c2z

Parser

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General Information

The attempt of this program/document is to explain what I am experimenting with. There is a "GCC" for various IBM systems, but I found them difficult, if not impossible to use.

Several years ago, I help write a "P-code" Basic compiler/interpreter, So, why not a "C" Implementation parser!!!

I took the approach of a "front-end" to convert "C" to Z390 MLC assembler. Then feed the MLC file to the Z390 assembler.

The design of c2z is based on information found in the book, Compiler Design in C, by Allen I. Holub, 1990, Prentice Hall Software Series.

The parser program c2z (pronounced c to z) runs under Linux.

The following individuals have provided time,support and understanding on working on this project:

Abe Kornelis
Melvyn Maltz
James Cray

Need To Know

Listed below are the differences/changes that will affect your C program converted to IBM assembler.

All variables are set to zero or blanks.
printf is mapped to console.
fprintf is mapped to a printer file.
Any MLC variable that starts with C370xxxx is an internal c2z variable.

C field names often exceed 8 characters. c2z has a translation table that takes the long C name and generates an internal parser field name that will not exceed 8 characters. These fields start with “C37xxxx” and used by the parser. Dump the stats.txt file to see this table.

Command line execution

```
c2z pg-name flag
      c2z         This is the parser.

      Pg-name     The name of the file which contains the
                  C source code.  The .C extenstion is NOT
                  required. Can be upper or lower case.
                  ex:         c2 HELLO

      flag        The only flag defined at this time is the -d.  This
                  is a debug flag.  It has three levels, increasing in
                  output as the level
                  is increases.
                        -d1   Input lines only
                        -d2   Adds function calls
                        -d3   Adds subroutines calls
```

Data definitions

"C"	ASM	Type
int	PL6	I
char	C	C
double	D	D

c2z Functions

Status of "C" functions

Name

++
–
atoi
break
case
char
ctime
double
enum
exit
feof
fclose
fflush
fgets
fopen
for
fputs
fprintf
free
gets
goto
if
Int
isalpha
isdigit
isspace
isupper
localtime
memcpy
memmove
printf
puts
scanf
sizeof
snprintf
sprintf
strcat
strchr

strrchr
strcmp
strcpy
strlen
strncpy
switch
time
time_t
tolower
toupper
while

Math

addition
subtract
multipliction
division

Subroutines

c2z

#define

++

```
X++;              simple variable
array[x]++;       numeric array
array[2]++;       numeric array
sheet[x][y]++;
sheet[18][8]++;
```

–

```
X--;              simple variable
array[x]--;       one dim numeric array
array[2]--;       one dim numeric array
sheet[y][x]--;
sheet[3][6]--;
```

atoi

break

case

char

```
Defines a character field.  c2z converts to a DC  CLx'xxxxxx' .
     Ex:
          char string[5];
          Converts to:
          STRING    DC    CL5'STRING'
```

double

enum

enum is the abbreviation for ENUMERATE, and we can use this keyword to declare and initialize a sequence of integer constants. Here's an example:

```
enum colors (red,  yellow green, blue);
```

Here, *colors* is the name given to the set of constants - the name is optional. Now, if you don't assign a value to a constant, the default value for the first one in the list - *RED* in our case, has the value of *0*. The rest of the undefined constants have a value 1 more than the one before, so in our case, *YELLOW* is *1*, *GREEN* is *2* and *BLUE* is *3*.

But you can assign values if you wanted to:

```
enum colors (red=1, yellow, green=6, blue);
```

Now RED=1, YELLOW=2, GREEN=6 and BLUE=7.

The main advantage of *enum* is that if you don't initialize your constants, each one would have a unique value. The first would be zero and the rest would then count upwards.

```
#include <stdio.h>


int main() {
enum {RED=5, YELLOW, GREEN=4, BLUE};

printf("RED = %d\n", RED);
printf("YELLOW = %d\n", YELLOW);
printf("GREEN = %d\n", GREEN);
printf("BLUE = %d\n", BLUE);
return 0;
}
```

This will produce following results

```
RED = 5

YELLOW = 6

GREEN = 4

BLUE = 5
```

exit

Terminates program.

fclose

Closes a stream. fclose closes the named stream.

```
fclose(flog);
```

fflush

This is for software compatibility ONLY. Performs no activity in Z390.

fgets

Gets a string from a stream.
fgets reads characters from stream into the string. The function stops reading when it reads either n -1 characters or a newline character, whichever comes first.

