DRC 190 *DIGITAL REMOTE CONTROL*

The DRC-190 digital Remote Control can be operated manually, or, with the addition of standard computer peripherals, will monitor, display, and print all relevant readings including phase, relative amplitude, calculated ratios and deviations. Upon finding a parameter out of limits, the DRC-190 can be programmed to print the reading, make appropriate adjustments, then print the corrected reading along with a notation of the adjustment. With the addition of a modulation controller the DRC-190 can be programmed to meet FCC requirements for full ATS and, with distortion analysis equipment, test and log Proof of Performance data — *automatically.*

The system is based on the Motorola 6802 microprocessor. The use of a microprocessor vastly simplifies the hardware design, thereby reducing system costs. The DRC-190 uses standard peripheral chips and bus architecture so design updates may be easily implemented by merely changing EPROMs. This insures the user that he will not be stuck with an obsolete system as integrated circuit design advances.

Unlike other systems that employ different hardware at the studio and transmitter sites, the DRC-190 studio and transmitter units are interchangeable, further reducing design and manufacturing expenses. The result is a low cost manual remote control that can expand to provide automated capabilities no other system has — *at any price.*

Features:

Manual or automated operation:
RS232 port provided for computer access

Programmable in BASIC to meet your stations requirements

Includes enough RAM for standard control and logging — can be expanded to full ATS

10 analog metering inputs
10 Raise outputs
10 Lower outputs
10 "Channel Selected" outputs
each expandable to 100 channels

Specifications:

A/D converter
4.5 digit modified dual slope with 10.5 ppm/C degree tempco ref

Calibration
Keyboard entered calibration scaling and curve

Sample
+/− 2 VDC max, +/− 100 V maximum common mode

Analog Multiplexer Reed Relays

Control Out Open Collector transistors, 0.5A, 30 VDC max

Failsafe
Failsafe output at each site. Each user programmed to respond or ignore each possible site.

Control Lockout
Control from any group of sites can be locked out at each site

Channels 10, expandable to 100 in groups of 10

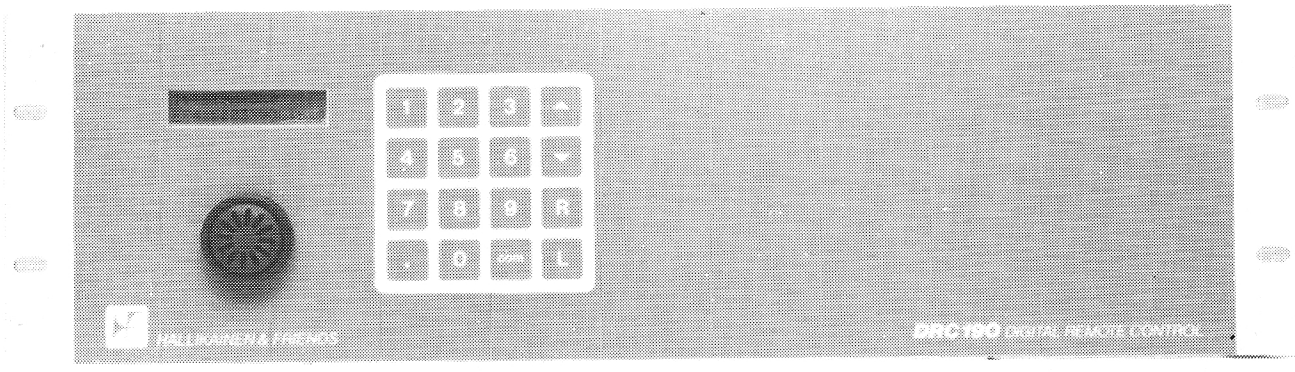
Communications
1200 bits/second, half duplex, voice grade link. Strappable 2 or 4 wire, 2 isolated inputs and 2 isolated outputs for microwave relay stations. Open Collector transistor to key external radio transmitter.

