acc notes

SEPT/OCT '83

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SCHEDULER CONTEST WINNER(S)! Judging the winner of the ACC RC-850 controller "Scheduler Contest" was really tough. It came down to two entries, and instead of splitting the Digital Multimeter prize in half, we decided to declare two winners, and thus two DMMs. The winners are Graham Newton, VE3MEG (of VE3TRO Repeater), and Dave Schultheis, WB6KHP (of repeater of the same call). Graham and Dave each will be getting their Fluke D-800's shortly. Thanks to everyone for your entries.

One of the highlights of Graham's entry is his "scheduling around" the weather service weekly alert test on Wednesdays from 11:55 AM to 12:05 PM (see SITE ALARM APPLICATIONS - STORM ALERT later in this issue). In addition to Graham's Friday afternoon "TGIF" (Thank goodness it's Friday) tail message, he's got an "OGIM" (Oh goodness it's Monday) message Monday mornings. Weekdays from 3PM to 6PM, his rush hour setup shortens the timeout timer, with a different courtesy tone to indicate such, and selects a time-of-day tail message.

Graham's machine goes to nightime state at 12:01 AM weeknights, with a "daytime extend" arrangement whereby at 12:02 AM on Friday and Saturday nights it returns to daytime state, until 2 AM. The weekend daytime extend accomodates partygoers! At night, Graham disables the Autopatch and User Autodialer (Emergency Autodialer remains enabled), and generally tightens up security of the machine. He also enables the Beacon ID at night, calling it the "light-house mode" considering all the scanners it must light up during the night.

Dave's machine's manual operation was part of the inspiration for the design of the scheduler (ACC staff members are users of Dave's machine). Dave's 220 repeater includes a 2M remote, which he actively uses on a scheduled basis for linking the 220 users to 2M - Monday nights at 9:29 to listen to Westlink, and Tuesday nights at 8:29 for the West Valley Radio Club net. A "Net tonight 8:30" tail message Tuesday afternoon and evening reminds users of the net, and "West valley tonight" tail message Wednesdays reminds users of their weekly meeting.

Dave likes to monitor his machine all night for emergencies, but to discourage long QSO's he selects the short timeout timer each night at 10 PM, with "Timer 30 seconds" tail message, and "The timer is set at 30 seconds" ID message. At 2 AM, the repeater goes to Touch-Tone access, available for emergency use only. The repeater wakes up again at 5:55 AM each morning, except Sunday and Monday (Dave's days off) letting him sleep in until 6:30.

Graham and Dave's uses of the scheduler illustrate how the RC-850 controller makes life easy for control operators (since it's fully automatic), and provides predictable operation for the users, in additon to automatically reminding all of routine events.

The scheduler capability is available with the RC-850 controller configured at less than $1600, and is an example of how ACC is setting the standard for repeater control.

REMOTELY CONTROL REMOTE BASE PL FREQ AND ANTENNA DIRECTION. The RC-850 Version 2 software provides PL frequency control and antenna direction information in response to user commands. The information is sent out serially along with the BCD frequency information, and is recovered externally in shift registers. Five bits, compatible with Comm-Spec SS-32/TS-32 type PL units, plus a sixth PL on/off bit allow remote PL selection. Seven bits controlled by the antenna direction command may drive an analog circuit which controls an antenna rotator.

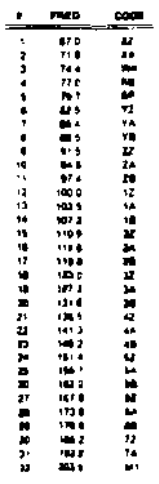
A remote base with remotely controlled PL encoder allows accessing PL'd repeaters through your remote, without the need for PL in your radio, and independant of your own repeater's PL. Antenna direction control allows use of a directional antenna with a rotator, increasing the range of your remote, and helping to prevent bringing up multiple repeaters on the same frequency.