*f*open

Opens a stream.

```
Ex:   c_input = fopen(filename, "r");
```

for

fprintf

(Mapped to a file name list.txt{z390])

```
fprintf(flog,"this a test to the printer\n");
fprintf(flog,"My age is = %d\n", age);
fprintf(flog,”My name is - %s\n”, name);
```

fputs

Outputs a string on a stream.

free

C2z performs a free somewhat different than the standard. Free in c2z clears charcater fields to blanks and numeric fields to zeros.

gets

goto

if - else

```
if(field1  operand  field2)
      {
            . . . .
      }
else
      {
            . . . .
      }
```

field1 and field2 can be an numeric variable or a numeric constant.

Numeric variable
ex: int ct

Numeric Constant
ex: 1,55,1234 . . . .

operand allowed:

==	field1 equal to field2
!=	field1 not equal field2
>	field1 greater than field2
<	field1 less than field2
>=	field1 greater than or equal to field2
<=	field1 less than or equal to field2

int

Defines an integer field. c2z converts the variable to a PL6'0'.

```
Ex:  int x;
     Converts to:
     X         DC     PL6'0'
```

isalnum

isalnum classifies ASCII-coded integer values by comparison. Islanum returns nonzero if c is a a letter (A-Z or a-z) or a digit (0-9).

isalpha

Test a single character inclusive A through Z. If returns nonzero (1) if the character is a letter (A-Z). Returns a zero (0) if not.

isalpha can be used in IF and WHILE loops.

```
Ex:  char ch;
     strcpy(ch, “C”)
     if(isalpha(ch))
          {
               printf(“this is a character\n”);
          }
```

In the above example, isalpha will test CH. If it is a letter (A – Z), then it will return positive and the printf statement will be processed. If CH contains something other than A-Z, then it will return negative and the printf statement will not be processed.

isalpha can be used in a **NOT** condition.

```
Ex:  char ch;
     strcpy(ch, “C”);
     if(!isalpha(CH))
          {
               printf(“not a character C\n”);
          }
```

in the above example, as long as CH does not equal C, then the printf loop will process.

isdigit

Test a single character inclusive 0 through 9. If returns nonzero (1) if the character is a letter (0-9). Returns a zero (0) if not.

isdigit can be used in IF and WHILE loops.

```
Ex:   char ch;
      strcpy(ch, “1”)
      if(isdigit(ch))
            {
                  printf(“this is a digit\n”);
            }
```

In the above example, isalpha will test CH. If it is a digit (0 – 9), then it will return positive and the printf statement will be processed. If CH contains something other than 0-9, then it will return negative and the printf statement will not be processed.

isdigit can be used in a **NOT** condition.

```
Ex:   char ch;
      strcpy(ch, “2”);
      if(!isdigitCH))
            {
                  printf(“not a digit\n”);
            }
```

in the above example, as long as CH does not equal C, then the printf loop will process.

isspace

isspace returns nonzero (one) if c is a space, tab, carriage return, newline, vertical tab or formfeed.

isupper

localtime

To obtain either the current time or date, use the following command:

```
struct tm *local = localtime(&now);
```

It will return the following fields in char format:

```
local->tm_hour        /* get hours since midnight(0-23)  */
local->tm_min         /* get minutes passed after the hour
                      (0 – 59) */
local->tm_seconds     /* get seconds passed after the
                      minute (0 – 59) */
local->tm_day         /* day of the month (xx) */
local->tm_month       /* month (xx) */
local->tm_year        /* year (xxxx) */
```

memcpy

Copies a given number of bytes from one string into another, truncating or padding as necessary.

Ex: strncpy(astring, xstring,3);

In this example, 3 characters will be copied from xstring into astring starting at position zero of pstring, and placed in astring starting at position 0.

Ex: strncpy(astring, xstring+2, 4);

In this example, 4 characters of xstring starting at position 2 in xstring will be copied to astring starting at position 0.

memmove

Copies a given number of bytes from one string into another, truncating or padding as necessary.

Ex: strncpy(astring, xstring,3);

In this example, 3 characters will be copied from xstring into astring starting at position zero of pstring, and placed in astring starting at position 0.

