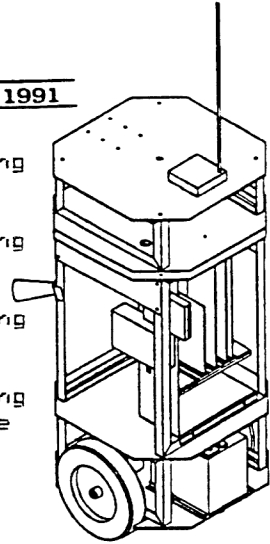


# ROBOT BUILDER

The official publication of the **ROBOTICS SOCIETY of SOUTHERN CALIFORNIA**  
10471 South Brookhurst, Anaheim, Ca 92804

## UPCOMING EVENTS CALENDAR SEP 1991

Sept. 12 7 - 9 p.m. RSSC General Membership Meeting  
Sept. 14 10 -12 a.m. RSSC Robot Project Workshop  
Sept. 24 7 - 9 p.m. RSSC Board Meetings  
Oct. 10 7 - 9 p.m. RSSC General Membership Meeting  
Oct. 12 10 -12 a.m. RSSC Robot Project Workshop  
Oct. 29 7 - 9 p.m. RSSC Board Meetings  
Nov. 14 7 - 9 p.m. RSSC General Membership Meeting  
Nov. 16 10 -12 a.m. RSSC Robot Project Workshop  
Nov. 26 7 - 9 p.m. RSSC Board Meetings  
Dec. 12 7 - 9 p.m. RSSC General Membership Meeting  
General Membership Meeting, at Orange Coast College  
Robot Project Workshop, at Jerry Burton's Lab  
Board Meetings, at Jerry Burton's Lab  
Robot Faire Planning, at Joe Mc Cords's Shop



### GENERAL MEMBERSHIP MEETING TOPICS

Sept. Dynalloy Flexinol Actuator Wire  
Oct. Odetics Mechanical Hand  
Nov. Network Architecture/Lan  
Dec. 68HC11 Controller Demonstration

### PARKING - ORANGE COAST COLLEGE

I included another copy of the OCC map on the back again. I am concerned that some of you that came to MCI haven't made it down to Orange Coast yet. Come one, come all. Its a great place. They do charge 50¢ for parking. Its their way of controlling the cars in their parking lot. The parking lot has both metered and unmetered spaces. You need a pass to park in the unmetered spaces. I found the easy way to get the pass. Follow the arrows on the map and its self explanatory or intuitively obvious. Enter the campus on ARLINGTON DR. and keep to your right. On the map you'll see a little black dot in the street. This is the location of a little red box thats just waiting to devour your two quarters and give you a valid pass for the night. Proceed to your left and turn right on MERRIMAC WAY and proceed down the street and turn right into the parking lot. See you in room 123 of the Technical Building .....JJ

### CLUB BULLETIN BOARD

The RSSC Bulletin Board is now operational. There is a good resource for every one to use. It is to be used to discuss problems and to ask for help, etc. The phone is Jerry's and should be used after 6 o'clock. Phone 714-535-5432, 300/1200/2400 Baud using ProCom software with a protocol of N-8-1. See you there soon.....JJ

## The Forth Corner

I contacted a company called Silicon Composers about a true thirty two bit Forth Engine called the SC32. With its highly parallel architecture, it can perform up to six instructions per clock cycle. With the fastest chip at ten megahertz, it can hit up to sixty MIPS. It is currently using a ceramic PGA package which is expensive to produce and costs \$295 for the eight megahertz version (this will only hit forty eight MIPS...). They expect to have the SC32 available in the first quarter of 1992 in a plastic J pin package bringing the price way down. They also have a 100mm x 160mm SC32 board available for \$1595, and a IO board with a SCCI interface, 16 bit parallel port, and 4 serial ports for \$995. You get a complete development system including a Forth Interpreter and manuals. I am interested in designing a robot brain using this processor with a SCCI hard disk tightly coupled for a virtual memory environment. With a thirty two bit address and data width, and true thirty two bit Forth system, you could have more than 2 billion words in RAM. With a virtual memory system this would be limited only to hard disk space. I ordered the information and will talk about it next month.

### Forth Lesson #2

One of the reasons the Forth compiler is so simple and fast is that it does not do fancy type conversions, type checking, or explicit type casting. Forth does check for balanced structures though. When you want to define a variable for instance, Forth has several words to do this with based on the amount of memory required.

