The QS-59 is a radically new approach to receiver design. Two oscilloscopes on the panel provide simultaneous panoramic observation of three adjacent amateur bands and continuous monitoring of the selectivity settings and threats of QRM.

The group of concentric knobs at the left control the bandwidth and slope characteristics of the i.f. amplifier and the depth and position of the Q multiplier notch. The three knobs at the right handle i.f. and a.f. gain and the b.f.o. pitch.

Die-cast panels and chassis contribute to the mechanical stability of the receiver, and its compactness is obtained through the use of printed circuits and transistors in the i.f., audio and control circuits. The r.f. sections use saturable reactors for tuning.

The QS-59 Communications Receiver

ONE of the best-kept secrets of the radio industry has been the development of the QS-59 communications receiver. In contrast to the usual advance publicity and trade-show scuttlebutt, this receiver is being offered to the amateur with none of the traditional fanfare that accompanies such an event. However, the receiver is so far ahead of anything that has been available that the immediate acceptance of the receiver is a foregone conclusion.

Some of the ARRL Headquarters staff were fortunate enough to have enjoyed the confidence of the manufacturer and to have been in on the advance planning of this revolutionary approach to amateur reception, and as a result the first receiver off the production line was shipped to the League lab for appraisal and evaluation. Frankly, we don't know where to begin to describe it!

Basically the receiver is a single-conversion superheterodyne using an i.f. at 2.3 Mc. It covers the amateur bands only, from 80 through 10 meters inclusive. The accessory equipment and operating aids are what make it so strikingly different. Looking at the die-cast panel of the receiver, the large 3-inch tuning knob is in the center, below a slide-rule tuning scale that shows only the band being tuned. A square-faced oscilloscope to the left of the dial gives a panoramic presentation of the signal being received and the spectrum ±5 kc. either side. The i.f. selectivity is continuously variable, and the *slope* and *frequency* of each side of the pass band are also continuously variable. To indicate to the operator how the signal is positioned in the pass band, where the interference is and how it can be rejected, the selectivity positioning controls (slope and frequency) are ganged to individual transparent masks on which are stamped white lines showing the sides of the pass band. As the frequency of one side of the pass band is changed, the corresponding mask moves horizontally, and as the slope is changed the mask is canted accordingly. A third mask, carrying the rejection notch offered by the *Q* Multiplier, moves up and down with a notch depth control and horizontally with the *Q* Multiplier frequency control. A fourth mask, carrying a single engraved vertical line to represent the b.f.o. frequency, moves back and forth across the pass band as the b.f.o. pitch control is changed. When the b.f.o. is switched off, edge-lighting of the b.f.o. mask is also removed and the b.f.o. line becomes invisible. As a result of these overlapping masks on the scope face, the operator has at all times a visual picture of the received signal, how it is positioned with respect to the i.f. pass band, and the relative position of any potential interference. No S meter is required, of course, because the amplitude of the signal in the scope is a measure of the signal strength. Dynamic compression in the panoramic channel provides an 80-db. range that will take care of most conditions without running off the scope.

The continuously-variable selectivity in the i.f. amplifier is obtained through the use of recently-developed low- and high-pass crystal lattice filters that can be varied in cut-off frequency and slope. The block diagram of the basic receiver, Fig. 1, shows the position of the filters in the i.f. amplifier. The first filter following the mixer is a fixed bandpass filter 7 kc. wide and −6 db. and 10 kc. wide at −60 db., which affords initial protection to the i.f. amplifier. The range of adjustment of the high- and low-pass filters is such that effective bandwidths of from 180 cycles to 7 kc. at −6 db. can be obtained, with 6- to 60-db. shape factors of from 1.19 to 3, within the restrictions imposed by the 10-kc. pass band at −60 db. of the fixed filter. Following the *Q* multiplier (second i.f. stage), the signal channel is quite conventional in the detector, audio and b.f.o. circuits.

The single bit of circuit wizardry that makes so many of the operating innovations possible in this receiver is the use in the tuned circuits of saturable-reactor tuning.[1] Instead of the conventional variable capacitors or permeability-

[1] Gabriel, "Ferrite Inductors Tune Panoramic Receiver," *Electronics*, August, 1956.