Ex: strncpy(astring, xstring+2, 4);

In this example, 4 characters of xstring starting at position 2 in xstring will be copied to astring starting at position 0.

printf

```
printf("this is a test\n");
printf("My name is - %s\n", name);
printf("My age is - %d\n", age);  (raw number)
printf("My age is - %.1d\n",age); (one decimal position)
printf("My age is - %.2d\n",age); (two decimal position)
```

puts

scanf

```
scanf("%c",tt)
      Accepts a single character from the console.

scanf("%s",tt)
      Accepts a string from console.  Stops at first space,tab
      or newline.

scanf{"%d",x)
      Accepts a integer from console.
```

sizeof

snprintf

strcat

```
Appends one string to another.
      Ex:   strcat(p_string, xstring);

String xstring will be appended to the end of p_string.

      Ex:   strcat(p_string, "1234")

Literal 1234 will be appended to the end of p_string.

      Ex:   strcat(sv_stack[2], xstring);
      Ex:   strcat(sv_stack[t], xstring);
      Ex:   strcat(sv_stack[2], "1234");
```

```
Ex:   strcat(sv_stack[t],”1234”)'
Ex:   strcat(sv_stack[2], sv_stack[6];
Ex:   strcat(sv_stack[t], sv_stack[x];
```

The above will strcat a character string or array from various input options.

```
Ex:   strcat(gw_variable[gv_ct].gv_name, “abc”);
Ex:   strcat(gw_variable[gv_ct].gv_name, fname);
```

“C” structures are handled in the parser.

strcmp

Compares one string to another.

```
Ex:   int ret;
      char fielda[10];
      char fieldb[10]
      ret = strcmp(fielda, fieldb);
```

ret must be defined as an int.

strcpy

Copies one string into another.

```
Ex:   strcpy(xstring,"test of strcpy");
      strcpy(xstring, any);
```

xstring is the receiving field, and the data to the right of the comma is the sending field.

```
Ex:   strcpy(sv_stack[x], “testing”);
Ex:   strcpy(sv_stack[2], “different”);
Ex:   strcpy(sv_stack[y], bstring);
Ex:   strcpy(sv_stack[18], “comment”);
Ex:   strcpy(gw_variable[gv_ct].gv_name, “Tom”);
Ex:   strcpy(gw_variable[45].gv_name, “testing”);
```

strlen

Calculates the length of a string.

```
Ex:   s = strlen(p_string);
```

s will contain the length of p_string. s must defined as an int.

strncpy

Copies a given number of bytes from one string into another, truncating or padding as necessary.

Ex: strncpy(astring, xstring,3);

In this example, 3 characters will be copied from xstring into astring starting at position zero of pstring, and placed in astring starting at position 0.

Ex: strncpy(astring, xstring+2, 4);

In this example, 4 characters of xstring starting at position 2 in xstring will be copied to astring starting at position 0.

strrev

Reverses a string.

strrev changes all characters in a string to reverse order, except the terminating null character. The receiving field and the sending field both must be defined as

character fields.

```
pp        DC     CL10
string   DC     CL10'ABCDEFGHIJ'
```

Ex: pp = strrev(string);

strset

Sets all characters in a string to a given character.

Ex: strset(p_string, '#');

This will replace all characters in p_string with '#'.

switch

time

Returns the current time, in seconds, elapsed since 00:00:00

GMT, January 1, 1970, and stores that value in the location pointed to by timer, provided that timer is not a null pointer.

Ex:

```
double seconds;
seconds = time(NULL);
```

t_time

tolower

The *tolower*() function takes an uppercase alphabet and convert it to a lowercase character. If the arguments passed to the *tolower*() function is other than an uppercase alphabet, it returns the same character that is passed to the function.

toupper

The *toupper*() function takes an lowercase alphabet and convert it to a uppercase character. If the arguments passed to the *toupper*() function is other than an lowercase alphabet, it returns the same character that is passed to the function.

while

```
while(field1  operand  field2)
      {
            . . . .
      }
```

field1 and field2 can be an numeric variable or a numeric constant.