Applications Program Language Microsoft Floating Point Basic

Serial I/O RS232/C at programmable baud rate

Alphanumeric LCD prompts operator for required input and displays resulting readins (with label, units and decimal point)

16 key membrane keypad for manual operation



Speaker provides audio signal for keypad operation, and intercom between sites in the system

RS232 port for computer access

Hallikainen & Friends 141 Suburban Road, Building E4, San Luis Obispo, CA, USA 93401-7590 805/541-0200

DRC190 Remote Control System
General Specifications

The DRC190 Digital Remote Control can be operated manually, or, with the addition of standard computer peripherals, will monitor, display, and print all relevant readings of a broadcast system. These readings include measured transmitter parameters such as plate voltage, plate current, antenna base current, common point current, FM forward and reflected power, and directional array loop currents and phases. When operating in the automatic mode, additional calculated parameters are available. These include output power calculated by the direct or indirect method, transmitter efficiency, directional array loop current ratios, deviation of loop current ratio from licensed values, and deviation of phase angles from licensed values. The instructions for the automatic operation of the DRC190 are written in Basic, allowing field modification of the system operation. Generally, automatic operation includes the display and logging of system parameters, alarming any that are out of set limits, and making adjustments that are available (power trim, day/night power/pattern select, etc.).

The DRC190 is based on the 68B02 microprocessor operating in an STD bus system. Where available, standard STD bus cards are used to implement standard functions (such as system RAM). The hardware and firmware located at the different sites in the system are the same. Any "control" unit can be changed to a "transmitter" unit by plugging in analog to digital converter boards. Any unit can run a Basic controlling program, and all units have an RS232 port where a printer or CRT can be connected.

The DRC190 allows up to 100 sites to be used in the system. Such a system might consist of 99 "remote" sites and 1 control point. All units are on a "party line", with each unit transmitting a request for data when it needs it, or responding to a request for data when it has data available. All units communicate on the same frequency using Bell 202 standard FSK 1200 bit per second coding. The firmware includes a multiple access anti-contention system that assigns each unit a time slot when it is allowed to start transmitting data, if it has any data. If no data needs to be transmitted, no carrier is brought up, and no data transmitted. This absence of data is detected by other units in the system. Permission to transmit is then passed to the next unit in the system. On a system where it is not necessary to wait for external key-up and squelch delays (such as wire line or dedicated subcarrier), the time slot allocated to each unit typically runs 50 mS. If a site starts transmitting data in its allocated 50 mS time slot, the advancing of the site counter in all units is inhibited until the data transmission is completed. If no data is transmitted in the 50 mS time slot, the site counter at each site is advanced, granting permission to the next site to transmit, if it has any data. This forms a modified token passing system. The absence of transmitted data acts as a token passing permission to transmit to the next unit in the system. The use of absence of data as a token yields several improvements over typical token passing systems. Since no data is to be transmitted, the carrier bring up and shut down delays can be eliminated from the system when no data is to be transmitted. This results in higher speed token passing. Since the absence of data is the token, there is no danger of the token being "smashed" or lost due to a data error. This improves system reliability and reduces software complexity. When a site fails, it transmits no data, which is equivalent to always passing the token. This avoids system failures and system reconfiguration software requirements.

A system is specified using a "site specification form". This form refers to the various components that can be used in building a DRC190 unit. These components are discussed below:

Main Frame

The main frame includes the system cabinet, a switching power supply, a 32 character backlit alphanumeric liquid crystal display, a front panel speaker, and a 16 key membrane keyboard. All system setup and manual operation are performed using the keyboard and display. The speaker provides acoustic feedback for keyboard operation and serves as an intercom between sites.

Standard Processor

The standard processor includes the processor itself, 32 Kbytes of EPROM, 32 Kbytes of RAM, 2 Kbytes of battery backed RAM, a real time clock, front panel keyboard and display interface, a 1200 bit per second half duplex modem with intercom and Morse Code identification circuitry, and an RS232 port. The EPROM holds the system firmware (the software that tells the system how to be a DRC190). This firmware includes interface software for all the hardware (keyboards, displays, modems, A/D converters, etc.) and the Basic interpreter. The Basic interpreter is an extended Microsoft 8 Kbyte Basic for the 6800 series of processors.

