Most Kenwood, Yaesu, and Icom transceivers have "up conversion" receivers. (The Kenwood TS-590S uses dual-mode up-conversion and down-conversion.) Roofing filters are discrete or monolithic crystal filters. They are easy to make for down-conversion receivers, and the VHF-type narrow filters have not been readily available for up-conversion receivers until just a few years ago. Roofing filters as narrow as 250 Hz are available for the lower IFs in down-conversion receivers. Practical VHF filters are not that narrow.

Another filter precedes the roofing filter. It is an LC (inductance-capacitance) bandpass filter at the antenna connection. It is usually as wide as an amateur band, or even wider. Therefore, many signals might be at the input of the first mixer, requiring a good design to reduce intermodulation distortion (IMD). The difference between the signal level that produces IMD and the noise-floor level is the receiver's dynamic range (DR). The DR is generally measured with two equal-strength signals within a specified frequency spacing. If the two sig-

**The Next
OCRACES
Meeting Is**

**April 4, 2016
1930 Hours**

**840 N. Eckhoff Street,
Suite 104, Orange**

**EmComm Battery Box
Tony Gawel, W6TNY**



Orange County Sheriff's Department
Communications & Technology Division

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Captain's Corner *Continued from page 1*

nals are within the operating band, this is called 3rd-order IMD-DR. The DR is determined by the first mixer and other early stages if the signal spacing is much greater than the roofing-filter bandwidth. Modern high-end transceivers have a dynamic range of at least 87 to 110 dB for a signal spacing of 20 kHz or more.

As a potentially interfering signal moves into the passband of the roofing filter, it will affect the second mixer and following IF stages, creating IMD at much lower levels and dropping the DR significantly. The roofing filter's bandwidth determines the transition width from the first mixer DR limit to the second mixer limit.

Selecting a narrower roofing filter does not reduce IMD caused by widely spaced signals. However, a narrower filter can be improve receiver performance for close-in signals. The minimum spacing at which the dynamic range will be improved is about one-fourth of the roofing-filter bandwidth.

Narrow roofing filters improve both 3rd-order IMD and blocking dynamic range ("desense"). Blocking dynamic range (BDR) is the ratio in dB between the strongest signal that a receiver can amplify linearly (with a maximum of 1 dB reduced gain) and the receiver's noise floor in a specified bandwidth.

The narrowest roofing filter available for the Elecraft K3 or K3S is 200 Hz, recommended for CW or data (certainly not for SSB). Signal spacing down to 50 Hz would be improved, but operating that close to another station is not recommended. Wider bandwidth filters might be more practical, according to some opinions, and the insertion loss would be slightly less, with better receiver sensitivity.

Receiver noise floor can deteriorate if there is a gain reduction close to the front end due to the insertion loss of

a very narrow filter. An amplifier or other means of changing the gain might be needed to accommodate the extra filter loss of a narrow eight-pole filter. Four-pole or five-pole filters would have an insertion-loss advantage at very narrow bandwidths, even though the selectivity is not as good for signals falling down the skirts. There is less advantage to going to a wider filter, because the difference in insertion loss is not that great. However, for the wider SSB bandwidths, an eight-pole filter will outperform a five-pole filter, all factors considered, but for very narrow bandwidths (CW or data), the simpler four-pole or five-pole filter is best.

Elecraft says its narrow filters, especially the eight-pole CW filters, improve 3rd-order IMD and BDR. They say IMD does not degrade when using the narrower eight-pole CW filters. In fact, it improves at close spacing.

