NICOLET
USERS
SOCIETY

PROGRAM LIBRARY
CATALOG

NICOLET USERS SOCIETY

The Nicolet Users Society (NUS) is an organization of all Nicolet 1080 system users. Principally, it maintains a collection of user-written programs which are available to all 1080 owners free of charge upon request. In addition, application notes describing the use of 1080 systems are distributed from time to time.

Any 1080 user who has developed a program which he feels may be of general interest to other users may notify all other owners by submitting a copy of the program to NUS at Nicolet Instrument Corporation in Madison. NUS will duplicate and distribute these programs to all owners who request them.

In order that you may be kept up to date on NUS activities, please fill out the registration form and return it to Nicolet Instrument Corporation.

To order NUS programs, please fill out the attached order form. We ask that you limit your orders to five programs per month to allow most rapid service to all NUS members. Listings of NUS programs may be generated from the supplied source tapes, using the Assembler-Editor.

NICOLET USERS SOCIETY
PROGRAM SUBMISSION FORM

NUS will duplicate and distribute any program which is submitted after it has been evaluated by our test department, providing the following are included:

(1)   a source tape or listing,
(2)   a binary tape, and
(3)   a set of instructions on the program's use.

Please complete the form below, or a facsimile, and submit it with each program.

Program Title _____

<u>Short</u> Abstract:

Author(s) _____

_____

Address _____

_____

_____

I hereby give NUS and Nicolet Instrument Corporation full permission to utilize and distribute this program in any form they see fit.

_____
Signature

Enclosures:

_____ Source Tape
_____ Listing
_____ Binary Tape
_____ Full Operating Instructions

LIST OF NUS PROGRAMS BY CATEGORY

Hardware Test Programs

7201	Memory Test
7202	1080 Jump Test
7203	Operations Test
7204	Multiply-Divide Test
7238	293 Timer Test
7239	293 Digital I/O Test
7240	293 DAC Test
7241	293 ADC Test
7248	Astrotest

Applications Programs

7215	Nmrcal 1085 Overlay
7217	Three Point Smooth and Baseline
7218	Forward-Inverse Fourier Transfer
7219	Isometric Plot
7222	Normalization Constant
7223	Intensity Printout
7226	Fixed Integral
7227	Variable Scale Integral
7229	Block Averaging
7230	Fixed Block Size
7231	Fast EM
7232	Integrate Limits
7233	JEOL Pulse 3 - Relay 1 Hardware
7234	Fast Pass
7235	Manual T_1 Measurement
7236	Fixed Point Output
7242	Spectrum Reverse
7250	Phase Correction Using Knobs

Utility Programs

7205	Desk and Resistance Calculator
7206	Nicodupe
7207	Nico-Decin
7208	Nico-Tab
7214	Nico-Page
7220	Decimal-Octal Conversion Table
7221	Put and Take Program
7246	UTIL1
7247	UTIL2

Demonstrations and Games

7210	Massage
7211	Computer Art
7212	Times Square
7213	Dice Game
7219	Isometric Plot
7225	Snoopy
7245	Power-of-2

Programming Aids

7209	Floating Point, 1972
7224	Overlay to Assembler
7237	Program Decoder
7244	Bugbomb
7246	UTIL1
7247	UTIL2

Mathematical Tools

7216	MDIAG
7243	Astrocal
7249	TTI-Calculator

NUS PROGRAM ABSTRACTS

MEMORY TEST (WORST PATTERN GENERATOR) - NUS-80/U-7201

This test program generates a worst case memory pattern and reads from it repeatedly attempting to induce an error. All errors along with their addresses are then typed out. Source and Binary - Occupies $\emptyset$ - 571

1080 JUMP TEST - NUS-80/U-7202

Direct and indirect jump instructions are executed repeatedly to and from pseudorandom addresses. If a jump fails, the exact location of the failure can be ascertained. Source and Binary - Occupies 300 - 507

1080 OPERATIONS TEST - NUS-80/U-7203

All GROUP I instructions are executed repeatedly in an attempt to induce equipment failure. If failure does occur, it is possible to localize the hardware trouble. Source and Binary - Occupies $\emptyset$ - 302