Word	Memory Allotted
<i>VARIABLE</i>	2 bytes
<i>2VARIABLE</i>	4 bytes
<i>CONSTANT</i>	2 bytes
<i>2CONSTANT</i>	4 bytes

Used as:

```
VARIABLE    MY16VAR
2VARIABLE   MY32VAR
64000       CONSTANT MY16CONST
640000000.  2CONSTANT MY32CONST
```

There are now two words added to the dictionary called *my16var* and *my32var*. When you type in a variable name, Forth leaves the memory address of that variable on the stack. In order to use these variables, we must learn to store and fetch values. This brings us to the word *!* and *@*. The word *!* will store a 16 bit value at a memory location, and the word *@* will fetch(retrieve) a 16 bit value. For 32 bit variables such as *my32var* we would use *2!* and *2@*. Note that the stack is only 16 bits wide so double numbers ( 32 bit ) will use two stack positions. The following code will show you how to use these words:

```
64000    MY16VAR ! ( n -- )    \ store 64000 into variable
64000000. MY32VAR 2! ( d -- )  \ store 6400000 into double variable
MY16VAR @      ( a -- n )    \ fetch a 16 bit value and put on stack
MY32VAR 2@     ( a -- d )    \ fetch a 32 bit value and put as two 16 bit
                          \ values on the stack.
MY16CONST     ( -- n )      \ leaves a 16 bit value on the stack
MY32CONST     ( -- d )      \ leaves a 32 bit value put as two 16 bit
                          \ values on the stack
```

Note the *stack diagrams* to the right of the words. Forth ignores anything within parentheses and anything from the backslash to the end of the line. It is considered good Forth programming to **ALWAYS USE STACK DIAGRAMS!** ( a -- n ) documents the action of a word that expects an address on the stack and returns a 16 bit number.

*a* address of something  
*n* 16 bit number  
*d* 32 bit number

I plan to schedule a Forth class for September.  
See you at the next meeting...

## WIRELESS LINK

### HARDWARE

GOALS  
BLOCK DIAGRAM  
FIELD GLUE

### SOFTWARE

AUTOEXEC.BAT  
GOSUB OPEN COM  
GOSUB INITILIZE MODEM  
GOSUB SEND COM  
ON COM GOSUB

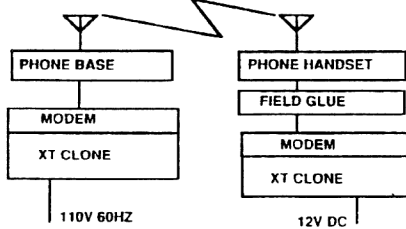
### GOALS

FULL DUPLEX  
DIGITAL  
UNTETHERED  
MOBIL COMMUNICATION

WORKS WITH EXISTING  
COMPUTER  
WORKS WITH EXISTING  
POWER SOURCE



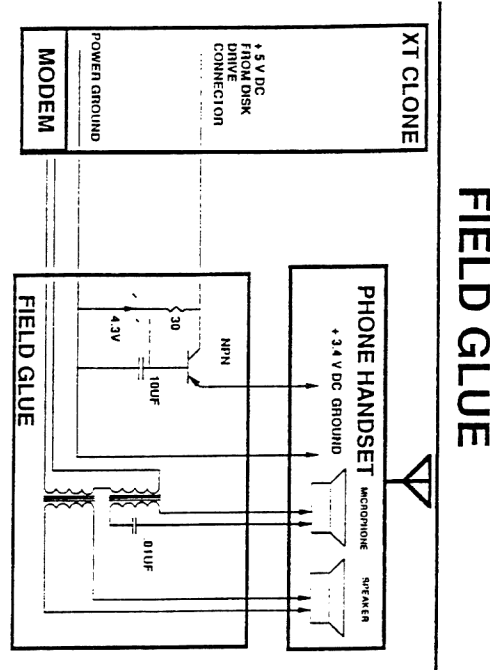
### BLOCK DIAGRAM



### Codeless Phone Makes Link

An inexpensive untethered link can be formed between two personal computers using a cordless telephone. Two modems, some field glue and software are also required. I purchased a cordless phone on sale at K-Mart for under \$65.00. I picked up two 1200 baud modems used at the ACP Swap Meet for \$5.00 each. I went all out and put the extra parts in a box from Radio Shack and still finished the project for under \$100.00.

The tricky part you will have reproducing the project is to locate the two transformers located in the field glue.