To achieve the best BDR, such as in the 140 dB+ range, you must use a narrow crystal filter such as a 400-Hz eight-pole or 200-Hz five-pole filter for closer interfering signal spacing, in front of the DSP (digital signal processing). If you only use a stock SSB filter (such as a 2.7 kHz five-pole filter) for CW or data operation, you will be significantly desensed once signals within that filter's bandwidth exceed about S9 + 25 dB. This is before phase noise from the transmitting station becomes a factor. Changing to a 400-Hz or 200-Hz filter reduces blocking from signals 1 to 5 kHz away. For example, a 400-Hz eight-pole filter would perform slightly better than a 500-Hz five-pole filter due to its narrower shape factor. A 200-Hz five-pole filter is even sharper. Using narrow crystal filters ahead of the DSP also reduces AGC pumping from static crashes, which are common on 80 and 160 meters.

Icom Introduces IC-7300 HF + 6 m Transceiver

The new Icom IC-7300 HF plus 6-meter 100-watt transceiver uses a direct RF sampling approach rather than a conventional superheterodyne system. RF signals are directly converted to digital data and then processed in the FPGA (Field-Programmable Gate Array), which reduces noise. The "IP+" function improves the 3rd-order intercept point (IP3) performance, improving the ability to copy a weak signal that is adjacent to strong interference. In this process, the A/D converter is optimized to reduce or eliminate signal distortion. The TFT touch screen provides operational status including a real-time spectrum display with waterfall plus an audio scope. Features include a built-in tuner, voice memory, 15 bandpass filters, CW/RTTY memory keyer functions, RTTY decode, SD card slot, USB for CI-V and audio I/O, digital noise reduction, and 101 memories.



Icom IC-7300 HF plus 6-meter transceiver.

101 memories.

Next OCRACES Meeting: April 4th

The next County of Orange RACES meeting will be on Monday, April 4, 2016, at OCSD Communications & Technology Division, 840 N. Eckhoff Street, Suite 104, in Orange. At this meeting, Tony Gawel, W6TNY, will give a detailed presentation on how to build an EmComm basic battery box, as described in his article on page 4 of the March 2016 issue of *NetControl*. Important upcoming events will be discussed at this meeting, such as the next City/County RACES & MOU Drill on Saturday, May 7, 2016 (0900 to 1100 hours), and Field Day on Saturday and Sunday, June 25-26, 2016.

Welcome Aboard, Tony Scalpi, N2VAJ

Tony Scalpi, N2VAJ, recently passed OCSD background, and we are pleased to announce that he is now a member of County of Orange RACES.

Tony was born in Beacon, New York, and graduated from Manhattan College with a BSEE. He was first licensed in 1993 as a Technician and worked his way up to Extra Class. He is presently employed as a Senior Program Manager for an electronics manufacturer. Soon after getting his license, he joined the Putnam Emergency and Amateur Repeater League (PEARL). PEARL is very active in public service and emergency preparedness in the Putnam County area of New York State. Tony was active in RACES/ARES after passing the background check through the Putnam County Sheriff's Department. Major responsibility was the civilian evacuation around the Indian Point nuclear power plant, with drills reviewed yearly by FEMA. Tony was also a member of the Mount Beacon Amateur Radio Club (MBARC), in which he served as a technical aid.



Tony Scalpi, N2VAJ.

Tony moved to Sunnyvale, California, in 1997, and joined the Sunnyvale Amateur Radio Emergency Service (SARES) organization. He passed the background check with the Sunnyvale Police Department and attended training classes with the Santa Clara County Sheriff's Department. He served as a Disaster Service Worker for Santa Clara County and City of Sunnyvale. He moved to Southern California in 2010, and works and resides in the City of Orange.

Tony is an AMSAT Project Team Member for the AO-85 (FOX-1A) Satellite. He solved a technical problem and was given a plaque from AMSAT for work on AO-85. He is an ARRL and Catalina Amateur Repeater Association (CARA) member, an Orange County Amateur Radio Club (OCARC) Director at Large, and a member of the Southern California Antique Radio Society (SCARS). He is an active participant in the California Rescue Communications 40 Meter Net (Gordon West Net). Tony is active on 80 meters to 1.2 GHz, DMR, analog, and digital.

