

TEKniques Vol. 6 No. 4 T1

Part #062-6704-01

TEKniques Vol. 6 No. 4 T1 tape consists of 17 programs: two CAD, four Education/Research, three Graphing, two Interfacing, one Mechanical Engineering, two Programming Aids, one Recordkeeping, one Text Processing, and one Utility.

Four of the programs must be transferred to their own dedicated tapes. Complete instructions for accomplishing the transfers are included in the documentation.

The individual abstracts describe the programs.

Program 1

Title: 4052A/54A Assembler

Author: Ed Post
Tektronix, Inc.
Wilsonville, OR

Memory Requirement: 64K

Files: 1 ASCII Program

Statements: 600

A CALL "EXEC" routine has been added to the 4052A and 4054A Series Graphics Systems to allow users to execute programs written in 6800 machine code. Extensions allow access to the enhanced A-series instruction set.

This program is an assembler written in 4052A/54A extended BASIC which will read an assembly language program from a tape/file, assemble it (generating relocation information as well), then store the object code in another file for later execution.

Any of the editors available in the Applications Library, or the 4052R06 Editor ROM pack, can be used to create an assembly program in a file.

This assembler program will prompt for the input file of the assembly program and the output file on which to store the object code. A listing will also be displayed on the screen with any syntax errors listed below the erring line of code. A symbol table is produced after the completed listing, showing all absolute and relative labels generated.

This is not meant to be a production assembler. It's missing several features commonly available in assemblers such as expressions, ASCII constants, decimal and octal modes.

It assembles about two lines of code a second. It does, however, document the command format for "EXEC", give some idea of the format of the extended opcodes designed into the 4052A/54A bit-slice processor, and really work.

Users who experiment with "EXEC", however, will undoubtedly crash the firmware regularly until they figure out what they are doing.

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Included in the 4052A/54A Assembler documentation is the complete description of all new instructions in the "A" instruction set, and a listing of "entry points" to system firmware routines. The user will also need the *M6800 Programming Reference Manual* published by Motorola, Inc.

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Program 2

Title: 4050A TECO

Author: Ed Post
Tektronix, Inc.
Wilsonville, OR

Memory Requirement: 32K "A" Series

Files: 1 ASCII Program

Statements: 750

For those of you Real Programmers that think TECO is the only REAL text editor, there now exists one that runs on the 4052A and 4054A. This TECO implements most of the commands available in common versions running on DEC time sharing systems, and is capable of editing files on

tape, disk, or extended memory. Numeric and string 'Q' registers are available, and Q registers can be run as Macros. The combination of TECO, the 4050A assembler, and the extended memory option makes creation and testing of assembly language programs convenient.

Program 3

Title: Printed Circuit Board Layout

Author: Franz Reiter
Rohde & Schwarz - Tektronix
Austria

Memory Requirement: 4054 Opt. 30, 64K

Peripherals: 4663 Plotter

Files: 1 Binary Program
1 Data File (example)

Statements: 844

Design the printed circuit board on the 4054 screen. Define symbols of up to 50 solder-tags for quick duplication. All lines and solder-tags are in the standard grid (DIP size, 2, 54 mm) or in half grid. Design two layers at once, one drawn in dashed lines on the screen or with the second pen on the plotter. Redraw just Layer 1 or Layer 2 or just all solder-tags or the whole drawing. Full zooming of any board section, no restriction of board size. Delete any line, solder-tag or symbol for correction. The standard line is 0.3 mm broad, any other value selectable. The standard solder-tag has a diameter of 1.5 mm, any other value selectable.

Plot the drawing on foil in any desired scaling. Generate your copper board now with an ultraviolet-sensitive lacquer or make a printing-foil of it. Store the drawing on tape. Retrieve the drawing, delete and add as you need, make a new plot and store again.

A program for listing coordinates of all the holes on a printer or on a paper tape punch on request. Data output for a light-plotter (direct to plotter, to paper tape or to tape) on request.

Program 4

Title: Pipe Construction

Memory Requirement: 16K

Peripherals: Optional-4662/3 Plotter

Files: 1 ASCII Program

Statements: 290

This program illustrates the use of graphics in a mechanical engineering or construction area.

The program calculates and makes a scale drawing of two pipes connected together at any angle between 0° to 45°, giving inside and outside dimensions, wall thickness and bell diameter. Required inputs are pipe diameter, pipe lengths and bend angle. Measurements returned are in standard form, i.e., wall thickness is the standard size for the pipe diameter.

This program will draw on the 4050 screen or the plotter.

This particular program is used in a pipe prefabrication plant and gives the designer a graphic representation of the final product as well as supplying him with all measurements in standard pipe sizes.

Program 5

Title: Moment of Inertia Optimization

Authors: Khiem Ho
George I. Tzitzikalakis
Columbia University
New York, NY

Memory Requirement: 32K

Peripherals: Optional-4662/3 Plotter

Files: 1 ASCII Program

Statements: 648

This program plots Moment-of-Inertia curves for six types of cross-sections: square, rectangle, solid circle, hollow circle, I-beam and hollow circular sector.