HARDWARE MULTIPLY-DIVIDE TEST - NUS-80/U-7204

This program starts at location zero and types out sequentially the results of hardware and software controlled multiplication, division and bit inversion if they differ. If they agree, the messages MULTIPLY OK, DIVIDE OK, and BIT INVERT OK are typed. Binary - Occupies $\emptyset$ - 667

DESK AND RESISTANCE CALCULATOR - NUS-80/U-7205

NICALC performs floating point addition, subtraction, multiplication, division, square root, log, and exponentiation functions. Furthermore, it can solve normal voltage divider equations, calculate the effective resistance of two parallel resistors, and determine the decibel relationship between two numbers. Utilizes FPP-1972. Source and Binary - Occupies $\emptyset$ - 736

NICODUPE - NUS-80/U-7206

This program will duplicate tapes, make additional copies and verify binary tapes with a standard (200) leader and checksum parity. In addition, NICO-LOADEON, which has a non-standard (000) leader and in part no checksum, may be duplicated, copied and verified. Source and Binary - Occupies $\emptyset$ - 724

NICO-DECIN - NUS-80/U-7207

When called, this program will accept decimal input from the Teletype. Overflow and invalid characters are automatically checked for within the program. Source and Binary - Occupies 0 - 111

NICO-TAB - NUS-80/U-7208

Gives the equivalent of a tabulate instruction to the Teletype, thus allowing neat columns to be easily typed. Source and Binary

FLOATING POINT PACKAGE 1972 - NUS-80/U-7209

Now part of the standard Software Package. Source available from NUS.

MASSAGE - NUS-80/U-7210

This program allows an output of alphabetic characters along a paper tape. It is an ideal program for permanently labeling paper tapes. Source and Binary - Occupies 41 - 311 and 400 - 432

COMPUTER ART - NUS-80/U-7211

This program generates exponentially decaying Lissajous figures and normalizes the result to drive an x-y plotter. Fascinating moire patterns can be produced, where several constants can be controlled by the artist. Source and Binary - Occupies 0 - 357. Requires FPP, 1972.

TIMES SQUARE - NUS-80/U-7212

This program displays the typed text on the scope in a rotating fashion similar to the news signs in Times Square. Source & Binary - Occupies 400 - 553 and 41 - 311.

DICE GAME - NUS-80/U-7213

Displays two dice on the scope and "rolls" them on Teletype command. Source and Binary - Occupies 0 - 270.

NICO-PAGE - NUS-80/U-7214

Any tape may be converted into a page by page listing.   Source and Binary -
Occupies Ø - 112.

NMRCAL 1085 OVERLAY - NUS-80/U-7215

This overlay causes an entire 4K section to be used for the stick display and
another 4K to be used for the Lorentzian display. Requires a 1085 (20K) or
larger system.   Source and Binary - Occupies no new space.

MDIAG - NUS-80/U-7216

This matrix diagonalization routine operates on a packed upper triangular matrix
stored in data memory, and produces an N x N matrix of eigenvectors and a dia--
gonalized matrix, where the eigenvalues are contained in the diagonal. It operates
in conjunction with Floating Point, 1971. The program also contains useful two
dimensional array to single-dimensional array conversion routines and Floating
Point Skip subroutines.   Source only. Utilizes FPP-1971 and Occupies 700 - 1760.

THREE POINT SMOOTH AND BASELINE SMOOTH - NUS-80/U-7217

Overlay to FT-Nmr 1972. Upon command SM performs a three point smooth on
all displayed data. Upon command BS it picks out major peaks and performs
a three point smooth on the baseline between them. The scientific validity of
this latter command is roughly equivalent to the initials of the command. Source
and Binary - Occupies 5213 - 5312 and 106 - 111

FORWARD AND INVERSE COMPLEX FOURIER TRANSFORM - NUS-80/U-7218

This is the classical Fast Fourier Transform method and will accept both real
and imaginary data. The inverse transform can also be taken via this program.
Source and Binary - Occupies 600 - 1015 and 1055 - 1161. Overlays FT-Nmr 1972.