May 7th Drill Scenario: Massive Power Outage

A regional massive power outage will be the scenario of the City/County RACES & MOU Drill on Saturday, May 7, 2016 (0900-1100 hours). We plan to deploy the OCRACES van to Fullerton Airport during the drill, especially with new members who need training on setting up the van. May 7th is Fullerton Airport Day, and this will be an opportunity to show our capabilities to the public attending this event. The OCSD Aero Squadron Reserve Unit will also be exhibiting. All other members will report to the EOC RACES Room by 0830 hours for pre-drill orientation.

New 2-Meter Primary Simplex: 146.595 MHz

Over the years, County of Orange RACES has never had to use all three of its 2-meter simplex frequencies during an activation, and only one of those frequencies during a drill. Furthermore, the Two Meter Area Spectrum Management Association (TASMA) has modified its band plan to show that 147.480 MHz, which has been our 2-meter primary simplex frequency, is now in its list of "Linking & Remote Base Frequencies," and is not designated for simplex operations. The County of Orange RACES 2-meter primary simplex frequency has been changed to 146.595 MHz, which formerly was the South Squad simplex frequency. The North Squad frequency of 146.520 MHz has been dropped, and the North and South Squads no longer have their own simplex frequencies. We selected 146.595 MHz as our primary (and only) 2-meter simplex frequency because of relatively little usage compared to the very popular national calling frequency of 146.520 MHz.

Configuring a 12-Volt Vehicle-Mounted Panel

Ken Mirabella, KM6YH, of Powerwerx advised of an interesting article posted on the RCGroups.com forum at <http://www.rcgroups.com/forums/showthread.php?t=2629420>, about the use of a vehicle-mounted Powerwerx panel installation to provide 12 volts DC power in the field. (See the article for more details.)

In the article, Matt Gunn, the author, installed a 12-volt power panel in the bed of his 2013 Toyota Tacoma. He took 12 volts from an ODYSSEY 205-minute reserve capacity deep-cycle battery under the hood and ran it back to the bed. From there, he branched out from a fuse block, providing connections for charging and running anything that needs 12 volts. He also added a switch for bed-mounted LED strips, and finished it off with a digital voltage gauge. His parts list consisted of a Blue Sea Systems six-circuit fuse block with negative bus, a Powerwerx four-hole panel mounting plate, a Powerwerx red 12-volt switch, a Powerwerx digital red volt meter, a Powerwerx PanelPole two-Anderson Powerpole housing, a Powerwerx automotive cigarette-lighter socket, Hobbyking waterproof white LED strips, 4-gauge power wire and safety wire loom, 4-gauge ground wire and safety wire loom, and a 100-ampere circuit breaker.

The Blue Sea Systems six-circuit fuse panel allows branching out from the single power wire running back from the main battery. It has an integrated negative bus that should be grounded to the frame near to the panel. The author mounted his inside the storage compartment in the bed of his Tacoma. This circuit panel is designed for marine use, so it can be mounted in the bed of a truck without worrying about getting it wet. The author ran the 4-gauge power wire from the battery, down the frame of his truck, and up to the Blue Sea fuse block. He mounted the 100-A circuit breaker as close as possible to the battery, protecting the system from a short circuit or accidental grounding situation. The power wire is also protected with plastic wire loom. The ground wire attaches to the frame below the fuse block.



Powerwerx PanelPlate4 with PanelSW-Red 12-volt switch, PanelDVM digital red volt meter, PanelPole housing for two Powerpole connectors with a weather-resistant cover, and a marine-grade cigarette-lighter socket.

Robert Stoffel Throws More Puns!