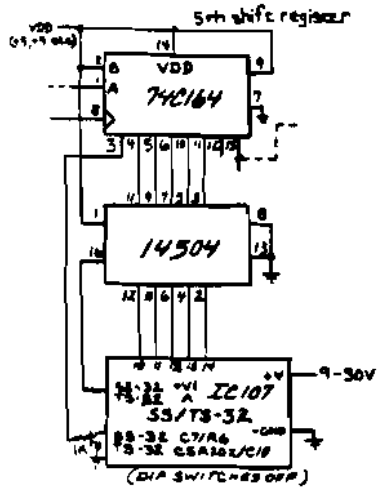
Interfacing the PL control bits to the TS-32 or SS-32 simply involves logic voltage level shifting from the operating voltage of the shift registers (which should depend on the operating levels of the remote base transceiver) to the TS/SS-32 voltage level (around 8 volts). One IC, the Motorola MC14504, provides the level translation. Five of the control bits simply drive the IC-107 control pins as shown. Be sure to open all DIP switches on the SS/TS-32 so that the switches don't ground the control bits. The sixth bit is an on/off bit, which may drive a transistor switch that grounds an internal point of the SS/TS-32 when PL is turned off.

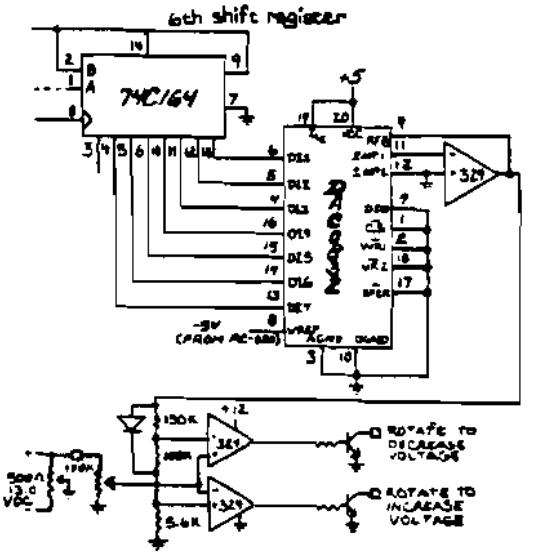
The PL frequency is commanded with the control code prefix defined in the manual, followed by 1 thru 32 to select the desired frequency. Zero disables the PL encoder. PL frequencies may be stored in each bank of five memories, so that calling up a frequency from a memory automatically updates the PL frequency.

Our ideas on antenna direction control are based on an article in November, 1982, 73 Magazine (Automatic Beam Aimer), adapted to a remotely controlled dc control voltage. The seven direction bits from the controller may drive a digital to analog converter to create the control voltage. An analog window comparator compares the commanded control voltage to the voltage-vs-direction signal returned from the rotator. If a significant error exists, the rotator is commanded in the proper direction to eliminate the error.

Direction, like PL, may be stored in each of the memory locations so that selecting a memory frequency updates PL, direction, and transceiver frequency at the same time. PL and direction may also be scheduled. We've built up all the circuitry here in our lab, and we know of several people using the remote PL circuitry, but the rotator control may require some experimentation based on your particular rotator and control box.





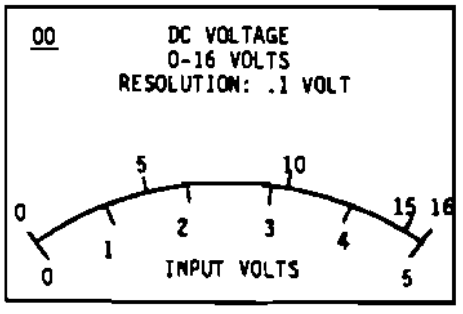


METERING NOTES - VOLTAGE AND CURRENT. The RC-850 controller allows its users to read back various meter readings from the repeater site. Readback is requested by Touch-Tone commands and is provided in synthesized speech. Two of the many meter types supported in Version 2 software are voltage and current.