- Numeric variable
  - ex: int ct
- Numeric Constant
  - ex: 1,55,1234 . . . .

operand allowed:

==	field1 equal to field2
!=	field1 not equal field2
>	field1 greater than field2
<	field1 less than field2
>=	field1 greater than or equal to field2

<=	field1 less than or equal to field2

Math

Addition

```
x = 7;
x = ct;
x = x + 8;
x = x + ct;
x = 8 + x;
x = 8 + 8;
x = ct + d;
```

Subtraction

```
z = z – 8;
z = z – ct;
z = 10 - 2;
```

Multiplication

```
x = 8 * 2;
x = z * 2;
x = 10 * z;
x = y * z;
```

Division

```
x = 8 / 2;
x = z / 2;
x = 10 / z;
x = y / z;
```

String

Example 1:

```
int pi;
char ch;

pi = 3;

ch = pstring[pi];
```

In this example, ch holds the char found in pstring at location pointed to by pi. Only **ONE** character at a time may be moved this way.

Example 2:

```
int pi;
char ch;

pi = 2;

pstring[pi] = ch;
```

In this example, pstring[pi] is set to the character found in ch. Only **ONE** character a time may be moved this way.

Array – Integer

Declaring Arrays

To declare an array in C, a programmer specifies the type of the elements and the number of elements required by an array as follows –

```
type arrayName [ arraySize ];
```

This is called a *single-dimensional* array. The **arraySize** must be an integer constant greater than zero and **type** can be any valid C data type. For example, to declare a 10-element array called **balance** of type double, use this statement –

```
double balance[10];
```

Here *balance* is a variable array which is sufficient to hold up to 10 double numbers.

Initializing Arrays

You can initialize an array in C either one by one or using a single statement as follows –

```
double balance[5] = {1000.0, 2.0, 3.4, 7.0, 50.0};
```

The number of values between braces { } cannot be larger than the number of elements that we declare for the array between square brackets [ ].

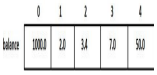
If you omit the size of the array, an array just big enough to hold the initialization is created. Therefore, if you write –

```
double balance[] = {1000.0, 2.0, 3.4, 7.0, 50.0};
```

You will create exactly the same array as you did in the previous example. Following is an example to assign a single element of the array –

```
balance[4] = 50.0;
```

The above statement assigns the 5^{th} element in the array with a value of 50.0. All arrays have 0 as the index of their first element which is also called the base index and the last index of an array will be total size of the array minus 1. Shown below is the pictorial representation of the array we discussed above –



Accessing Array Elements

An element is accessed by indexing the array name. This is done by placing the index of the element within square brackets after the name of the array. For example –

```
double salary = balance[9];
```

The above statement will take the 10^{th} element from the array and assign the value to salary variable.

Array – Character

Structures

Includes

```
time.h
```

Non Processed Functions

FILE *f_log;

Z390 does not require this pointer. It can be left in the “C” program, but will not be processed by c2z.

#include <xxxxx.h>

System include header files are not processed as c2 uses the installed libraries of the underlying operating system. They can be included in the “C” program for compatibility be are **NOT** processed by c2z.

malloc

Z390 does not require this keyword. It can be left in the “C” program, but will not be processed by c2z.

c2z Functions

Function	Passed	Compare	Return
isalnum	C370L1	C370L1A	C370ISAL
Isdigit	C370L1	C370L1A	C370ISDG
isupper	C370L1	C370L1A	C370ISAL

NOTE: In all functions, return value is decimal value:

0 = False
1 = True

c2z Parser Examples

if

The following math operands are supported:

```
==
!=
<=
>=
<
>
```

```
if(temp_byte[x]  !=  0)
if(pi < len)
```

strcpy

```
strcpy(abc,”1234”)                    Variable - Literal
strcpy(abc,xyz)                       Variable - Variable
strcpy(abc[x],xyz[z])                 Array - Array
```

strlen

```
xyz = strlen(abc);                    Variable
xyz = strlen(array[ii]);              Array
```

while

The following math operands are supported:

```
==
!=
<=
>=
<
```

```
while(ch != '\0')
```

MATH

```
int x;                                Integer set to zero (default)
int x = 2;                        Integer set to 2
```

```
ch = p_string[pi]
token[t1] = ch
in_stack[ndx][0] = '\0'
iv_stack[ndx] = rdp_set();

temp_byte[x] = array1[z];              Array - Array
```

Example Program

Below is a sample “Hello World” program.

```
/*********************************************
*
*
*  hello.c
*
*  Sample demo hello world program                                    *
*********************************************/
```