As mentioned in the March 2016 issue of *NetControl*, OCS&T Communications & Technology Division Director Robert Stoffel, KD6DAQ, has retired at the end of March, after an illustrious 26+ years with the County. His accomplishments make him a legacy, indeed! He rode into the sunset in the March 2016 issue of the *Communications & Technology Newsletter* with a detailed and highly interesting article of his activities during his tenure with the County. In true Stoffel fashion, he ended his article with a list of his favorite puns, which we couldn't resist republishing in this issue of *NetControl*. Here they are:

- Bakers trade bread recipes on a knead to know basis.
- When I saw my first strands of gray hair I thought I'd dye.
- You are stuck with your debt if you can't budge it.
- The guy who fell onto an upholstery machine was fully recovered.
- A bicycle can't stand alone; it is two tired.
- The dead batteries were given out free of charge.
- The roundest knight at King Arthur's round table was Sir Cumference.
- When fish are in schools they sometimes take debate.
- The deputy was dispatched to a daycare where a three-year-old was resisting a rest.
- I wondered why the baseball was getting bigger. Then it hit me.
- Did you hear about the guy whose whole left side was cut off? He's all right now.
- The short fortune teller who escaped from prison was a small medium at large.
- A thief who stole a calendar got twelve months.
- Those who get too big for their britches will be exposed in the end.
- Santa's helpers are subordinate clauses.

K6MKL Hides at La Habra/Fullerton Border

Michael Berchtold, K6MKL, son of OCRACES Member Roger Berchtold, WB6HMY, was the fox on Monday, March 21, 2016, on the monthly cooperative T-hunt. He turned on the fox box immediately following the 2-meter OCRACES ACS net, at the border between La Habra and Fullerton, just west of Idaho Street/Gilbert Street.

Ron Allerdice, WA6CYY, from Costa Mesa, was the first hunter to find the fox. Second place was taken by Ken Bourne, W6HK, and Fran Needham, KJ6UJS, who battled signal reflections throughout the hills of Fullerton. Coming in third was Tony Scalpi, N2VAJ. All had a good time hunting for the fox, who was in a very good location. Afterwards, the fox and hunters met at Applebee's at Idaho Street and Imperial Highway, for good food and good conversation, including the desire to recruit more T-hunters to increase the enjoyment of our monthly hunts.

The next cooperative T-hunt will be held on April 18, 2016 (the third Monday in April), immediately following the OCRACES 2-meter net (approximately 7:20 PM). The fox will transmit on the input (146.295 MHz) of the 146.895 MHz repeater. Hunters will compare bearings via the 449.100 MHz repeater, and are encouraged to beacon their positions via APRS throughout the hunt. The fox will be hiding in a sector of Orange County (to be announced a few days prior to the hunt) on paved, publicly accessible property. No fees will be required to drive directly to the fox.

To resolve scheduling conflicts with RACES meetings, events, and County holidays in 2016, we have moved all cooperative T-hunts to the third Monday, except for the second Monday in October.

The cooperative T-hunts provide excellent practice in working together to find sources of interference. The hunts are not official RACES events, so DSW (Disaster Service Worker) coverage does not apply. Please drive carefully!

Fox-hunt loops and beams are available from Arrow Antenna and HRO, including the Arrow Model FHL-VHF fox-hunt loop (covers 1 MHz to 600 MHz) and the Arrow Model 146-3 three-element portable hand-held yagi. The Arrow OFHA 4-MHz offset attenuator can be useful when close to the fox, to prevent receiver overload. An all-mode transceiver is quite useful, allowing hunters to switch to the SSB or CW mode for detecting extremely weak signals, or to switch in a built-in attenuator, reduce RF gain, or tune slightly off frequency when dealing with extremely strong signals.



At the fox's den are (left to right) Fran Needham, KJ6UJS, Ron Allerdice, WA6CYY, Michael Berchtold, K6MKL (the fox), and Tony Scalpi, N2VAJ.

ARRL Introduces Three New E-Books

ARRL has introduced three new e-books to its growing digital library. The newest titles available in the popular Amazon Kindle format include *Work the World with JT65 and JT9* by ARRL author Steve Ford, WB8IMY, *ARRL's Small Antennas for Small Spaces*, 2nd edition, and *Antenna Physics: An Introduction*, by Robert J. Zavrel, Jr, W7SX.