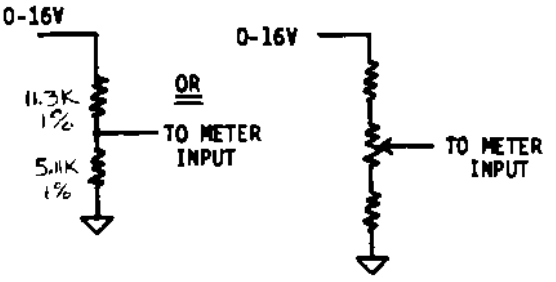
The 850 controller's 16 analog input channels are capable of measuring 0-5 volt signals. The measurement is layed against the "template" assigned to that channel, and the readback is made in appropriate measurement units. A meter face for 0-16 volts, and 0-16 amps are provided for voltage and current measurement.

Scaling of voltage levels to match the 0-5 volt measurement range is easy - just a voltage divider composed of two resistors. Current is a little trickier, but still only involves an op amp and a few resistors. To provide a voltage proportional to current, a sensing resistor with a true differential, or instrumentation, amplifier is used. The output of the op amp is equal to the current times the sensing resistor, times the voltage gain of the amplifier. The value of the sense resistor that should be used depends on the maximum load current, since the voltage drop across the resistor reduces the voltage to the load. (Ideally, a power supply with remote sensing capability would be used, with the sense return after the sensing resistor. That way the voltage to the load would be independant of current.)

The four resistors around the op amp should be 1 or 2 % metal film types (these are available from RCA in bubble pack). Be sure that the common mode input voltage range of the op amp will accomodate the operating voltages that result from resistor/gain selection. For example, an LM324 or LM358 operating at +12 volts and ground will operate properly with input voltages between 0 and 10 volts (Input Common-Mode Voltage Range from data sheet). An example is shown below for measuring current drain from a repeater power supply.