The processor is a Motorola 68B02, operating at a bus speed of 2 MHz (500 nS bus cycle time). The battery backed RAM includes a battery backed clock that continues to keep accurate time in long term power failures. This clock keeps track of the time of day (hours, minutes, seconds), the day of week and the date (year, month, date). It also correctly compensates for leap years.

The battery backed RAM holds the site specification data (site number, communications speeds, etc.) and calibration data. Each metering channel is assigned ten bytes of battery backed RAM. These ten bytes hold a three character label for the parameter (such as ICP for common point current) and a two character units symbol (such as KV for kilovolts). Also stored in these ten bytes are a conversion curve (linear or square law), a sample delay, and a

scaling factor. The sample delay is programmable in thirds of seconds up to five seconds to allow for settling time of measuring equipment, such as antenna monitors. The scaling factor is determined by the DRC190 firmware during calibration. The desired indication is divided by the A/D conversion (or the squared A/D conversion if in square law mode) to yield the scaling factor. During normal operation, this scaling factor is multiplied by the A/D conversion to yield an appropriate indication based on the sample. This results in a two point linear calibration. It is assumed that zero volts of sample represents a parameter of zero. The calibration point establishes the slope of the line representing the relationship between the parameter and the sample voltage. The calibration uses the linear equation Y= mX + B where B=0 (y intercept is zero).

About 1 Kbyte of battery backed RAM is free to store a user Basic program. This program is automatically loaded and run on system reset. This program could be a simple logging program, or could be a "boot" program that loads another program from disk or from another bank of memory (see the RAM board description).

The standard processor board includes 32 Kbytes of RAM. 32 Kbytes is generally sufficient to hold quite sophisticated application programs. In addition, a 64 Kbyte RAM board is available. This has 2 banks of 32 K, starting at decimal address 8192. When a RAM board is ordered, the RAM on the processor board is reduced to 8 Kbytes (starting at address 0). The processor board RAM is common to all banks, as is the system EPROM, battery backed RAM and I/O. Currently, the multibank RAM card allows non-volatile program storage in "bank 2", while the program runs in bank 0. This can reduce the need for a disk drive, although a disk drive is still suggested, as it allows for program backup and transport.

The processor board includes various features to make it fault tolerant. All unused memory is filled with software interrupt instructions. Should the processor try to execute the contents of this unused memory, the system will reset and begin execution from the reset state. The processor board includes a watchdog timer. At various places in the Basic interpreter, the watchdog timer is reset. Should the program lose control of the processor, the timer will not be reset. When the timer times out (about 40 seconds), the system resets and starts execution from the reset state. An additional timer resets the system should a modem get "stuck" in the transmit state. A stuck modem would not allow other sites access to the communications link. A modem may get "stuck" in transmit due to a user programming error (an endless loop of raise or lower commands). Finally, should there be a processor crash, it would be possible for the out of control processor to damage calibration data in the battery backed RAM prior to the watchdog timer timing out. For this reason, the battery backed RAM is write protected. The processor must go through a several step procedure before it can write to the battery backed RAM. It is unlikely that such a procedure would be successfully completed by an out of control processor. These features have been included to maximize the reliability of the DRC190.

The processor board includes a Morse code identifier. This allows the DRC190 to identify a radio transmitter (TRL) that it is operating using International Morse Code. This code is sent at 20 words per minute using a 1.6 KHz tone. The frequency of the ID can be varied between an ID message every minute to an ID every 99 minutes. The ID frequency and the ID message can be programmed through the front panel keyboard and display. The ID is stored in battery backed RAM, preserving it during power failure.