“C” source code:

```
*
*  This program was generated by c2z parser.
*  Generated code is for the z390 MLC.
*  Copyright (c) TCCS 2015 - 2016
*
*  This is a modified MVC2 macro.  Modified for baseless code
*  Modified by TCCS 2016
*  Performs a MVC operation, BUT using the Source Length NOT Target Length
*       MVC2   BUFFER,=C'Message Text'      Should move 12 characters
*
*BUFFER  DS    CL133
*
          MACRO
&LAB      MVC2   &TARGET,&SOURCE
          LARL   R8,&SOURCE
&LAB      CLC    0(0,0),R8
          ORG    *-6
          LARL   R9,&TARGET
          LA     0,R9.(0)
          ORG    *-4
          DC     AL1(X'D2',L'&SOURCE-1),AL4(X'90008000')
          MEND
*
hello    SUBENTRY
         JLU   START                   /* Ln#- 0 R5 parm lg */
*****************************************************
*  open/close macro code goes here                  *
*****************************************************
*
*
C370END  DS    0H
         SUBEXIT
*****************************************************************
*                                                               *
* STATIC STORAGE AREA FOR CSECT - NO BASE REG REQUIRED.         *
*                               - LARL ADDRESSING IS USED       *
*                                                               *
*****************************************************************
*****************************************************************
*                                                               *
* CODE AREA FOR CSECT -DOESN'T REQUIRE BASE REGISTER COVERAGE    *
*                     -USE RELATIVE BRANCHES HERE               *
```

```
*                    -DON'T CODE LITERALS HERE                  *
*                                                               *
*****************************************************************
START    DS    0H
         XR    0,0
         LARL  R1,L10
         LARL  R2,C370WTOB
MV10     MVST  R2,R1
         JO    MV10
         BRASL C370PRTR,WTOALPHA
C370EXIT DS    0H
         SUBEXIT
*
WTOALPHA DS    0H
         LARL  R9,C370WTO
         WTO   MF=(E,0(R9))
         LARL  R9,C370WTOB
         LARL  R8,C370WTOB
         XC    0(78,R9),0(R8)
         BR    C370PRTR
*
WTOMVC   DS    0H
         LARL  R9,C370L10
         LARL  R8,C370B10
         MVC   0(10,R9),0(R8)
         LARL  R9,C370EDN
         LARL  R8,C370N3
         CP    0(4,R9),0(4,R8)
         JLH   PRT2
         LARL  R9,C370DEC
         LARL  R8,C370ZERO
         CP    0(4,R9),0(4,R8)
         JLE   PRT10                   /* Ln#- 15 br zero dec */
         LARL  R9,C370DEC
         LARL  R8,C370ONE
         CP    0(4,R9),0(4,R8)
         JLE   PRT11                   /* Ln#- 15 br one dec */
         LARL  R9,C370DEC
         LARL  R8,C370TWO
         CP    0(4,R9),0(4,R8)
         JLE   PRT12                   /* Ln#- 15 br two dec */
         JLU   PRT99
PRT10    DS    0H                      /* Ln#- 15 zero dec */
         LARL  R9,C370PN2
         LARL  R8,C370EDN
         ZAP   0(4,R9),0(4,R8)
         LARL  R9,C370TDW2
         LARL  R8,C370EDW2
         MVC   0(4,R9),0(R8)
         LARL  R9,C370TDW2
         LARL  R8,C370PN2
         ED    0(4,R9),2(R8)
         LARL  R9,C370L10
         LARL  R8,C370TDW2
         MVC   0(4,R9),0(R8)
         JLU   PRT99
PRT11    DS    0H                      /* Ln#- 15 one dec printf */
         LARL  R9,C370PN2
         LARL  R8,C370EDN
         ZAP   0(4,R9),0(4,R8)
         LARL  R9,C370TD1D
         LARL  R8,C370ED1D
         MVC   0(10,R9),0(R8)
         LARL  R9,C370TD1D
```

```
         LARL  R8,C370PN2
         ED    0(10,R9),0(R8)
         LARL  R9,C370L10
         LARL  R8,C370TD1D
         MVC   0(9,R9),2(R8)
         JLU   PRT99
PRT12    DS    0H                      /* Ln#- 15 two dec printf */
         LARL  R9,C370PN2
         LARL  R8,C370EDN
         ZAP   0(4,R9),0(4,R8)
         JLU   PRT99
PRT2     DS    0H
         LARL  R9,C370EDN
         LARL  R8,C370N5
         CP    0(4,R9),0(4,R8)
         JLH   PRT3
         LARL  R9,C370DEC
         LARL  R8,C370ZERO
         CP    0(4,R9),0(4,R8)
         JLE   PRT20                   /* Ln#- 15 br zero dec */
         LARL  R9,C370DEC
         LARL  R8,C370ONE
         CP    0(4,R9),0(4,R8)
         JLE   PRT21                   /* Ln#- 15 br one dec */
         LARL  R9,C370DEC
         LARL  R8,C370TWO
         CP    0(4,R9),0(4,R8)
         JLE   PRT22                   /* Ln#- 15 br two dec */
         JLU   PRT99
PRT20    DS    0H                      /* Ln#- 15 zero dec printf */
         LARL  R9,C370PN3
         LARL  R8,C370EDN
         ZAP   0(4,R9),0(4,R8)
         LARL  R9,C370TDW3
         LARL  R8,C370EDW3
         MVC   0(6,R9),0(R8)
         LARL  R9,C370TDW3