ISOMETRIC PLOT - NUS-80/U-7219

ISOPLOT produces a two dimensional projection of the three dimensional plot of
real data vs. imaginary vs. frequency as viewed at a 45° angle down the frequency
axis. It operates as an overlay to the FT-Nmr Program. ISOPLOT operates with
an x-y plotter only.   Source and Binary - Occupies 5213 - 5400 and 172-3.

DECIMAL-OCTAL CONVERSION TABLE - NUS-80/U-7220

This program types out a decimal-octal conversion table on the Teletype, modulo
4096. The formatting can be changed to produce more or less significant figures
by modifying the source code. Source and Binary - Occupies $\emptyset$ - 156.

PUT AND TAKE PROGRAM - NUS-80/U-7221

This program occupies locations 7600 - 7631 in place of Swap. It copies the 4K
area selected by the Readout Buttons into the second 4K of program memory. Upon
starting at a second address, it copies the contents of the second 4K of program
memory into the area selected by the Readout Buttons. This program requires two
stacks of program memory. Source and Binary.

NORMALIZATION CONSTANT OVERLAY TO FT-NMR 1972 - NUS-80/U-7222

This patch allows the user to access the Normalization Constant used in scaling
the FT data upon typing the command NC. This is useful in comparing the rela-
tive amplitudes of different transformed spectra. Source and Binary - Occupies
5401 - 5410, and 112-113.

INTENSITY PRINTOUT OVERLAY TO FT-NMR 1972 - NUS-80/U-7223

This patch to FT-Nmr 1972 allows the Peak Printout routine (PP) to list out a
fifth column: the intensity of the highest data point in the spectrum. In cases
where intensity is more important than integral, this information can be useful.
Source and Binary - Occupies 5374 - 5400.

OVERLAY TO ASSEMBLER - NUS-80/U-7224

This patch causes the Assembler program to fill the last page of a listing with line
feeds to the standard 11 inch length and to punch a Rubout in the trailer section of
binary and source tapes. Source and Binary.

SNOOPY - NUS-80/U-7225

All the fun of Schulz's character in digital form. Snoopy occupies 1K of data
memory and can be Fourier transformed and restored using the inverse transform
program in NUS-80/U-7218. Imagine the surprise of your students when the trans-
form of "garbage) produces an old doggy friend. Binary only. Occupies 100000 - 101777.

FIXED INTEGRAL PATCH TO FT-Nmr 1972 - NUS-80/U-7226

The P subcommand under ID (Integrate Display) is replaced with the Command F which fixes the integral in memory. Plotting can then be accomplished with the standard PL routine. Source and Binary. Uses no new memory.

VARIABLE SCALE INTEGRAL PATCH TO FT-Nmr 1972 - NUS-80/U-7227

Withdrawn. Is part of FT-Nmr 1972 Revision I.

FULL SCALE DIGITAL PLOT PATCH TO FT-Nmr 1972 - NUS-80/U-7228

Withdrawn.

BLOCK AVERAGING PATCH TO FT-Nmr 1972 - NUS-80/U-7229

The "Block Averaging" technique is utilized for signal averaging in the frequency domain. This technique is useful when it is desirable to signal average data having a huge dynamic range, such as when one or more strong solvent lines are present. Data are acquired in the time domain until the strong signals almost overflow memory. The resulting sum is processed and transformed and added to a second block of data memory. The first block can then be zeroed and new time domain data taken until memory is again almost full. The result of this process is that only the strong line will overflow memory in the frequency domain and that a very large dynamic range can be handled efficiently. Source and Binary - Occupies 142-3, 74-77.

FIXED BLOCK SIZE FOR MC, PC and AP - NUS-80/U-7230

Withdrawn - Part of FT-Nmr 1972 Revision I.

FAST EM FOR FT Nmr - NUS-80/U-7231

This patch uses an approximation to produce an exponential window in only 1 second per 4K data block. The accuracy is somewhat less than the standard EM near the tail of the exponential. Binary only - Occupies 4714 - 4775.