For plots with two independent variables, the user may select which variables will be on the X-axis and which on the Z-axis.

For a plot with more than two independent variables, the user may select which variable(s) will be constant(s) for the plot, so that there are only two independent variables at a time.

Discrete values of the plot are given if the user elects to have them.

Program 6

Title: FFT of 2048 Real Numbers
Author: Pierre Thore
L.A.G.A.S.
Roubault, France
Memory Requirement: 4052/4 56K
Peripherals: 4052R08 FFT ROM
Files: 1 ASCII Program
Statements: 38

This routine should be considered a subprogram of a master program that must compute the G array then lead to the computation of FFT through a GOSUB.

The routine performs FFT of an array of 2048 real numbers. It provides the result in the same G array, under the same format as after a ROM pack computing. The computation lasts 30 seconds.

Program 7

Title: IFT of 1024 Complex Numbers
Author: Pierre Thore
L.A.G.A.S.
Roubault, France
Memory Requirement: 4052/4 56K
Peripherals: 4052R08 FFT ROM
Files: 1 ASCII Program
Statements: 77

This routine should be considered a subprogram of a master program.

It performs the reverse operation with the same I/O formats as Program 6 of this tape.

The processing time is one minute.

Program 8

Title: Newton Integration and Plot
Author: J.E. Jobaris
U.S. Postal Service
San Bruno, CA
Memory Requirement: 16K
Files: 1 ASCII Program
Statements: 256

This program uses the Newton (sometimes called the Newton-Rhapson) method to solve an equation of two variables for which no direct or easy solution is available. The Newton method iterates the following equation:

$$X_{n+1} = X_n - F(X_n)/F'(X_{n+1}) \quad n=0, 1, \dots$$

until the term $F(X_n)/F'(X_{n+1})$ has no effect on the last decimal place of accuracy as specified by the user.

An optional plot can be produced within the range of the independent variable as input by the user. The plot of the function can be produced with or without the root of the equation. The plot with the solution uses dashed lines whose intersection represents a root. Because the Newton method calculates only one root, the intersection of the horizontal dashed line and the function plot indicates other solution points.

The equation, its first derivative, and the value of the equation at which a solution is required are entered at specified lines in the program.

Program 9

Title: Bauer-Reinsch Inversion
Author: Roger P. Denlinger
USGS
Lakewood, CO
Memory Requirement: 16K
Files: 1 ASCII Program
Statements: 56

A modification of the Gauss Jordan algorithm solves the linear problem $Ax = b$ where A is a positive definite symmetric matrix. The working storage needed is only the matrix itself, since the inverse is overwritten on the original matrix.

Matrix A must be computationally positive definite.

Program 10

Title: 4050-4010 Utilities
Author: Ed Sawicki
Tektronix, Inc.
Wilsonville, OR
Memory Requirement: 16K
Peripherals: 4010 Graphics Terminals
Files: 2 ASCII Programs
Statements: 300

This is a package of routines for driving 4010 family terminals from a 4050 Graphics System. The routines are written in 4050 BASIC and are organized as callable subroutines.

Most of the routines perform conversion from 4010 style data to decimal data (or vice-versa) which can be manipulated easily by a user-written mainline program. Each routine is well documented with a banner preceding the actual code. The banner lists subroutine entry and exit requirements as well as temporary (scratch) variables used.

A sample program is included.

Program 11

Title: TELEX
Author: Ruud Borstel
Tektronix, Inc.
Amstelveen, The Netherlands
Memory Requirement: 16K
Peripherals: Opt. 1 Data Comm. I/F
RS-232 Paper Tape Punch
Optional-4641/3 Printer
Files: 1 ASCII Program
Statements: 301

This program creates telex code paper tapes. As a source of data, it will use files from the internal cartridge tape. These files (containing ASCII data) can be produced by other programs (e.g., MATRIX package). This makes it possible to put (computer generated) data on a telex without human interference.

Program 12

Title: Data Chart
Author: Hayward Hulick
U.S. Army
New Cumberland, PA
Memory Requirement: 32K
Peripherals: 4662/3 Plotter
Optional-4907 File Manager
Files: 1 ASCII Program
Statements: 869

Displaying a graph with its tabular data gives this program a unique touch. Menu driven, the program plots a graph with corresponding data shown in formatted tabular form below.

Up to four curves, eight curve styles — 4 lines, 4 bar, or not plotted — and negative or positive data may be plotted. The scale, scale interval, X-axis label, and four title headings are user specified. Up to 15 periods on the X-axis with auto or user specified labels.

Chart files may be stored on a mounted disk, marked tape or both. The chart is plotted on the plotter and allows the user to change pen colors for each curve.

Program 13

Title: SDBAR
Author: Leland C. Sudlow
Purdue University
West Lafayette, IN
Memory Requirement: 8K
Peripherals: 4662/3 Plotter
Files: 2 ASCII Programs
Statements: 194

SDBAR is a short program which will draw Standard Deviation bars on multiple line graphs that have been previously generated from any source.