Dual Audio Option

The dual audio option provides two separate inputs and outputs for the audio data. The audio outputs containing the FSK data leaving this site. The audio inputs are summed and presented to the FSK demodulator. Dual audio is normally used at intermediate two way microwave sites. In a North/South system, one audio output would drive the North bound transmitter, the other would drive the South bound transmitter. One audio input would receive data from the North bound receiver. The other would receive data from the South bound receiver. In this manner, all units in the system can hear all other units, yet we do not introduce crosstalk between North and South paths.

Battery Backup

The battery backup option adds an Uninterruptable Power Supply, a 12 volt rechargable battery, and battery charging circuitry to the system. The UPS module converts the 12 volts DC from the battery to +/- 150 volts DC, which replaces the output of the off-line rectifier of the switching power supply during a power failure. During a power failure, the battery charging circuit is shut down. On power recovery, the battery charger returns to operation. The Battery Backup runs the entire DRC unit for about 30 minutes, instead of merely backing up the system memory.

Disk/Status I/O

These additional serial I/O lines on the power supply interface board allow the DRC190 to communicate with a disk drive and a status transceiver. The disk drive allows program storage on a 5.25 inch floppy diskette. The status transceiver transmits and receives digital status information between sites.

A/D Converter

The analog to digital converter board takes analog samples from the external equipment. This analog sample can be floating with a maximum common mode voltage of +/- 100 volts peak and a maximum differential voltage of +/- 2 volts DC. If the differential voltage exceeds 2 volts, resistors can be plugged into the A/D board to form a voltage divider that is applied to all channels on that board. The sample voltage must be DC. Reed relays are used to select which sample voltage is presented to the analog to digital converter.

The analog to digital converter is a 4.5 digit (maximum count of 19999) modified dual slope converter. The converter completes three conversions per second. It is driven by a temperature controlled precision voltage reference and a precision voltage divider. Dual slope A/D converters are noted for their extremely high linearity and resolution. The A/D used in the DRC190 has a resolution of 100 uV of sample voltage.

The A/D converter board also presents 10 Raise and 10 Lower control

outputs to the rear panel. These outputs are pulsed low for a programmable multiple of 333 mS by selecting the appropriate A/D channel and pressing the R or L key on the front panel keyboard. They can also be reached using the RAISE (S,C) or LOWER (S,C) commands from Basic, where S is the site number and C is the channel number. Raise or Lower commands from specific sites can be locked out by programming the system during initial setup through the front panel.

The A/D converter also provides 10 "channel selected" outputs. These outputs are enabled as each channel is selected. These outputs are generally used to drive tower select relays on antenna monitors.

The A/D converter also provides a "fail safe" output. This output is active as along as all required sites have been "heard from" in the past minute. The "required sites" are those that the user has programmed into the system during initial setup through the front panel keyboard. The fail safe firmware keeps a record of all sites heard from in the past 30 seconds. If the fail safe timer reaches 30 seconds and all required sites have been heard from, the timer resets. If not all required sites have been heard from, the unit sends an "all call" status request. If all required sites respond, the fail safe timer is reset. If the required sites do not respond, the unit keeps sending the all call request every five seconds. It the fail safe timer reaches 60 seconds, the fail safe output is disabled. This can be used to discontinue the operation of a transmitter, if desired.

The A/D board also provides a "local" output. Through the front panel of the DRC190, an operator may lock out control from other sites for a period between 1 and 599 minutes. While control is locked out, the "local" output is activated. This output typically drives a warning indicator, preventing the operator from leaving the site with control locked out.

All the A/D board outputs (Raise, Lower, Channel Selected, Local and Fail Safe) are open collector outputs that are pulled to ground when active. The open circuit voltage must not exceed +30 volts and the short circuit current must not exceed 500 mA.

Each A/D board provides ten channels of metering. Up to ten boards (for 100 channels of metering) may be plugged into each DRC190 main frame.