INTEGRATE LIMITS PATCH TO FT-Nmr - NUS-80/U-7232

The new subcommand I under the IR command causes the integral of the intensified (or expanded) region to be printed out in digital form. Occupies 5213 - 5244.

OVERLAY TO DRIVE JEOL PULSE 3 - RELAY 1 HARDWARE - NUS-80/U-7233

This patch drives the Nicolet modification to the 1080 which steps JEOL 5400 step recorders. The pen lift is automatically actuated using RELAY 1 and the hardware division network divides the 16,384 pulses into 5400 steps. Source and Binary Occupies no new memory.

FAST PASS - NUS-80/U-7234

This program can be used to cross correlate the response of a rapidly scanned cw-nmr spectrum with the response of an (a) theoretical or (b) experimental reference line. The program is written to utilize the method described by J. Dakok et. al. at the 13th Experimental Nmr Conference. Source and Binary.

MANUAL T_1 MEASUREMENT USING THE JEOL PULSE PROGRAMMER - NUS-80/U-7235

This patch allows the setting of the interval between the 180° and 90° pulses using the command IN. This sets and resets the interval counter in the JEOL pulse programmer T_1 plug-in. Overlays FT-Nmr 1972. Occupies 5213 - 5337, and 106-113.

FIXED POINT OUTPUT FOR FT-Nmr - NUS-80/U-7236

Withdrawn - Part of FT-Nmr 1972 Revision I.

PROGRAM DECODER - NUS-80/U-7237

This program is a classical "disassembler," which, given an initial and final memory address, causes the printing of the specified region in either octal or assembler instructions. This has the advantage that unknown pieces of code can be decoded during a dump for later analysis. Binary only - Occupies $\emptyset$ - 1177.

NIC-293 TIMER TEST - NUS-80/U-7238

The duration of the 293 Timer may be selected arbitrarily using Teletype input. Source and Binary - Occupies $\emptyset$ - 265.

NIC-293 DIGITAL I/O TEST - NUS-80/U-7239

This program allows an easy test to see if the I/O module of the 293 Controller is making errors. A digital ramp is loaded into the output register and read via the sense-contact lines. If what is read back does not agree with what was loaded into the output register, an error message is printed. Source and Binary - Occupies $\emptyset$ - 117.

NIC-293 DAC TEST - NUS-80/U-7240

Ramp and square waves may be generated under software control to test the
operation of the DAC and allow easy calibration.   Source and Binary - Occupies
∅ - 150.

NIC-293 ADC TEST - NUS-80/U-7241

Two alternate inputs are multiplexed under software control, allowing easy cali-
bration of the ADC module.   Source and Binary - Occupies ∅ - 26.

SPECTRUM REVERSE PATCH TO FT-Nmr 1972 - NUS-80/U-7242

This causes the left to right reversal of the displayed region upon giving the command
SR. This is particularly useful when the rf carrier was placed at the high frequency
end of the spectrum instead of the low frequency end. This command is non-destructive
of data and can be called twice to restore the spectrum to its original configuration.
Source and Binary - Occupies 5213 - 5235 and 174 - 5.

ASTROCAL - NUS-80/U-7243

ASTROCAL is a sophisticated desk calculator routine, which allows multiple operations
in the same expression, transcendental functions, and 100 special storage locations.
It operates in either fixed point or floating point mode and utilizes FPP-1972. Occupies
location ∅ - 536 and 6000 - 7577, leaving pages 2000 and 4000 free for the Assembler-
Editor and Nicobug.   Source and Binary.

BUGBOMB - NUS-80/U-7244

BUGBOMB is a special tape for reloading the Binary Loader after a program "bombs"
if Nicobug is intact. It enters and starts Nico-Loadeon at the Teletype keyboard - reader.
Nico-Loadeon is attached and reads in automatically. Finally the Binary Loader is
started by overlaying the intermediate loader with a jump to 7777.   Binary Only.