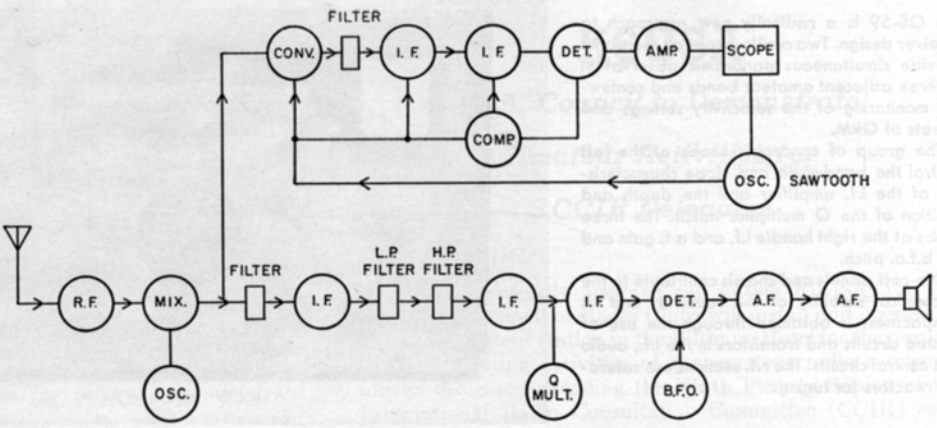

Fig. 1—Block diagram of the signal circuit of the QS-59. The a.f.c. and auto-tune sections are not shown.

tuned inductors, the r.f. circuits (r.f., mixer and oscillator) all use saturable reactors that are tuned by the current changes through control coils on the small toroid forms. Manual tuning of a "front end" for any band is accomplished through a three-gang potentiometer that varies a small direct current through the applicable control coils. This resistance tuning, through a 15:1 reduction drive, is unusually smooth, with no trace of backlash (or hysteresis), although we would have liked it a bit better if the dial could be "spun" a little faster. However, this is really a personal prejudice, because three tuning rates (10 kc., 50 kc. and 200 kc. per knob rotation) are available at the flip of a switch that cuts in suitable shunts and biases. It will seem strange to many operators to find miniature potentiometers used for trimming the r.f. circuits along with the more familiar adjustable capacitors, but there are a number of new concepts in this receiver one must become accustomed to.

One of the more attractive features of the QS-59 is to be found in its perfected automatic frequency control for use in the reception of single sideband. It is a conventional type of a.f.c. (aside from its use of a quartz-crystal discriminator), and its inclusion is made possible through the use of the saturation-tuned front end and the extreme sensitivity of the receiver. Most sideband signals suppress the carrier only 40 or 50 db., enough to be negligible in the usual receiver but a usuable signal in the QS-59. As a result of the a.f.c., a sideband signal that is mistuned by as much as 150 cycles will be pulled back immediately to perfect phase synchronization by the a.f.c. working in conjunction with the h.f.o. Of course the b.f.o. has to be set up properly on the pass band, but this is a simple matter of checking on the positioning of the masks on the signal oscilloscope. Using this feature for the reception of s.s.b. is a revelation, and it makes tuning in a sideband signal no more difficult than tuning in a broadcast station on a car radio. With this feature switched in, it is just as easy to recognize a sideband operator by his voice as it was in the old days of a.m.

Triple Panoramic

So far of course the receiver is merely a superlative job that any one of three or four enterprising manufacturers might have developed within the next 10 years. But the real feature, the one that will endear the QS-59 to the hearts of DX and contest men everywhere, is the inclusion of "triple panoramic reception." A 4-inch 3-trace scope to the right of the tuning scale furnishes a panoramic representation of three bands at any instant. The middle trace shows the band in use, the top trace the next low-frequency band, and the bottom trace the next high-frequency band. These traces are controlled by the band switch, so that the middle trace is always the band the operator is tuning. The middle trace moves horizontally with manual tuning as in conventional panoramic reception, but the top and bottom traces remain fixed and show the entire bands at all times. Thus when the operator is tuning the 15-meter band, he can watch 20 and 10 for pile-ups and openings! When tuning 10 or 80, the next two lower or higher bands are shown on the outside traces.

It probably isn't "cricket" to criticize a receiver that represents such a giant stride forward, but after several weeks of operation with it we were able to spot an improvement that should be considered for the next model. The 3-band panoramic reception was found to be invaluable for spotting desirable signals, but a directly-calibrated frequency scale on the panoramic traces would have allowed us to tune more quickly to a pile-up on another band. When there is more than one pile-up it is sometimes confusing to know which one to tackle first.