32 Channel Status Transceiver

The status transceiver accepts 32 status inputs and provides 32 status outputs. The status transceiver appears on the right half of the front panel of the DRC190. 32 LEDs show the current received status. These LEDs are in four columns of eight. The vertical spacing is 0.400 inches, allowing the use of 0.375 inch embossed tape to label the LEDs.

The front panel LEDs and the rear panel status output lines reflect the received status. The received status is received from a site selected by programming jumpers on the status transceiver board. This allows the LEDs to continuously display the status of one of the sites in the system (00 to 99). If the site select jumpers are set to 100, the displayed status follows the site selected by the front panel keyboard and LCD. If there are several sites that have the same meaning to the various status indications, a common label can be attached to each LED. For example, if LED 0 is lit and the LCD is showing a parameter from site 1, this may indicate that the main transmitter is on at site 1.

Status of all sites is available to Basic at all sites using the function STATUS (S,C), where S is site and C is channel. This returns a -1 if status is true, and a 0 if it is false. STATUS(S,96) returns a -1 if site S is "in local". Otherwise it returns 0. In addition, status may be returned to Basic using the function STATUS$(S). This returns a 13 character (byte) string where each bit of each byte represents one line of status. Checking for a change in status at a site can be done very quickly using a string compare instruction. In addition, the compact form of STATUS$ allows storing of a large amount of status data in a circular buffer built using a string array with integer variables as input and output pointers.

The condition of the status LEDs is also available on the rear panel of the DRC190. These 32 outputs (0 to 31) are open collector outputs with a maximum open circuit voltage of 40 volts and a maximum sink current of 100 mA.

STX191 Status Expander

The STX191 Status Expander adds 64 channels of status input and output to the DRC190. If the DRC already has a 32 channel status transceiver, this allows a capability of 96 status channels per site. The STX191 is a separate 5.25 inch high rack mount cabinet with 64 LEDs on the front panel.

Bell 212 Modem Board

This board includes an FCC approved direct connect, auto dial, auto answer 1200/300 bit per second modem and an extra RS232 port. The modem and RS232 port are accessible to the local Basic program, allowing dial up operation of the system. Typical dial up applications include: complete dial up control where dedicated circuits are not available, paging an engineer on system malfunction and giving the engineer access to system parameters, providing routine readings and alarm reporting to a central location. The modem supports both tone and pulse dialing. The modem speed is selectable as 1200 or 300 bits per second under software control.

Dual Serial Port

Systems requiring more than the one standard serial port, but not requiring a direct connect modem (which provides an additional serial port) may utilize this board. The board consists of the above Bell 212 direct connect modem board without the modem module. The serial port that usually drives the modem is brought out the rear panel of the DRC at RS232 levels. This port (port #2) can run at either 300 or 1200 bits per second. The second serial port on this board (port #3) can be run at any of several speeds between 50 and 19.2K bits per second. The speed of port #2 is programmed from within Basic using the MDMSPD (modem speed) statement. The speed of port #3 is programmed through the DRC190 front panel.

64 Kbyte RAM Board

This board expands system RAM beyond the 8 Kbytes on the processor board. See the description of processor board RAM, above. Processor board RAM is reduced from 32 Kbytes to 8 Kbytes when this bank switched RAM board is used. The 64 Kbytes are broken into two banks of 32 Kbytes, called banks 0 and 2. Bank 0 is used for holding an expanded Basic program, variable storage and temporary storage (system stack, etc.). Bank 2 is battery backed. This can provide non-volatile storage of the Basic program that is down-loaded to bank 0 on system reset.

A LOAD instruction (whether it is a load from battery backed RAM or from disk) does not disturb existing variables. This allows large programs to be handled using a form of overlays. Note, however, that this overlay method replaces all code with the newly loaded code (instead of just a particular overlay area). A suggested overlay programming technique would be to include a "LOAD table" (similar to a JUMP table) as the first block of each overlay. All program redirection references (GOTO and GOSUB) are made through this area of code, which keeps track of which overlay needs to be loaded to execute each routine. This approach takes advantage of the fact that variables are not disturbed on a program load.