Through the joystick on the plotter, the user defines the graph area. The

program prompts for the values to define the window then previews the width of the crossbar on the 4050 screen. The user may choose to increase or decrease this width.

Using the joystick the user indicates the point locations then keys in the standard deviation around the point. The program will draw the standard deviation lines up, down, or both.

Program 14

Title: 4050/468 Utility III

Author: Craig Bulmer
Tektronix, Inc.
Chicago, IL

Memory Requirement: 64K

Peripherals: Tektronix 468 Oscilloscope
4052R07/4052R08 ROMS

Files: 1 ASCII Program
Requires dedicated tape

Statements: 1257

This program is similar to 4050/468 Utility II (in *TEKniques* Vol. 6 No. 1 T1 tape) with additional features. The addition of these functions was at the cost of plotter support.

The program will take waveforms from the 468 Oscilloscope and display the waveforms on the 4050 screen; with printed header information of Channel 1, 2 and/or Add; Volts/Div; Time/Div; Trigger Point; Max Volts; Min Volts; Min/Max Pulse Parameters; Histogram Pulse Parameters; Integrate Waveform; Differentiate Waveform; FFT; and Waveform Analysis.

Added functions will multiply waveforms (channel 1 \times channel 2 waveform stored in Add channel); Lissajous pattern (channel 1 vs. channel 2), and waveform cursors on 4052 display with analysis of data between cursors. (Cursors are moveable with constant readout of both cursors' voltage and time from start of sweep and delta time and voltage between cursors.)

Program 15

Title: Inventory Control

Author: Larry E. Davis
Tektronix, Inc.
St. Louis, MO

Memory Requirement: 32K

Peripherals: 4052R06 Editor ROM
Optional-4641/3 Printer

Files: 4 ASCII Programs

Statements: 319

This is a simple, but quick, program to track approximately 465 11-digit (including hyphens, i.e., 670-4289-01) part numbers to control the inventory.

Each item is stored and listed by PART #, MODEL-DESCRIPTION and LOCATION. The entire inventory can be sorted or listed by any of these.

Five functions included are:

Add
Alter
Locate
List
Sort

Program 16

Title: Flowcharter II

Author: Richard G. Meitzler
USN
San Francisco, CA

Memory Requirement: 32K

Files: 5 ASCII Programs

Statements: 1168

This program will flowchart any 4050 BASIC program stored in ASCII. The first pass of the program builds a branch table, a FOR...TO table and a NEXT table.

The second pass matches the FOR...NEXT statements in the two tables.

The third pass draws the actual flowchart using standard ANSI symbols.

The page number, starting and finishing line numbers are printed at the bottom of each page.

The user may store the program being analyzed and the results of the first two passes on tape.

Program limitations: 500 branches
200 FOR statements
200 NEXT statements

Program limitations: Output to screen

Program 17

Title: Friendly Graphing

Author: Paul Howard
Tektronix, Inc.
Wilsonville, OR

Memory Requirement: 4052/54 56K

Peripherals: Optional-4662/63 Plotter
-4641/43 Printer

Files: 1 ASCII Program

1 Binary Program

1 ASCII Text

Requires Dedicated Tape

Statements: 1767

Friendly graphing allows a 4052/54 user to easily create, modify, save, copy or draw graphs. Defaults, automatic tape marking and graph directory maintenance mean a user needs minimal 4052/54 experience.

Similar to Data Graphing (Graphing T3 062-5966-01), Friendly Graphing adds some features.

Four Graphs may be plotted on one page, with up to six curves and 52 events per graph.


In addition to the normal curve display types, a triline (triangle with dot) has been added for point plotting.

Data sources include those specified in Data Graphing plus running average, moving average, difference of two previous curves, and % of two previous curves.

Enhancing the graph design choices of Data Graphing are a zoom on events and/or curves, and a grid on both axes. Three labels with one designated as free (placed anywhere on the graph) annotate the graph. A right Y-axis aids in comprehension.

Editing has been expanded to insert data at any point, delete an event from all curves and add a new curve in any sequence.

Utility functions maintain the tape files. Curves or graphs may be saved and recalled from tape (up to 30 per tape). A new Friendly Graphing tape may be automatically produced. And graphs stored on a Friendly Graphing tape may be transferred to another Friendly Graphing tape facilitating data base exchange. The Graph/Curve Directory is automatically maintained.

For those users with the 4662 Option 31 (8-pen) Plotter, Friendly Graphing provides for different pen colors. 

4050 Series Program Updates

Package/Program/File

062-6443-01/*TEKniques* Vol. 6 No. 1 T1
Program 1/4907 to 4909 File Transfer and
Conversion Utility Documentation

The source code for this program was updated prior to its release in the *TEKniques* tape. Unfortunately, the old instructions were included in the documentation package.

Those of you who have received this tape and require the updated 4907 to 4909 File Transfer instructions, please call (503) 685-3618 (or write to the address noted on page 2) to receive a new set. The current set will carry the date of November, 1982, to identify it from the outdated set which carries a date of February, 1982. 