APPLICATIONS:
SUPPLY VOLTAGE
BATTERY VOLTAGE
INTERNAL REGULATED VOLTAGES



10 WATT REPEATER

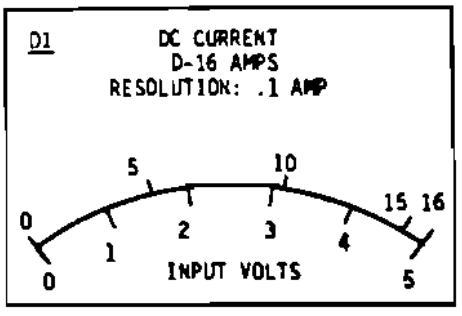
MAX CURRENT DRAW ≈ 3 AMPS

SELECT RSENSE = .1Ω , 5W

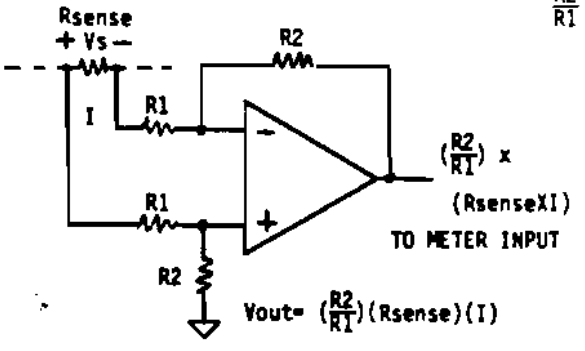
$V_{S\ MAX}$ = .3V

GAIN NEEDED = $3.125 = \left(\frac{5}{16} \times \frac{1}{RSENSE}\right)$

$\frac{R2}{R1} = 3.125$ R2= 31.6K R1= 10.0K



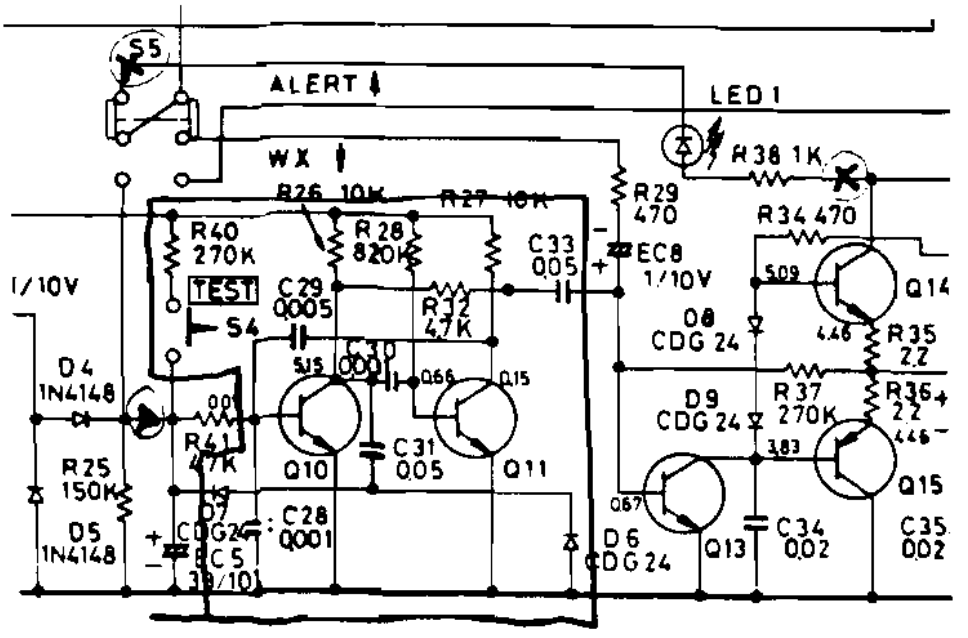
APPLICATIONS:
REPEATER CURRENT DRAIN
XMTR/PA CURRENT DRAIN
BATTERY CHARGING CURRENT

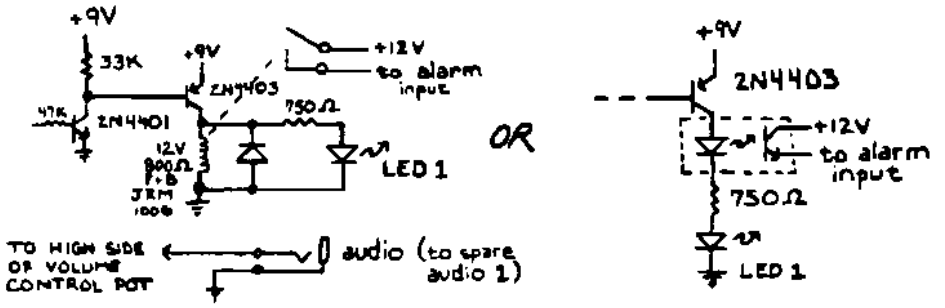


SITE ALARM APPLICATIONS - STORM ALERT. Graham Newton, VE3MEG supplied us with information on how he interfaced his Radio Shack #12-154 or #12-155 Weatheradio Alert ($39.95) to his RC-850 controller. The alert output activates the '850 over-the-air alarm, with a programmable message such as "Weather Alert, zap/zap, Weather Alert". The weather service audio may be selected with Spare Audio 1 user command, if you consider that legal during an emergency. Otherwise you can call up the weather service using the autodial to get the details. Graham "schedules" around the weather service weekly tests by disabling the alarm for a few minutes around test time. Thanks, Graham, for the info.

1. Remove all components associated with alert tone oscillator.
2. New switch wiring inside radio:
   Pressed - audio to local speaker via internal amp, short rectifier (tone) to ground at junction of 1N4148 and 150K resistor
   Released - open internal audio feed, release junction of 1N4148 and 150K resistor
3. Add 2 transistors, 3 resistors, diode, and relay as shown.
4. Re-wire LED across the added relay to indicate when tone alert (1050 Hz) is being received.
5. Connect audio output to '850 Spare Audio 1. Connect one side of relay to 12 volts, the other side to Alarm 1 or Alarm 2 input of '850.