I used two modem transformers off a Sinclair modem card. I found the cards at the ACP Swap Meet for \$1.00 each. Two cards are required with one transformer on each card. Any small audio transformer should work.

If your still wondering why, there is a need to have an untethered link between a self powered mobile robot and a stationary desk top computer, then trust me, some day you will be trouble shooting a problem and wish you had such a tool.

The desk top end of the link sets up quickly. Install the modem into the computer. The telephone base set is plugged into the modems phone line jack instead of the phone jack on the back of the modem. The base unit has a line cord that is also plugged into the wall with the computer.

The mobile end of the link requires some extra work to glue things together. The hand set is not equipped to plug into a modem. Further the hand set is battery powered. A small circuit board was used to hold the parts needed to patch the hand set audio into the modem and power the hand set from the computer. As show in the FIELD GLUE figure a four part voltage regulator was built to regulate the 5 VDC power down to 3.4 VDC for the hand set. I spliced into a disk drive power harness and brought the power out the back panel of the computer. I notched the back plate on the modem card to clear the wire. A short cord was also fabricated to go from the modem line jack to the matching box.

Six wires were brought out of the hand set. The back cover was removed. The battery pack was removed. A small hole was drilled in the back cover to accommodate the six wires. The wires were soldered into the hand set as follows; 3.4 VDC, ground, 2 to the microphone and 2 to the speaker. One wire to each side of the speaker and microphone. No changes are made inside the phone. Solder in the wires and close it back up.

Every thing joins together on a small printed circuit card mounted inside a small project case. The case was drilled to accept the six wires from the hand set. The case was further drilled to accept the modem line from the mobile computer and power from the computer. The case was also drilled to accept a pair of tie wraps. The tie wraps were used to strap the project case to the hand set. This makes a very presentable project.

The power supply parts are arranged on the circuit card as shown in the FIELD GLUE figure. The two audio transformers are used to couple the speaker and microphone to the modem. The .01uf cap is used to block DC from the microphone. The microphone contains a built in op amp and is DC powered. The cap keeps the dc power out of the low impedance transformer winding. The transformers are wired as shown in the figure. Do not worry about mixing up the signals here. The signals normally get mixed on the phone lines anyway. The modem filters sort everything out correctly. The transformers here just serve as a method to couple things together. My unit has been working well not for over four months.

The software to communicate between the two computers over the link need not be very complex. I used a short basic program to pass data from the keyboard on each end two the CRT on both ends. REMEMBER TO START ONE END AS RECEIVE AND THE OTHER END AS SEND. This is a one character change in modem set up string of the program.

The following short AUTOEXEC files were used to start each end of the link. Do a warmboot on each computer and let them start together. The software will establish a link.

```
REM AUTOEXEC.BAT
BASIC SEND.BAS
REM LOAD BASIC AND RUN SEND
```

```
REM AUTOEXEC.BAT
BASIC REC.BAS
REM LOAD BASIC AND RUN REC
```

The link software first opens a com file to the modem (OPEN COM1:). The software then has an on com statement directed to a procedure. When ever data arrives the procedure reads the modem, prints the data and returns to where ever the program was. The initialize procedure sends a string to the modem (PRINT com1: "ATHOCOE0F1A") The program then loops forever waiting for keyboard input. On input print it to COM. I will present the full program listing in the next edition. .... RR

#### Newton Makes TV Debut

It has been reported that the Cal Edison energy conservation commercial featuring Newton is now showing on television. The commercial was first seen September Fourth. Newtons are the creation of the SYNPET corp. in Boise Idaho. The Robot Company in Costa Mesa (714) 722-0890 is the west coast distributors for Newton if you would like some more information on the home robot. The Robot Company's Newton was used in the production of the commercial. Wetware training speed was still exceeding software programming speed at the time the commercial was made in early August 1991. I have reliable sources who tell me the dog learned to walk down the sidewalk with the robot before the robot learned to walk down the sidewalk with the dog. The robot pleaded sensor problems, while the production crew labeled him a hard to work with personality. Its also reported it took a second day of shooting before the robot was skilled enough to handle the mower. But he's now a star seen on TV every where and ahead of me. Odds are he will get to get immortalized in film again before I make my hollywood debut. ....RR

## ROBOT: D.C. Does Dinner Deliveries

■ **Technology:** With flashing lights and a voice warning workers to 'stand clear,' the \$6-an-hour machine saves medical personnel from doing routine chores.