A simpler approach, that allows only one overlay, is to break the program into an initialization part and a runtime part. The initialization part initializes all variables, then loads the runtime part. Since the runtime part does not need to rerun initialization, the initialization code is deleted during the load.

Subcarrier Transceiver

The subcarrier transceiver board generates and demodulates FM subcarriers between 20 and 200 KHz. The generator portion uses a single chip function generator. The generator portion includes controls for coarse frequency adjust, fine frequency adjust, deviation, waveform symmetry, and sine shaper distortion.

The demodulator portion of the subcarrier transceiver board uses the superhetrodyne principle. The baseband is up-converted to 455 KHz. The upconverted subcarrier is filtered from the remainder of the baseband using a ceramic filter. The Intermediate Frequency is then amplified and presented to a ceramic discriminator. The audio output of the discriminator is amplified and presented to the DRC190 processor board for FSK demodulation. The DC component of the discriminator output is applied to the local oscillator to form an Automatic Frequency Control.

Note that the minimum acceptable subcarrier level is about 150 mV P-P. This is generally available from the multiplex output of STL systems, but is not available from the baseband output of most FM modulation monitors. To recover SCA data from FM stations, an SCA monitor or SCA receiver is suggested.

CRT Terminals

Most standard CRT terminals can be used with the DRC190. The following terminals are available from Hallikainen & Friends.

Fluke 1020

This terminal has a touch screen overlay allowing operator interaction with the DRC190 without the use of a keyboard. This considerably simplifies the operator interface, as only the options available to the operator at a specific time are presented. This compares favorably with dedicated function keys or the use of alphanumeric keys for making menu selections. With the touch-screen, the operator touches the screen to make the choice. This is the ultimate "soft key". A typical applications program uses screen graphics to draw a "control panel" of back lit push buttons. The operator pushes the appropriate "button", the corresponding commands are sent, and the screen updated to show the new status.

ITT Qume QVT101+

This low cost terminal satisfies many DRC190 applications. It includes a printer port for driving a logging printer. It is available with green or amber screens. The QVT101+ has many useful features. The printer port on the terminal is a separate port that is individually programmed. This port allows pass through of software handshaking, allowing the terminal with the Brother M1509 printer (listed below) to run at 9600 bits per second with no buffer overflow problems.

In addition, the QVT101+ has 16 programmable function keys (programmed functions held in non-volatile memory). In systems utilizing dial up lines, this allows the operator to hit one of 15 keys to auto-dial one of 15 stations (with the terminal driving a low cost modem). The terminal also includes a non-volatile answerback, allowing automatic password exchange.

Printer

Most RS232 printers can be used with the DRC190. Hallikainen & Friends is presently supplying the Brother M1509 dot matrix printer. This 180 character per second dot matrix printer includes an RS232 port for connection to the DRC190 or to the printer port on a CRT terminal. The printer accepts paper up to 16 inches wide.

Disk Drive

The DRC190 uses the Commodore 1541 (or compatible) disk drive for program storage. This low cost disk drives include its own processor and operating system firmware. Up to five disk drives can be connected to each DRC190 equipped with a disk drive interface. Each disk holds up to 167,000 bytes of program. The disk drive can be used only for program storage (not data storage). DRC190 disk drive commands allow the loading and saving of programs, renaming and erasing files, and formatting of disks.

UHF Telemetry/Control Radio Transceiver

Hallikainen & Friends supplies radio equipment from Neulink for telemetry and control. Several configurations are available.

Internal Telemetry/Control Radio Transceiver

The Neulink DCL-SX-U telemetry transceiver with the narrow band filter option fits inside the DRC190. In these installations, the radio is powered by the DRC190 power supply, allowing the entire system to be battery backed, if desired.

The radio is rated for 1 to 2 watts output at 100% duty cycle. The transmit frequency stability is rated at 5 ppm between -30 and +60 degrees C. It meets the base station frequency stability requirements (2.5 ppm) between 0 and 40 degrees C.