Work the World with JT65 and JT9 shows you how to assemble an effective digital communications station and configure the software for best performance. Some operators use these popular digital modes with as little as 5 watts RF output and an indoor antenna. The book is filled with tricks and tips to help you get on the air making contacts.

The fully updated, second edition of *ARRL's Small Antennas for Small Spaces* is a must-have for radio amateurs who live in apartments, condominiums, or houses on small lots. The book is filled with practical advice, and will guide you to finding the right antenna design to fit whatever space you have available.

Antenna Physics: An Introduction was written to bridge the gap between basic theory and graduate-level engineering texts. Delve deeper into antenna theory, and explore the underlying principles, and mathematics, of antennas and antenna physics.

All of these publications are also available in a printed format, directly from ARRL and ARRL publication dealers.

ARRL reminds anyone shopping on Amazon to consider visiting smile.amazon.com. Amazon will donate 0.5% of the price of your eligible AmazonSmile purchases to ARRL whenever you shop on AmazonSmile.

RACES/MOU News from Around the County

"RACES/MOU News" provides an opportunity to share information from all City & County RACES/ACS units and MOU organizations in Orange County.

Please send your news to NetControl Editor Ken Bourne, W6HK, at: w6hk@ocraces.org

Fountain Valley RACES

Fountain Valley RACES Member Alan Hill, W6ARH, reported that the West Coast Amateur Radio Club conducts testing for all classes of licenses on the third Thursday of the month at 5:30 PM at the Michael E Rodgers Senior Center, 1706 Orange Avenue, in Huntington Beach. Walk-ins are allowed. VEC contact is Ken Simpson, W6KOS, at 714-651-6535 or w6kos@arrl.net. VEC accreditation is ARRL/VEC.

Huntington Beach RACES

The April 4, 2016, Huntington Beach RACES meeting at the City's EOC will include a debrief of the Baker to Las Vegas Challenge Cup Relay. Their team started on March 19th at 3:00 PM with a 98-degree air temperature and over 120 degrees on the blacktop. The HBPD team did well but there were a number of medical casualties from other teams, some serious enough to require medevac out to Las Vegas. Chief Radio Officer Steve Graboff, W6GOS, said the HBRACES communications skills were top notch and an integral part of HBPD Team 50's successful completion of the event. Roy Lothringer, N6SLD, pre-wired the power harness for the follow van in Huntington Beach before they headed out to the desert and set it up at Baker High School. Tim Sawyer, WD6AWP, maintained his linked repeater system for HBRACES, which provided seamless communications from Baker to Las Vegas and throughout the desert race course (except for an expected few dead spots tight between mountain walls).

Tri-Cities RACES

Members of Tri-Cities RACES served during the Swallows Day Parade in San Juan Capistrano on Saturday, March 12, 2016. They assisted with the support of several CERT teams that covered driveways facing the parade route and kept the public safe before, during, and after the parade. A team of mesh-node specialists configured a seven-node camera system to help keep everyone safe.

The Orange County Sheriff's Department observed the system with the assistance of Tri-Cities RACES unit members to monitor potential areas of concern.

Irvine RACES (IDEC)

IDEC's next no-host breakfast meeting ("VickiBreak") will be on Saturday, April 9, 2016, at Knowlwoods, Sand Canyon and Burt. Visitors are welcome.

Hospital Disaster Support Communications System (HDSCS)

The Orange County Hospital Disaster Support Communications System is holding a license exam session on Saturday, April 23, 2016, at Care Ambulance in Orange. All classes of license are available for testing. Session starts at 9:30 AM and pre-registration is required. For information, details, and registration, call Ken Simpson, W6KOS, at 714-651-6535.