         LARL  R8,C370PN3
         ED    0(7,R9),1(R8)
         LARL  R9,C370L10
         LARL  R8,C370TDW3
         MVC   0(6,R9),0(R8)
         JLU   PRT99
PRT21    DS    0H                      /* Ln#- 15 one dec printf */
         LARL  R9,C370PN2
         LARL  R8,C370EDN
         ZAP   0(4,R9),0(4,R8)
         LARL  R9,C370TD1D
         LARL  R8,C370ED1D
         MVC   0(10,R9),0(R8)
         LARL  R9,C370TD1D
         LARL  R8,C370PN2
         ED    0(10,R9),0(R8)
         LARL  R9,C370L10
         LARL  R8,C370TD1D
         MVC   0(9,R9),2(R8)
         JLU   PRT99
PRT22    DS    0H                      /* Ln#- 15 two dec printf */
         JLU   PRT99
PRT3     DS    0H
         LARL  R9,C370DEC
         LARL  R8,C370ZERO
         CP    0(4,R9),0(4,R8)
         JLE   PRT30                   /* Ln#- 15 br zero dec */
```

```
         LARL  R9,C370DEC
         LARL  R8,C370ONE
         CP    0(4,R9),0(4,R8)
         JLE   PRT31                   /* Ln#- 15 br one dec */
         LARL  R9,C370DEC
         LARL  R8,C370TWO
         CP    0(4,R9),0(4,R8)
         JLE   PRT32                   /* Ln#- 15 br two dec */
         JLU   PRT99
PRT30    DS    0H                      /* Ln#- 15 zero dec printf */
         LARL  R9,C370TDW4
         LARL  R8,C370EDW4
         MVC   0(10,R9),0(R8)
         LARL  R9,C370TDW4
         LARL  R8,C370EDN
         ED    3(7,R9),0(R8)
         LARL  R9,C370L10
         LARL  R8,C370TDW4
         MVC   0(7,R9),3(R8)
         JLU   PRT99
PRT31    DS    0H                      /* Ln#- 15 one dec printf */
         LARL  R9,C370PN2
         LARL  R8,C370EDN
         ZAP   0(4,R9),0(4,R8)
         LARL  R9,C370TD1D
         LARL  R8,C370ED1D
         MVC   0(10,R9),0(R8)
         LARL  R9,C370TD1D
         LARL  R8,C370PN2
         ED    0(10,R9),0(R8)
         LARL  R9,C370L10
         LARL  R8,C370TD1D
         MVC   0(10,R9),0(R8)
         JLU   PRT99
PRT32    DS    0H                      /* Ln#- 15 two dec printf */
         JLU   PRT99
PRT99    DS    0H
         BR    C370PRTR
         EQUREGS
C370PRTR EQU   R11                           /* c2 gen variable  */
C370LNK  EQU   R10                           /* c2 gen variable  */
*
*
* Character Literals
*
*
         DS    0H
*
* Math Literals
*
*
C37F1    DC    P'0000000'            /* c  */
NULL     DC    P'-000001'            /* NULL  */
argc     DC    P'0000000'            /* argc  */
         DS    0H
*
* Global Variables
*
L10      DC    C'Hello z390 World',X'0'
         DS    0H
*
*
*
C37F2    DS    F'0'                  /* STRLEN  */
```

```
*
argv     DC    CL32' '               /* argv  */
*
* Local Variables
*
         DS    0H
*
*
*
* c2z Parser Variables
*
C370WTO  DC    AL2(C370WTOE-*,0)             /* c2z gen variable  */
C370WTOB DC    CL78' '                       /* c2z gen variable  */
C370WTOE EQU   *                             /* c2z gen variable  */
C370EDN  DC    P'0000000'                    /* c2z gen variable  */
C370PN2  DS    P'0000000'                    /* c2z gen variable  */
C370PN3  DS    P'0000000'                    /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
C370L8   DC    C'        '                   /* c2z gen variable  */
C370B8   DC    C'        '                   /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
C370ZERO DC    P'0000000'                    /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
C370ONE  DC    P'0000001'                    /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
C370TWO  DC    P'0000002'                    /* c2z gen variable  */
C370EDW2 DC    X'40202120'                   /* c2z gen variable  */
C370TDW2 DS    C'    '                       /* c2z gen variable  */
C370EDW3 DC    X'402020202120'               /* c2z gen variable  */
C370TDW3 DS    C'      '                     /* c2z gen variable  */
C370EDW4 DC    XL10'40202020202021202020'    /* c2z gen variable  */
C370TDW4 DS    CL10                          /* c2z gen variable  */
C370N3   DC    P'0000999'                    /* c2z gen variable  */
C370N5   DC    P'0099999'                    /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
C370DEC  DC    P'0000000'                    /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
C370PER  DC    C'.'                          /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
C370TD1D DS    CL10                          /* c2z gen variable  */
         DS    0H                            /* c2z gen variable  */
C370ED1D DC    XL10'402020206B2120204B20'    /* c2z gen variable  */
C370B10  DC    C'          '                 /* c2z gen variable  */
C370L10  DS    CL10                          /* c2z gen variable  */
         END
```