A single BNC connector appears on the rear panel of the DRC190 for the antenna connection when the internal radio is used.

External Telemetry/Control Radio Transceiver

The Neulink RCL-DUC with the narrow band filter option is a 1 to 2 watt (100% duty cycle) rack mount radio transceiver. It can be configured as a standard telemetry/control transceiver (half duplex, transmit and receive on the same frequency), or as a repeater.

When utilized as a repeater, it can act as a standard repeater providing omnidirectional transmit and receive coverage using the same antenna for transmit and receive with the addition of a duplexer.

It can also act as a "point to point" repeater, utilizing a separate antenna for transmit and receive. Such a system is typically used over a path in parallel with a microwave circuit that carries programming. In such a system, the DRC at an intermediate site would be equipped with the dual audio option. Assuming a North/South path, one DRC input monitors the Southbound data. The other DRC input monitors the Northbound data. The two DRC outputs drive the inputs of the Northbound and Southbound transmitters. Use of the dual audio option allows each DRC to hear all data in the system.

Data in one direction is often carried on a subcarrier on the program link microwave. External subcarrier demodulators and generators are suggested for such applications (typically available from the microwave equipment manufacturer). Data in the other direction could be carrier by the RCL-DUC links. If this "return" path is the Northbound path, data from the South might be received on 450.01 MHz and transmitted to the North on 455.01 MHz. Alternate sites would, of course, swap the transmit and receive frequencies. Each site would include a directional receive antenna and a directional transmit antenna. The RCL-DUC radio at each site would operate continuously, providing a full time, full duplex link. The use of two antennae with a 5 MHz transmit/receive separation allows operation without a duplexer.

It may be desirable to have the telemetry/control system operate independently of the microwave system carrying programming. An intermediate site in such a system would utilize two RCL-DUC radios, one relaying data North, the other relaying data South. Such a site would utilize four UHF frequencies. One site might, for example, receive Southbound data on 450.01 MHz and retransmit that data on 455.01 MHz. This site would also receive Northbound data on 450.02 MHz and retransmit that data on 455.02 MHz. Alternate sites would alternate frequencies. Since there is still a 5 MHz split between transmit and receive frequencies, four separate antennae (two receive, two transmit) could be used without duplexers. It may be more economical, however, to use a duplexer on each antenna to allow a single antenna pointing North and a single antenna pointing South.

Finally, a transmitter or receiver may be deleted from an RCL-DUC. This may be desirable at an end point of a path where microwave subcarrier has been used for the other direction. Also, the DRC is fully compatible with Telemetry Return Link equipment from other manufacturers, including Marti and Moseley.

Applications Software

Since the DRC190 is programmed in Basic, it is suggested that the user program the system to meet her/his exact requirements. User written software allows for improvements in the system software as needs are discovered. H&F will write custom software for DRC installations on a bid basis. Typical systems run $2,000 to $3,000. These include automatic control of multiple sites, full use of screen graphics to show block diagrams of site configurations, etc.

The DRC190 Basic is an extension of "standard" Basic. As such, it is restricted to two character variable names and requires line numbers for each program line. A precompiler is available that utilizes unnumbered program lines, long variable names, labels (allowing goto and gosub to a label instead of a line number), and other features. The precompiler also adds structured constructs such as if-then-else-endif (standard DRC Basic supports if-then), repeat-until, and repeat-while. The precompiler then compacts the code by deleting source code remarks, deleting spaces and putting multiple statements on a line. Finally, it generates a symbol table and a crossreference table relating each long variable name to the assigned two character variable name and listing the line numbers where the variable was referenced. The DRC Development Package includes the precompiler and a download program that sends the compiled object code to the DRC. The development package is available in a variety of CP/M and MS/DOS formats.

Instruction Manual

A detailed instruction manual is included with each DRC190 main frame. This manual can also be purchased separately for $30 per copy.