A feature that will appeal to any DX man with over 275 countries is the auto-tune device. This is simply a very slow sweep of the signal channel by automatic means. The sweep automatically stops on each signal that is weaker than S7, and holds on that signal for approximately 20 seconds before releasing and moving on to the next. This allows the tired DX man to rest on a couch in the shack while keeping an

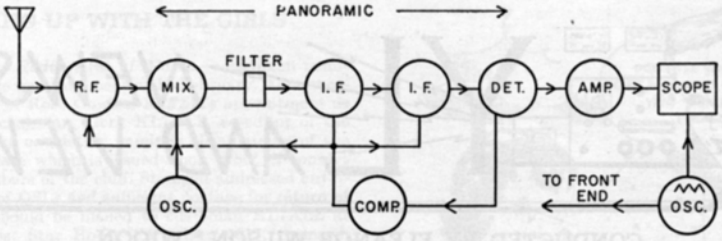

Fig. 2—Block diagram of one of the two panoramic channels that monitor the adjacent bands.

ear on the band. Magnetic memory and erase circuits in the receiver hold the tuning positions for the previous five signals, so that an operator who isn't as agile as he used to be can still jump up from the couch, rush over to the receiver, and immediately locate the rare DX the receiver just tuned through. Of course he has to remember how many signals back the rare one was, but this is no particular hardship.

There is an output jack at the rear of the receiver that can be connected to the input of a tape recorder to record the call of a rare DX station. This is for the specialist who recognizes that he has a better chance of raising a bit of rare (c.w.) DX by calling at the same speed as the CQ. Recording the DX station's sign-over and using it to key the transmitter not only enables the station to be called at the identical same speed but with the identical same fist! The psychological advantage this gives the caller can often mean the difference between raising and not raising a station. This feature seems like a very worthwhile one, and we suspect that it will be included in nearly all receivers in the future. A tape recorder is not furnished with the QS-59, but any of the standard brands can be used.

One of the minor things that bothered us when we first tried out the receiver on the higher bands was the appearance of a backwave or echo on most DX stations that were tuned in. It was finally pointed out to us by a visitor that this was the signal coming around the world again, a remarkable tribute to the sensitivity of the receiver and the effectiveness of the wide dynamic range a.v.c. Judicious use of the gain controls eliminated this effect, and if we had read the instruction book first, as *QST* keeps telling its readers, we would have found that the manufacturer warns against opening the gain to maximum except on the very weakest signals, for this very reason. The manufacturer attributes the superlative sensitivity of the QS-59 to the use of special r.f. and mixer circuitry combined

(*Continued on page 170*)

Edison Award to K2KGJ

(*Continued from page 57*)

happened in Antaretica has also happened in other camps of Americans the world over. What has happened to make this change? I am quite sure that you will find that amateur radio is the answer.

When a camp is being established, there is a lot of activity, and bustle that keeps men's minds off their own troubles, but when this hurried routine is over then they settle down to worry over what is happening at home. Once the ham shack is built, antennas erected, cables plugged in, and your first call is answered from the States, a different spirit pervades that camp and morale rises. Home is only as far away as the ham shack.

The man who can get away from daily routine to talk to his family at home has his horizons widened. His concepts grow and he is happier. Sometimes just to hear the voice of a wife or mother is all a fellow needs. Communication may be difficult at that moment, but just to have heard them is enough, the news can come at another time.

We have been born into a life of easy communication with the telephone. Before the day of the dial, and we had to rely on the operator in the exchange. We still took her work for granted, and once the connection was made we promptly forgot her and we completed our communications alone. With the dial mechanisms, even the operator has been eliminated. In amateur radio relaying of messages, there are always the two operators that are present and listening to the conversation and waiting for the word "over" that they may throw the switch. We depend on these operators very much. They become the confidants with members of a family, and they bury many secrets in their hearts of love and hate, joys and sorrows, hopes and despairs, almost as a Father Confessor would. You are sorry with one man's financial troubles and you worry about anothers sick child; sometimes you feel like "throwing the switch" to stop some of the woes that come pouring through your receiver to a man and the next time you are the Gabriel who is bringing him news of joy; you hear his little child trying to pipe a "Hello Daddy" over thousands of miles of the ether; and you smile as you hear a fond mother reminding her bearded son to keep his feet dry and not to catch cold. In every case, the amateur operator is in the middle and in the midst of every family. I don t know which area gives the greater thrill to operate from here or to operate from there, as the gratitude expressed is most rewarding. We have all experienced the difficulty in trying to hang up the telephone with a mother you have just completed a contact for — you learn all about her boy from infancy to the present day as she thanks you for bringing him back to her; or the exultation punctuated with sobs of the wife who has just been reunited with her husband on the other side of the world. Perhaps the operators at the base see their efforts more clearly rewarded. There you can watch a man's face as you hand him a hamgram, the first news he has had in months. Or, as you complete a contact for another, there is a squeeze on your shoulder or a thump in the back expresses more gratitude than any words can. Few people think of Hertz, Marconi, DeForest and the rest who have made radio possible, these grateful people think only of the operator who made this contact a reality.