POWER-OF-2 - NUS-80/U-7245

POWER-OF-2 utilizes a set of special driver subroutines, UTIL1 and UTIL2 and
calculates any positive power of 2 leaving up to 4096 <u>digits</u>. Uses FPP-72.
Occupies ∅ - 1777 and 6000 - 7577. Uses first data stack for scratch.   Source and
Binary.

UTIL1 - NUS-80/U-7246

UTIL1 is a series of source subroutines for message and text handling. They include:

ASFPM - prints a message, gets a floating point number and stores it
ASKFXM - prints a message gets a number, fixes it and stores it
PRINTM - prints an in-line string of characters
PRNTMS - prints a message
DOLOOP - sets up a do loop
NOLOOP - terminates a do loop
TSTACC - sign test on AC
TSTFAC - sign test on FAC
CMPFX - arithmetic comparison of two integers
CMPFP - arithmetic comparison of two floating point numbers
SHIFTN - variable length shift routine

Source Only.

UTIL2 - NUS-80/U-7247

UTIL2 is a series of source subroutines for array handling. They are:

ARYDIM - "Dimensions" an array by making a table entry
ARYSET - Sets each word of an array to a given integer
SUB1 - singly subscripted array handling
SUB2 - doubly subscripted array handling
ARYLKP - looks up the table entry for an array

Source Only.

Astro-Test - NUS-80/U-7248

Astro-test is a simple minimum length program for testing and diagnosing faults
in core memory. Source and Binary - Occupies $\emptyset$ - 150.

TTI - Calculator - NUS-80/U-7249

This program converts the 1080 into a simple desk calculator with iterative capabilities.
Strings of commands can be entered and run continuously until interrupted. Source
and Binary - Occupies $\emptyset$-526 and 6000 - 7577.

Phase Correction Using Knobs - NUS-80/U- 7250

This program replaces the AP command of FT-Nmr 1972 with the PH command
which allows adjustment of the phase of the displayed spectrum using two knobs
attached to the NIC-293 ADC board channels $\emptyset$ and 1. A simple schematic for
attaching two 10-turn pots to the NIC-293 Controller is provided. Source and Binary -
Occupies 5531 - 5655 and 161 - 165.

PUT AND TAKE PROGRAM - NUS-80/U-7221

This program occupies locations 7600-7635 in place of Swap. It copies the 4K area selected by the Readout Buttons into the second 4K of program memory. Upon starting at a second address, it copies the contents of the second 4K of program memory into the area selected by the Readout Buttons. This program requires two stacks of program memory.

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This patch allows the user to access the Normalization Constant used in scaling the FT data upon typing the command NC. This is useful in comparing the relative amplitudes of different transformed spectra.

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The P subcommand under ID (Integrate Display) is replaced with the Command F which fixes the integral in memory. Plotting can then be accomplished with the standard PL routine.

VARIABLE SCALE INTEGRAL PATCH TO FT-Nmr 1972 - NUS-80/U-7227

The ID integral display becomes variable using the Vertical Display Scale switch. No other functions are affected.

FULL SCALE DIGITAL PLOT PATCH TO FT-Nmr 1972 - NUS-80/U-7228

The digital plotter routine is modified so that the same plotter width is used regardless of the number of points plotted.

BLOCK AVERAGING PATCH TO FT-Nmr 1972 - NUS-80/U-7229

The "Block Averaging" technique is utilized for signal averaging in the frequency domain. This technique is useful when it is desirable to signal average data having a huge dynamic range, such as when one or more strong solvent lines are present. Data are acquired in the time domain until the strong signals almost overflow memory. The resulting sum is processed and transformed and added to a second block of data memory. The first block can then be zeroed and new time domain data taken until memory is again almost full. The result of this process is that only the strong line will overflow memory in the frequency domain and that a very large dynamic range can be handled efficiently.

FIXED BLOCK SIZE FOR MC, PC and AP - NUS-80/U-7230

Regardless of what region is displayed, this patch causes the program to assume that the size of the data to be operated on is the same as that specified during the last FT command.

FAST EM FOR FT Nmr - NUS-80/U-7231

This patch uses an approximation to produce an exponential window in only 1 second per 4K data block. The accuracy is somewhat less than the standard EM near the tail of the exponential.