Application Notes

Most application notes are available at no charge. Existing application notes include:

Network Control of Affiliate Broadcast Transmitters (No charge)

Legal Considerations of Remote Control ($5.00)

Insight On Rules, review of FCC radio station operation requirements ($25)

For further information, or to place an order, call

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Phone: (805) 541-0200
Fax: (805) 544-6715
Telex: 4932775 HFI UI

DRC190 Site Specification Form

Specified by: _____ Company: _____

Phone: _____

PO#: _____ H&F SC#: _____

Site Number: _____ Serial Number: _____

Qty	[Qty Range]	Description	Cost ea	Total Cost
1	[1]	DRC190 Main Frame (0000-1900)	1,100	1,100
		Processor Options Choose one only		
___	[0..1]	Standard Processor (0010-1442) with 32K RAM	715	_____
___	[0..1]	Standard Processor (0011-1442) with 8K RAM	715	_____
___	[0..1]	Dual Audio (0012-1442) with 32K RAM	815	_____
___	[0..1]	Dual Audio (0013-1442) with 8K RAM	815	_____
		Power, Special I/O Interface Options		
___	[0..1]	Standard (0010-1443)	55	_____
___	[0..1]	Battery Backup (0011-1443, 0010-0104, 4000-0005)	220	_____
___	[0..1]	Disc/Status I/O (0012-1443)	110	_____
___	[0..1]	Battery Backup & Disc/Status I/O (0013-1443, 0010-0104, 4000-0005)	330	_____
		A/D, Memory, Subcarrier Boards		
___	[0..9]	Ten Channel A/D Boards (0010-1441)	660	_____
___	[0..1]	Bell 212 Modem Board (0010-1445)	660	_____
___	[0..1]	Dual Serial Port Board (0011-1445)	165	_____
___	[0..1]	32 Channel Status Transceiver (0010-1449)	550	_____
___	[0..1]	64K RAM Board (2000-6440)	620	_____
___	[0..1]	Subcarrier Transceiver (0010-1444) RX Freq: _____ KHz TX Freq: _____ KHz	330	_____
___	[0..1]	Internal UHF Transceiver RX Freq:_____ MHz TX Freq:_____ MHz	990	_____
		External I/O Equipment		
___	[0..1]	64 Channel Status Expander (0000-1910)	1,320	_____
___	[0..1]	Fluke 1020 Touch Screen CRT See separate price list		_____
___	[0..1]	Qume QVT31G+ CRT Terminal, Green Screen (2000-0101)	495	_____
___	[0..1]	Qume QVT31A+ CRT Terminal, Amber Screen (2000-0102)	495	_____
___	[0..1]	Brother M1509 Printer (2000-1509)	659	_____
___	[0..2]	Commodore 1541 Disk Drive (2000-1541)	330	_____
___	[0..2]	Neulink RCL-DUC UHF Transcvr with Narrow Band Filter Transmit Frequency:_____ Receive Frequency: _____	1,533	_____
___	[0..1]	Neulink RCL-DUC UHF Transmit Only Transmit Frequency:_____	1,304	_____
___	[0..1]	Neulink RCL-DUC UHF Receive Only with Narrow Band Filter Receive Frequency: _____	1,325	_____
		TOTAL COST THIS SITE >>>>>>>>>	$	_____
___	[0..1]	DRC190 Software Development Package Disk Format:_____	100	_____

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Shannon Towers
4405 Mall Blvd., Suite 125
Union City, GA 30291
404 964 1464

Allied Broadcast Equipment
5215 Old Orchard Road, Suite 970
Skokie, IL 60077
708 470 0303

Allied Broadcast Equipment
1101 East Plano Pkwy, Suite B
Plano, TX 75074
214 423 8667

Allied Broadcast Equipment
10 West Pearce St., Unit 6
Richmond Hill,
Ontario, Canada L4B 1B6
416 731 3697

Northeast Broadcast Lab
P.O. Box 1176
South Glens Falls, NY 12801-0028
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