NOTE: There are sufficient holes in board to allow all added components except the relay to be mounted on the board. You might also consider an opto-coupler instead of the relay interface to the alarm input.





IC-22U GREAT FOR MORE THAN JUST LINKS. Bob Hague, WA8EBD, reports that after trying a variety of RF equipment for his 2M repeater, his best results have been with a pair of ICOM IC-22U's (one for TX, one for RX). Bob has single site repeater at his home, running with a 75 watt pa, separate antennas (at 90' and 150'), and an RX/TX Varinotch filter on each leg. There is no detectable desense.

The IC-22U is great as a 2M remote base transceiver as well, since it's parallel BCD frequency controlled, and is an excellent RF package. ICOM reports that the 22U is alive and well as a product, even though it's aging, and is "plain Jane" compared to their newer radios. It should be available through any ICOM dealer.

REPEAT WWV LEGALLY. The National Bureau of Standards now offers WWV audio. Now it appears that you can dial up WWV for time and propagation checks without illegally rebroadcasting transmissions from another service. Put WWV into an RC-850 or RC-85 controller Emergency Autodial slot, with response message "WWV", or into a User Loadable Autodial slot. The number is (303) 499-7111. Thanks, Westlink Report.

AUDIO INTERFACING - SOME HINTS. Interfacing repeater and link radio audio signals to the RC-850 and RC-85 is straightforward, but sometimes we get questions on the value of capacitor, etc. Some ideas on interfacing to repeater rx/tx and link transceivers:

The controller audio outputs are dc coupled (dc voltage at ground). When interfacing to a transmitter which is also dc coupled, insert a coupling (or dc blocking) capacitor in series. The value needed is dependant on the input impedance to the transmitter. A worst case would be into, say, 600 ohms, where a 10uF cap would provide flat response down to 30 Hz. Higher input impedances can tolerate proportionately smaller caps. An electrolytic cap should be installed properly, realizing that the controller outputs are at dc ground. Too small a coupling cap will cause "tinny" audio.

The audio levels should be run as high as practical through the system to maximize signal-to-noise ratios. Internal to the '850 controller, receiver audio level is set with R113 at TP2 on the main controller board. This adjustment is important to maximize the s/n through the audio processing. Audio should be run through the mixers at as high a level as possible - usually this means about 4V p-p at the Transmitter Audio output. If the transmitter wants to see less audio, knock it down at the transmitter, or lower the gain of the transmitter input stage.

Audio inputs to the controllers are high impedance, typically 100K ohms. This means that audio can be picked from almost any point in the receiver without risk of loading. No impedance matching is necessary unless you're running very long interconnects (hundreds of feet). If the level out of the receiver is too low, most of the '850 and '85 inputs have provisions for increasing the sensitivity by installing a resistor to make the non-inverting op amp input gain greater than one.

The Processed Receiver Audio Output from the '850 for driving link transmitters is fairly high impedance, so that it shouldn't drive a low impedance audio input. Find a high impedance audio input (>50K), or build a buffer. The main Transmitter Audio Output is low impedance, however, so it should be able to drive any load down to about 600 ohms directly.

RC-85 READY FOR PRODUCTION. At the time of this writing, an RC-85 Repeater Control Board is at a test site and we're finishing up the last details of getting it into production. Our first shipments of production hardware should be early November. When we get our flier back from the printer we'll get a copy out to everyone on our mailing list.

The RC-85 is the scaled down version of the '850, which offers the high-tech basics of repeater control, like synthesized speech, remote programming, and autopatch/autodial. (Of course, the '850 with its non-volatile memory, meter readback, scheduler, paging, mailbox, and more, is in a different league.) More details on the '85 next time.

NEW PRICE LIST. We've redone our Price List and Order Form. We haven't raised the prices, just changed the format to make the price breakdown more clear. Several ordering examples on the back should help as well, and of course if you have any questions don't hesitate to call or write us.

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