#### **DOWNEY**

By **DICK WAGNER**  
TIMES STAFF WRITER

"I am about to move, please stand clear," the robot said in the kitchen of Downey Community Hospital. Wearing a name badge that identified him as "D.C. Dietary," he was programmed to deliver food trays to a nurses station.

"He's like any of my employees, he's doing a job," said Nancy Hipp, director of dietetic services, who punches in codes on D.C.'s computer screen that tell him where to go. "He has a personality almost."

The robot, who has been running errands at the hospital for two months, was leased, not to replace people, but to allow employees to do what they were trained for, officials said.

Headless and without arms, D.C. does not completely fit the stereotype of a robot. With his white 4½-foot-tall, 350-pound frame, he looks somewhat like a washing machine. His wheels are recessed behind wraparound bumpers.

Equipped with a "backpack," computer-controlled sensors, an internal map of the hospital and an infrared camera, he rolled along the corridors during a media demonstration Monday. His pace was slower than the average person who might deliver food, but D.C. never stopped to engage in conversations.

He even used the service elevator without assistance, selecting a floor through a radio transmitter.

If something was in his path, he would flash his gold warning lights, stop and say in his deep voice, "My way is blocked.

## 'D.C. Dietary'

A new high-tech device was unveiled this week at Downey Community Hospital. The self-guided, trackless robotic courier is used to deliver items from one area of the hospital to another without assistance from hospital personnel. Here is a brief look at the robot, called 'D.C. Dietary.'

■ **Size:** 36 inches by 32 inches by 55 inches tall

■ **Weight:** 350 pounds

■ **Body composition:** Steel and fiberglass

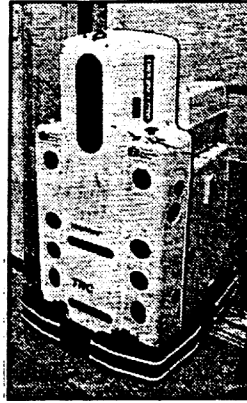
■ **Energy source:** 24-volt battery

■ **Manufacturer:** Transitions Research Corp., Danbury, Conn.

■ **Cost:** \$60,000

■ **Special abilities:** Utilizes vision and ultrasonic proximity sensors to evaluate its environment and avoid obstacles as they are encountered. Navigates from point to point by using a map of the building to compute the best route. Independently uses elevators without human assistance.

Source: Downey Community Hospital

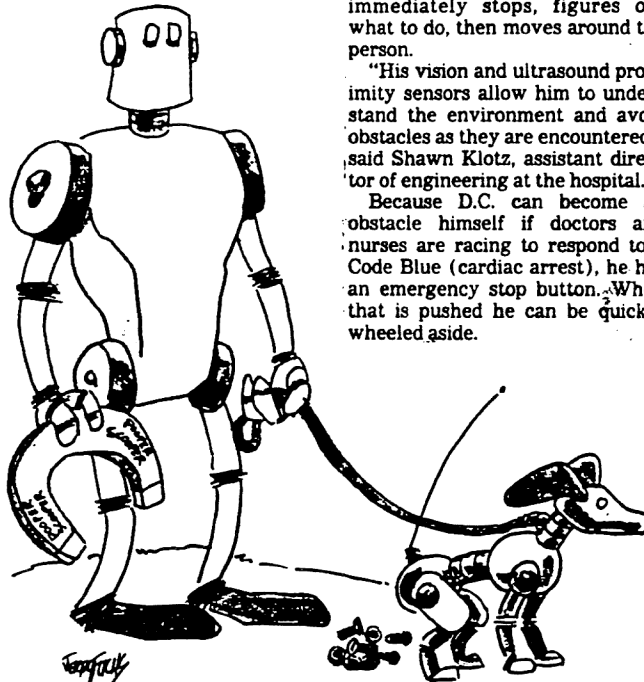


please move the obstacle."

A patient who happens to get in D.C.'s way need not worry about being run over because the robot immediately stops, figures out what to do, then moves around the person.

"His vision and ultrasound proximity sensors allow him to understand the environment and avoid obstacles as they are encountered," said Shawn Klotz, assistant director of engineering at the hospital.

Because D.C. can become an obstacle himself if doctors and nurses are racing to respond to a Code Blue (cardiac arrest), he has an emergency stop button. When that is pushed he can be quickly wheeled aside.



Downey Community officials say the 207-bed, four-story hospital is only the second in the nation to use the trackless robot, which was developed by Transitions Research Corp. of Danbury, Conn. The other one is in Danbury.