Programs

c2z.c

c2z_char.c

c2z_debug.c

c2z_double.c

c2z_eoj.c

c2z_error.c

c2z_files.c

c2z_for.c

c2z_if.c

c2z_int.c

c2z_macro.c

c2z_math.c

c2z_mem.c

c2z_misc.c

c2z_paramaters.c

c2z_print.c

c2z_string.c

c2z_time.c

c2z_utility.c

c2z_while.c

prototyp.h

Functions

Function	Program
int main(argc, argv[]);	c2.c
void a_bort(int,int);	c2_error.c
void a_warn(int,int);	c2_error.c
void c2_eoj(void);	c2_eoj.c
void c2_while(void);	c2_while.c

```
/*          c2z_if.c       */
     void c2_if(void);
     void c2_case(void);
     void c2_switch(void);
     void c2_case_end(void);
     void c2_break(void);
     void c2_case_default(void);


/*          c2z_string.c         */
     void c2_strcpy(void);
     void c2_strcat(void);
     void c2_strlen(void);
     void c2_strchr(void);
     void c2_strrchr(void);
     void c2_strcmp(void);
     void c2_strncpy(void);
     void c2_strset(void);

/*          c2z_time.c           */
     void c2_ctime(void);
     void c2_time(void);
     void c2_compute_time(void);
     void c2_localtime(void);


/*           c2z_utility.c         */
     void write_remark();
     void write_short();
     void write_variable();
```

```
      void check_blank(void);
      void check_length(void);
      void check_continuation(void);
      void check_semi(void);
      void change_case(void);

/*          c2z_files.c          */
      void c2_open(void);
      void c2_close(void);
      void c2_scan_fopen(void);
      void c2_fgets(void);
      void c2_scan_fgets(void);
      void c2_fputs(void);
      void c2_scan_fputs(void);
      void c2_scan_feof(void);


/*          c2z_for.c      */
      void c2_for(void);


/*          c2z_math.c           */
      void c2_math(void);
      void c2_plus(void);
      void c2_minus(void);
      void c2_atoi(void);


/*          c2z_print.c          */
      void c2_fprintf(void);
      void c2_printf(void);

/*          c2z_misc.c           */
      void c2_regs(void);
      void c2_func_call(void);
      void c2_func_end(void);
      void c2_func_sub(void);
      void c2_goto(void);
      void c2_goto_label(void);
      void c2_isalpha(void);
      void c2_isdigit(void);
      void c2_exit(void);
      void c2_define(void);
      void c2_main(void);


/*          c2z_mem.c      */
```

```
     void c2_mempy(void);
     void c2_memmove(void);


/*          c2z_int.c      */
     void c2_int(void);
     void c2_int_1(void);
     void c2_int_2(void);


/*          c2z_double.c         */
     void c2_double(void);


/*          c2z_char.c           */
     void c2_char(void);


/*          c2_debug.c           */
     void c2_debug(void);


/*          c2z_paramaters.c     */
     void c2_parm_ct(void);


/*          c2z_macro.c          */
     void c2_sizeof(void);
```