The stateside operators, I think, have the more burdensome task. At the end of a year, their task is not over, they have to begin all over again. The band may fade out with one area then they must turn to answer calls from another, and it is rare that an operator ever turns down a call when needed despite the fact his own tired body is crying for rest. These are the real heroes who have brought a good deal of America to the exiles away from home . . . QST

identify, and even harder to figure out. W6VHS, Van Nuys, Cal., lists inexpensive publications available from the Superintendent of Documents, Washington 25, D. C., that may be helpful. These include:

Radar Electronic Fundamentals, Navships 900,016 — $1.25

Radar System Fundamentals, Navships 900,017 — $1.25

Microwave Techniques, Navships 900,028 — $.55

Price list 82, *Radio, Electronics, Radar and Communications*, (no charge) lists these and other publications that may be of interest. QST

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HIGH CLAIMED SCORES
1959 V.H.F. SWEEPSTAKES

Growth in interest in the V.H.F. SS has been meteoric. From the first holding in 1948 through 1953, the logs received hovered between 300 and 400. Then the boom began. In 1954, there were 610 and the figure held around 750 the next two years. By 1957 it reached 837, only to be followed by a giant 41 per cent increase to nearly 1200 logs in 1958.

Both in amount and complexity, the checking at ARRL has risen apace. Contact totals in the hundreds are registered and duplicate QSOs on a given v.h.f. band must be removed. The higher claimed section multipliers need attention. More mathematical errors occur which must be corrected. Every effort must be made to guarantee that the right individual wins the award.

The V.H.F. SS is firmly established as a major contest. This, coupled with the later scheduling (January 10 and 11 this year), requires a new reporting system. While we await the final standings, which we can't get ready by April *QST* deadline, let's examine some high *claimed* scores.

Single operator: W1RFU 15,530, W1HOY 13,216, W1RJA 12,420, W1HDQ 16,830, W2BLV 17,264, K2HLA 13,344, W2PAU 12,848, W2BV 12,528, W3TYX 18,032, W3HYJ 16,140, W3KKN 16,107, W3TDF 13,286, K4HZO 6900, W4RMU 5022, K5MJW 8086, K5RCZ 5658, K6TYW 9520, K6MZN 7781, K6RNQ 7130, W6BAZ 7098, W7RT 6672, W8RLT 10,014, W8LPD 9072, W8NRM 8832, K8BPC 7560, K9DOE 13,920, W9ROS 13,332, K9CSI 12,012, K9GFQ 10,000. W9JCI 8700.

Multiple operator: W1MHL/1 19,343, K1CRQ 11,400, W1HPM 8418, K2ITP 36,001, W2ADE 23,764, W2PEZ 14,444, W3KWH 14,280, W4ZZ/4 5450, K5STI 12,903, W6SDW/6 13,328, WA6CID 11,308, K6TJL/6 7946, K6SLQ/6 7614, K9KGI 6300, KØQQC 5040.

Dozens of other excellent totals were run up around the U. S. and Canada. We'll tell you about these, identify all Novice, Technician, club and ARRL Section winners, and present a full list of all entries in *QST* as soon as the sorting and checking is completed. Figures on participation are not yet available but, man, what a stack of logs! QST

Happenings

(*Continued from page 65*)

14 copies of all statements, briefs, or comments filed shall be furnished the Commission.

FEDERAL COMMUNICATIONS COMMISSION

MARY JANE MORRIS

Secretary

Released: February 20, 1959

APPENDIX

IT IS PROPOSED TO AMEND PART 12 OF THE COMMISSION'S RULES AS FOLLOWS:

Amend Section 12.111(d) to read as follows:

(d) 14,000 to 14,350 kc. using type A1 emission, 14,000 to 14,200 kc. and 14,300 to 14,350 kc. using type F1 emission and on frequencies 14,200 to 14,350 kc. type A3 emission or narrow band frequency or phase modulation for radiotelephony.

QS-59

(*Continued from page 69*)

with automatic antenna-coupling control that provides the best match regardless of the antenna characteristics.

Although the price of the QS-59 has not yet been definitely fixed by the manufacturer, we suspect that it will sell for around $40,000. For further information on how to get one, see your banker or bookmaker. — *L. E. R.* QST