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FIXED POINT OUTPUT FOR FT-NMR - NUS-80/U-7236

This patch causes all FT-Nmr output to be in fixed point rather than floating point format. This improves readability but decreases the dynamic range somewhat.

PROGRAM DECODER - NUS-80/U-7237

This program is a classical "disassembler," which, given an initial and final memory address, causes the printing of the specified region in either octal or assembler instructions. This has the advantage that unknown pieces of code can be decoded during a dump for later analysis.

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The duration of the 293 Timer may be selected arbitrarily using Teletype input.

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NIC-293 DAC TEST - NUS-80/U-7240

Ramp and square waveforms may be generated under software control to test the operation of the DAC and allow easy calibration.

NIC-293 ADC TEST - NUS-80/U-7241

Two alternate inputs are multiplexed under software control, allowing easy calibration of the ADC module.

FT-Nmr Overlay for 293 Pulse Controller - NUS-80/U-7301

Introduces the commands, P1, P2, P3, D1, D2 and D3 referring to three pulses and delays whose values can be entered at the Teletype and used with the NIC-293 Controller. The triggering of the pulse sequence as well as turning it on and off are entirely flexible. Occupies 5127 - 5177, 5213, 5366, 136 - 7, 102 - 3. It overlays the entire user's area and the MC command. Source and Binary.

Zero Beyond Cursor FT-Nmr Overlay - NUS-80/U-7302

This program causes all address beyond the entered address to be set to $\emptyset$.
Source and Binary - Occupies 106 - 107 and 5213 - 5247.

Multipled Pulse Patch for the Measurement of T_2 - NUS-80/U-7303

This patch, in conjunction with NUS-7301 allows the setting and use of 5 timers to produce the sequence $P1 - D1 - (P2-D2)_n - P3$, where n is an entered parameter. The sequence can be used for a Carr-Purcell train, where P1 is the initial 90 and P2 the 180° pulse. P3 can then be used to trigger the onset of data acquisition. Source and Binary - Occupies 3141 - 3200, 142-3, 122-3, 146-7. The punch routine is removed.

Non-Normalized Integral Patch to FT-Nmr - NUS-80/U-7304

This patch causes the absolute value of the integral to be printed in the PP routine, rather than the normalized integral. The MI command no longer has any effect. Source and Binary - Occupies no new core.

Astro-Kaleidoscope - NUS-80/U-7305

Astro-Kaleidoscope produces interesting, constantly changing patterns on the oscilloscope. A Fibonacci series is involved in the generation of the patterns; however, the user is invited to speculate as to the exact mode of operation, since the code is entirely uncommented and unintelligible. Source and Binary - Occupies 0 - 76.

QED-18B - NUS-80/U-7306

QED is a fast, more sophisticated text editor, having a three character search, multiple line deletions, and line modification commands. It stores text in a different

fashion than the Assembler-Editor and the code must be punched out and re-read before assembly. With disk systems, FORCON may be used. Binary only - Occupies 2000 - 5777 and utilizes 8K of data memory for text.

FORCON - NUS-80/U-7307

FORCON performs the format conversion from QED format to Assembler format using the disk for scratch storage. Source and Binary - Occupies 0 - 151. Utilizes 3000 - 5777 and 8K of data memory.

TIMES SQUARE - Version 2 - NUS-80/U-7308

This version of Times Square allows all punctuation as well as all integers and alphabetic characters. It also recognizes the rubout for deletion during message entry. At the end of the text, a FORM (CONTROL/L) begins the circulating display. Source and Binary - Occupies 0 - 464 and utilizes 1K of data memory for each 17 characters.

XAP - Fixed Point Arithmetic Routines - NUS-80/U-7309

This is a signed multiply-divided, square and square root routine package which assumes that the binary point lies between bits 18 and 19. Source only - Occupies 113 locations.

DISASSEMBLER - NUS-80/U-7310

This program decodes binary instructions stored in memory and prints out an assembly language listing. It recognizes pointers, starts of subroutines and constants as well as all mnemonics. Source and Binary - Occupies 0 - 3050.