Orange County SKYWARN

NWS San Diego activated all SKYWARN including Orange County SKYWARN at 0652 hours on Monday, March 7, 2016, due to a fast moving storm. The day began with significant thunderstorms, high winds, and heavy rain. Spotters were requested to report significant weather via computer at <http://www.srh.noaa.gov/StormReport/SubmitReport.php?site=sgx> or by amateur radio. OC SKYWARN staff monitored the Santiago Peak repeater at 448.040 MHz (-), 136.5 Hz PL, as their primary tactical repeater. Spotters were asked to send reports of wind damage, rain total, urban flooding, debris flows, and any other significant weather or damage as a result of the weather. SKYWARN was deactivated at 1700 hours.

On Friday, March 11, 2016, OC SKYWARN Coordinator Scott O'Donnell, WX6STO, advised spotters that SKYWARN would be on standby later in the day, due to possible thunderstorms that evening. However, the storm was not intense and activation was not required.

April 2016

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2 <i>Weekly 40 m ACS Net</i>
3	4 <i>OCRACES Meeting & Weekly 2 m ACS Net</i>	5	6	7	8	9 <i>Weekly 40 m ACS Net</i>
10	11 <i>Weekly 2 m ACS Net</i>	12	13	14	15	16 <i>Weekly 40 m ACS Net</i>
17	18 <i>Weekly 2 m ACS Net & Cooperative T-Hunt</i>	19	20	21	22	23 <i>Weekly 40 m ACS Net</i>
24	25 <i>Five-Band ACS Nets & SWACS Radio Test</i>	26	27	28	29	30 <i>Weekly 40 m ACS Net</i>

Upcoming Events:

- **April 4:** OCRACES Meeting, 840 N. Eckhoff Street, Suite 104, Orange, 1930-2130 hours
- **April 18:** Cooperative T-Hunt on input of 2-meter repeater, 1920 hours
- **April 25:** Five-band ACS nets and Southwest ACS Frequency/Radio Test
- **May 7:** City/County RACES & MOU Drill and Fullerton Airport Day
- **June 25-25:** Field Day



www.ocraces.org



Mission Statement

County of Orange RACES has made a commitment to provide all Public Safety departments in Orange County with the most efficient response possible to supplement emergency/disaster and routine Public Safety communications events and activities. We will provide the highest level of service using Amateur and Public Safety radio resources coupled with technology, teamwork, safety, and excellence. We will do so in an efficient, professional, and courteous manner, accepting accountability for all actions. We dedicate ourselves to working in partnership with the Public Safety community to professionally excel in the ability to provide emergency communications resources and services.

County of Orange RACES Frequencies

40 m: 7250 kHz SSB (City/County/MOU Net—Saturdays, 1000 hours)
 10 m: 29.640 MHz output, 29.540 MHz input, 107.2 Hz PL
 6 m: 52.620 MHz output, 52.120 MHz input, 103.5 Hz PL
 2 m: 146.895 MHz output, 146.295 MHz input, 136.5 Hz PL*
 2 m: 146.595 MHz simplex
 1.25 m: 223.760 MHz output, 222.160 MHz input, 110.9 Hz PL
 70 cm: 446.000 MHz simplex
 70 cm: 449.100 MHz output, 444.100 MHz input, 110.9 Hz PL (private)
 70 cm: 449.180 MHz output, 444.180 MHz input, 107.2 Hz PL (private)
 23 cm: 1287.650 MHz, 1287.675 MHz, 1287.700 MHz, 1287.725 MHz, 1287.750 MHz, and 1287.775 MHz outputs, -12 MHz inputs, 88.5 Hz PL
 *Primary Net—Mondays, 1900 hours

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Questions or Comments?
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**“W6ACS ...
Serving
Orange County”**

Meet Your County of Orange RACES Members!



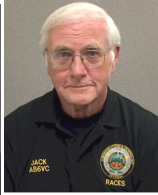
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N8RG



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Fran Needham
KJ6UJS



Kenan Reilly
KR6J



Tom Riley
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Brad Russo
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Tony Scalpi
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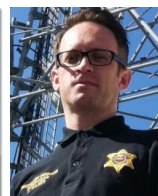
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