Downey hospital officials saw the robot as a means to alleviate the dietary department's problem of having to make special runs to deliver food requested after the regular mass deliveries.

The department did not have funds in its budget to hire someone strictly to deliver those trays, so an employee would have to leave his or her regular job to deliver them.

"My employees have accepted it extremely well," Hipp said. "They were not fearful it would take their jobs. They were excited about it."

D.C., who does not go into patient rooms, can deliver between 35 and 40 trays a day. He carries two at a time, but future modifications of his rear compartments will allow him to carry more.

"We end up paying someone a minimum of \$6.55 an hour to go from point A to point B," Hipp said. "Considering the amount of time and money it takes to train employees, and the salary and benefits paid to a full-time employee, it makes sense to invest in a piece of equipment like D.C.."

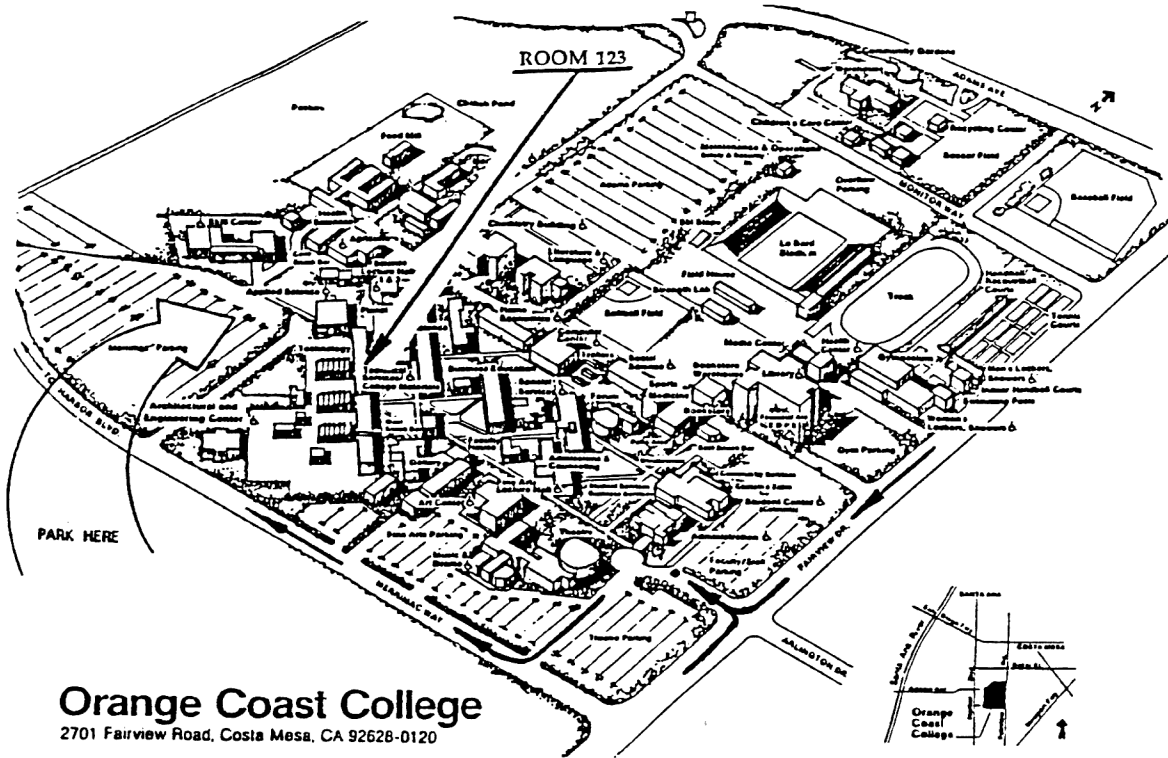
The hospital, which is leasing D.C. for \$6 an hour, may eventually buy the \$60,000 robot.

D.C., whose initials are derived from the hospital's name, works most of the time for dietary. But in the evening he delivers prescriptions for the pharmacy department before being plugged into a battery pack for an eight-hour rest overnight.

He has become a favorite of patients, especially younger ones, said Lisa Domke, the hospital's public relations coordinator. "Kids think it's the greatest thing ever," she said.

When the elevator door opened on the second floor Monday and D.C. got off, saying, "Please stand clear," hospital visitor P.D. Howard of Norwalk was taken by surprise.

"I thought there was only humans here," the man said. "It's a peculiar looking thing. I don't know if I'd want it doing anything for me."



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