Test Programs

The following test programs can be executed by running in the Z390 the batch job stream ASMLG. This will compile, link and execute the test program.

ctest_1.c

Simple hello world program.

ctest_2.c

example of int and char defines.

ctest_3.c

math addition examples

ctest_8.c

for / next examples

ctest_9.c

while examples

ctest_10.c

strcpy, strcat, strlen examples

ctest_11.c

atoi examples

ctest_12.c

int and char array examples

```
/* usage counters  */
int var_use[24];

/* ********************************************************************
*  1  =      asmct               2      =      printf              *
*  3  =       fprintf            4      =      branch              *
*  5  =      fopen               6      =      fclose              *
*  7  =      if                  8      =      strcpy              *
*  9  =      isalpha             10     =      isdigit             *
*  11 =      isspace             12     =      isalnum             *
*  13 =      atoi                14     =      free                *
*  15 =      strcat              16     =      strlen              *
*  17 =      define              18     =      fgets               *
*  19 =      unsigned            20     =      isupper             *
******************************************************************** */

/* compiler generated fields usage counter                        */
int work_use_ct[80];
/* ************************************************************
*   1        =      C370ISAL     2      =      C370L1        *
*   3        =      C370L2       4      =      C370L3        *
*   5        =      C370L4       6      =      C370L5        *
*   7        =      C370L6       8      =      C370L7        *
*   9        =      C370L8       10     =      C370L80       *
*  11        =      C370MTOT     12     =      C370MT1       *
*  13        =      C370MT2      14     =      C370MT3       *
*  15        =      C370MT4      16     =      C370MT5       *
*  17        =      C370PTOT     18     =      C370PT1       *
*  19        =      C370PT2      20     =      C370PT3       *
*  21        =      C370PT4      22     =      C370PT5       *
*  23        =      C370CLCT     24     =                    *
*  25        =      C370EDW2     26     =      C370EDW3      *
*  27        =      C370EDW4     28     =                    *
*  29        =      C370PN2      30     =      C370PN3       *
*  31        =      C370ISDG     32     =      C370ZERO      *
*  33        =      C370ONE      34     =      C370TWO       *
*  35        =      C370UCA      36     =      C370UCZ       *
*  37        =      C370LCA      38     =      C370LCZ       *
*  39        =      C370NL1      40     =      C370DEND      *
*  41        =      C370IENT     42     =      REMAINDER     *
*  43        =      C370ISOR     44     =      C370MLT1      *
*  45        =      C370MLT2     46     =      C370MLT3      *
*  47        =      C370STRG     48     =      C370U         *
*  49        =      C370NWK1     50     =      C370NWK2      *
*  51        =      C370EDN      52     =      C370B1        *
*  53        =      C370B8       54     =      C370TDW2      *
*  55        =      C370TDW3     56     =      C370TDW4      *
*  57        =      C370N3       58     =      C370N5        *
*  59        =      C370L1A      60     =      C370NL1A      *
*  61        =      C370LWQ      62     =      C370LZER      *
*  63        =      C370LNIN     64     =      FW00XX004     *
*  65        =      C370NWK3     66     =      C370PDBL      *
*  67        =      C370DEC      68     =      C370TD1D      *
*  69        =      C370ED1D     70     =      C370PNID      *
*  71        =      C370L10      72     =      C370XXX       *
*  73        =      C370LPCT     74     =      C370EOF       *
*  75        =      C370PER      76     =      C370B10       *
*  77        =      C370ECB      78     =      C370NWK3      *
*  79        =      C370FONE                                 *
************************************************************ */
```

Internals

These entries are stored in the v_variable table.

Variable type

A	=	Arrays – Character
C	=	Character
D	=	Double
G	=	Array - Integer
I	=	Integer
M	=	Entry in w_variable for reference only

For v_type **A** and **G**, the following fields should always be mapped to the following:

field5	=	v_dsect
field6	=	v_label
field7	=	v_table
field8	=	v_label
field9	=	v_sv_reg
field10	=	v_wk_reg